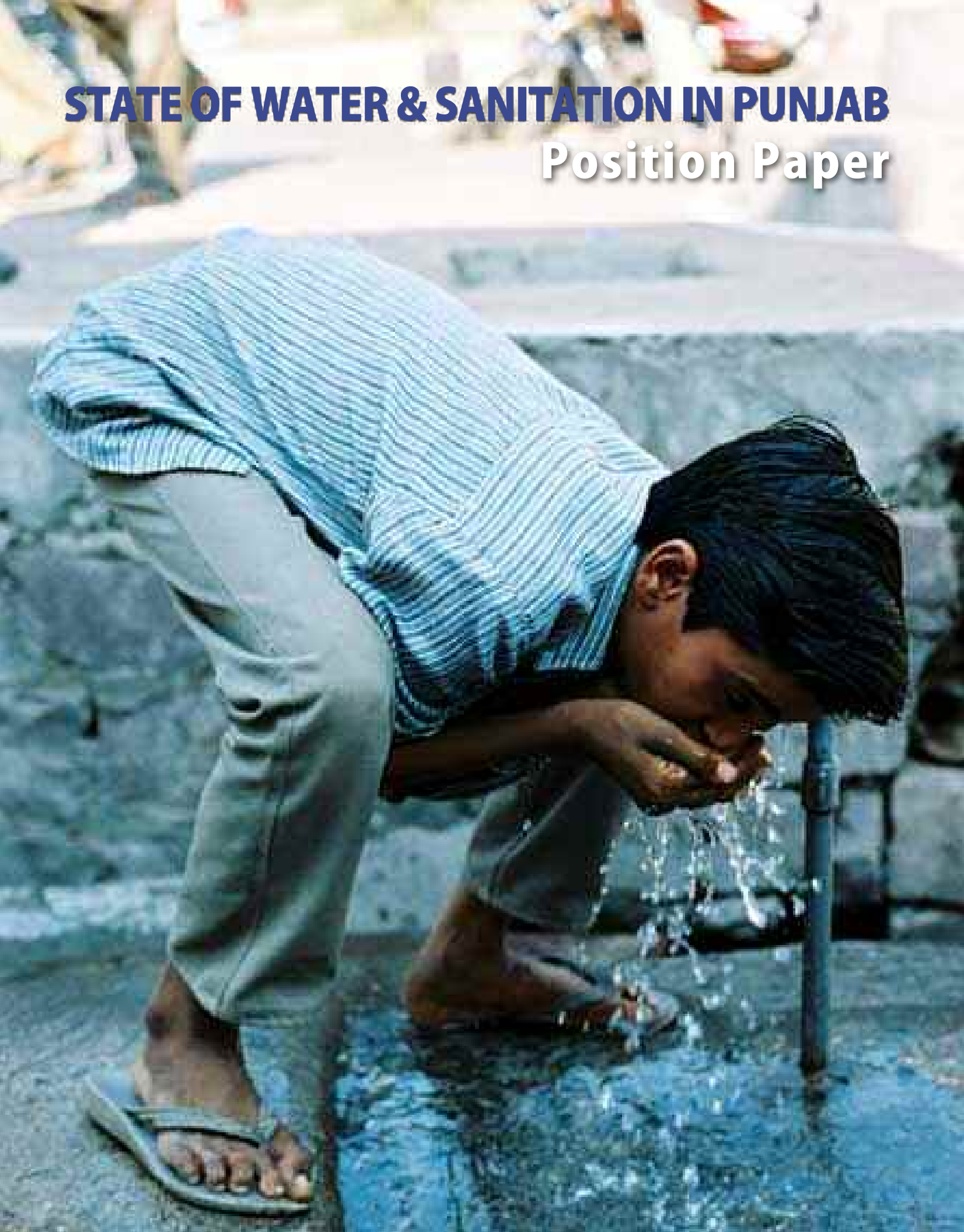
STATE OF WATER & SANITATION IN PUNJAB

Position Paper



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Preface

Punjab urban Resource Centre (PURC) With the financial assistance of WaterAid. has drafted State of Water & Sanitation in Punjab with an aim to analyze the existing water and sanitation scenario in the province. This is a desk study containing review of legislative, policy and institutional framework, statistical data, significant issues in the sector and possible solutions to improve the state of affairs in water and sanitation sector. Key findings of the paper reflect that in Punjab provision of water from improved sources is not an issue as this is available to about 97% of the population. The issue is of quality as 49% of the water is contaminated due to poor sanitation arrangements. Therefore this paper recommends that water and sanitation policy makers should redirect their human and capital resources towards betterment of sanitation in rural and urban areas of the province.

PURC research team has completed this paper with the cooperation of water and sanitation sector actors. The team owes its gratitude to all who contributed in the paper specifically the officials of Public Health Engineering Department, Water and Sanitation Agencies, Tehsil Municipal Administration and representatives of civil society and sector experts who provided the team with required data and contributed by their consultation to improve the quality of paper. Research team is also thankful to WaterAid for supporting PURC for this paper.

