3. Present Situation of Environmental Problems

3.1 Natural Environment

The goals, issues and programmes regarding the natural environment of the Ten Year Perspective Development Plan 2001-2011 are shown in Table 3-1-1 and Table 3-1-2.

Table 3-1-1 Environment Goals in Ten Year Perspective Development Plan 2001-2011 (Natural Environment)

Goals	Benchmark	Projection		
	2001	2004	2010	2011
Forest cover (including state-owned and private forests)	4.8% of total land area	5.0 %	5.5 %	5.7 %
Protected areas under management (214 protected areas in Pakistan; 10.4% of the total land area of Pakistan)	4.0% of total land area	4.0 %	8.0 %	8.0 %
Land area affected by desertification	43.9 million hectares	43.9 million ha	40.0 million ha	40.0 million ha
Area under reclamation (National Drainage Programme)	1.00 million hectares	4.45 million ha	10.0 million ha	12.0 million ha

Table 3-1-2 Issues, Strategies and Programmes for Natural Environment

Issues	Strategies	Programmes
Environmental Degradation Ecosystem Management: Degraded, damaged and unproductive ecosystems, such as forests, wildlife, freshwater, wetland, deserts, coastal and marine and other ecologically sensitive areas Deforestation: The deforestation rate is approximately 7,000–9,000 hectares per year. This contributes to erosion, water logging and salinization, resulting in the loss of grassland cover and the loss of habitat of flora and fauna. Rehabilitation, restoration and upgrading of the ecosystem	Establishment of a trust fund for the protection of fragile ecosystems. Afforestation of marginal and degraded land and encouragement of agro-forestry and social forestry; Encouragement of the community management of forestry and natural resources Conservation of biodiversity; sustainable use of biodiversity;	Upland ecosystem management; marine and coastal ecosystem management; irrigated ecosystem management; wetlands management; protected area management
Environmental Policy Issues	Environment policies relating to the environment	National Sustainable Development Programme (NSDP); National Land Use Plan; Provincial Conservation Strategies; Forest Sector Master Plan; Biodiversity Action Plan; National Response Strategy on Climatic Change; Action Plan to Combat Desertification

Source: Ten Year Perspective Development Plan 2001-2011 and Three Year Development Programme 2001-2004

(1) Deforestation, Desertification and Land Degradation

1) Forests

The forest area (including scrub forests and farmland woods) in Pakistan accounts for only 4.9% of the total national land (88 million ha) even if forests in the Northern Areas (NAs) and AJK are included. This figure is much lower than that for other countries (for example, approximately 67% in Japan and 14% in China), primarily because of the natural environment in which forests are difficult to develop due to the coverage of 68 million ha (more than 77% of the national land) by arid or semi-arid areas with mean annual rainfall of 300 mm or less and the predominance of mountainous areas covered by snow and glaciers rising above the forest limit in areas with relatively high annual rainfall. Accordingly, sizable forests are coniferous forests (45%) found on south facing slopes in northern mountainous areas in the NAs and AJK and also in the western highlands, mainly in Balochistan Province, thorny bush forests (30%) mainly found in the lower reaches of the Indus Plain, riverine forests (8%) along Indus River and mangrove forests (7%) at the mouth of Indus River.

The ratio of forest area by province shows an especially high ratio of 32% for the AJK situated at the southern foot of the mountains, followed by 13 – 14% for both the NWFP and NAs. The forest area per capita is 1.06 ha for the NAs and 0.14 ha for the AJK but is extremely low at 0.02 – 0.07 ha for other provinces.

Forest administration is in the hands of the provincial forest departments. The MELGRD is responsible for the formulation and implementation of national policies, coordination of the parties involved in problems affecting more than one province. The federal activities for forest management, such as surveys, research, education and international treaties, are also conducted by the Pakistan Forest Institute, Zoological Survey Department and National Council of Conservation of Wildlife, all of which are affiliated to the MELGRD.

In 1992, the Government of Pakistan formulated the Forestry Sector Master Plan (FSMP) featuring the five fields of "Soil Conservation and Watershed Management", "Forest Management", "Wood Production and Industrial Development", "Protection of the Ecosystem and Biodiversity" and "Provincial and Federal Institutional Strengthening" following examination of the socioeconomic conditions affecting forests and identification of the causes of forest depletion. This FSMP clearly indicated investment of Rs 48 billion (approximately US$ 1,900 million based on the 1992 foreign exchange rate) to increase the forest cover from 5% in 1992 to 10% in 2018. In response, the World Bank provided a loan of US$ 25 million for the Punjab Provincial Investment Programme while the ADB provided a loan of US$ 42 million and a loan of US$ 1.5 million for the NWFP Investment Programme and the revision and monitoring of the

FSMP respectively. The recent policy guidance of maintaining independence for the formulation of forest policies from political interference as well as the socioeconomic conditions suggests that the implementation of the FSMP in the past has not been necessarily smooth. Recent policies emphasise clarification of the resources management responsibility and stricter regulations and monitoring.

To be more precise, an afforestation campaign involving the private sector and NGOs is in progress with the cooperation of international organizations for the protection of nature and the World Bank. Some 142 – 172 million seedlings a year are being planted under this campaign, mainly in the NWFP and AJK, and some 28,8000 ha are said to have been planted in 2000. Meanwhile, deforestation is said to be attributed to disorderly cutting, the opening up of forests to create farmland, deterioration of the land fertility and decline of the river discharge. Despite the above-mentioned afforestation campaign and post-cutting reforestation efforts, the annual depletion of 7,000 – 9,000 ha is still observed. In reality, forest loss is estimated to be taking place at a rate of 40,000 ha (0.9% of the forest area) a year, necessitating a strong call for the employment of measures to arrest land degradation, participatory forest management and sustainable forest management.

Table 3-1-3 Forest Facts in Pakistan

	Item	Area (million ha)	Percentage
A	Total Land (include NAs & AJK)	87,980	
B	Total Forest Area	4,280	4.9% / A
C	Productive Forest	1,120	26.2% / B
D	Annual Afforestation (2000)	28.8	0.7% / B, 2.6% / C
E	Annual Reforestation (2000)	23.8	0.6% / B, 2.1% / C
F	Annual Loss of Forest	7 – 9	0.2% ± / B

Source: Annual Progress Report 2001-2002, PFI, etc

Table 3-1-4 Internationally Supported Major Forestry Sector Projects

Title	Cost	Duration	Implementation	Donor
Environmental Rehabilitation in NWFP and Punjab (ERNP)	31.80 m euros	7 years	Forest Dep., Govt. of NWFP & Punjab	EC
Small Grants Programme for Operation to Promote Tropical Forests	15.132 m euros	5 years	UNDP	EC
Punjab Forest Sector Development	US$ 33.75 m	6.5 years	Punjab Forest Dep.	WB
Balochistan Natural Resources Management Project	US$ 17.8 m	6 years	Balochistan Forest and P&D Dep. - through a Project Management Unit	WB
Forestry Sector Project, NWFP	10.64 m euros	8 years 1996-2001		RNE (Netherlands)

Conservation of Mangrove Forests in the Coastal Areas of Sindh and Balochistan	1.47 m euros	5 years 1996-2003		RNE (Netherlands)
Loan # 1403-PAK & TA # 2563 – PAK Forestry Project	US$ 23.297 + 14.145 m	7 years 1996-2003	Dep. of Forestry, Fisheries and Wildlife (FD) in NWFP	ADB

2) Desertification and Land Degradation

The UN Convention to Combat Desertification defines desertification as the degradation of land in arid, semi-arid and dry sub-humid areas, primarily caused by human activities and climatic variations. In order to achieve the goals of the UN Convention, Pakistan takes the desertification control measures aimed at preventing and controlling all land degradation processes caused by human activities and climatic variation. Those measures are not simply preventing the spread of sand-covered land.

The phenomenon of desertification, in fact, includes all types of land degradation, such as soil erosion (water erosion and wind erosion), water-logging, salinization and surface soil covering by flood, all of which are highly noticeable in arid areas. The reason for the inclusion of land degradation in the broader definition of desertification is that the ecosystem in arid areas is extremely vulnerable to climatic variations, excessive harvesting and inappropriate land use.

As Pakistan has 68 million ha of arid or semi-arid areas with annual rainfall of 300 mm or less, mainly in Punjab, Sindh and Balochistan Provinces, accounting for some 80% of the total national land, it is generally vulnerable to land degradation.

Meanwhile, land degradation is also caused by such human factors as a decline of the erosion resistance due to cultivation and the excessive cutting of trees, the decline as well as over-running of vegetation due to over-grazing and inefficient water use due to deterioration of the old irrigation network.

