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A Special Report

Pakistan's Waters at Risk

Water & Health Related Issues in Pakistan
&
Key Recommendations

Based on Information/Data drawn from Government Documents and NGOs / IGOs Publications

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WATER & HEALTH RELATED ISSUES IN PAKISTAN

A SPECIAL REPORT

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ABBREVIATIONS

ADB	Asian Development Bank
BOD	Biological Oxygen Demand
CDA	Capital Development Authority
CDWA	Clean Drinking Water for All
CDWI	Clean Drinking Water Initiative
CETPs	Common Effluent Treatment Plants
COD	Chemical Oxygen Demand
CRCP	Consumer Rights Commission of Pakistan
DALYs	Disability Adjusted Life Years
DHHS	Department of Health and Human Services
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organization
FPCCI	Federation of Pakistan Chamber of Commerce and Industry
GDP	Gross Domestic Production
GoP	Government of Pakistan
HWHF	Hazardous Waste Handling Facilities
IEEM	Industrial Efficiency and Environmental Management
KITE	Korangi Industrial and Trading Estate
KWSB	Karachi Water and Sewerage Board
MAF	Million Acre Feet
MGD	Million Gallons per Day
MSTQ	Meteorology Standards Testing and Quality
MTDF	Mid Term Development Framework
NDWP	National Drinking Water Policy
NEP	National Environment Policy
NEQS	National Environmental Quality Standards
NGO	Non Governmental Organization
NIH	National Institute of Health
NWFP	North West Frontier Province
NWC	National Water Council
NWP	National Water Policy
OICCI	Overseas Investment Chamber of Commerce and Industry
PCRWR	Pakistan Council for Research in Water Resources
PEPA	Pakistan Environmental Protection Act

PPB	Parts Per Billion
PRS	Poverty Reduction Strategy
PSQCA	Pakistan Standards and Quality Control Authority
PWRC	Provincial Water Regulatory Commission
RSC	Residual Sodium Carbonate
SAR	Sodium Absorption Ratio
SCEA	Strategic Country Environmental Assessment Report
SITE	Sindh Industrial Trading Estate
SMART	Self Monitoring And Reporting Tool
SOE	State of the Environment Report (Draft) 2005
TDS	Total Dissolved Solids
TP	Treatment Plant
UNDP	United Nations Development Programme
UNICEF	United Nations International Children's Emergency Fund
USAID	United States Aid
US EPA	United States Environmental Protection Agency
WAPDA	Water And Power Development Authority
WASA	Water And Sanitation Agency
WB	World Bank
WB-CWRAS	World Bank, Country Water Resources Assistance Strategy
WHO	World Health Organization
WSS	Water Supply and Sanitation

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EXECUTIVE SUMMARY

Water is an essential element for our survival. Unfortunately, while Pakistan is blessed with adequate surface and groundwater resources, rapid population growth, urbanization and unsustainable water consumption practices have placed immense stress on the quality as well as the quantity of water resources in the country. Deterioration in water quality and contamination of lakes, rivers and groundwater aquifers has resulted in increased water-borne diseases and other health impacts.

Per capita water availability in Pakistan has decreased from 5,000 cubic meters per annum in 1951 to 1,100. The principal source of drinking water for the majority of people in Pakistan is groundwater. About 80% of the Punjab has fresh groundwater, but in Sindh, less than 30% of groundwater is fresh. In NWFP, increasing abstraction has resulted in wells now reaching into saline layers, and much of Balochistan has saline groundwater.

As per Government figures, the Punjab has the best rural water supply amongst the provinces. It is stated that only 7 % of the rural population depends on a dug well or a river, canal or stream. In Sindh, some 24% of the rural population depends on these sources. The rural water supply situation in NWFP and Balochistan is worse; about 46% and 72% respectively of the rural population depend on water from a dug well or from a river/canal/stream.

There is a clear evidence that groundwater in the country is being over-exploited, yet tens of thousands of additional wells are being put into service every year. There is an urgent need to develop policies and approaches for bringing water withdrawal into balance with recharge.

A national water quality study was carried out by the Pakistan Council for Research in Water Resources (PCRWR) in 2001. In the first phase of the programme, covering 21 cities, all samples from four cities and half the samples from seventeen cities indicated bacteriological contamination. In addition, arsenic above the WHO limit of 10ppb was found in some samples collected from eight cities. The same study also indicated how the uncontrolled discharge of industrial effluent has affected surface and groundwater, identifying the presence of lead, chromium and cyanide in groundwater samples from industrial areas of Karachi, and finding the same metals in the Malir and Lyari rivers flowing through Karachi and discharging into the sea. A second PCRWR study was launched in 2004, and preliminary results indicate no appreciable improvement, while a separate study reported that in Sindh almost 95% of shallow groundwater supplies are bacteriologically contaminated.

There is very little separation of municipal wastewater from industrial effluent in Pakistan. Both flow directly into open drains, which then flow into nearby natural water bodies. There is no regular monitoring programme to assess the water quality of the surface and groundwater bodies. There is no surface water quality standard or drinking water quality standard in Pakistan. A comparison of the quality of surface water with the effluent discharge standard clearly demonstrates the extent of pollution in the water bodies due to the discharge of industrial and municipal effluent.

About 5.6 million tonnes of fertilizer and 70 thousand tonnes of pesticides are consumed in the country every year (2003). Pesticide use is increasing annually at a rate of about 6%. Pesticides, mostly insecticides, sprayed on the crops mix with the irrigation water, which

leaches through the soil and enters groundwater aquifers. In 107 samples of groundwater collected from various locations in the country between 1988 and 2000, 31 samples were found to have contamination of pesticides beyond FAO/WHO safety limits. A pilot project was undertaken in 1990-91 in Samundari, Faisalabad District over an area of 1,000 km^2, to look into the extent of groundwater contamination by agrochemicals. In an analysis of 10 groundwater samples drawn from a depth of 10-15 m, seven were contaminated with one or more pesticides (PCRWR, 1991). As there has been a four-fold increase in the use of pesticide use in the country since 1990, the contamination levels are likely to have increased significantly.

It is estimated that 40 million residents depend on irrigation water for their domestic use, especially in areas where the groundwater is brackish. The associated health risks are grave, as bacteriological contamination of irrigation water often exceeds WHO limits even for irrigation.

A recent study of 11 cities of Punjab shows an excess of arsenic and fluoride concentrations in the water supply systems of six cities; Multan, Bhawalpur, Shaikhupura, Kasur, Gujranwala, and Lahore (PCRWR 2004). Alarmingly, over 2 million people in these cities are drinking unsafe water, some with a high arsenic concentration.

Major industrial contributors to water pollution in Pakistan are the petrochemicals, paper and pulp, food processing, tanneries, refineries, textile and sugar industries. Only a marginal number of industries conduct environmental assessments (about 5 % of national industries). The sugarcane based industry, the 2nd largest in the country, is a major cause of industrial water pollution. The problem of industrial water pollution has remained uncontrolled because there have been little or no incentives for industry to treat their effluents. Biological Oxygen Demand (BOD) levels in water courses receiving these wastes are as high as 800mg/l and Mercury levels over 5 mg/l (Maximum allowable limits as per NEQS for BOD is 80mg/l and for Mercury is 0.01mg/l). The salinity level of groundwater is increasing. Industrial wastewater including toxic chemicals, organic matter and heavy metals is discharged directly into public sewers without prior treatment. There is reported leaching of wastes into groundwater, causing outbreaks of water-borne diseases. At present, irrigation uses about 93% of the water currently utilized in Pakistan.

The links between water quality and health risks are well established. An estimated 250,000 child deaths occur each year in Pakistan due to water-borne diseases. Apart from the human losses, these diseases are responsible for substantial economic losses.

Although they have yet to be enforced, important policies regarding water issues such as the National Water Policy (Draft), National Environment Policy etc. and regulatory framework like the Pakistan Environmental Protection Act 1997 exist. Other laws that also relate to pollution prevention of water bodies include the Canal and Drainage Act (1873) and the Punjab Minor Canals Act (1905), which prohibit the corrupting or fouling of canal water; Sindh Fisheries Ordinance (1980), which prohibits the discharge of untreated sewage and industrial waste into water, and The Greater Lahore Water Supply Sewerage and Drainage Ordinance (1967).

The government has launched a comprehensive nationwide clean drinking water programme under two parallel phases, the ‘Clean Drinking Water Initiative’ (CDWI) and the ‘Clean Drinking Water for All (CDWA) which encompasses 6,579 water treatment plants throughout the country.

There are a number of factors which need to be highlighted and addressed in order to improve, protect and maintain the quality of freshwater resources of the country. These factors include;

Government Priorities: the treatment of sewage and industrial effluents is at present a low priority. Land allocated to WASA, Lahore for wastewater treatment is now being disposed of to other organizations for different purposes, which shows the level of commitment from Government authorities to treat wastewater and to improve the quality of freshwater. There is a need to bring provision of clean water back as a top priority.