Research Team
March 31, 2011.

Abbreviations

Ca	Calcium
CBO	Community Based Organizations
CDG	City District Government
Cl	Chlorine
E.Coli	Escherichia Coli
EPD	Environment Protection Department
HCO3	Bicarbonate
Mg	Magnesium
MOU	Memorandum of Understanding
Na	Sodium
PCRWR	Pakistan Council of Research in Water Resources
PHED	Public Health Engineering Department
PMU	Project Management Unit
SO4	Sulphate
SWM	Solid Waste Management
TDS	Total Dissolved Solids
TMA	Tehsil Municipal Administration
TH	Total Hardness
WASA	Water and Sanitation Agency
WASCO	Water and Sanitation Community Organization
WSS	Water Supply and Sanitation
WATSAN	Water and Sanitation
UC	Union Council

Table of Contents

Executive Summary

Introduction

Punjab Urban Resource Centre (PURC), a research and advocacy organization working in urban planning and development has drafted this position paper to critically examine various facets of prevailing water and sanitation situation in Punjab province. The study examined available water resources, drinking water zoning, water and sanitation quality and coverage, regulatory, policy and institutional framework and key issues in the sector. Research team collected primary and secondary data from relevant government departments, research and academic institutions, Non-Governmental Organizations (NGOs) and community to form an analysis for this paper. The study identified gaps at macro and micro levels and generated recommendations for certain strategic actions essential for improvement in the sector.

Water Resources in the province

The Punjab is the second largest province of Pakistan after Baluchistan with 205,344 km2 (79,284 sq mi) area with a population of 90 million. The province is rich in both surface and ground water resources owing to the five rivers of Pakistan passing through the province giving birth to large irrigation network, a great source of water recharge. Province can be divided into four drinking water zones; predominately sweet ground water zone (53%) comprising of districts from central and southern parts, predominately brackish zone (29%) mostly located in southern part, predominately mixed (brackish/ barani) areas (13%) comprising of southern and northern parts and predominately water scarce zone (5%) mostly located in north in Potohar belt.

Water and Sanitation in Punjab - Existing Situation

Piped water facility is available to less than 50% of population in both urban and rural areas. This coverage is less than 30% in rural areas. Overall access to drinking water is 97% out of which 49% water is contaminated. Furthermore, over 20% the population lives near arsenic "hot-spot" districts exposed to arsenic contamination above World Health Organization (WHO) limits of 10 ppb.

On the whole 58% population has access to sanitation facilities. Situation of sanitation is worse in villages and small towns. The unsafe drainage and disposal of waste water is predominant in both urban and rural settlements. As per findings of recent sanitation survey conducted by Public Health Engineering Department (PHED), in 44% villages no sanitation system exists. The disposal of untreated sewerage into canals, rivers, lakes, open spaces and agriculture fields is common. Sewage treatment is hardly available in any of the cities of the province except to some extent in Faisalabad and Rawalpindi. Solid waste collection and disposal systems are available to approximately 66% population living in major cities and 1% to rural areas.

The small and medium towns have very poor solid waste management system. Only 14 per cent of households have access to a proper solid waste disposal system. More than 75% (46% urban, 99% rural) households dispose of such waste in the open fields. Proper landfill sites and the recycling plants are meagerly available. Regulatory framework for industrial, hospital and other waste management is too weak to enforce compliance.

Water & Sanitation in Major Cities

Access to piped water in Punjab's cities is about 80%.The average water supply per day is 4 hours. The quality of water is generally poor owing to Improper chlorination and damaged outlived distribution network letting in effluents and to pollute the water. As far sanitation is concerned, 96 percent of households have installed flush latrines in major cities. The coverage of sewerage varies from 50-85% in major cities. Solid waste collection and disposal facilities are available to 66% population in major cities as compared to 33% in other urban areas. Solid waste system lacks sanitary landfill sites. Recycling of solid waste is limited.

Rural Water Supply & Sanitation in Punjab

The PHED has been providing water supply and sanitation schemes in rural areas since its inception in the year 1961. The department has handed over all new and old schemes to the water user committees formed of local people since 1997. For the operational purposes PHED has divided the province into two zones i.e. north and south zones. PHED completed 4069 schemes in Punjab, in which 2,039 schemes were constructed in north and 2,030 in south Punjab. 35% and 32% schemes are non functional respectively in northern and southern part of the province. Source failure and engineering flaws are the primary reasons for closure of these schemes.