Desertification control measures are considered to be part of the development efforts for sustainable agriculture and forestry and special emphasis is placed on the participatory management of natural resources and enhancement of the environmental awareness among the public. The control of soil erosion is important for watershed management for dams and is also expected to have the economic effect of suppressing the decline of the efficiency of hydropower generation by reducing the speed of sedimentation.

(2) Biodiversity and Ecosystem

Pakistan ratified the Convention on Biological Diversity (CBD) in 1994 and the Biodiversity Action Plan for Pakistan (BAP) formulated in 2000 was the first attempt to implement the CBD. This BAP was formulated based on agreement with the World Bank, GEF and IUCN and plans the implementation of 25 different activities for 13 components of the CBD in cooperation with the WWF.

Here, the reorganization and strengthening of the implementing bodies, particularly the MELGRD which plays a central role and provincial government organizations as front-line implementing bodies, are required to start with together with promotion of the cooperation of various government organizations, local communities and NGOs.
Review of the protected area (PA) system where the management of more than 200 protected areas is found to be insufficient, strengthening of the system management and conservation through the use of sustainable bio-resources are considered to be important field activities.

The cooperation of international organizations includes the input of UNDP and EU funds via the GEF and the actual field work is being conducted by the forest departments of the NWFP and NAs, etc. with the cooperation of the WWF. The main projects in progress regarding conservation of the ecosystem and the protection of biodiversity are listed in Table 3-1-5. In addition, funding of Rs 4 million by the UNDP has been decided for the construction of the Islamabad Botanical Gardens under the NEAP-SP.

Table 3-1-5 Major Projects for Biodiversity

Title	Cost	Area	Funding	Remarks
Pakistan Mountain Areas Conservancy Project (MACP)	US$ 10.35 m	NWFP, NAs 16,000km^2	GEF, UNDP, IUCN, EU	Cooperation for the conservation of habitat and species, development, education, trust fund.
Protected Areas Management Project (PAMP)	US$ 10.73 m	3 PAs, Sindh, Balochistan, NWFP	GEF	Management of protected areas; community participation in the conservation and management of biodiversity; management of natural resources
Palas Conservation and Development	US$ 5.6 m	NWFP	EU, WWF, (UK)	Fragile ecosystem in the western Himalayas, particularly the protection of the bird diversity
Protection and Management of Pakistan Wetlands	(US$313,800)	Balochstan, NWFP etc.	GEF, WWF	Various project proposals are prepared by the government and NGOs, aiming at community-based management. Each project cost is not yet finalised. The figure in brackets is funding for the MELGRD for project preparation.

3.2 Urban Environment

The goals, issues and programmes regarding the urban environment of the Ten Year Perspective Development Plan 2001-2011 are shown in Table 3-2-1 and Table 3-2-2.

Table 3-2-1 Environment Goals in Ten Year Perspective Development Plan 2001-11 (Urban Environment)

Goals	Benchmark	Projection		
	2001	2004	2010	2011
Air pollution: cost of treating resulting human diseases	Rs. 25.0 billion	Rs. 35.0 bil.	Rs. 10.0 bil.	Rs. 8.0 bil.
Access to adequate sanitation (percentage of population)	Urban: 59% Rural : 26%	65% 32%	76% 42%	80% 45%
Urban solid waste management	25% of total SW generated	30%	50%	55%

Table 3-2-2 Issues, Strategies and Programmes for Degradation of Urban Environment

Issues	Strategies	Programmes
<u>Air Pollution</u> Suspended particulate matters in big cities are about 6 times higher than the WHO standards. Air pollution is mainly due to the following: • Vehicular emissions • Industrial gaseous emissions • Indoor air pollution Objective: Provision of a clean living and work environment	• Institutionalization of the pollution charge enforcement system • Inter-fuel substitution and the introduction of clean fuels • Strict enforcement of the EIA regulations for gaseous emissions • Control of the indoor air quality	Phasing out of lead from gasoline; phasing out of sulphur from diesel/furnace oil; promotion of CNG, including public transportation; periodic testing of motor vehicles and strengthening of the institutions for motor vehicle examination; full-scale implementation of the SMART programme; promotion of efficient wood stoves; promotion of biogas plants and extension of natural gas / bottled gas to forest areas
<u>Water Quality</u> The poor quality of waterways is causing a threat to health and the loss of aquatic ecosystems and biodiversity. Sewage systems are also a significant source of the pollution of drinking water. Water pollution is mainly due to the pollution of surface and underground water resources caused by the following:	• Institutionalization of the pollution charge system • Improvement of the operation of the existing sewage system and treatment plants • Installation of an additional number of treatment plants • Control of the drainage of untreated domestic waste water into open streams where sewage systems exist	Improvement of the awareness of the effects of poor water quality on human health; capacity controlling drainage of untreated domestic waste water into open streams; improvement of existing sewage systems and treatment plants; empowerment of local governments for the collection of taxes for the development and management of municipal services

• Domestic, municipal and industrial effluent • Pesticides and fertilizers • Disease burden due to the use of untreated drinking water	• Management of fresh water resources • Control of marine pollution • Increase of organic farming with improved pesticides and fertilizer application	• Full implementation of the Self-Monitoring and Reporting (SMART) Programme for industry • Establishment of a pollution charge system; enhanced enforcement of EIA regulations • Environment zoning of industrial activities • Improvement of pesticide and fertilizer application practice through information dissemination and education for farmers; alternative pest control methods
<u>Solid Waste Management</u> The existing capacity to safely dispose of solid waste is only 25% of the total solid waste generated by both municipal and industries. The main issues are as follows: • Inadequate and inappropriate collection and disposal of municipal solid waste • Lack of adequate disposal of industrial solid and toxic waste • Empowerment of local government institutions for proper monitoring, collection and disposal of municipal and industrial solid waste	• Promotion of reuse and recycling by the privatization of collection • Introduction of a streaming waste collection system • Composting of municipal solid waste • Establishment of proper landfill sites • Safe disposal of industrial toxic and hazardous waste and hospital waste	Development and implementation of innovative mechanisms by mobilizing local communities and resources for community-based disposal schemes; establishment of composting sites and municipal incinerators if required in all major cities and towns; streaming waste grading, recycling and waste collection; charge for waste collection and disposal; establishment of NEQS for industrial solid waste; establishment of regulations for the transportation and disposal of industrial solid waste

Source: Ten Year Perspective Development Plan 2001-2011 and Three Year Development Programme 2001-2004

(1) Water Pollution

1) Situation of Water Pollution

The situation of water pollution in Pakistan has been analysed based on the findings of various studies conducted in 2000 and thereafter, including river water quality investigation in Islamabad, Rawalpindi and Lahore, a water quality survey at drinking water sources for major cities and a water quality study on industrial waste water in Karachi as listed in the table below.

Table 3-2-3 Investigation Reports on Water Quality in Pakistan

	Title	Issue	Study Period
1	Three Cities Investigation of Air and Water Quality (Lahore, Rawalpindi and Islamabad)	June, 2001 / JICA – Pak-EPA	4-29 Apr., 2000
2	Water Quality Status in Pakistan (Report 2001-2002)	October, 2002 / PCRWR	2000
3	Investigation of Actual Conditions of Pollution by Industrial Toxins in Karachi	March, 2001/ OECC / Pak-EPA	Jan.-Feb., 2001
4	Basic Study for Formulation of a Project to Deal With Industrial Waste Water in Karachi (Japanese)	May, 2003 / JICA	Mar., 2003

① River water Quality

When compared to the environmental standards in Japan (Type C Rivers), the DO, total nitrogen, BOD and coli-form group in rivers in Pakistan far exceed the relevant Japanese standards.

A BOD above 100 mg/litre is detected at 14 out of 20 sites in Lahore and three out of 20 sites in Islamabad and Rawalpindi. In the case of Lyari River and Maril River to which industrial waste water is discharged, the detected BOD and TSS values are 212 – 848 mg/litre and 71 – 636 mg/litre respectively, far exceeding the effluent standards.

② Environmental Load of Waste Water

Domestic and industrial waste water in Lahore initially undergoes simple treatment prior to storage at six ponds, followed by discharge to Ravi River. The total discharge volume is 963,772 m^3/day and the BOD load is estimated to be 200 – 250 tons/day.

The city of Karachi discharges waste water at a rate of 1,280,000 m^3/day, consisting of 1,100,000 m^3 of untreated sewage, 100,000 m^3 of treated sewage and 80,000 m^3 of industrial waste water. The BOD load is estimated to be 220 tons/day from untreated sewage, 6 tons/day from treated sewage and 56 tons/day from industrial waste water, totalling 282 tons/day.

③ Industrial Waste Water

Most of the samples of industrial waste water collected in Karachi exceeded the NEQS. Waste water from the leather industry in particular shows a chromium level of 110 mg/litre which is approximately 110 times higher than the relevant NEQS while waste water from the battery industry shows a lead level of 41.1 mg/litre which is some 82 times higher than the relevant NEQS. In regard to the BOD, waste water from the steel industry (85 mg/litre) and chemical industry (1,590 mg/litre) far exceeds the relevant NEQS standard of 80 mg/litre (discharge to inland water bodies).