Rules and Regulations: while unregulated groundwater abstraction is the cause of water depletion, there are no clear guidelines, rules or regulations for groundwater abstraction. In addition, surprisingly, there are also no surface water classification standards in the country. Such rules and regulations must be established at the earliest.

Weak Law Enforcement & Compliance: the level of compliance to environmental laws in the country is extremely low, particularly in the industrial and housing sectors, as law enforcement is weak. Strong law enforcement and compliance are necessary for the protection of freshwater resources. Organisations working in the environmental sector in Pakistan appreciate the recent decision of the Supreme Court demanding that Environmental Tribunals must be functional in all provinces.

Water Policy: Even though relevant policies like National Environment Policy, National Water Policy (Draft), National Drinking Water Policy (Draft) etc. are in place, there is no clear strategy devised so far to implement them. A clear and practical strategy needs to be defined to implement these policies.

The provision of water and sanitation services in Pakistan is inadequate, inequitable, and highly inefficient. The services are mainly provided by the public sector. These services generally fail to meet water quality standards and are unable to provide adequate sanitation needs of a growing population. The major reasons why these service providers have failed to perform are;

- Confusion of social, environmental, commercial, and political aims;
- Poor management structures operating without clear policy guidelines;
- High capital investment needs with low or no rate of return;
- Resistance to achieving full or even partial cost recovery;
- Decentralized water agencies with service responsibility but few resources;
- Political interference at most levels of operation;
- Non-existent regulator;
- Lack of proper legal framework;
- Lack of platforms for contribution by concerned citizens.

Under these constraints/ existing ground realities in Pakistan, improvements in service delivery of potable water and sanitation must be linked to improvements in the following functions and areas:

- Defining the policy, aims and objectives clearly;
- Strengthening of institutions and capacity building;
- Improving financial sustainability;
- Making better and more efficient use of funds;
- Attracting foreign investment by making an environment conducive to it;
- Better water management practices - reuse, conservation etc.

1. INTRODUCTION & BACKGROUND

Water is an essential element for the survival of all life. Unfortunately, while Pakistan is blessed with surface and groundwater resources, with the passage of time rapid population growth, urbanization and unsustainable water consumption practices in the agricultural and industrial sectors have placed immense stress on the quality as well as quantity of water resources in the country.

According to the Pakistan Strategic Country Environmental Assessment Report 2006 (SCEA 2006), per capita water availability in Pakistan has decreased from 5,000 in 1951 to 1100 cubic meter per annum. The increasing gap between water supply and demand has led to severe water shortage in almost all sectors.

As per Ministry of Environment, Draft State of the Environment Report 2005 (SOE 2005), Pakistan stated a population growth rate of 1.9% in 2004. The projected figures for 2010 and 2025 have reached 173 million and 221 million respectively. These estimates suggest that the country will slip below the limit of 1000 cubic meters of water per capita per year from 2010 onwards. The situation could get worse in areas situated outside the Indus basin where the annual average is already below 1000m^3 per head (SOE 2005).

In Pakistan, water remains a critical resource for sustained well being of its citizens. The water shortages and increasing competition for multiple uses of water has adversely affected the quality of water, consequently, water pollution has become a serious problem in Pakistan. It is now established that most of the reported health problems are directly or indirectly related to polluted water.

Pakistan is already one of the most water-stressed countries in the world, a situation which is going to degrade into outright water scarcity (WB).

This special report presents the existing status of water quality and quantity in Pakistan and establishes the linkages between water quality and its associated health effects. In conclusion, some urgent actions are recommended to improve the situation.

2. CURRENT SITUATION / ISSUES OF WATER IN PAKISTAN

The stress on water resources of the country is from multiple sources. Rapid urbanization, increased industrial activity and dependence of the agricultural sector on chemicals and fertilizers have led to water pollution. Deterioration in water quality and contamination of lakes, rivers and groundwater aquifers has, therefore, resulted in increased water borne diseases and negative impacts on human health.

2.1 WATER AVAILABILITY

Water availability on a per capita basis has been declining at an alarming rate. It has been decreased from about 5,000 cubic meters per capita in 1951 to about 1,100 cubic metes currently, which is just above the internationally recognized scarcity rate. It is projected that water availability will be less than 700 cubic meters per capita by 2025 (Pak-SCEA 2006).

The principal source of drinking water for the majority in Pakistan is groundwater. Most of the rural areas and many major cities rely on it, although some cities such as Islamabad, Karachi, Hyderabad etc., get water from a number of other sources.

About 80% of Punjab has fresh groundwater, with some saline water in the south and in desert areas. There is also some evidence of high fluoride or arsenic content locally in Punjab. A number of locations have also been contaminated by industrial wastewater discharges. In Sindh, less than 30% of groundwater is fresh. Much of the province is underlain by highly brackish water and some instances of elevated fluoride levels. In NWFP, increasing abstraction has resulted in wells now reaching into saline layers, and much of Balochistan also has saline groundwater (Pak-SCEA 2006).

As per government figures, Punjab has the best rural water supply amongst the provinces. The vast majority of the rural population has either piped water or water from a hand pump or motor pump. It is stated that only 7 % of the rural population depends on a dug well or a river, canal or stream. The situation in Sindh is considerably worse: some 24% of the rural population depend on these sources. The situation in rural Sindh also appears to have deteriorated. The rural water supply situation in NWFP is worse still, and is worst of all in Balochistan. In these two provinces, 46% and 72% of the rural population, respectively, depend on water from a dug well or from a river/canal/stream (SOE 2005).

Over 60% of the population gets their drinking water from hand or motor pumps, with the figure in rural areas being over 70%. This figure is lower in Sindh, where the groundwater quality is generally saline and an estimated 24% of the rural population gets water from surface water or dug wells. In almost all urban centres, groundwater quantity and quality has deteriorated to the extent that the availability of good quality raw water has become a serious issue. Over abstraction has also resulted in declining groundwater levels (Pak-SCEA 2006).

Uncontrolled extraction of groundwater and extended dry periods has also caused its depletion and drying up of some of the sources. A study in Kirther shows that the water table has dropped by 3 meters per year on average. The drying up of wells has important social consequences, particularly on the women and children responsible for water collection. In Islamabad, the drop has been 50 feet between 1986 and 2001 while in Lahore the drop has been about 20 feet between 1993 and 2001. Estimates show that without an artificial recharging, groundwater in the sub basin of Quetta would be exhausted by 2016. (SOE 2005)

It is important to note that although, there is a clear evidence that groundwater is being over-exploited, yet tens of thousands of additional wells are being put into service every year. Pakistan has now entered an era in which laissez-faire becomes an enemy rather than a friend. **There is an urgent need to develop policies and approaches for bringing water withdrawals into balance with recharge.** Since much groundwater recharge in the Indus Basin is from canals, this requires an integrated approach to surface and groundwater. There is little evidence that government and/or donors have re-engineered their capacity and funding to deal with this great challenge. The delay is fatal in this situation, because the longer it takes to develop such actions, the greater would become the depth of the groundwater table, and the higher would be the costs of the “equilibrium” solution. (WB, CWRAS 2005)

Per Capita Water Availability

Year	Population (million)	Per Capita Availability (m^3)
1951	34	5300
1961	46	3950
1971	65	2700
1981	84	2100
1991	115	1600
2000	148	1200
2013	207	850
2025	267	659

Source: Draft State of Environment Report 2005

The water shortage in the agriculture sector is another serious issue. As per SOE 2005, the shortage has been estimated at 29% for the year 2010 and 33% for 2025. In addition, uncontrolled harvesting of groundwater for irrigation purposes has also led to severe environmental problems. Today groundwater contributes a mere 48% of the water available. The construction of private wells for irrigation has also been promoted through a policy of high subsidy on electricity cost. The hike in the cost of electricity in 1990s, and the development of new technologies have led to a considerable increase of diesel pumps whose numbers have grown 6 times over the last 30 years. (SOE 2005)

2.2 WATER DEMAND/CONSUMPTION

According to the National Water Policy (NWP), at present, irrigation uses about 93% of the water currently utilized in Pakistan. The rest is used for supplies to urban and rural populations and industry. However, as mentioned earlier, Pakistan's population is set to increase by 221 million by the year 2025, the percentage of water required, particularly for urban water supply, is set to increase dramatically. This will place further pressure on water resources which are already deficient in meeting demands across all sectors (NWP).

Pakistan's Water Scenario		
Year	**2004**	**2025**
Availability	104 MAF	104 MAF
Requirement(including drinking water)	115 MAF	135 MAF
Overall Shortfall	11 MAF	31 MAF

Source: Ten Year Perspective Development Plan 2001-11, Planning Commission

It is observed that the expanding imbalance between supply and demand has not only led to water shortages but also initiated an unhealthy competition amongst end-users, which is ultimately causing environmental degradation in the form of persistent increase in water logging in certain areas, decline of groundwater levels in other areas, intrusion of saline water into fresh groundwater reservoirs, etc. (NWP).