Regulatory Framework

Various acts, ordinances and regulations are promulgated by various public agencies to regulate water and sanitation functions. Punjab Local Government Ordinance (PLGO) 2001 created a binary between PHED and Tehsil Municipal Administration (TMAs) as PHED functions were devolved to the TMAs but PHED was never devolved. The new law is in making which may clarify the roles of two. Punjab Development of Cities Act 1976 has provisions on seeking permission for water extraction which are hardly implemented. Canal and Drainage Act 1873, and Pakistan Environment Protection Act 1997 strictly prohibits

disposal of untreated waste water into water bodies but service providers keep on violating the law. Punjab Municipal Water Act, currently in the making, has provisions to regulate water extraction and safe disposal of effluent. PLGO 2001 has provisions for zoning of cities for housing. Housing bye laws prohibits unplanned housing. If both these statutes are implemented properly, they would curtail unplanned housing and ensure development of proper water and sanitation services.

Policy Framework

National policy on Drinking Water 2009, aiming at provision of safe drinking water to citizens at reasonable cost and to improve quality of life of people by reducing water borne diseases, revolves around principles of water as first priority and basic human right, equity and delegation of functions to local authorities. Increased access, water protection and conservation, community participation and enforcement of legislation are the guiding parameters of the policy.

The Punjab Government has drafted Punjab Drinking Water Policy (PDWP) in 2010, which follows the national policy and highlights provision of safe drinking water in adequate quantity at an affordable cost through equitable, efficient and sustainable services to all citizens by 2020. For effective implementation of PDWP 2010, Punjab Drinking Water Strategy (PDWS) has been drafted which envisages improvement in existing legislations, institutional reforms in WASA, improvement in rural water supply, effective monitoring systems and allocation of equitable resources and adoption of component sharing approach.

National Policy on Sanitation 2006, aims at improving sanitation coverage, provision of safe disposal of liquid and solid wastes and promotion of health and hygiene practices. Policy principles focuse on utilization of existing local resources, evolving community participation, using low cost and affordable techniques, adopting component sharing models and following National Environment Quality Standards (NEQS) for treated waste water disposal. The policy also highlights documentation of existing sanitation systems with Geographic Information System (GIS) including solid waste. To follow suit, Punjab Government has drafted Punjab Sanitation Policy (PSP) 2011 which aims at promotion of health and hygiene and providing excreta free environment through safe disposal of solid and liquid excreta. To implement PSP, Punjab Sanitation Strategy (PSS) is drafted which focuses on institutional reforms in public service provider agencies, adoption of component sharing and community led total sanitation approaches, clarifying roles and responsibilities of various actors, ensure community investment in the sector, legislative improvements and behavioral change and communication for awareness rising.

Institutional Framework

There are multiple agencies working to cater water and sanitation service provision. Public Health Engineering Department, Water and Sanitation Agencies in five major cities, Tehsil Municipal Administrations, private housing schemes, Cantonment boards and private vendors are mainly the entities working in water and sanitation sector. Local Government, through City District Governments and Tehsil Municipal Administrations, are looking after solid waste management. Recently, Lahore Waste Management Company (LWMC) has been established under City District Government Lahore (CDGL) to work exclusively on solid waste management in the city by adopting Turkish models.
In private sector, few companies are working in solid waste management and recycling. The duplication in roles and responsibilities of sectoral departments leads to the overlapping of functions. Secondly the tools for planning are either missing or outdated as most of the executing agencies do not have accurate maps and documents of their areas of jurisdictions which leads to poor planning and improper allocation of funds.

WASAs working in five major cities are undergoing

financial crunch. The working ratios of all these agencies are imbalanced which is very high (1:86) in case of WASA Lahore. This ratio is increasing every year. To put it back on the track, WASAs have to increase tariffs. WASAs are preparing business development plans with a purpose to achieve breakeven incrementally. TMAs lack human and financial resources and in-house capacity to deal with water and sanitation service delivery for whole Tehsils. However they are successful in towns under specific projects such as Southern Punjab Basic Urban Services Project. On the other hand PHED has been instrumental in rural sanitation. It would be wise if TMAs take care of Tehsils and small towns while PHED works in rural areas. Private entities are working very well in service delivery.

Tariff and Recovery System

In Punjab, the tariff of water and sanitation is set according to flat rate. In this process, property size is measured and bills are issued according to their sizes. Another way is to set tariff according to type of use, i.e. domestic, industrial and commercial. As water metering is negligibly functional, i.e. only 12% in Lahore, 6% in Rawalpindi and 1.8% in Faisalabad, it is not the major system of tariff setting. It has been more than five years since the tariff is revised in major cities. The range of tariff varies from 72 to 800 rupees. The collection efficiency ranges from 25-40%.

Key Issues in Major Cities

Issues in water and sanitation are almost identical in all the major and minor cities of Punjab. In major cities despite there is more coverage but illegal water connections, uncounted water, and high operational cost, low tariff collection, absence of drainage system and disposal of waste water into water bodies devoid of treatment are some of the key issues being faced by major cities.