④ Pollution of Groundwater/Drinking Water

A survey on the drinking water quality was conducted at 287 sites in 21 cities and it was found that the coli-form group exceeds the relevant WHO standard at more than 70% of these sites, presumably because of the inflow of untreated domestic water to rivers, etc., contaminating the sources of drinking water. The levels of arsenic, fluorine and iron also exceed the relevant WHO standards are many sites.

The water quality survey on groundwater at seven sites in the industrial zone of Karachi detected values which even exceed the industrial effluent standards at two sites. The detected levels of such heavy metals as lead, cadmium, chromium, mercury, arsenic and cyanogen exceed the relevant WHO standards for drinking water at most sites.

2) Situation of Damage to Health, etc.

The bacterial pollution of drinking water is likely to cause such diseases as diarrhoea, dysentery, typhoid, cholera, hepatitis, stomach ailments and dyspepsia. Reflecting the finding that colon bacilli are found in more than 70% of the drinking water analysis samples, the number of patients and rate of incidence are high for diarrhoea, intestinal infections, amoebic dysentery and bacillary dysentery in urban areas, particularly in Multan and Peshawar. Water-borne diseases account for more than 60% of all deaths of those aged 14 years or younger.

3) Causative Factors for Water Pollution

The causative factors for water pollution are described in Table 3-2-4.

Table 3-2-4 Causative Factors for Water Pollution

Causative Factors	Characteristics of Pollution Sources
Plant Operation (Industrial Waste Water)	• Industrial waste water is discharged practically untreated. Organic pollution and heavy metal pollution typically shown in terms of the BOD are believed to almost exclusively originate from industrial plants. Waste water from the leather industry and chemical industry contains a particularly high concentration of chromium. • In Lahore, 963,772 m^3 of waste water (including domestic waste water) a day is discharged to Ravi River via six treatment ponds, generating an estimated BOD load of 200 – 250 tons/day. • Karachi has an industrial water demand of 80,000 m^3/day and the BOD concentration of industrial waste water is approximately 700 mg/litre, causing a BOD load of 56 tons/day. • Industrial waste water adversely affects not only river water but also groundwater through infiltration into the ground. As a result, contaminated groundwater is believed to be the source of such infectious diseases as dysentery, cholera and hepatitis as well as diarrhoea and digestive diseases. • High levels of such heavy metals as mercury, chromium, lead, arsenic and zinc, etc. are detected in fish caught around the industrial zone and the coast of Karachi, causing concern in regard to adverse impacts on the local ecosystem.
Domestic Waste Water	• Domestic waste water is largely discharged without any prior treatment. In Karachi, while the BOD concentration of domestic water is thought to be one-third of that of industrial waste water, domestic waste water is still a major source of the organic pollution of water. • The BOD concentration of urban waste water in Karachi is 200 mg/litre and the water demand and BOD load are estimated to be 1.2 million m^3/day and 226 tons/day respectively.
Deterioration of Water Supply and Sewer Pipelines	• The development of the water supply system in large cities has fallen behind the demand increase and the theft of water through illegal connection to water supply lines is taking place. Illegal connection to sewer lines by households and plants is also common. As a result, there is much leakage from both types of service lines, causing a problem of pollution of the water supply.

4) Development Situation of Legal Framework

The National Environmental Quality Standards (NEQS 1993; Revised NEQS 2000) form the only regulatory framework for urban and industrial waste water in Pakistan. The WHO Guidelines for Drinking Water are used as the standards for drinking water.

5) Water Quality Conservation Measures (by Pakistan and Donors)

① Measures Dealing with Stationary Emission Sources of Water Pollution: Self-Monitoring, Reporting Tools System and Penalty System

The Pak-EPA has introduced several compulsory requirements to make local companies abide by the NEQS. These include self-monitoring and reporting by companies (NEQS Rules, 2001) and the payment of an industrial pollution charge by companies violating the effluent standards (Industrial Pollution Charge Rules, 2001).

② Preferential Tax System

A preferential tax system is included in the Law of Customs Duty as a system to provide incentives for companies to invest in the environment.

③ Assistance by International Organizations

International assistance to improve water pollution in Pakistan is mainly provided in terms of capacity building (ADB and Norway, etc.) and the development and extension of cleaner production (UNIDO, ADB and the Netherlands, etc.). The Netherlands is providing funds and technical guidance for the Korangi central waste water treatment facilities in Karachi which are under construction by the Tanners Association.

④ Japanese Assistance

At present, a long-term expert is dispatched to Pakistan to clarify the present situation of water pollution and to train human resources to assist the environmental administration in Pakistan.

In 2003, a basic study to formulate a project to mainly deal with industrial waste water in Karachi was conducted by the JICA. In addition, a preliminary study was conducted with a view to providing grant aid for a project to develop an environmental monitoring system in major cities.

Table 3-2-5 Japanese Assistance (Water Pollution)

	Project	Year of Reporting and Implementing Body	Period
1	Three Cities Investigation of Air and Water Quality (Lahore, Rawalpindi and Islamabad)	June, 2001 / JICA – Pak-EPA	4th – 29th April, 2000
2	Dispatch of Long-Term Experts	JICA	Continued from 1999

6) Monitoring System and Equipment, etc.

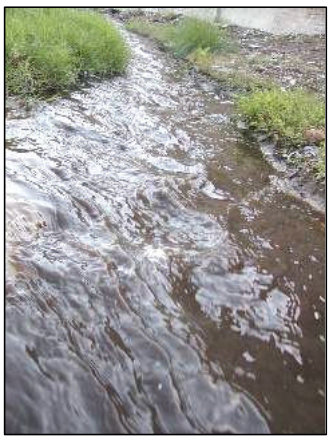
In order for a water analysis laboratory to obtain official authorization, application and approval based on the NEQS Rules 2001 (Approval of Laboratories Conducting Environmental Analysis) are required. According to the JICA's Report, thirty five (35) laboratories are authorized in the nation.

Among public sector laboratories, the Pakistan Council of Research in Water Resources (PCRWR) of the Ministry of Science and Technology has an excellent range of equipment and conducts the analysis of the coliform group and others which the Pak-EPA is unable to analyse.

Situation of Water Pollution and Improvement Efforts in Peshawar

- **Situation of River water Pollution**

Rivers in the city of Peshawar are classified into natural rivers and irrigation channels. Basically, there is no natural water flow in the natural rivers apart from at the time of rain and urban and industrial waste water runs through these rivers throughout the year. One paper plant in the Hayatabad industrial area, which is the main industrial area in Peshawar, discharges "black liquor" which is waste water from the process of removing non-fibre substances. Water quality analysis using simple equipment found a pH value of 9.0 and a COD value of 100 mg/litre or higher, both of which are higher than the relevant effluent standards.



Effluent from a paper mill in the Hayatabad industrial area

Note: Generating process of black liquor
The raw materials for paper are largely classified into wood and non-wood (bamboo, ditch reeds, rice straw and kenaf, etc.). These are treated with sodium hydroxide and sodium sulphide to remove the non-fibres from wood and to bind the fibres for non-wood. The solution resulting from this treatment is called black liquor which shows alkalinity. Even though it is not very toxic to the human body, it is still a major cause of organic pollution.

- **Response by the EPA**

The NWFP-EPA demands that companies discharging industrial effluent conduct self-monitoring and submit reports (Self-Monitoring and Reporting by Industries, NEQS Rules 2001) and also provides guidance. As companies which were found to discharge polluting effluent have failed to implement improvement measures, the NWFP-EPA is preparing to bring cases to the Environmental Protection Tribunal in Lahore.
While the integrated treatment of both domestic waste water and industrial waste water from the Hayatabad Town has been planned, waste water which is only treated at a sedimentation basin is currently discharged to a river because of the deterioration and damage of the waste water treatment plant.

Downstream of a river in the Hayatabad industrial area
The river water appears black which is said to be caused by a paper mill and oil plant in the upperstream

- **Situation of Drinking Water**

Drinking water is said to be polluted nationwide because of illegal connection to the water supply line. Peshawar is no exception and there are many places where a hole is made in the water supply pipe to take water without payment and the supply water is in contact with ambient water. A newspaper in Peshawar has reported that water-borne diseases (dysentery and cholera, etc.) frequently occur in suburban areas (Polluted Water Spreading Diseases in Peshawar Suburbs: The News on 2nd November, 2003).

Waste water treatment plant in the downstream of the Hayatabad industrial area
This plant only functions as a sedimentation basin and the bad odour of methane from the basin spreads around the plant. The Peshawar Municipal Authority has no plan to rehabilitate this plant but plans to construct a new plant further downstream and to develop a new housing complex by landfilling this plant.