2.3 WATER QUALITY

Domestic waste containing household effluent and human waste is either discharged directly to a sewer system, a natural drain or water body, a nearby field or an internal septic tank. It is estimated that only some 8% of urban wastewater is treated in municipal treatment plants. The treated wastewater generally flows into open drains,

and there are no provisions for reuse of the treated wastewater for agriculture or other municipal uses. Table below shows ten large urban centres of the country, which produce more than 60% of the total urban wastewater including household, industrial and commercial wastewater. (WB-CWRAS Paper 3, 2005)

Wastewater Produced Annually by Towns and Cities

City	Urban Population (1998 Census)	Total Wastewater Produced (million m^3/y)	% of Total	% Treated	Receiving Water Body
Lahore	5,143,495	287	12.5	0.01	River Ravi, irrigation canals, vegetable farms
Faisalabad	2,008,861	129	5.6	25.6	River Ravi, River Chenab and vegetable farms
Gujranwala	1,132,509	71	3.1	-	SCARP drains, vegetable farms
Rawalpinidi	1,409,768	40	1.8	-	River Soan and vegetable farms
Sheikhupura	870,110	15	0.7	-	SCARP drains
Multan	1,197,384	66	2.9	-	River Chenab, irrigation canals and vegetable farms
Sialkot	713,552	19	0.8	-	River Ravi, irrigation canals and vegetable farms
Karachi	9,339,023	604	26.3	15.9	Arabian Sea
Hyderabad	1,166,894	51	2.2	34.0	River Indus, irrigation canals and SCARP drains
Peshawar	982,816	52	2.3	36.2	Kabul River
Other	19,475,588	967	41.8	0.7	-
Total Urban	**43,440,000**	**2,301**	**100.0**	**7.7**	**-**

Source: Master Plan for *Urban Wastewater (Municipal and Industrial) Treatment Facilities in Pakistan*. Final Report, Lahore: Engineering, Planning and Management Consultants, 2002

Another important aspect is that there is very little separation of municipal wastewater from industrial effluent in Pakistan. Both flow directly into open drains, which then flow into nearby natural water bodies. There is no regular monitoring programme to assess the water quality of the surface and groundwater bodies. There is no surface water quality standard in Pakistan. A comparison of the quality of surface water with the effluent discharge standard clearly demonstrates the extent of pollution in the water bodies due to the discharge of industrial and municipal effluent. (WB-CWRAS Paper 3, 2005)

There is also no regular monitoring of drinking water quality. A national water quality study was carried out by the Pakistan Council for Research in Water Resources

(PCRWR) in 2001. In the first phase of the programme, covering 21 cities, all samples from four cities, and half the samples from seventeen cities indicated bacteriological contamination. In addition, arsenic above the WHO limit of 10 ppb was found in some samples collected from eight cities. The same study also indicated how the uncontrolled discharge of industrial effluent has affected surface and groundwater, identifying the presence of lead, chromium and cyanide in groundwater samples from industrial areas of Karachi, and finding the same metals in the Malir and Lyari rivers flowing through Karachi and discharging into the Arabian Sea. A second PCRWR study was launched in 2004, and preliminary results indicate no appreciable improvement, while a separate study reported that in Sindh almost 95% of shallow groundwater supplies are bacteriologically contaminated (Pak-SECA 2006).

Water samples collected from Karachi harbour have also revealed the presence of trace metals in concentrations far exceeding any other major harbour in the World.

About 5.6 million tonnes of fertilizer and 70 thousand tonnes of pesticides (GoP, 2003) are consumed in the country every year. Pesticide use is increasing annually at a rate of about 6%. Pesticides, mostly insecticides, sprayed on the crops mix with the irrigation water, which leaches through the soil and enters groundwater aquifers. In 107 samples of groundwater collected from various locations in the country between 1988 and 2000, 31 samples were found to have contamination of pesticides beyond FAO/WHO safety limits. A pilot project was undertaken in 1990-91 in Samundari, Faisalabad District, over an area of 1,000 km^2, to look into the extent of groundwater contamination by agrochemicals. In an analysis of ten groundwater samples drawn from a depth of 10-15 m, seven were contaminated with one or more pesticides (PCRWR, 1991). The study concluded that the contamination had reached only the shallow aquifers; however, there were evidences that it was gradually reaching the deeper aquifers as well. As there has been a four-fold increase in the use of pesticide use in the country since 1990, the contamination levels are likely to have increased significantly (WB-CWRAS Paper 3, 2005).

In addition to municipal and industrial effluents, contamination of groundwater by arsenic is also becoming a serious problem. In Sindh and the Punjab, approximately 36% of the population is exposed to a level of contamination higher than 10ppb and 16% is exposed to contamination of 50ppb. (SOE 2005)

Due to impact of water shortage and accompanying pollution, many wild animals, plants, aquatic species, birds and other forms of flora and fauna are also affected. The biodiversity in Sindh is particularly at risk as biotic potential of many species is starting to be diminished, and they may be lost for ever if the environmental devastation due to water shortage is not reversed or properly controlled.(SOE 2006)

3. MAJOR WATER SECTORS IN PAKISTAN

3.1 INDUSTRIAL SECTOR

The pressures on water resources due to industrial growth are quite significant and have increased water pollution problems. According to the SOE 2005, only a marginal number of industries conduct environmental assessments (about 5 % of national industries). The national quality standards specifying permissible limits of wastewater are seldom adhered to. Most industries in the country are located in or around major cities and are recognized as key sources of increasing pollution in natural streams, rivers, as well as the Arabian Sea to which the toxic effluents are discharged. The contamination of shallow groundwater near industrial plants has

been an area of concern as groundwater pollution is often long-term and it may take hundreds or even thousands of years for pollutants such as toxic metals from the tanneries to be flushed out of a contaminated aquifer. (SOE 2005)

In Pakistan, only 1% of wastewater is treated by industries before being discharged directly into rivers and drains. For example in NWFP, 80,000 m^3 of industrial effluents containing a very high level of pollutants are discharged every day into the river Kabul causing observable incidence of skin diseases, decrease in agricultural productivity and decrease in fish population (SOE 2005).

Major industrial contributors to water pollution in Pakistan are petrochemicals, paper and pulp, food processing, tanneries, refineries, textile and sugar industries. The industrial sub-sectors of paper and board, sugar, textile, cement, polyester yarn, and fertilizer produce more than 80% of the total industrial effluents (WB-CWRAS Paper 3, 2005)

The sugarcane based industry, the 2nd largest in the country, is a major cause of industrial water pollution due to discharge of wastewater containing high pollutant concentrations. There are now 76 factories in the country and the installed capacity is 360,000 tonnes of sugar per day. Several hundred thousand cubic meter of wastewater is generated per day. This wastewater is most often discharged directly into the drains or rivers. In Hyderabad for example, wastewater from the sugarcane industry is discharged directly into the drains without any prior treatment. Only 2 industries in Sindh (out of 34) have installed mechanisms for wastewater treatment mainly because of international pressure as these industries (distilleries) export their products (SOE 2005).

The leather tanneries are another major source of large-scale water pollution. The construction of a common wastewater treatment plant in the Korangi industrial area, in Karachi, co-financed by the government (export promotion council) and the embassy of Netherlands, was started by the tanneries jointly in 2003. Out of 170 tanneries concerned, 85 are not part of this scheme (SOE 2005).

Another source of water pollution is the textile industry. Due to its size, it is at the top of the list in terms of generating environmentally damaging pollutants (SOE 2005).

The problem of industrial water pollution remained uncontrolled because there have been little or no incentives for Industry to treat their effluents. Although, rules and regulations exist but lack of implementation and absence of proper monitoring and policing has resulted in problem persisting. (WB-CWRAS Paper 8, 2005)

Throughout Pakistan, the industrial approach towards environment is the same; In Lahore, only 3 out of some 100 industries using hazardous chemicals treat their wastewater. Biological Oxygen Demand (BOD) levels in water courses receiving these wastes are as high as 800mg/l and Mercury levels over 5 mg/l. Consequently hundreds of tons of fish are killed causing a loss of millions of rupees. (WB-CWRAS Paper 8, 2005)

In Karachi, Sindh Industrial Trading Estate (SITE) and Korangi Industrial and Trading Estate (KITE), two of the biggest industrial estates in Pakistan, there is no effluent treatment plant and the waste containing hazardous materials, heavy metals, oil etc. is discharged into rivers and the already polluted harbour. The industrial pollution discharges combined with mangrove forest ecosystem degradation are resulting in a decrease in shrimp and fish production. (WB-CWRAS Paper 8, 2005)

In Faisalabad, one of the biggest industrial cities, there is little segregation of domestic and industrial wastes. Groundwater is being polluted and its salinity level is increasing. Industrial wastewater including toxic chemicals, organic matter and heavy metals is discharged directly into public sewers without prior treatment. There is reported leaching of wastes into groundwater causing outbreaks of water borne diseases. There is, however, a waste stabilization pond treatment plant, treating some 20mg/day of flow, but its operational efficiency is not known as there is no regular monitoring. (WB-CWRAS Paper 8, 2005)

In Multan, a fertilizer factory discharges its waste untreated to cultivated land causing death of livestock and increasing health risk to humans. (WB-CWRAS Paper 8, 2005)

3.2 AGRICULTURE SECTOR

According to the information provided in the National Water Policy (NWP), the irrigation network of Pakistan is the largest infrastructural enterprise accounting for approximately $ 300 billion of investment (at current rates) and contributing nearly 25% to the country's GDP. Irrigated agriculture provides 90 % of food and fibre requirements while "barani" (rain fed) area contributes the remaining 10 % (NWP).