Conclusions & Recommendations

On the basis of key findings of the study it is concluded that service providers should increase coverage and ensure provision of quality water to all. To improve the quality of water they need to address sanitation on priority by promoting safe drainage through underground sewers and its disposal after treatment. More investment should be made in sanitation rather than in water as improved sanitation will reduce contamination of water resultantly ensuring its quality. Water utilities should also improve chlorination facilities to ensure safe water supply. Outlived pipes need to be replaced to curtail contamination of water networks.

For conservation of water, water metering needs to be made mandatory. In this regard pilot project should be launched to build a model. Water storage should also be ensured to keep 24/7 supply. Third party studies needs to be launched to uncover unaccounted water and illegal connections. WASAs should look for self reliance and discourage loans. *citizens can be the better donors*. Community can be involved to ensure its investments under Component Sharing Model.

Maintenance of the services can be transferred to the communities by formulating community organizations which will further reduce the financial burden on WASA. Sewerage is available more in urban areas than that of rural areas. Hence the focus should be on rural sanitation now. Disposal of liquid waste into water bodies should be curtailed by in placing low cost waste water treatment techniques. Social mobilization campaigns need to be arranged to mobilize dwellers to collect and dispose solid waste properly. Sanitary workers should be provided for each settlement who should be equipped with hand carts, donkey carts or other vehicles to collect waste from households.

Instead of temporary storage in containers, solid waste enclaves should be promoted. Landfill sites and recycling should also be ensured. Provincial Government should ensure that TMAs implement Hospital management disposal rules 2005 notified by ministry of environment.
A comprehensive solid waste management strategy should be developed and implemented.

Context of study

PURC being one of the partners of WAP not only conducts research on various urban issues revolving around water and sanitation but also advocates the findings of its research through urban forums to give a direction to the Water and Sanitation (WATSAN) actors to play their role to undertake development initiatives on the basis of findings of scientific research. With the financial assistance of WAP, PURC has drafted this position paper with an aim to critically examine various facets of prevailing water and sanitation position in Punjab. It is a desk study based on the analysis of secondary data collected from relevant Government Departments, research and academic institutions and Non-Governmental Organizations (NGOs) and primary data collected directly from the interviews with the staff of Government Agencies and NGOs and field observations conducted by the study team. The study focused on the latest figures and statistics on service provision, identified gaps at macro and micro levels and the generated recommendations for certain strategic actions essential for improvement in the water and sanitation situation in Punjab. It has thoroughly examined the progress of various entities and deliberated on the lacunas identified and their remedial actions. The framework of the report is as per following scheme.

Scope of study

The scope of study entails status of water supply, sanitation and solid waste services in major cities, tehsils and rural areas of Punjab. The focus is laid on description of services in these areas along with deficiencies and gaps in the service provision. Broadly, following aspects are studied under the overall scope of study.

- Context of study topic.
- General Information on Punjab Province
- Water resources of the Punjab
- Overall scenario of water, sanitation and solid waste in Punjab
- Salient features of nine major cities of Punjab.
- Quality and coverage of the services (water supply, sanitation and solid waste) in both urban and rural areas
- Water supply and sanitation service providers and their systems
- Solid waste management system in major cities
- Salient features of related policies and regulations
- Tariffs and recovery systems of services
- Key issues in different cities and challenges faced at various levels
- Conclusions & Recommendations for the improvement of current situation

The study covers nine cities including five major cities namely Lahore, Faisalabad, Gujranwala, Rawalpindi, Multan and four TMAs namely Bahawalpur, D.G Khan, Sargodha and Sialkot. These cities represent northern, central and southern parts of Punjab. The comparative picture of WASA administered and Tehsil administered towns is given to have an analysis of both the utilities.

Approach & Methodology Adopted

The study for position paper is mainly a desk study. It comprises of analysis of secondary data collected from various utilities and agencies with spot verification by collection of primary data, and information collected from the representatives of various agencies by conducting meetings with them. Field visits were also conducted to have observations on existing water and sanitation scenario in urban and rural settings. Following four-pronged methodology was adopted to undertake this study.

a) Review of secondary data

The study team consulted relevant studies and documents including Draft Data Book of Punjab WASAs – 2007, Integrated Master Plan for Lahore 2021, Punjab Urban Water and Sanitation Policy 2007, Technical and Service Delivery Standards for Water Supply and Sanitation Sectors 2008, Punjab Solid Waste Management Reform strategy 2007 and national and provincial laws and policies.

b) Collection of Primary Information

Conducted interviews of concerned officials of Departments like WASAs, TMAs, Public Health Engineering Department (PHED), Local Government, Pakistan Council of Research in Water Resources (PCRWR) and Environmental Protection Department (EPD). List of person met is enclosed as Annexure-1

c) Verification of primary data

Carried out field visits and surveys of the major cities of Punjab for gathering and verification of data of water, sanitation and solid waste management.

d) Analysis and Reporting:

The information collected through primary and secondary sources has been processed and analyzed and made part of this paper.
Write up is raised by using this analysis.