Concern for pollution due to damage or illegal connection to the water supply line:
This water supply line laid along the median strip has a hole and the standing water around it flows into the water supply system. →

(2) Air Pollution

1) Situation of Air Pollution

The general situation of air pollution in the three major cities in Pakistan can be understood from the document listed below.

Table 3-2-6 Report on the Situation of Urban Air Quality

Title	Issue	Study Period
Three Cities Investigation of Air and Water Quality (Lahore, Rawalpindi and Islamabad)	June, 2001, JICA and Pak-EPA	4th – 29th April, 2000

The investigation on the air quality referred to in Table 3-2-6 was conducted in April, 2000 jointly by the JICA and the Pak-EPA, featuring roads with heavy traffic and industrial areas in Lahore, Rawalpindi and Islamabad. The number of sampling sites for air quality analysis was 10, consisting of five in Lahore, three in Rawalpindi and two in Islamabad. Compared to the WHO standards, the NO_2 and SPM levels were higher at two sites and all 10 sites respectively. Among heavy metals, the detected level of lead, presumably originating from vehicular emissions, far exceeded the standard. The detected levels of CO, SO_2 and NO_2 (as the difference between NOx and NO) were four to eight times higher than those in Japan. In Lahore, winter smog occurs due to the domestic fuel consumption for heating purposes and the use of low quality fuel at various plants and is said to be the cause of respiratory as well as cardiovascular illnesses.

2) Situation of Health Damage, etc.

Although the relation to air pollution has not been clearly established, the number of people suffering from respiratory illnesses which are assumed to be caused by emission gases from vehicles and plant offgas is increasing in urban areas. Illnesses most affecting the public are cataracts and pneumonia, followed by such chronic illnesses as bronchitis and asthma and those affecting the pharynx and tonsils. Cataracts and pneumonia are two illnesses with a high rate of incidence, particularly in Abottabad and Peshawar.

In areas close to industrial areas in Islamabad, SPM, hydrogen sulphide and other hazardous substances are discharged from ironworks and fertiliser plants and are said to cause serious health damage to local residents. In Lahore, 1,300 out of 3,000 plants are said to discharge harmful substances.

3) Causative Factors for Air Pollution

The causative factors for air pollution are described in Table 3-2-7.

Table 3-2-7 Causative Factors for Air Pollution

Causative Factor	Characteristics of Pollution Sources
Road Traffic (Mobile Sources)	• Vehicular emissions in Lahore are believed to be responsible for 92% of CO, 89% of C_NH_M (hydrocarbon), 63% of NOx, 50% of SO_2 and 17% of SPM. • The underlying reasons for the acceleration of air pollution due to vehicular emissions are (i) the significant increase of the number of vehicles (between 1991 and 1997, the rate of increase in Punjab Province was 11.54% for all vehicles, 9.52% for passenger cars, 13.62% for motorbikes, 9.83% for light trucks, 6.53% for large trucks and 6.1% for buses), (ii) the high average age of vehicles, (iii) the use of leaded petrol and (iv) the high pollutant emission level due to the high percentage of diesel engine vehicles and two stroke vehicles (motorbikes and auto-rickshaws).
Plant Operation (Stationary sources)	• Almost all plants emit exhaust gas without purification. In Islamabad, damage to the health of local people due to the emission of a large quantity of PM from an ironworks and hydrogen sulphide from a fertliser plant has been reported. • A study by the Institute of Public Health Engineering and Research in 1983 estimated that plants were responsible for 68% of SPM. • Winter smog is caused by the decline of the use of less polluting fuel (natural gas) by plants because of its priority sale to domestic users, resulting in the consumption of large quantities of low quality fuels (kerosene, diesel oil and coal) by plants.
Natural Origin	• Plant offgas and vehicular emissions account for approximately 68% and 17% of SPM respectively with the remainder presumably originating from household and soil particles.

Source: Three Cities Investigation of Air and Water Quality (Lahore, Rawalpindi and Islamabad), June, 2001, JICA-PakEPA

4) Development Situation of Legal Framework

While air quality standards are set under the NEQS 1993 and the Revised NEQS 2000, the standard for NOx is the only practical standard for the ambient air quality. Meanwhile, standards regarding plant offgas, etc. are set for 16 items in addition to SO_2 and NOx as well as a set of standards for vehicular emissions.

5) Air Quality Conservation Measures

① Measures to Deal with Stationary Sources of Air Pollution: Self-Monitoring and Reporting Requirements and Penalty System

The Pak-EPA has introduced self-monitoring and reporting by companies as compulsory requirements to make companies abide by the NEQS. Any company found to exceed the emission standards based on a report compiled by the SMART

(Self-Monitoring and Reporting Tool) is required to pay an industrial pollution charge which is calculated based on the amount of excess emission.

② Preferential Tax System

A preferential tax system is included in the Law of Customs Duty as a system to provide incentives for companies to invest in the environment.

③ Measures to Combat Mobile Sources of Pollution: Establishment and Activities of the VETS

In 1997, the Vehicular Emission Testing Station (VETS) was established in Peshawar with the assistance of the GTZ for the purpose of preventing air pollution originating from vehicular emissions. While the development of a national network of the VETS is planned, firm funding has not yet been secured.

④ Japanese Assistance

Since 1999, the JICA has dispatched a series of long-term experts to conduct environmental monitoring and the training of human resources to assist the environmental administration in Pakistan. In addition, a preliminary study has been conducted with a view to providing grant aid for a project to develop an environmental monitoring system in major cities.

6) Monitoring System and Equipment, etc.

In order for a water analysis laboratory to obtain official authority, application and approval based on the NEQS Rules 2001 (Approval of Laboratories Conducting Environmental Analysis) are required. There are 35 approved laboratories nationwide.

Situation of Air Pollution and Improvement Efforts in Peshawar

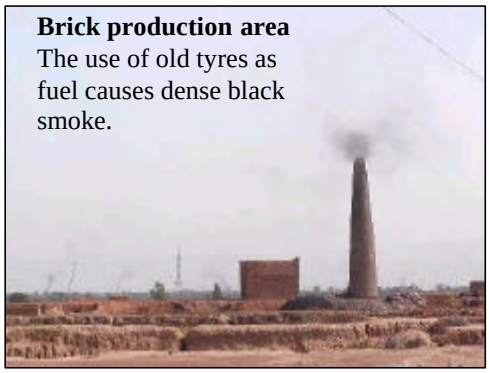
- **Situation of Air Pollution**
  Using a simple analyser (detector tube), the air quality was analysed at a site on Saddar Road because of the seemingly high level of air pollution there. The analysis results are shown in the table below. Based on a simple comparison with the situation of air pollution in Japan (average annual values), the levels of NOx and SO_2 detected at this site were some three times and eight times respectively higher than the Japanese levels. The air quality was poor enough to cause coughing and a sore throat.

Traffic jam at a roundabout in Peshawar
The area is foggy because of the high number of diesel engine vehicles, auto-rickshaws and old cars with a high emission factor.

Air quality measured on Saddar Road in Peshawar

Item	Saddar Road (at 12:00 noonon 13th October, 2003)	National Average in Japan (the Emission Gas Analysis Bureau, 2002)
NOx	0.2 ppm	0.073 ppm (NO average value + NO_2 average value)
SO_2	0.05 ppm	0.006 ppm

In the suburbs of Peshawar, there are more than 300 brick kilns where old tyres are used as additional fuel and the resulting black smoke is said to fill the sky around them from time to time. While the NWFP-EPA provides guidance, the use of old tyres is still popular because of their low cost and ability to make the produced bricks a reddish-brown colour which makes them appears like high quality bricks.



Brick production area
The use of old tyres as fuel causes dense black smoke.

- **Efforts to Regulate Vehicular Emissions in NWFP**
  These photographs show the inspection conducted at the VETS which was established with the assistance of the GTZ. While emission control in Pakistan features black smoke and CO, the VETS only checks black smoke and issues a certificate of vehicle inspection to those passing the black smoke inspection.

(3) Other Types of Pollution

1) Road Traffic Noise and Soil Pollution

① Road Traffic Noise

No published data is available on road traffic noise in Pakistan because of the absence of any relevant survey. The situation of road traffic noise measured in the Kantoment area along Saddar Road in Peshawar during the field survey showed an extremely high level of noise pollution. The 83.2 dB (A) recorded exceeds the suggested limit of the Noise Control Law of Japan by more than 8 dB (A).

Table 3-2-8 Road Traffic Noise Survey Result Using Simple Equipment

Survey Date	12:00 noon on 13th October, 2003
Location	Saddar Road in Kantoment Area in Peshawar
Result	83.2 dB (A), 10 min. Suggested limit by the Noise Control Law of Japan: 75 dB (A)

Table 3-2-9 shows the estimated number of vehicles in Pakistan which increased by fivefold in 20 years, suggesting that the problems of road traffic noise and air pollution due to traffic jams will become more prominent without improvement of the road conditions as well as the standard of the vehicles on the road.