At present, irrigation uses about 93% of the water currently utilized in Pakistan. The rest is used for supplies to urban and rural populations and industry (NWP).

In addition to the study of PCRWR on groundwater contamination due to pesticides and fertilizers mentioned earlier under section 2.3, another study by WAPDA on the situation of pollutants in the drainage system of Pakistan was conducted in April 2004. The study revealed that in Punjab all drains were carrying saline and sodic waters due to high values of Total Dissolved Solids (TDS) and Residual Sodium Carbonate (RSC) or Sodium Absorption Ratio (SAR) and all of them also had very high values for Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD). The data for Sindh and Balochistan showed that majority of drains had very high saline waters due to high values of TDS and in Shahdad Kot drain this reached as high as 13,187ppm during 2002. In addition, the COD values were higher than the permissible limits and at some sampling points these even surpassed the high levels recorded for Punjab and NWFP (SOE 2005).

The contribution of agricultural drainage to the overall contamination of the water resources exists but is marginal compared to the industrial and domestic pollution. For example, in Sindh, the pollution of water due to irrigation is only 3.21% of the total pollution (SOE 2005).

3.3 MUNICIPAL SECTOR

Most surface water pollution is associated with urban centres. Typically, nullahs and storm water drains collect and carry untreated sewage which then flows into streams, rivers and irrigation canals, resulting in widespread bacteriological and other contamination. It has been estimated that around 2,000 million gallons of sewage is being discharged to surface water bodies every day (Pak-SCEA 2006).

Although there are some sewerage collection systems, typically discharging to the nearest water body, collection levels are estimated to be no greater than 50% nationally (less than 20% in many rural areas), with only about 10% of collected sewage effectively treated. Although treatment facilities exist in about a dozen major cities, in some cases these have been built without the completion of associated sewerage networks, and the plants are often either under loaded or abandoned. In effect, only a few percent of the total wastewater generated receives adequate treatment before discharge to the waterways. (Pak-SCEA 2006)

4. WATER QUALITY & HEALTH IMPACTS

The poor quality of water, especially of that which is commonly consumed, has major socioeconomic consequences for Pakistan.

The high pollution level of rivers and groundwater has led to different environmental consequences such as reduction of biodiversity, increase in water related diseases, and decrease in agricultural productivity. In addition, mismanagement of water resources has strong socioeconomic repercussions, especially on food security and health (SOE 2005).

It is also important to note that although groundwater is still the primary source of drinking water supplies, it is estimated that 40 million residents depend on irrigation water for their domestic use, especially in areas where the groundwater is brackish. The associated health risks are grave, as bacteriological contamination of irrigation water often exceeds WHO limits even for irrigation. The poor quality of drinking water has major socioeconomic consequences for Pakistan (Pak-SECA 2006).

Hudiara Drain, Lahore

A recent study of eleven cities of Punjab shows an excess of arsenic and fluoride concentrations in water supply systems of six cities; Multan, Bhawalpur, Shaikhupura, Kasur, Gujranwala, and Lahore (PCRWR 2004). UNICEF has also conducted studies and concluded that the population of Punjab in the main cities is exposed to high arsenic concentrations. A similar study by Environmental Protection Agency (EPA) on quality of sub-soil water in 14 districts of Punjab revealed that 85% of samples tested were unfit for human consumption. Alarmingly, over two million people are drinking unsafe water, some with high arsenic concentration (WB-CWRAS Paper 8, 2005)

The quality of water in the twin cities of Islamabad and Rawalpindi is no better than the rest of the country. A survey carried out by National Institute of Health (NIH), revealed that 75% of water in Islamabad and 87% in Rawalpindi is unsafe for human consumption (WB-CWRAS Paper 8, 2005).

4.1 WATER-BORNE DISEASES

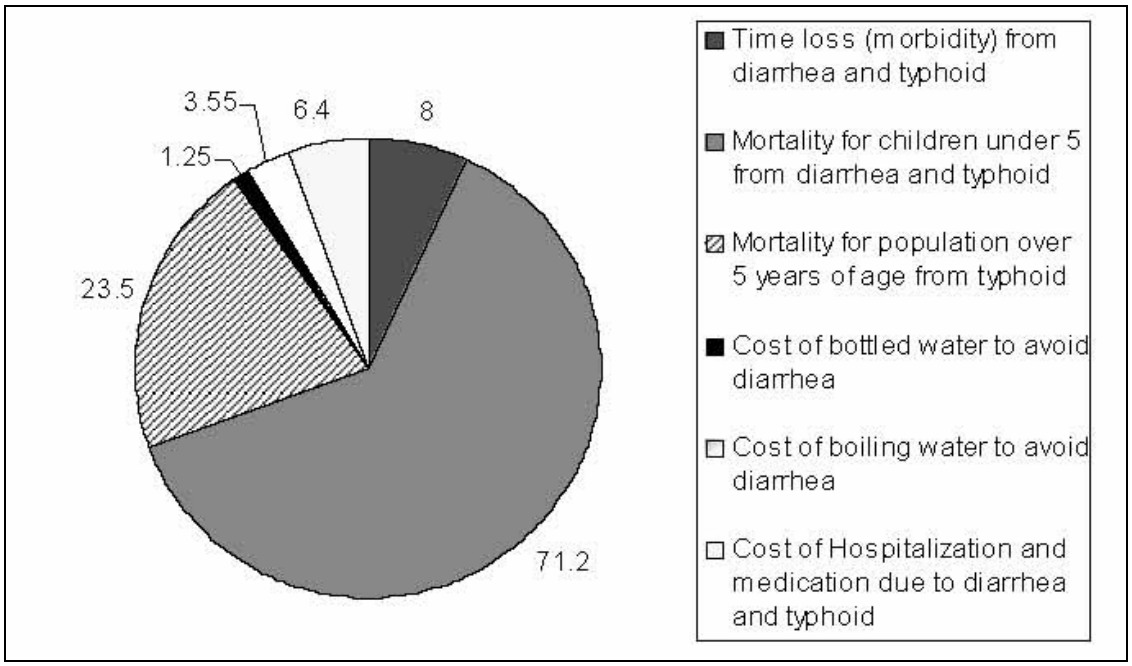
As per USAID report, an estimated 250,000 child deaths occur each year in Pakistan due to water-borne disease.
(http://www.usaid.gov/stories/pakistan/fp_pakistan_water.html)

The links between water quality and health risks are well established. Inadequate quantity and quality of potable water and poor sanitation facilities and practices are associated with a host of illnesses such as diarrhoea, typhoid, intestinal worms and hepatitis. It is estimated that more than 1.6 million DALYs[1] (Disability Adjusted Life Years) are lost annually as a result of death and disease due to diarrhoea, and almost 900,000 as a result of typhoid. Diarrhoeal and typhoid mortality in children accounts for the bulk of the losses, reflecting the vulnerability of children to these diseases. From a policy perspective the more informative estimate is presented in the Figure below, which summarizes the costs of water related mortality and morbidity. The total health costs are estimated at Rs 114 billion, or approximately 1.81 percent of GDP. The high proportions of costs due to premature child deaths, followed by the mortality impacts of typhoid in the older population are striking (Pak-SCEA 2006).

Boy living near Hudiara Drain, Lahore

A study conducted by UNICEF found that 20-40% of the hospital beds in Pakistan are occupied by patients suffering from water-related diseases, such as typhoid, cholera, dysentery and hepatitis, which are responsible for one third of all deaths (Pak-SCEA 2006).

Figure: Estimated Cost from Water Related Mortality and Morbidity (Rs. billion per annum)



Source: Pakistan Strategic Country Environmental Assessment Report, May 2006

[1] DALYs are a standard measure that combines disparate health effects using a consistent common denominator. DALYs adjust the years of healthy life lost to illness and premature mortality, with a weighting function that corrects for the impacts of death and illness at different ages. Though DALYs provide a useful summary measure of the physical effects of illness and death, they provide little information about the economic consequences of ill-health.

Health Effects Due to Water Borne Diseases as Published in National Newspapers

A number of articles have been written in national newspapers regarding water borne diseases in the country.

Article on "Water-borne diseases on the rise in Multan" published on *February 04, 2006 in "The News"* reflects that the continuous use of contaminated drinking water, due to rusting and leakage of very old underground drinking water supply pipes, is causing widespread cases of ulcer, cholera, acute dehydration, diarrhea, intestinal problems in Multan city.