Water & Sanitation in Punjab Province

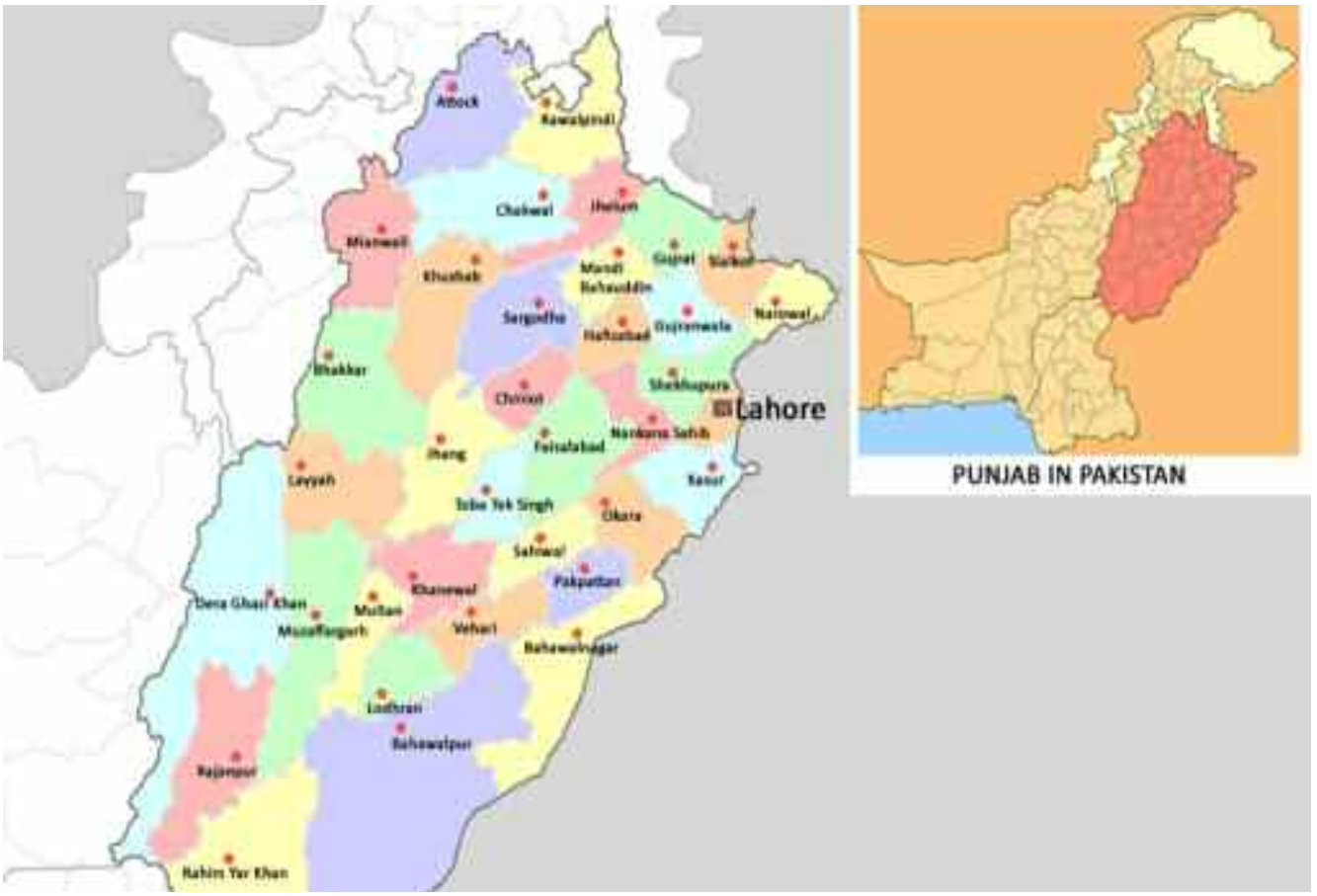

Figure-1 Map showing Districts of Punjab and its location in Pakistan

Punjab: An Overview

The Punjab is the second largest province of Pakistan after Baluchistan with 205,344 km2 (79,284 sq mi) area. Geographically the province is surrounded by Azad Kashmir and Islamabad Capital territory in the north, Indian Punjab in the east, Sindh in the south, Baluchistan in south west and Khyber Pakhtunkhwa in North West. Punjab being the most populous province of Pakistan inhabiting 90 million people which makes 56% of total population of Pakistan. Of the 90 million people living in the province, 31% (28 million) live in urban and 69% (62 million) in rural areas. Province consists of five city districts, 36 districts, 144 Tehsils, 3,464 union councils and 26,075 villages. Lahore has been the capital of Punjab for a thousand years; it is Punjab's main cultural, historical, administrative and economic center. Other important cities include Multan, Rawalpindi, Faisalabad, Gujranwala, Sialkot, Bahawalpur Sargodha and D.G Khan.