Table 3-2-9 Number of Vehicles in Pakistan

Vehicle Type	Fuel Type (Petrol/Diesel/CNG/LPG)	Traffic Volume		Rate of Increase (%)
		1980	2000	
Delivery Vans (Suzuki Vans)	D/P	8,503	109,722	1,190
Motorbikes	P	287,622	2,113,078	634
Taxis	P/D/CNG/LPG	148,334	748,909	405
Trucks	D	34,193	158,649	364
Buses	D	25,275	919,190	264
Auto-Rickshaws	P	31,950	93,300	192
Total	-	682,059	4,293,836	530

② Situation of Soil Pollution

Although there is no official data on soil pollution, it is said that agrochemicals of which the use has been prohibited are still leaving without management, resulting in soil pollution. As part of the pilot project in the NWFP, the GTZ conducted an inventory survey and discovered the existence of 185.5 tons of past-date pesticides at 150 illegal storage sites in the province. Ninety tons were subsequently restored at appropriate warehouses following their transfer to sealed safe containers, etc. and 50 tons were incinerated in the UK with the transportation cost being paid by Germany and the manufacturers. In the case of the remaining pesticides of which

the ownership was not established, it was decided to examine the possibility of their transfer to warehouses in other provinces where there was extra room for storage. No information was obtained regarding the areas and levels of soil pollution.

2) Causative Factors for Road Traffic Noise

The causative factors for road traffic noise are described in Table 3-2-10.

Table 3-2-10 Causative Factors for Road Traffic Noise

Causative Factor	Characteristics of Pollution Sources
Sources	• Relatively high ratio of vehicles with a comparatively high power level, such as old/deteriorated/poorly maintained cars, auto-rickshaws and motorbikes • High level of vehicle travelling noise due to the poor road surface
Traffic Flow	• Proximity of noise sources in urban areas due to traffic congestion caused by the heavy traffic volume • Severe traffic congestion due to the non-observation of traffic regulations and mixed traffic (pedestrians, light vehicles and animals and motor vehicles)

3) Development Situation of Legal Framework

The Revised NEQS 2000 which were set forth pursuant to the provision of the Pakistan Environmental Protection Agency Ordinance (1983) includes a noise standard for single vehicles. There is no environmental standard for noise in general areas or roadsides.

Table 3-2-11 Noise Standard of NEQS

Item	Standard	Measuring Method
Noise	85 dB (A)	To be measured at a distance of 7.5 m from the noise source

4) Road Traffic Noise Reduction Measures

Nationwide public awareness of the noise problem is not particularly high. However, the NWFP-EPA, traffic police and military police jointly conduct a campaign to control vehicles equipped with an excessively loud horn in Peshawar and have removed such horns from 3,517 vehicles.

Under the GTZ project, an inexpensive silencer for auto-rickshaw was developed with the cooperation of the traffic police, Pakistani engineers, Union of Rickshaw Drivers and government officials to reduce the noise generated by auto-rickshaws. They installed the silencers to 7,400 auto-rickshaws in 2000 – 2001. It has been reported that the test results indicate a reduction of the noise level to 80 dB which is lower than the environmental standard for noise of 85 dB.

(4) Solid Waste

1) Situation of Solid Waste Management in Pakistan

The following paragraphs summarize the current situation regarding solid waste management in Pakistan, based on the following literature and field surveys implemented by the OECC Study Team in October 2003.

Table 3-2-12 Report on Solid Waste Management Conditions

Title	Issue	Study Period
Final Report For Domestic Solid Waste Management In Pakistan	JICA April 2002	February 25 ~ April 15, 2002
JICA expert work report (Japanese)	Akio Ishii	Ibid
The Study on Comprehensive Flood Mitigation and Environmental Improvement Plan of Lai Nullah Basin In the Islamic Republic of Pakistan	CTI engineering International CO., LTD. Pacific Consultants International	July 2003
Ten Year Perspective Development Plan 2001-11 and Three Year Development Program 2001-04	Government of Pakistan Planning Commission	September 1, 2001
Revised Draft Hospital Waste Management Rules 2002	Environmental Health Unit Health Services Academy Ministry of Health Islamabad	2002

① Legislation and programmes regarding solid waste management

Pakistan currently has no comprehensive federal law for dealing with waste products; moreover, definitions concerning waste are not clearly established. Each province and city tackle waste management issues based on independently formulated guidelines and ordinances, however, some areas do not even have these limited systems. Even when such systems do exit, they are limited to routine waste collection and treatment, but no long-term plans (master plans) are compiled based on data of the actual amount of generated waste, etc.

② Discharged quantities of waste

It is said that 47,920 tons (19,190 tons in cities, 28,730 tons in rural areas) of waste is generated every day in Pakistan. However, since these figures are merely estimate values based on visual observations and so forth, they lack the reliability of actual measurements obtained from weighing equipment, etc.

③ Waste collection rate

Low waste collection rates lead to more illegal disposal and deterioration of urban landscapes, etc. The waste collection rate is reported as 25% (2001), but it is intended to increase this to 30% by 2004 and 50% by 2010 during the Ten Year Perspective Development Plan 2001-2011.

④ Hospital waste

Inappropriate disposal of hospital waste, in particular infectious waste, leads to epidemics of infectious diseases and so on. Accordingly, it is particularly necessary to treat infectious waste separately from domestic waste. The inappropriate disposal of infectious waste not only causes direct damage to the health of waste collection staff in hospitals and scavengers, etc. on disposal sites, but also the re-use of medical implements such as syringes, etc. can adversely affect ordinary patients. In Karachi, due to current shortages of plastic raw materials, there are reports of hospital waste derived from imported medical supplies being used to make recycled plastic.

Hospitals in Lahore and Shalamar previously compiled their own excellent guidelines for waste treatment, however, the federal Ministry of Health has since issued the Hospital and Biochemical Waste Management and the Hospital Waste Management Rules 2002, and the Specifications & Guideline on Hospital Waste Incinerators, and these prescribe methods for the handling, storage, transportation and disposal of hospital waste. However, nationally speaking, the level of awareness concerning hospital waste treatment is low and it is hoped that the above guidelines, etc. will be thoroughly advertised and regulations strengthened nationwide in future.

⑤ Final disposal situation

In Pakistan, there is hardly any planned development of disposal sites based on generated quantities of solid waste. Actual waste management is limited to waste collection, transportation and land filling, while waste carried into disposal sites is simply dumped in the open without undergoing any special treatment. There are hardly any disposal sites that implement earth covering following disposal.

2) International Assistance in the Waste Sector

The following table summarizes past assistance projects by international agencies in the waste sector.

Table 3-2-13 Assistance by International Agencies in the Waste Sector

Year	City	Donor	Loan / Grant	Name of Project	Contents
1986-	Islamabad	Japan	Grant Aid	CMTA	-
1989-91	Lahore	World Bank	Loan	Garbage Collection & Disposal Project	Collection equipment
1990-92	Karachi	ADB	Loan	Karachi Special Development Project I	Collection equipment
1991-92	Karachi	Japan	Grant Aid	Karachi Environmental Improvement Project	Collection equipment
1992-93	Karachi	Japan	Grant Aid	Karachi Environmental Improvement Project	Collection equipment
1995-96	Peshawar	ADB	Loan	Project Management Unit, Phase I	Collection equipment
1995-97	Karachi	ADB	Loan	Karachi Special Development Project II	Collection equipment
1995-	Hyderabad	Spain	Loan	Hyderabad Development Authority	Collection equipment
1996-	Peshawar	ADB	Loan / Grant Aid	Project Development Unit, Phase I	Collection equipment
1996-97	Peshawar	Germany	-	Urban Industrial Environment Protection I	Project study
1996-	Rawalpindhi	Japan	Grant Aid	Rawalpindhi Urban Waste Treatment Improvement Project	Project study
1996-	Rawalpindhi	Japan	Grant Aid	Rawalpindhi Urban Waste Treatment Improvement Project	Collection equipment
1996-	Quetta	Japan	Grant Aid	Quetta Urban Environmental Improvement Project Basic Design Study	Project study
1999-2001	Rawalpindhi	UNDP	-	SWEEP	Citizen participation and citizen education
-	Lahore	Netherlands	Grant Aid	Hospital Waste Treatment System	Shalimil Hospital incinerator
2002-	EPA	Japan	Grant Aid	JICA Short Term Experts	t

Source: Report by JICA short-term expert (Akio Ishii, 2002)

3) Present Situation of Waste Management in Major Cities

① Outline of Waste Management in Major Cities

Following completion of the site surveys (Islamabad and Peshawar) by the OECC Study Team in October 2003, a questionnaire survey of waste management conditions was implemented via the local governments in five major cities (Peshawar, Multan, Hyderabad, Quetta, Faisalabad) in January 2004. By referring to the questionnaire findings given in the Final Report for Domestic Solid Waste Management in Pakistan issued by JICA in April 2002, it is possible to roughly ascertain the situation of waste management in Pakistan's major urban centers.