An official report revealed that contaminated drinking water carrying bacteria and virus both in public water supply and private sources has been causing chronic water borne diseases hepatitis and gastroenteritis in city areas due to leakage of damaged pipes by ex-filtration and infiltration.

Multan Nishtar Hospital statistics revealed reporting of more than 295 deaths due to water-born diseases besides registration of 46166 cases of chronic diseases, 5921 cases with civil hospital, and 7689 cases with municipal dispensaries in this connection.

50 % of the population of Multan city, total 1.780 million, has been waiting for fresh drinking water from contaminated sources. Experts' sources disclosed that average daily demand of drinking water was 89 million gallon (MGD) and maximum demand was 133.50 MGD but water production in a day was just 62.28 MGD. Thus the average shortage is 26.28 MGD and maximum shortage is 71.22 MGD on daily basis.

The World Health Organisation (WHO) had recommended a comprehensive plan for continuous freshwater supply to Multan's population in 1999 but the implementation upon the recommendations or groundwork could not be initiated till today. According to recommended design, an additional 124 tube-wells of 5 cusec costing Rs 140 million were to be installed but so far these have not been installed.

President of Pakistan General Pervez Musharraf has said that up to 60% diseases in Pakistan are water borne and there would be a tremendous amount of saving in monetary terms if safe drinking water is made available to the people. "This would help control almost 60% of diseases in the country," he said, adding that it would also help ease the load on hospitals, basic health centres and rural health centres.http://southasia.oneworld.net/article/view/137648/1/
http://www.thenews.com.pk/daily_detail.asp?id=19306

4.2 PREVALANCE OF ARSENIC AND FLOURIDE IN DRINKING WATER

Arsenic is a tasteless, odourless inorganic element that occurs naturally in rocks, minerals and soils. It is also present in trace amounts in all living organisms. Arsenic can also be released into the environment from sources such as pesticides applications, wood preservatives, mining activities and petroleum refining.

The Department of Health and Human Services (DHHS), USA has determined that arsenic is a known carcinogen. Breathing inorganic arsenic increases the risk of lung cancer. Ingesting inorganic arsenic increases the risk of skin cancer and tumours of the bladder, kidney, liver and lung. Arsenic poisoning can happen in two ways; acute poisoning results from ingesting a large amount of arsenic in a short time, while ingestion of small amounts of arsenic over long time periods leads to chronic

poisoning. According to US-EPA, the following diseases are suspected to be caused or aggravated by arsenic in drinking water;

- Cancer of lungs, bladder, skin, prostate, kidney, nose and liver
- Still births
- Post neonatal mortality
- Ischemic heart diseases (heart attack)
- Diabetes mellitus
- Nephritis (chronic inflammation of kidneys)
- Nephrosis (degenerative kidney diseases)
- Hypertension, hypersensitive heart diseases
- Emphysema, bronchitis
- Chronic airway obstruction
- Lymphoma (tumours in the lymph)
- Black foot disease and development deficit.

Considering the adverse effects of inorganic arsenic on human health, several investigations have been carried out in Pakistan. The first investigation on arsenic in groundwater was undertaken in the Attock and Rawalpindi Districts of Pakistan in 2000 jointly by PCRWR and UNICEF. The second detailed investigation was initiated by PCRWR through its National Water Quality Monitoring Programme. The investigations revealed the presence of excessive arsenic in many cities of Punjab (Multan, Sheikhupura, Lahore, Kasur, Gujranwala & Bahawalpur) and some cities of Sindh (Dadu & Khairpur) provinces. The concentration of arsenic was found to be 50 ppb in most of the samples, which is almost five times higher that the prescribed limit of 10 ppb by WHO. (PCRWR)

4.3 IMPLICATIONS OF HEALTH IMPACTS

A study carried out by UNICEF has revealed that 20 to 40% of the hospital beds were occupied by patients suffering form water related diseases. Diseases such as typhoid, cholera, dysentery and hepatitis, are responsible for 33% of deaths. Irrigation water does not satisfy the quality standard which leads to contamination of vegetables cultivated in certain regions further increasing the risk of human health. (SOE 2005)

Poor water and sanitation is a major public health concern. Water borne diseases are responsible for substantial human and economic losses. These include loss of millions of working hours of productivity annually, and associated costs for health care. Sickness of the main bread earner can have a severe economic impact on a poor household, and in case of contagious diseases, may even affect the whole community. Reduction in the occurrence of water borne diseases will go a long way in the efforts to alleviate poverty. In rural areas especially women will be primary beneficiaries of improved water supply and sanitation through health, productivity and safety related impacts. Hence sanitation, water quality and quantity, and public awareness and education are of prime importance to Pakistan in implementing its Poverty Reduction Strategy (PRS). (WB-CWRAS Paper 8, 2005)

5. POLICY AND REGULATORY FRAMEWORK & ITS IMPLEMENTATION STATUS

Important policies regarding water issues such as the National Water Policy, National Environment Policy etc. and regulatory framework like Pakistan Environmental Protection Act 1997 are discussed in this section. Other existing laws that also relate to pollution prevention of water bodies include Canal and Drainage Act (1873) and the Punjab Minor Canals Act (1905), which prohibit the corrupting or fouling of canal

water, Sindh Fisheries Ordinance (1980), which prohibits the discharge of untreated sewage and industrial waste in water, and The Greater Lahore Water Supply Sewerage and Drainage Ordinance (1967).

PAKISTAN
Pakistan Debates New Water and Sanitation Policies
http://www.asiawaterwire.net/node/243
By Irfan Shahzad

ISLAMABAD (Asia Water Wire) - For the first time in almost six decades, Pakistan has put together two major policies related with water use and conservation. The National Drinking Water Policy (NDWP) and the National Sanitation Policy (NSP) will become official upon cabinet approval.

The main goal of the water policy is to assure safe drinking water to all "at an affordable cost in an equitable, efficient and sustainable manner" and to reduce mortality and morbidity caused by water-borne diseases.

"The draft has been prepared after consulting stakeholders," says Dr. Javed Iqbal, Director, Pakistan Environment Protection Agency. "The draft has been formulated after extensive consultations with stakeholders."

The policy draft, however, has yet to satisfy all consumer rights advocates who say there are many issues – such as rehabilitation of dysfunctional schemes, inequities in access, modes of levying of user charges and locations where filtration plants are to be installed – that need further debate.

The Consumer Rights Commission of Pakistan (CRCP), an NGO, says every fifth Pakistani child under the age of five suffers from water-borne diseases and that any new policy should be able to change the situation.

The CRCP adds that roughly 50 percent of mortality and 20 to 40 percent of hospital admissions are also caused by water-borne diseases.

According to United Nations Children's Fund (UNICEF) in 2004 the under-five infant mortality rate in Pakistan was 101 per 1,000 live births. The estimated number of annual under-five child deaths was 478,000.

The water policy introduces the idea of raising user fees for cost recovery but stops short of privatising water supply – triggering another debate between advocates and supporters of privatisation.

"It is regrettable that the policy has out rightly rejected privatisation," says Ele Jan Saaf, General Director of Saaf Consult B.V., a water management consultancy. "I don't understand why drinking water has been kept outside the ambit of privatisation."

Others support the new policy stance. "I am not against privatization of water, provided we also have strong and independent regulations," said Moshin Babbar, project coordinator at the Network of Consumer Protection. Babbar adds that privatising water would not work with the weak governance – not to talk about Pakistan's poor track record of implementing plans and policies.

The centrally formulated water policy makes provincial governments responsible for the service through special agencies that would be created in the cities and district-

sub divisions.

This “cure-all” approach is what social activists say will not work. “A single policy with fixed parameters can not be implemented in deserts and green areas,” said Agha Shakeel, an anthropologist and a water rights campaigner. “We need policies for each tehsil (sub-district) or at least at the district level,” he added.

The NDWP seeks to install water filtration plants at all the districts and village level by next year, and aims to provide safe drinking water to all by 2015.

Government officials say both the draft policies can be revised to accommodate concerns of NGOs working on water issues. “The policy will be revised in the light of comments we receive from stakeholders,” said Jawed Ali Khan, at the policy coordination and environmental governance unit at the environment ministry.

The other policy – NSP – acknowledges the lack of proper sanitation facilities and public toilets, and suggests ways to change the situation.

According to UNICEF, in 2002 only 54 percent of Pakistanis had access to “adequate” sanitation facilities, but most of those with access were urban residents (92 percent). In the villages, only 35 percent had access to sanitation facilities.

5.1 NATIONAL DRINKING WATER POLICY (Draft)

The National Drinking Water Policy (NDWP) provides a framework for addressing the key issues and challenges facing Pakistan in the provision of safe drinking water to the people. The overall goal of NDWP is;

- To ensure safe drinking water to the entire population at an affordable cost in an equitable, efficient and sustainable manner.
- To ensure reduction in the incidence of mortality and morbidity caused by water borne diseases.