Climatically, Punjab has three major seasons i.e. hot weather (April to June) when temperature rises as high as 40°C, rainy season (July to September) and cold weather (October to March) when temperature goes down as low as 0°C. Average annual rainfall ranges between 96 cms sub-mountain region and 46 cms in the plains.

Water Zones of the Province

Punjab is rich in both surface and ground water resources. The Punjab as its name formed of Panj (five) Abs (waters) comprises of five rivers namely Indus, Jhelum, Chenab, Ravi and Satluj. A large irrigation network is stemming out of these rivers to irrigate the agriculture land of the province. The dams constructed on various rivers also form water storages which feeds the irrigation systems. In such scenario, the availability of drinking water is abundant especially in and around the rivers due to heavy recharge of ground water. However, water is scarce in the rain fed areas located at north and north-west parts of the province. Central and eastern parts of the province have sweet water and southern side have pockets of brackish water. The Province can be categorized into four zones i.e. barani /water scares (rain fed), sweet, brackish and mixed (brackish and barani). The description of these zones is given in the ensuing paragraphs.

a) Predominately Sweet Ground Water Zone (53%)

In this zone, plenty of ground water is available and it can easily be extracted as the water table is not very deep. This zone consists of high density population area such as Lahore, Sheikhupura, Nankana Sahib, Gujranwala, Sialkot, Narowal, Hafizabad, M.B. Din, Bhakkar, Jhang, Chiniot, Pakpattan, Layyah and Muzaffargarh Districts. Contamination of sweet water is major issue across the board in sweet water zones occurring primarily out of un-disposed domestic and, industrial liquid waste as well as due to agriculture waste. Gujranwala city is the worst example of such areas where ground water is contaminated below 150 feet due to penetration of liquid waste into water table.

b) Predominately Brackish Zone (29%)

Brackish areas exist mostly in southern part of Punjab where ground water is available but it is brackish and not fit for drinking purposes. Water table is very shallow and taste is salty. The areas located near the irrigation channels are better off due to recharge of groundwater by the seepage of canals, water their water is sweet.
Faisalabad, T.T. Singh, Multan, Lodhran, Bahawalpur, R.Y. Khan, Okara, Sargodha, Bahawalnagar, Vehari, Khanewal, Sahiwal and Kasur Districts falls in brackish zone.

c) Predominately Mixed (Brackish / Barani) Areas (13%)

D.G. Khan, Rajanpur, Mianwali, Khushab, Jhelum and Gujrat Districts fall under mixed areas where ground water table is deep and brackish to be extracted hence leaving the rain water as main source of drinking water. Springs and natural ponding of rain water are the means of drinking water in these areas. Besides check dams and river based water supply systems are also available in these areas.

d) Predominately Water Scarce (5%)

The main districts under this zone include Rawalpindi, Attock and Chakwal. One of the important features of such areas is that they are low density population areas.

Water and Sanitation in Punjab - Existing Situation

Drinking Water

In Punjab, less than 50% of population has access to piped drinking water.[1] The percentage of rural population, which has access to clean drinking water, is even less than 30%. The latest Multiple Indicator Cluster Survey (MICS) Report shows that 97% of people in the Punjab have access to improved drinking water sources, out of which, 49% of the water source is contaminated. Further, over 20% the population lives near arsenic "hot-spot" districts and is exposed to arsenic contamination above WHO limits of 10 ppb. The results from the five year National Water Quality Monitoring Program (2002-06) show that 40-100% of water sources were found contaminated with one or more contaminants.

As mentioned above relying chiefly on underground water, the province can be bifurcated broadly into barani / brackish, brackish, water scarce and sweet water zones. Barani areas face issue of availability of water while brackish areas are confronted with poor water quality. The quality is poor in many areas of sweet water zone where liquid waste has contaminated domestic and public water sources as well as the water bodies. The issues like presence of arsenic and fluoride in water are also haunting at some places.

There are 26,075 rural settlements in Punjab, out of which only 33% have been provided with drinking water through piped system. Rest of the population depends on unsafe sources such as contaminated, brackish water, uncovered wells, ponds and canals.[2] *(see annexure-2 for maps)*

Sanitation

A vast majority, especially those living in rural areas, lack access to proper sanitation. Overall, 58% population uses improve sanitation facilities in the province. Situation of sanitation is even worse as provision of underground sewerage is limited in villages and small towns. The similar scenario prevails in the low income areas of bigger cities. Mixing of sewerage with drinking water is common throughout Punjab raising serious health issues. The disposal of untreated sewerage (both domestic and industrial) into canals, rivers, lakes, open spaces and agriculture fields is common. Sewage treatment is hardly available in any of the cities of the province except to some extent in Faisalabad and Rawalpindi.