Figure 3-2-1 Major Cities in Pakistan

Table 3-2-14 shows population, generated amount of waste and budget, etc. in major cities in Pakistan. The per capita amount of waste generated per day was calculated from the figures for population and generated amount of waste obtained from the questionnaire. Concerning budget, this was calculated per ton of waste.

The ratio of population targeted by waste collection varied from 100% in cities like Quetta to 20% or less in cities such as Peshawar. The waste collection rate was around 60-70% in most cities. As for budget per ton of waste, this also varied greatly from less than 100 to a few thousand rupees.

Overall, there are cases where the figures are thought to be no more than estimates, certainly for population but particularly for generated amounts of waste and collection amounts. An issue for future attention will concern how to acquire more accurate data.

Tables 3-2-15 and 3-2-16 summarize conditions regarding legislation, collection and transportation, installation of composting and incineration equipment, and external assistance, etc. in the five targeted major cities. In cases such as Hyderabad and Peshawar where inner city areas are divided into a number of cleansing districts, data are presented for each district.

Of the five cities, only Multan has no legal system concerning waste, whereas Peshawar has legislation but many people including even waste management personnel are not fully aware of it. Concerning collection and transportation, many of the cities pointed to shortages of collection equipment, budget and personnel. Concerning disposal sites, there are one or two for every city or cleansing district, however, hardly any of the cities implement the planned construction and selection of sites, and there are some cases where sites are causing pollution and other environmental problems.

Table 3-2-14 Generated Amounts of Waste and Budgets, etc. in Major Cities

City /Area		Population			Per capita generated waste per day	Generated Amount of Waste					Budget		
		Total	Collection Population	Collection Ratio		Estimated collected waste	Estimated generated waste	Collection rate	Hazardous waste: Hospital waste	Hazardous waste: Industrial waste	Budget carried forward	Budget for the fiscal year budget	Budget per ton of waste (carry-over + budget for the fiscal year)
Unit		person	person	%	kg / head / day	t/year	t/year	%	t /year	t/year	Rs.	Rs.	Rs./ t
Multan		1,500,000	12Lacs	80%		186,800	365,000	51%	7,300	36,500	100,000,000	30,000,000	—
Hyderabad	Taluka city	510,000	408,000	80%	1.02	146,000	190,500	77%	7,300	30,000	150,000,000	—	1,027
	Taluka Latifabad	500,000	350,000	70%	1.10	140,000	200,000	70%	—	—	145,500,000	—	1,039
	Taluka Qasimabad	150,000	105,000	70%	1.20	46,000	65,700	70%	—	—	1,680,000	—	37
	Cantonment Board	79,015	40,000	51%	0.25	4,000	7,300	55%	—	—	1,200,000	—	300
	Total	1,239,015	903,000	73%	1.02	336,000	463,500	72%	—	—	298,380,000	—	888
Quetta		1,400,000	1,400,000	100%	0.50	191,625	255,500	75%	10		100,000,000	90,000,000	992
Faisalabad		2,300,000	1,495,000	65%	0.50	273,750	419,750	65%	164		196,027,000	1,000,000	720
Peshawar	Peshawar City	N/A											
	Charsadda Road	537,138	39,835	7%	0.03	3,000	5,000	60%	2,500	3,000	220,331	40,000	87
	Hayatabad	600,000	100,000	17%	—	—	—	—	800	300	2,500,000	—	—
	Kohat Road	630,000	65,000	10%	0.003	400	600	67%	30	100	3,300,000	35,000	8,338
	Total	N/A											
Islamabad *		600,000	250,000	42%	0.92	182,500	200,750	91%	110	—	85,000,000	—	466
Rawalpindhi *		1,500,000	1,000,000	67%	0.47	219,000	255,000	86%	7,300	—	16,000,000	303,500,000	1,459
Lahore *		7,000,000	4,900,000	70%	0.55	951,920	1,405,250	68%	—	—	530,000,000	73,000,000	633
Karachi *		5,840,000	2,628,000	45%	0.5	1,314,000	2,920,000	45%	—	—	—	—	—

* Quoted from the Final Report for Domestic Solid Waste Management in Pakistan April 2002.

Note : 1 Rs. (rupee) 2 yen

Table 3-2-15 Solid Waste Management Situation in 5 Major Cities (1)

City / Area		Legislation Yes/No	Collection/Transportation	Disposal Sites					
			Collection methods, issues, etc	No. of sites	Area	Distance from collection	Current conditions and problems	Start of use (year)	End of use (year)
Multan		No *1	- Collection of inorganic solid waste is not implemented. - Mechanization of the collection system is needed. - Utilization of organic solid waste through composting is a challenge.	1 site	10 acre	5～10km	Environmental pollution in surrounding areas is a problem.	2001	2003 *2
Hyderabad	Taluka city	Yes	- Collections are 1 or 2 times per day. - Decision of disposal sites is not planned. - It is necessary to supply collection equipment and bolster staff.	4 sites (each area)	15 ha	7km	Opposition from residents living nearby.	2003	2013
	Taluka Latifabad				43.5 ha	16km	Located appropriately because there are no houses nearby.	2003	2032
	Taluka Qasimabad				26 ha	2km	Currently no plans for new disposal sites.	2003	-
	Cantonment Board				22 ha	4km	Due to a residential area located nearby, a new site is required.	1947	-
Quetta		yes	- Collection has been implemented in each of 2 cleansing districts since August 2001. - Collection has been implemented in each of 2 cleansing districts since August 2001. - Mechanization of the collection system is needed. - There are budget and staff shortages. - NGOs are involved in the primary collection of waste.	1 site	150 acre	16km	Open dumping, i.e. not sanitary landfilling, is carried out. The site has a negative impact on the surrounding area, particularly due to dust in the dry season.	1982	2018 *3
Faisalabad		yes	- There are 3,477 cleansing personnel. - Primary collection by hand-pushed / donkey carts - Illegal dumping is a problem. - One-third of collection equipment in not functioning due to poor maintenance. - Final disposal sites are far from relay stations. - More vehicle repair shops are required.	2 sites	20 acre	19km	Land is not being acquired for new disposal sites. *4	1990	-
					40 acre	16km		2003	-
Peshawar	Peshawar City	yes *5	- Collection charge: 20 rupees/household/month - Lack of funds, staff shortages, need for hazardous waste management	several	-	-	Planned selection of dumping sites is not implemented. The administrative section in charge of waste management does not have the powers to acquire land for disposal sites. A former brick-baking site is leased for use as a disposal site.	-	-
	Charsadda Road								
	Hayattabad								
	Kohat Road								

*1: Scheduled for construction in the near future. *2: The next disposal site is scheduled to be acquired within 6 months. *3: Land has been acquired for a new disposal site.
*4: A written request has been submitted to the provincial government. *5: Related personnel are not aware of the conditions.

Table 3-2.16 Solid Waste Management Situation in 5 Major Cities (2)

City / Area	Composting Equipment		Incineration Equipment	External Assistance		
	Yes / No	Scale (t/year)	Yes / No	Type of assistance	Period	Donor
Multan	Yes	36,500	No	Technical and financial	March 2003	C.D.R.C
Hyderabad	No	—	No	No	—	
Quetta	No *1	—	Yes (hospital)	Technical and financial (collection equipment)	1995	**J I C A**
Faisalabad	No	—	Yes (hospital)	Suitable site selection Human resource development Equipment	1997, 2000-2002	DFID (UK)
				Collection equipment	2000	Hiroshima Peace Fund
Peshawar	No	—	No	—	—	—

*1: Scheduled for construction in the near future.

② Survey of waste management conditions in specific areas

The following pages describe the current situation of waste management in Islamabad and the Hayatabad Town of Peshawar based on the site surveys conducted by the OECC Study Team in October 2003.

In the Hayatabad Town of Peshawar, following the said site survey by the OECC Study Team in October 2003, the local government implemented a qualitative survey of waste and a survey of recycling conditions, etc. (January 2004). In the survey, which treated the said district as a model area, conditions of waste discharge (quantity and quality of waste), collection, transportation, landfilling and recycling were investigated, and the flow of solid waste from generation to disposal was quantitatively ascertained to provide data for use in future solid waste management.