There are a number of objectives set in the policy. The key objectives are;

- To provide a supportive policy and legal framework that facilitates access of all citizens to safe drinking water on a sustainable basis
- To provide guidelines that will allow consistency and conformity between the drinking water policy and the overall water sector policy, environmental policy, health policy and drinking water quality standards that will facilitate the provision of safe water to all.

A number of policy principals has also been provided in the policy document few important of them are;

- To recognize that access to safe drinking water is the basic human right of every citizen and that it is the responsibility of the state to ensure its provision to all citizens
- The right to water for drinking takes precedence over rights for water for all other uses such as environment, agriculture, industry etc.
- Water treatment will be an integral part of all drinking water supply schemes

Key targets have also been set in the policy to achieve the said goals, main targets includes;

- To provide safe drinking water to 93% of the population by 2015
- To provide at least one hand pump or spot source for every 250 persons
- To establish district and tehsil level water filtration plants by 2007
- To establish water treatment plants in all urban areas by the year 2015
- To ensure that water quality standards are approved and a system of surveillance, testing, monitoring and disseminating information regarding water quality is in place by 2007

5.2 NATIONAL WATER POLICY (Draft)

The top priority of the National Water Policy (NWP), approved recently by the Federal Government, is the provision of safe drinking water for all, along with hygienic sanitation for urban and rural populations. The NWP establishes important basic principles including protection of sources, monitoring and maintenance of drinking water quality, and progressive upgrading of facilities for the provision of water and sanitation, on a sustainable basis. It provides a framework within which to establish a single set of rules and regulations for Pakistan's future water management.

In accordance with the NWP, the government has decided to form a National Water Council (NWC) to take decisions on water-related issues and inter-provincial conflicts. At the provincial level, Provincial Water Regulatory Commissions (PWRC) will be set up to handle all water-related provincial matters, including domestic water and sanitation. One of the key roles of the NWP and PWRCs will be to provide advice and support to lower levels of government to help them in the improved delivery of water and sanitation services.

"By 2025, Pakistan should have adequate water available, through proper conservation and development. Water supplies should be of good quality, equitably distributed and meet the needs of all users through an efficient management, institutional and legal system that would ensure sustainable utilization of the water resources and support economic and social development with due consideration to the environment, quality of life, economic value of resources, ability to pay and participation of all stakeholders" (NWP).

It is clear that drinking water has a very high priority attached to it both in terms of quantity as well as quality. In order to achieve a financially sustainable urban water supply sector, it recognizes the need to promote private investment as well as the need to make efficiency improvements by reducing non-revenue water (NWP).

The Policy also recognizes the deteriorating water quality in surface and groundwaters and the fact that water supplied by various service providers does not meet any international or national standards for potable water. There is an urgent need to address water pollution of both surface water and groundwater aquifers. The Policy in this respect highlights the need to initiate a study to establish and implement a National Water Quality Monitoring Programme which will establish water quality standards for potable water and develop regulations for effluent disposal (NWP).

5.3 NATIONAL ENVIRONMENT POLICY 2005

The National Environment Policy (NEP) aims to protect, conserve and restore Pakistan's environment in order to improve the quality of life of the citizens through sustainable development.

The objectives of the Policy are:

(a) Conservation, restoration and efficient management of environmental resources.
(b) Integration of environmental considerations in policy making and planning processes.
(c) Capacity building of government agencies and other stakeholders at all levels for better environmental management.
(d) Meeting international obligations effectively in line with the national aspirations.
(e) Creation of a demand for environment through mass awareness and community mobilization.

The NEP also address the issues of clean drinking water and gave certain recommendations in order to provide sustainable access to safe water supply and effectively manage and conserve the country's water resources. The recommendations are to:

(a) Develop a legal and policy framework for promotion of safe drinking water in Pakistan.
(b) Increase coverage of water supply and water treatment facilities.
(c) Establish a water quality monitoring and surveillance system.
(d) Make installation of water treatment plants as an integral component of all drinking water supply schemes. .
(e) Promote low-cost water treatment technologies at the community and household levels.
(f) Promote appropriate technologies for rain water harvesting in rural as well as urban areas.
(g) Encourage artificial recharge of groundwater in arid and semi arid areas.
(h) Promote metering of water consumption to discourage the indiscriminate use of water for industrial and municipal purposes.
(i) Enact Water Conservation Act and relevant standards to foster water conservation.
(j) Promote integrated watershed management.
(k) Monitor sustained freshwater flows into the marine eco-systems.
(l) Establish standards for classification of surface water bodies.
(m) Launch phased programmes for clean up and gradual up-gradation of the quality of water bodies.

5.4 PAKISTAN ENVIRONMENTAL PROTECTION ACT (PEPA) 1997

Pakistan Environmental Protection Act, (PEPA) 1997 describes the functions of Environmental Protection Agency (EPA). PEPA, 1997 advises EPA to “Establish standards for discharge or emission of the ambient air, water and soil, coordinate environmental policies and programmes, nationally and internationally, designate laboratories for conducting tests and analysis for surveillance, monitoring, measurement, examination, investigation, research, inspections and audits to prevent and control pollution and estimate the cost of cleaning up and rehabilitation”.

Regulatory provisions of PEPA, 1997, related to pollution control under section 11 prohibit discharge or emission of effluent, waste, air pollutant or noise in excess of the NEQS, or the established ambient standards of air, water and land.

Article 3.15.2 of PEPA, 1997 gives the detail of the NEQS for municipal and liquid industrial effluents of the physical and chemical parameters into inland waters, sewage treatment plants and the sea.

5.5 PAKISTAN STANDARDS & QUALITY CONTROL AUTHORITY (PSQCA)

The development of Meteorology, Standards Testing and Quality (MSTQ) infrastructure provides an essential component for industrial development in a country. Feeling this need, the Government of Pakistan established the Pakistan Standards and Quality Control Authority (PSQCA), through Act No. VI of 1996. The implementation of this Act has commenced with the appointment of a Director General for PSQCA on 1st December 2000.

The three organizations; Pakistan Standards Institution (now SDC), Central Testing Laboratories (now QCC) and Metal Industries Research and Development centre (now TSC) have already been merged in PSQCA to provide a one window for standardization, quality control and other technical services.

5.6 MID-TERM DEVELOPMENT FRAMEWORK 2005 – 2010

The Mid-Term Development Framework (MTDF) 2005 – 10 has been prepared by the Federal Planning Commission with the long-term objective of attaining sustainable economic growth without environmental degradation. It identifies the country's specific priorities and addresses them within the framework of comprehensive national strategies for sustainable development as well as Millennium Development Goals, Johannesburg Plan of Implementation and Water, Energy, Health, Agriculture and Biodiversity framework. The MTDF notes that Pakistan is conscious that pursuit of growth and development has placed a heavy burden on sustainability for now and the foreseeable future. It notes that significant progress has been made in developing the environmental policy and regulatory framework, development of environmental institutions and raising awareness but that the current cost of environmental degradation is still considerably higher.

The MTDF emphasizes the integration of environment into all development efforts and policy formulation processes of cross cutting sectors of the economy and prioritizes the following issues that need to be addressed immediately, if Pakistan is to reverse the ecological imbalance. These include: pollution of air and water, climate change, ozone depletion, deforestation, desertification and vanishing biodiversity land degradation, lack of waste management, lack of urban land use planning and zoning. Carrying out Strategic Environmental Assessment in the development planning process is considered a pre-requisite in the MTDF. The MTDF also provides environmental indicators as well as future targets.

A major MTDF initiative taken by the Government is the provision of clean drinking water to almost entire population of the country. A Clean Drinking Water for All Programme would be implemented to complete by 2008 by installing the standardized water purification plants at convenient places (mosques, schools, hospitals, dispensaries, police stations, petrol pumps and fire stations) in urban and rural areas. A provision of Rs. 10 billion has been made under the MTDF to implement it with participatory approaches and active involvement of the Local Governments, who will become owner of the plants. Rs. 2 billion have been earmarked at Federal level to immediately commence the implementation of this Program by the Ministry of Environment. (www.**pakistan**.gov.pk/ministries/environment-ministry/media/mtdf.htm)

6. EXISTING MANAGEMENT PRACTICES TO COMBAT WATER POLLUTION

As water is relatively cheap and there is no effluent discharge policing, businesses have little incentive to save or conserve water. The more water it uses the more wastewater it generates. Water conservation and better in-house management

practices are an important “first steps” in controlling pollution. It is also important to note that NEQS specify only the concentration of effluents and thereby there is an incentive to use more water and dilute the effluents. However, with the passage of time, metered water supply at realistic costs will ensure there is incentive for the industry to improve its in-house water management (WB-CWRAS Paper 8, 2005).

Until November 2002, there was no quality standard for drinking water. As a result of lobbying with the Ministry of Science and Technology, Pak-EPA and by an NGO ‘The Network’, standards were issued but their application was not mandatory. Moreover, even after the standards were established, they were not communicated to the suppliers (in this instance the tehsils) until another campaign was launched by the civil society. These standards are currently being revised and the Government has set up an advisory committee to reformulate the policy. There are various possibilities of intervention in the water sector but actions must be consistent with the objectives of the Government as well as the private sector for mutual benefit (SOE 2005).