Proper waste water drainage and its safe disposal are almost negligible in rural areas. The villages have open surface drains which get choked with mud and solid waste resulting in pounding of waste water in the streets which is a major health and environment hazard. The open drains get damaged hence the waste water seeps into the structures and harms foundations. There is no proper disposal system at the end of these drains resultantly waste water flows to the depressions and existing cattle ponds. The

chemical pollutants from the agriculture fields also flow down to these poundings and contaminate groundwater. The problem is severe in high population density areas where water table is high and easily available. In low density population areas where water table is deep and availability of water is scarce the drainage and disposal is not a major issue. PHED has conducted sanitation survey of all the villages of the province. According to the findings of this survey conducted out of 26,075 villages 14,000 villages have sanitation system. This means that in 56% of villages one or other kind of sanitation system exist. The rest need attention as they do not have any sanitation facility.

Solid Waste

Solid waste collection and disposal systems are available to approximately 66% population living in major cities and nearly 1% of rural areas. The small and tehsil towns have very poor solid waste management system. Only 14 per cent of households have access to a proper solid waste disposal system (i.e. collected by a municipal institution, disposed of by solid waste management department or collected from the home by a private company vehicle). More than 75% (46% urban, 99% rural) households dispose of such waste in the open fields. This shows no significant change from the Punjab MICS 2003-04 which reported proper disposal rates of 15 %. Proper landfill sites and the recycling plants are meagerly available with the municipalities. Except few private companies none of the agency is into recycling which usually is income generating proposition. Regulatory framework for industrial, hospital and other waste management has been in place, but too weak to enforce compliance.

Regulatory and Instituional Framework

Regulatory Framework

Various acts, ordinances and regulations are promulgated by various public agencies having bearings on water and sanitation sector. Punjab Local Government Ordinance 2001, Punjab Development of Cities Act 1976, Canal and Drainage Act 1873, and Pakistan Environment Protection Act 1997 are such legislations which carry provisions on water extraction, drainage and waste water disposal and treatment. This section gives a brief overview of all these legislations and other statutory requirements for the sector highlighting shortcomings and and the importance of strict implementation of laws.

Punjab Local Government Ordinance (PLGO)

PLGO 2001 delegated functions of water and sanitation to local governments (TMAs and CDGs) to provide services in both urban and rural areas. Rural - urban divide was eliminated in the law. The provincial agencies dealing with the sector were to be devolved under the local governments. However this did not happen fully as PHED partly continued its working in the province under projects and the Chief Minister's directives. TMAs could also not take up the sector especially in the rural areas due to financial and technical handicaps. Presently new local government ordinance is under drafting. It has yet to be seen that water and sanitation functions are assigned to which agency.

Pakistan Environmental Protection Act (PEPA)

PEPA 1997 has certain provisions for water and sanitation sector. National Environmental Quality Standards (NEQS) set for the safe disposal of domestic, commercial and industrial waste and National Drinking Water Standards are to be followed under the PEPA. The enactment of the provision of act is not up to the mark as Environmental Protection Department (EPD) lacks capacity and well-defined inter-departmental coordination mechanism.

Punjab Development of Cities Act 1976

Punjab Development of Cities Act 1997 was promulgated to establish a comprehensive system of planning and development in order to improve the quality of life in the cities of the Punjab. This Act provided to establish an integrated development approach in land utilization, housing transportation, health education, and water and sanitation sectors. Under this law, development authorities along with specialized WASAs to take care of water and sanitation services in five major cities of the province. The development authorities functions entails development and operation and maintenance of water supply, sewage and drainage systems in the areas. This Act envisages a permission for water extraction for commercial usage.

Canal & Drainage Act 1876

Canal and Drainage Act (1876) entitles government of Punjab to use and control for public purposes the water of all rivers and streams flowing in natural channels, and of all lakes, sub soil water and other natural collections of still water. Under the clause 62-A, Provincial Government is responsible for carrying out the evaluation and assessment regarding the condition of aquifer, quality and availability of sub-soil water in any specified area and draw up the scheme for the proper management of the sub-soil water. Under section 59-A , A Provincial Government may, by notification in the official gazette, prohibit the discharge of any effluent, including any solid or liquid matter or combination of them from industrial, municipal or any other source, into any river, canal and drainage work including any natural drainage channel. Permission has to be sought by the entities from the Provincial Government before draining the effluent in

irrigation bodies. Service Providers have to seek a certificate from concerned authority that effluent is safe to be disposed of from the government.

Proposed Punjab Municipal Water Act

Punjab Municipal Water Act is being drafted defining roles and responsibilities of policy makers, regulators and service providers. The available draft reflect that a water commission will be formed under the Act which will regulate water and sanitation services in the whole province. This Act will ensure registration of service providers, permission before extraction of ground water and safe disposal of waste water into water bodies. The Act will ensure quality standards and impose penalties on violation of the provisions of the Act. Final version of the Act is awaited.