Solid Waste Management in Islamabad and Rawalpindi (1)

The metropolitan area is composed of Islamabad (municipality independent of the four provincial governments), and Rawalpindi, which is a district of Punjab Province and contains a large army post "Cantonment". Solid waste management as a rule is implemented according to district. Responsible authorities in the metropolitan region are the CDA (Capital Development Authority), which oversees solid waste management in Islamabad, the RCB (Rawalpindi Cantonment Board), in charge of military installations in Rawalpindi, and the TMA (Tehsil Municipal Authority), in charge of other urban areas.

■ Legal systems

Ordinances concerning solid waste management are as follows:

- The Local Government Ordinance 2001 (federal law), and
- The Punjab Local Government Ordinance 2002 (provincial law).

However, these ordinances only pertain to routine solid waste management activities, and there is no formulation of long-term solid waste management plans based on actual quantitative and qualitative waste data.

■ Collection rate and collection population

Collection rates and collection populations in this area are as follows.

Table 3-2-17 Waste Collection Rate and Collection Population (Islamabad and Rawalpindhi)

Items / Unit \ Organization		CDA	RCB	TMA	Total
Generated waste (predicted value)	t /day	550	900	700	2,150
Unit amount of discharge	kg / person/ day	0.92	1.00	0.47	0.72
Collected amount	t /day	500	700	600	1,800
Collection rate (area base)	%	90%	78%	85%	83%
Population	1000 people	600	900	1,500	3,000
Collection population	1000 people	250	900	1,000	2,150
Collection population ratio	%	41%	100%	66%	71%

JICA Study Team 2002

The slum (illegal residential district) known as "Kachi Abadi" is not included in the collection area, however, this is a hotbed for river dumping and other improper solid waste management practices. Waste incineration technology has not yet been introduced to this area.

(Note) The above data are quoted from The Study On Comprehensive Flood And Environmental Improvement Plan Of Lai Nullah Basin In The Islamic Republic Of Pakistan July 2003. Figures differ from those given in Table 3-2-14.

Solid Waste Management in Islamabad and Rawalpindi (2)

■ Recycling by Scavengers

There are approximately 200 scavengers in Islamabad, and 100 of these are active around final disposal sites (dumping sites). They are said to obtain an average daily income of 150~300 Rs., which is equivalent to the subsistence level in the city. Meanwhile, it is estimated they make a 1.5~2% contribution to recycling in Islamabad and 4% in Rawalpindi. However, since the waste they collect includes infectious waste, concerns are raised over damage to their health.

■ Collection/Transportation

Collection stations in Islamabad are currently used by 34 directly managed lorries and 16 consigned trolleys (pulled carts by tractors). Many of the directly managed vehicles were provided in equipment supply assistance from Czechoslovakia in the past. Of the 30 vehicles supplied in this assistance, 20 are currently out of order, a situation indicative of the city's inability to cover expensive maintenance costs with its current finances.

Collection station in Islamabad
(Vehicles on the verge of scrapping)

■ Dumping Sites

Open dumping without earth covering is carried out at dumping sites except for the site in Rawalpindi close to the Airport; however, earth covering has recently come to be implemented at dumping sites in Islamabad too. Moreover, some of the compost carried into dumping sites is now re-used in city parks, etc.

A new dumping site construction project is currently being advanced east of Lake Rawal approximately 22 km northeast of Islamabad, and geological surveys, etc. are being implemented by a local university in readiness for this. It is planned to construct a relay station on the way to the new site from the city and to carry out screening of saleable items.

Land for the planned dumping site

Solid Waste Management in Hayatabad, Peshawar (1)

Hayatabad, located in the southwest of Peshawar, is a combined residential and industrial town that was developed as a model development town by the Sarhad (Frontier) Development Authority. The following paragraphs describe the solid waste management situation in Hayatabad, based on the OECC's site survey as well as the investigation of the waste amount and components and the survey of recycling situation, etc., which were implemented in cooperation with the Pak-EPA in January 2004.

■ Waste discharge situation

As a result of surveying the generated amount of waste by residential class in residential areas, the per capita amount of discharged waste was around 0.5 kg/person/day. It is estimated around 60 tons of waste is discharged in the residential area of Hayatabad every day, and that 40 tons of this is collected while the remaining 20 tons is abandoned on the streets, etc. (collection rate: approximately 67%).

■ Collection situation

The Study Team observed collection conditions in the residential area of Hayatabad. Although there are two collection trucks, most of the collection work is carried out by donkey-pulled carts known as donkey cars. There are approximately 100 such donkey cars in Hayatabad Town, and 39 of these are employed in waste collection (1,100 Rs/month) while the remaining cars operate independently. Collection is carried out separately according to garbage and other domestic waste. Garbage is used for making compost and fertilizer. However, because this collection method causes traffic congestion in other areas, it cannot be called the most common approach in Peshawar.

Collection by donkey car

■ Collection tariffs

As is the case in the rest of Peshawar, a standard rate of 20 rupees per household is levied every month together with the water tariff.

(Note): The contents are quoted from a report by the Government of Pakistan entitled Urban Environmental Problems In Pakistan (A Case Study for Urban Environment in Hayatabad, Peshawar).

Solid Waste Management in Hayatabad, Peshawar (2)

■ Waste components

In the donkey car collection stage, waste is separated into garbage, saleable items, and non-saleable items. Garbage is recycled as compost and fertilizer, while saleable items are sold in recycling shops known as Kabari shops. Upon surveying the qualitative makeup of approximately 100 kg of waste in the collection stage, components were found to be as follows. Garbage accounted for the major share (more than 90% of the total), whereas saleable items accounted for 5.6%.

Table 3-2-18 Components of Waste in Hayatabad Town

Items		Weight (kg)	(%)
Non-Salable Items			
	Vegitables/fruits/other	650	90.3
	Pampers (Diapers)	20	2.8
	Used tea leaves	10	1.4
	Total	680	94.4
Saleable Items			
	Plastic,Rubber	8	1.1
	Textile	4	0.6
	Paper	8	1.1
	Metal	2	0.3
	Glass	4	0.6
	Bones	6	0.8
	Wood	3	0.4
	Bread	5	0.7
	Total	40	5.6
Grand Total		720	100

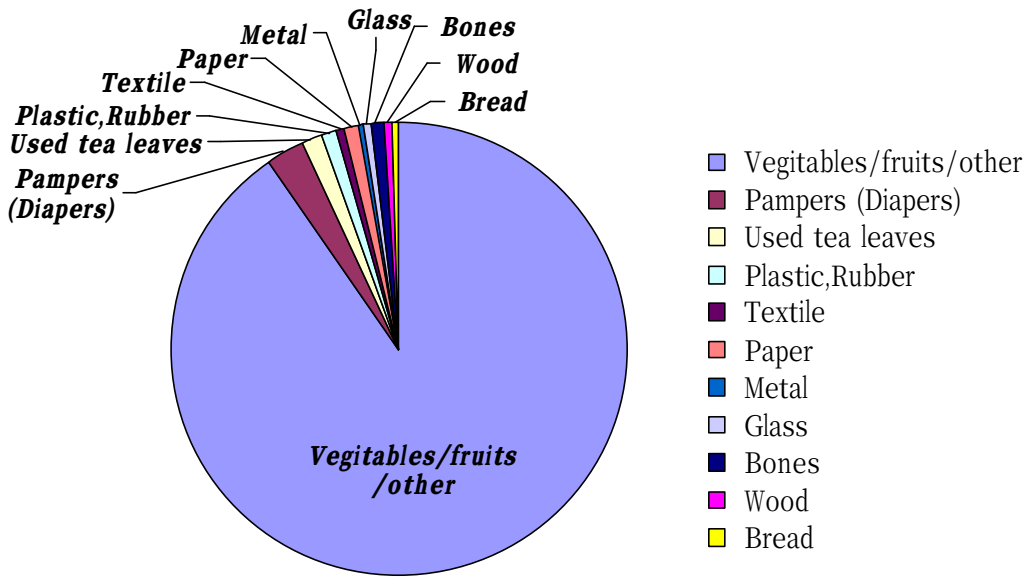


Figure 3-2-2 Components of Waste in Hayatabad Town

(Note) The above contents, table and graph are quoted from a report by the Government of Pakistan entitled Urban Environmental Problems In Pakistan (A Case Study for Urban Environment in Hayatabad, Peshawar).

Solid Waste Management in Hayatabad, Peshawar (3)

■ Dumping site

The dumping site is not officially recognized, but it is part of a separate development plan in which the site is scheduled to be used as a car park in the future.

Solid waste has been landfilled on the site for approximately six years and, according to the results of topographical surveying, it is estimated that 1,379 m^3 of waste has been landfilled until now. Between 10~15 tons of waste continues to be landfilled every day.

Current dumping site

The dumping site is situated next to a river, and leachate is discharged directly into this. Since the survey was conducted during the dry season, the river contained no surface water, but leachate could be seen welling up from below puddles in the riverbed. Upon surveying the quality of the leachate in comparison with Japanese standards (ministerial ordinances prescribing technical standards for general solid waste disposal and industrial waste disposal sites), values were far above standards concerning BOD, COD, TSS and zinc, etc. in particular, and pollution was thus confirmed.