In Karachi, supply of water to the areas not covered by the pipeline network is carried out with the help of tankers. These trucks get water from the public provider or the private suppliers licensed by Karachi Water and Sewerage Board (KWSB). However, there are many illegal suppliers who obtain connection to the public networks through fraudulent means. They are located on the banks of the highly polluted river Liyari and mix the water drawn from the river with the water from the public network before reselling it. Theoretically, different colours distinguish the tankers meant for drinking water from those carrying water for industrial and agricultural use. This does not always happen, and numerous carriers of drinking water get their water from illegal suppliers. Little action has been taken as yet to rectify the situation (SOE 2005).

Pak-EPA’s implementation of the self-monitoring and reporting programme, with the help of NGOs, and private sector institutions, including representatives from industries, is a step worth mentioning for effective industrial pollution control. In Pakistan, barriers such as indifferent attitudes and over consciousness before accepting any change for betterment exist among the industrialists. Recently, however, due to the introduction of a consultative process as in the case of NEQS, industrialists and organisations particularly, Federation of Pakistan Chamber of Commerce and Industry (FPCCI), Overseas Investment Chamber of Commerce and Industry (OICCI), and industrial associations have become willing to cooperate with regulatory agencies to control industrial pollution. To make this regulatory approach successful, a strong information intensive and regulatory programme is essential to complement an environmentally concerned industrial development policy in reducing the overall pollution load of industry. Pakistan will have to strengthen its regulatory institutions for effective implementation of the NEQS. (SOE 2005)

The experiences in Pakistan and other developing countries indicate that the new regulatory institutions are often unable to enforce conventional discharge standards at the factory level. Regulatory agencies like the Pak-EPA have realised that such standards would not be cost-effective because they require all polluting factories to toe the same line, regardless of abatement costs and local environmental conditions. To break out of this one-size fits all scenario, Pak-EPA’s approach to introduce the self-monitoring and reporting tool, implement pollution charge, exert influence through numerous channels and work more like a mediator and less like a dictator is a positive step to reduce pollution in Pakistan. Although some regulatory agencies like provincial EPAs in Sindh and the Punjab have started collecting baseline data on industrial effluents, there is still a need to conduct baseline studies to collect meaningful data. In addition, ambient water quality standards and industry specific standards need to be developed. (SOE 2005)

The government has also drawn up plans underlining the need for coordination. The first plan was prepared by WAPDA in 2001, WAPDA-Vision 25, which proposed an investment of 25 billion dollars over the next 25 years for a number of multipurpose reservoirs with a total capacity of 64 MAF. It also proposed new canals to extend the irrigation system, surface coating or lining of canals and construction of drainage infrastructure. In 2002, the Ministry of Water and Power prepared a strategy with institutional, political and investment components (SOE 2005).

6.1 ENFORCEMENT STATUS

While a comprehensive national policy and institutional framework for environmental management is in place, there are significant weaknesses in the current administrative and implementation capacity, typical of a developing country setting. Principal among these are a ubiquitous shortage of trained manpower and insufficient budgetary allocations, a lack of clear definition of roles, work plans and targets, and ineffective coordination and communication between federal, provincial and local administrative entities. The result is that, while an appropriate and necessary administrative capacity exists on paper, its effectiveness is seriously curtailed in practice due to these shortcomings. For example, the NEQS for industry and municipal discharges were originally formulated in 1993, but even voluntary compliance and reporting have yet to be instituted because of a lack of practical monitoring ability in the EPAs; the Environmental Impact Assessment (EIA) system is mandatory but seldom followed in the public sector; and environmental laboratories have been established in all provinces but function with skeletal staff and budgets inadequate even for their routine equipment and chemical needs. Similarly, environmental tribunals have been created but their capacity to deal with reported cases is extremely restricted, as minimal personnel have been deputed in only two provinces to collectively oversee the entire country (WB-CWRAS Paper 3, 2005).

Pollution Charge System

A pollution charge system for the industry was designed in 1997. The intent behind the proposal was to convert the compliance problem into an economic incentive, where the industries were to be subjected initially to a lower charge, which would gradually increase to a level where the industries would either close down or find it economic to install treatment facilities.

Unfortunately, the pollution charge system could not be implemented, since despite extensive negotiations, industries and the government were unable to agree on how the funds generated through the system would be eventually utilized. Industries were of the opinion that the pollution charges they paid should be used to help them meet the NEQS, through environmental capacity building measures within the industrial sector. Industries also did not want the funds to go into the state treasury; they wanted them to be easily accessible. The Government proposed an environmental fund, into which it would deposit matching contributions (WB-CWRAS Paper 3, 2005).

Self Monitoring and Reporting

Parallel to the pollution charge system, a self-monitoring and reporting programme was also proposed to encourage the industries to collect data on their environmental performance. A system labelled as Self Monitoring and Reporting Tool (SMART) was developed to support the pollution charge programme. The data collected under the SMART system could be used not only for ensuring industrial NEQS compliance by

the EPAs, but also directly contribute to establishing national environmental pollution databases and baselines. Countrywide implementation of SMART has, however, been delayed mainly due to lack of financial resources and administrative capacities in the EPAs (WB-CWRAS Paper 3, 2005).

Cleaner Production in Industry

Given the scarcity and value of clean freshwater, and the cost of treating and properly disposing of contaminated wastewater, it is logical to investigate methods for reducing such pollution in the first place by adopting strategies that minimize and conserve freshwater usage, lower the amounts of contamination, and recycle wastewaters after some treatment to reduce the need for fresh supplies. Cleaner production programmes have been implemented in the recent past and are presently underway in different industrial clusters around Pakistan (WB-CWRAS Paper 3, 2005).

Common Effluent Treatment Plants (CETPs)

The CETPs in industry clusters offer an economic alternative to the industries in comparison to setting up treatment facilities at the individual industrial units. In addition to lower investment and operating costs, the CETPs allow the industries to allocate scarce land and management resources to production, and shift the burden of compliance and reporting to the CETP operator. The Kasur Tannery Project was the first CETP established in the country with assistance from the UNDP and the Punjab Government, and was designed to process the wastewater produced by small and medium sized leather tanning units located in the city. The second CETP has been established in the Korangi Industrial Area in Karachi with support from the Export Development Fund of the Ministry of Commerce and the Netherlands Government (WB-CWRAS Paper 3, 2005).

The ADB initiated the Industrial Efficiency and Environmental Management (IEEM) Project in 2003 with the Ministry of Environment as the executing agency. The IEEM project aims to establish six CETPs and two Hazardous Waste Handling Facilities (HWHFs) in the country. The two HWHFs will be strategically located with respect to the CETPs, and will process the hazardous sludge produced by the proposed CETPs. The project targets clusters of export-oriented industries such as textile and leather that are under pressure to comply with the local and international environmental standards as required by the importers in the US, Europe, and Japan (WB-CWRAS Paper 3, 2005).

Municipal Wastewater Treatment

A recently completed study calculates the costs of providing proper Water Supply & Sanitation (WSS) cover to 90% of Pakistan's population as US$ 4.8 billion, with associated annual recurring costs of US$ 828 million. These are considerably less than the annual health care costs of treating WSS related diseases (US$ 1.8 to 4.8 billion), the current additional costs of obtaining clean water (probably of a similar order of magnitude), the annual loss in fishery output (about US$ 1 billion), and other unquantified economic impacts of polluted waters, including ecological damage. It is estimated that of these losses, about US$ 2 billion a year would emanate from urban water pollution, while the annual cost of providing a proper WSS infrastructure to the whole of urban Pakistan would only be approximately US$ 0.8 billion. The economic and financial benefits of wastewater treatment and WSS investments are therefore obvious, especially given the current poor status of these in the country (WB-CWRAS Paper 3, 2005).

The approach in the municipal wastewater treatment has relied mainly on the public sector for financing and operation of the treatment facilities. The municipal wastewater treatment facilities such as TPII and TPIII in Karachi and the treatment plant operated by Capital Development Authority (CDA) in Islamabad have not been able to achieve the performance standards set under the NEQS. While the treatment facilities in Karachi were established with support from multilateral financing agencies, the agencies mandated to operate these facilities have not been able to allocate adequate resources for management and maintenance of these facilities. Complete absence of regulatory or public pressure notwithstanding, the poor standard of water supply and sanitation services, inadequate tariffs and charges for the services provided, and limited capacity to collect revenues from the households and customers served can be considered as the main reasons for the failure. In the absence of internal revenue generation, the municipalities and local governments are dependent on financial support from the city and the provincial governments that are already stretched for resources (WB-CWRAS Paper 3, 2005).

Recycling of Treated Wastewater

The incentive for recycling of treated wastewater from the municipal as well as industrial treatment plants varies through the country. Groundwater or surface water can be acquired at a lower cost in Punjab and NWFP where supply is generally abundant, and the only option available is disposal of the treated effluent into the open drains. The option of disposing treated wastewater into canals can also be exercised, but will require stricter monitoring particularly when the canals are closed or in low flow conditions. While this option would yield economic benefit, no additional revenues will be available to the operator of the treatment facility. On the other hand, freshwater supply is limited in Karachi and urban centres of Balochistan such as Quetta, and the price of water is correspondingly higher. To supplement the limited quantities of water available from the city water supply, the industries in Karachi are paying in excess of Rs. 20 per cubic meter for water delivered by private tankers (WB-CWRAS Paper 3, 2005).

Clean Drinking Water Initiative (CDWI) and Clean Drinking Water for All (CDWA)

The government has launched a comprehensive nation wide clean drinking water programme under two parallel phases, "Clean Drinking Water Initiative" (CDWI) and "Clean Drinking Water for All (CDWA)" which encompasses 6,579 plants throughout the nook and corner of the country. Under CDWI project approved on 2004, 544 water purification plants with a capacity of 2,000 gallons per hour at each district and tehsil of the country were to be installed at the cost of 495.50 million.

7. CONCLUSIONS, POSSIBLE SOLUTIONS AND THE WAY FORWARD

The issues of water quality and quantity in Pakistan discussed in the earlier sections of this report are considered grave in nature. A number of factors need to be highlighted and addressed in order to improve, protect and maintain the quality of freshwater resources of the country. Theses factors include;

i. **Government Priorities:** as evident from the information presented in the report, the treatment of sewage and industrial effluents seems to be a low priority with the Government. According to reliable sources about 7,200 kanals of land allocated to WASA Lahore for wastewater treatment has remained vacant and not been used for the purpose. WASA is now disposing of that land to other organizations for different purposes. This shows the level

of commitment from government authorities to treat wastewater and to improve the quality of freshwater. Therefore, there is a need to bring provision of clean water back as a top priority.

ii. **Rules and Regulations:** Unregulated groundwater abstraction as discussed earlier is the cause of water depletion. Unfortunately there are no clear guidelines, rules and regulations for groundwater abstraction. In additions, surprisingly, there are no surface water classification standards in the country. Such rules and regulations have to be established at the earliest. A recent case where a bottled water company was stopped by our courts from setting up their unit due to risk of excessive groundwater extraction near Karachi is to be appreciated. The concern is that rather than on-off discussions such risks to excessive groundwater extraction need to be covered by legal rules and regulations.

iii. **Weak Law Enforcement & Compliance:** Even when there are relevant laws in the country like PEPA 1997, their enforcement is extremely weak and therefore the level of compliance is low particularly in the industrial and housing sector. There is a need to develop some sort of integrated land use planning to regulate particularly the housing sector. Weak enforcement of law can also be judged with the fact that environmental tribunals are not even functional in the country. Strong law enforcement and compliance is necessary for the protection of freshwater resources. One appreciates the recent decision of the Supreme Court demanding that Environmental Tribunals must be functional in all provinces by January 8, 2007.

iv. **Water Policy:** although relevant policies like National Environment Policy, National Water Policy (Draft), National Drinking Water Policy (Draft) etc. are in place, there is no clear strategy devised so far to implement them. A clear and practical strategy needs to be defined to implement these policies.

In addition to the above, the provision of water and sanitation services in Pakistan is inadequate, inequitable, and highly inefficient. The services are mainly provided by the public sector. These services generally fail to meet water quality standards and are unable to provide adequate sanitation needs of a growing population.

The major reasons why these service providers have failed to perform are;

- Confusion of social, environmental, commercial, and political aims
- Poor management structures operating without clear policy guidelines
- High capital investment needs with low or no rate of return
- Resistance to achieving full or even partial cost recovery
- Decentralized water agencies with service responsibility but little resources
- Political interference at most levels of operation
- Non-existent regulator
- Lack of proper legal framework
- Lack of platforms for contribution by concerned citizens

Under these constraints / existing ground realities in Pakistan, improvements in service delivery of potable water and sanitation must be linked to improvements in the following functions and areas:

i. **Defining the Policy, aims and objectives clearly;** there is a need to clearly define the policy, aims and objectives of the water and sanitation institution

responsible for the services. All employees should understand these and work together in achieving the goals stated.

ii. **Strengthening of institutions and capacity building;** one of the limitations of service providers in Pakistan is poor public sector management and limited skilled human resources. There is little incentive and motivation for workers to improve their performance. They complain of resource constraints and feel frustrated due to constant political interference. There is a need to enhance human resources management by evolving a system of merit based selection, training, performance evaluation and motivation. The role of concerned citizens needs to be formalized through mechanisms such as 'neighbourhood citizens committees' to monitor the performance of relevant Government employees.

iii. **Improving financial sustainability;** sustainable cost recovery is essential in creating a stable framework to enable service providers to maintain an acceptable level of water quality and quantity, and to provide adequate sanitation facilities.

iv. **Making better and more efficient use of funds;** the Government of Pakistan only contributes about 0.2% of the GDP to this sub-sector for both urban and rural development. This equates to only 0.8% of total Government expenditure on public health facilities. With this situation in mind, water and sanitation providers being mainly public sector organizations, there is a great constraint in providing the quality of service expected. However, whatever little funds become available, have to be spent in the most efficient manner.

v. **Getting our own house in order to attract foreign investment;** there is need for further investment to keep the existing infrastructure intact by continuing rehabilitation and asset replacement. Most of the urban water supply and sewerage systems are old and decrepit. Physical leakages in water supply distribution systems are high, often accounting for the loss of more than 40% of water production. Underground sewerage networks, likewise, are in a state of disrepair in most cities and towns resulting in sewage leakages and consequently pollution of underwater aquifers and water supplies. Government funding is limited and competed for by numerous other sectors. To meet even a fraction of the capital investment requirements, finance will need to be drawn from other sources. These sources include foreign aid, commercial loans, and private investments. However, investing in a financially unsustainable, totally inefficient organization is naturally not an attractive proposition.

vi. **Better water management practices - reuse, conservation etc.** with financial constraints and a water resource problem across the country, it is imperative that the service providers move towards better water management practices. In addition, water conservation, re-use, and industrial water recycling are areas that are considered crucial in any water scarce country. Better management practices can also be used in agricultural sector such as switching from high delta crops to those crops requiring less water inputs etc.

There should be an incentive based public campaign emphasizing the need to conserve water at all levels. In households, leaking taps, tank overflows, irresponsible use of potable water for washing cars and watering lawns and plants must account for a significant proportion of non revenue water. Water metering is a

must but with an intermittent supply of water it is of little use (WB-CWRAS Paper 8, 2005).

In conclusion, even though water is one of the most important requirements for life and Pakistan is a semi-arid country, water use practices in the country fall far short of the required minimum for water conservation and water quality. In simple terms, Pakistan's water is drying up, and what little remains is heavily polluted. We need to make sure that our practices change if Pakistan is to survive the next few decades.

Note: Government of Pakistan reports and surveys have been instrumental in the compiling of this report.

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www.
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Head Office

Ferozepur Road, PO Box 5180
Lahore - 54600
Tel: +92 42 5862360, 5869429
UAN: 111-WWFPAK (993725)
Fax: +92 42 5862358
E-mail: info@wwf.org.pk

Islamabad
House # 60, Bazar Road
Sector G/6-4 Islamabad
Tel: +92 51 2829456
Fax: +92 51 2820469
E-mail: amwwfisd@apollo.net.pk

Karachi
Marketing Unit, 12th Floor
Sidco Avenue Centre, 264-R A Lines
Stratchen Road, Karachi - 74200
Tel: +92 21 5693475/5674881/5
Fax: +92 21 5689604
E-mail: panda@gerrys.net

Conservation Unit, Room 606-607
6th Floor, Fortune Centre, Block 6 PECHS
Shahrah-e-Faisal, Karachi
Tel: +92 21 4544791-92
Fax: +92 21 4544790
E-mail: karachi@wwf.org.pk

Peshawar
34-D-2, Sahibzada Abdul Qayum Road
University Town, Peshawar
Tel:+92 91 5841593
Fax: +92 91 5841594
E-mail: wwfpsh@brain.net.pk

Gilgit
NLI Colony, Near Imamia Eid Gah
Shahrah-e-Quaid-e-Azam
Jutial, Gilgit
Tel: +92 0581155658
Fax: +92 0581155688
E-mail: gcic@glt.comsats.net.pk

Quetta
Killi Gishkori, Sabzal Road, Quetta
Tel: +92 81 2452251
Fax: +92 81 2452250
E-mail: ajdfo@qtapaknet.com.pk

Muzaffarabad, AJK
House # D-98, Chattar Housing Scheme
Upper Chattar, Muzaffarabad
Azad Kashmir
Tel: +92 058810 32041
Fax: +92 05881032149
E-mail: wwfajk@isb.paknet.com.pk

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