Table 3-2-19 Results of Water Quality Survey on Leachate from the Dumping Site

Item	Measurement	Unit	(Japanese Standard)
Outside temperature	22.7	mg/l	—
Humidity	24.8	mg/l	—
Leachate temperature	26.7	mg/l	—
pH	9.25	mg/l	—
BOD	805	mg/l	60
COD	2,840	mg/l	90
TSS	300	mg/l	60
Nitrogen content	10.3	mg/l	120
Coliform group	2 x 10^4 (units/g)	—	3,000 (units /cm^3)
Oil	820	mg/l	5 (mineral fat) 30 (animal / vegetable fat)
Lead	0.593	mg/l	0.1
Chrome	2.82	mg/l	2
Zinc	1.062	mg/l	5
Arsenic	N.D.	mg/l	0.1
Cadmium	N.D.	mg/l	0.1
Copper	0.381	mg/l	3

(Note) The above contents are quoted from a report by the Government of Pakistan entitled Urban Environmental Problems In Pakistan (A Case Study for Urban Environment in Hayatabad, Peshawar).

Solid Waste Management in Hayatabad, Peshawar (4)

■ Recycling situation

In Hayatabad, too, large numbers of scavengers were observed during the solid waste collection stage and at the dumping site. Saleable items recovered from waste are sold at recycling establishments known as Kabari shops, of which there are about 20 in Hayatabad. The amount and value of saleable items sold to an average Kabari shop per day are as follows.

Table 3-2-20 Amount and Unit Value of Saleable Items

Item	Weight (kg/day/shop)	Price (Rs./kg)
Bread	30	5
Bones	40	3
Plastic, Rubber	12	13
Metal	10	10
Glass (bottles)	5	3
Glass	4	1
Newspaper (English)	0.5	13
Newspaper (Urdu) + Note Books	1	8
Ghatta (Paper back, Cover)	4	4

Of the above saleable items, bread is consumed locally as feed for livestock. Bones are transported to Warirabad and Kala Shah Kako (Punjab Province), and mainly used by gelatine plants, as fodder for domestic poultry and as toothpaste. Glass is mostly transported to Gujrat (Punjab Province), Hattar and Haripur (NWFP), where it is used in ceramic and bottle plants. Metal, iron, scrap iron and tinplate are used in metal recycling plants. Items from Hayatabad are used in Peshawar and are also taken to Lahore, etc. Plastic items, too, are either used in Peshawar or a transported to Lahore for re-use as plastic rope, etc. Newspapers are re-used as wrapping paper, while books are handed over to recycled paper factories.

Screening and weighing at a Kabari shop

Screened bread

(Note) The above contents are quoted from a report by the Government of Pakistan entitled Urban Environmental Problems In Pakistan (A Case Study for Urban Environment in Hayatabad, Peshawar).

(5) Treatment of Urban Waste Water

1) Situation of Urban Waste Water

① Relevant Legal Framework

In regard to the treatment of urban waste water in Pakistan, the Ministry of Environment introduced the National Unified Policy for Waste Water Treatment in April, 2001 and set forth the following principles to control the planning, design and operation of treatment facilities.

The National Unified Policy for Wastewater Treatment (April 2001)

- The Urban Wastewater Treatment Plants to be run by the municipal governments or industrial estates will carry out biological treatment only.
- All individual industrial units and medical wastewater generators, whether located within the municipal area, or in an industrial estate, will be connected to the municipal sewer systems, only if they pre-treat their wastewater in such a way that its chemical contents/characteristics and BOD conform to the National Environmental Quality Standards.
- No municipal sewerage treatment plant will be installed if a system of wastewater collection system is not in place and operational.
- In areas where an integrated water borne sewer system does not exist, it must be mandatory to pre-treat the domestic wastewater, through the construction of a septic tank of approved design, before connecting to an open drain or small-bore sewer.

The master plan for urban waste water treatment facilities for 24 cities in four provinces which was formulated based on the above Unified Policy examines a suitable treatment system for each city. The master plan also shows the treatment flows for waste water treatment facilities at paper, textile, composting, chemical, food and other plants to treat industrial waste water.

② Reality of Waste Water Treatment in Pakistan

Urban waste water in Pakistan consists of domestic, commercial and industrial waste water. In some cases, it also contains infectious waste water from hospitals. The uncontrolled discharge of industrial water to the urban sewerage system sometimes causes corrosion of the sewer pipes and even the extinction of bacteria at waste water treatment plants.

Given such a reality, the master plan mentioned above makes it a compulsory requirement for industrial waste water to be pretreated to the level which satisfies the relevant NEQS by each work place prior to its discharge to the sewerage system.

The situation of waste water treatment in various cities in Pakistan is largely classified into the following three categories.

Table 3-2-21 Present Situation of Waste Water Treatment (in the 24 Cities Listed in the Master Plan)

Category	Type of System	Cities	Number	%
I	Combined system up to at least secondary trunk lines with miscellaneous waste water, septic tank effluent and human sewage flowing through tertiary open channels	All cities in Punjab (10) and Sindh (3), Quetta, Khuzudar and Loralai in Balochistan	16	67
II	Different systems depending on the area • Old city area: pretreatment at a septic tank prior to discharge to open channels • Newly developed area: standard sewer system	All cities in the NWFP	5	21
III	No regular system	Gwadar, Sibi and Usta Muhammad in Balochistan	3	12

Source: Master Plan for Urban Waste Water Treatment Facilities in Pakistan, 2002

The existing municipal waste water treatment facilities are shown in Table 3-2-14.

Table 3-2-22 Existing Municipal Waste Water Treatment Facilities in Seven Towns

Name of City and Municipal Waste Water Generated (2003) m^3/day	Conventional*		Stabilization Pond		Aerated Lagoons		No Treatment	
	Quantity (m^3/day)	%	Quantity (m^3/day)	%	Quantity (m^3/day)	%	Quantity (m^3/day)	%
Lahore (784,625)	-	-	450	0.06	-	-	784,154	99.94
Faisalabad (352,200)	-	-	90,000	25.6	-	-	262,032	74.4
Karachi (1,531,045)	135,000	8.8	108,000	7.1	-	-	1,287,609	84.1
Hyderabad (185,434)	-	-	63,000	34.0	-	-	122,386	66.0
Sukkur (63,819)	-	-	Abandoned	-	-	-	63,819	100.0
Peshawar (189,010)	-	-	60,000	32.0	8,000	4.2	120,588	63.8
Mardan (45,575)	-	-	18,000	39.5	-	-	27,573	60.5

*Tricking Filters / Activated Sludge
Source: Master Plan for Urban Wastewater Treatment Facilities in Pakistan, 2002

③ Situation of Domestic Waste Water Treatment in Areas without Sewerage System

A septic tank appears to be installed at many households in the peripheral areas of cities where no sewerage system has been established. The master plan emphasises the importance of self-treatment prior to the discharge of human extract and other domestic waste water in areas without a sewage system and points out the importance of providing technical assistance, etc. for municipal authorities. However, the septic tanks currently used in peripheral areas of cities are believed to

fail to conduct sufficient fermentation due to the lack of an aeration system, making the introduction of such improvement measures as clear design standards and a subsidy system for septic tank installation necessary.

Situation of Waste Water Treatment in Islamabad

- **Waste Water Treatment Plan for Islamabad**
  As Islamabad is the special capital territory, the development situation of its waste water treatment facilities, etc. is not described in the master plan. According to the interview results, the sewerage service rate in Islamabad is almost 100%, suggesting the implementation of a different waste water treatment plan than those for other cities.

- **Waste Water Treatment Plant in Islamabad**
  This plant conducts aeration treatment. Waste water is discharged after appropriate treatment and the discharged water quality is regularly checked. Although methane gas is recovered, it appears that this gas is only used on the premises because of the absence of any power generation facilities. Power is supplied by a commercial power supplier.

Aeration Treatment

Sedimentation Pond

Situation of Waste Water Treatment in Peshawar

- **Waste Water Treatment Map of Peshawar**
  Below is a map of the present waste water treatment network in Peshawar. The Study Team visited two existing waste water treatment plants marked A and B on the map. Plant A is located in the Hayatabad urban planning zone and consists of three water ponds. Aeration used to be conducted with the first water pond. However, its operation has been suspended due to electrical breakdown and it currently functions simply as a sedimentation pond. As a new plant ① is going to be constructed to the north of the present plant, a decision has been made to close down Plant A for development of the site as a commercial zone. Two water ponds have been built at Plant B which are not yet in operation due to the lack of funding for maintenance purposes.

Existing Sewerage Plant A

Waste Water Treatment Network in Peshawar