Other Relevant Regulation

Provision of water and sanitation services under various legislations can only be effective if strict rules and regulations are adopted to curtail the unplanned housing which is a constant phenomena occurring in all the cities of the province. Low income settlements usually are devoid of water and sanitation services as they are not created under the provision of existing laws. As per PLGO, TMAs are responsible for land use zoning to earmark areas for housing. Such provisions should be strictly adhered. Punjab Private Housing Schemes & Land Sub-Division Rules 2010 envisages that provision of sewerage and drainage is mandatory for private housing schemes. However, these rules are not being followed in practice. So, in order to ensure water and sanitation services, rules and regulations need to be through re-examined and implemented in their true spirit. Rules and regulations on solid waste management also need to be reviewed and amended.

Policy Framework

National policy on sanitation and National policy on drinking water were approved by Government of Pakistan in year 2006 and 2009 respectively. To follow suit, Punjab Government has drafted Punjab sanitation policy in year 2007 which could not get through owing to change in Government and lack of ownership on the part of Government. PHED in year 2010 reinitiated work on both the policies along with their respective strategies. The drafts for all these documents are ready. Punjab Drinking Water Policy is sent to Chief Minister for approval. In the upcoming text salient features of National and provincial policies are given.

National Drinking Water Policy 2009

The main purpose of national drinking water policy is to provide safe drinking water to citizens at reasonable cost and to improve quality of life of people by reducing water borne diseases. Policy principles around access to safe drinking water as basic human right, water allocation for drinking purposes is the first priority, equity and inclusion to remove disparities in service provision, and delegation of responsibility and resources to local authorities. Policy guides to increase access by building new schemes and rehabilitating the old ones, protection and conservation of water resources though water metering, rain harvesting and promotion of water efficient techniques, ensure water treatment and safety, use appropriate technologies and standardization, evolve community participation, raise public awareness, building capacity of service providers, introduce public private partnership, research and development , coordinated planning and implementation emergency preparedness and response and enforcement of legislation.

Punjab Drinking Water Policy (PDWP)-Draft

PDWP visualizes provision of safe drinking water in adequate quantity at an affordable cost through equitable, efficient and sustainable services to all citizens by 2020. The policy aims at the improvement of standards of public health, provision of water to all by making a road map for mobilization of resources, building capacity of local governments, organize public

private partnership, launch communication campaigns, develop monitoring and evaluation system, ensure protection and conservation of water and develop sectoral strategies for urban and rural areas for effective implementation of the policy. Policy principled on protection and conservation of water sources, need based allocation of resources, community participation especially in operation and maintenance, institutional reforms for public service providers and performance based service delivery.

Punjab Drinking Water Strategy (Draft)

For effective implementation of PDWP, Punjab Drinking Water Strategy (PDWS) is being prepared. As per its first draft, the strategy envisages improvement in existing legislations, institutional reforms in WASA, improvement in rural water supply, effective monitoring systems and allocation of equitable resources. Component sharing approach followed by *Changa Pani* Program, preparation of business development plan by WASAs, hundred percent water metering, introduction of rain harvesting, building storage capacity, removal of illegal water connections and improvement in service delivery performance are the key strategic prescriptions given in the strategy.

National Sanitation Policy (NSP), 2006

The main purpose NSP is to endorse and improve sanitation coverage in Pakistan which consists of safe disposal of liquid and solid wastes and promoting health and hygiene practices. Policy aims at defection free environment, installation of latrines in rural and urban areas at public places, promotion of community led total sanitation, develop guidelines for integrated management, community mobilization and awareness raising on health and hygiene, improving capacities of government agencies and meeting international sanitation standards. Policy envisions achieving sustainable development by utilizing existing local resources while avoiding foreign funds, understanding and accepting role of communities, NGO etc, using low cost and affordable local resources, adopting component sharing models and involving all responsible departments and communities for planning of schemes. NEQS for treated waste water disposal were to be ensured and for that prepared monitoring mechanism has to be adopted. Policy also envisages introduction of solid waste management systems and building sanitary landfill sites. Policy highlights documentation of existing sanitation systems with GIS , coordination of TMAs with Katchi Abadis for appropriate sanitation, use of waste water for agriculture purposes, domestic water treatment, pilot project for disposal of agriculture waste, conversion of any land into residential area should not be allowed without planning and sanitation plan approved by TMAs/development authority, public consultation on sanitation plans, enforcement of hospital management rules 2005, regulatory framework for implementation of sanitation policy, introduction of environment related course by higher education commission, Meeting Millennium Development Goals (MDGs) targets whereby the proportion of people without sustainable access to improved sanitation will be reduced by half by 2015 and 100 % population will be served by 2025 with improved sanitation.

Punjab Sanitation Policy (Draft)

Aim of sanitation policy is promotion of health and hygiene practice and providing excreta free environment through safe disposal of solid, liquid and excreta. Policy envisages defining roles and responsibilities of various tiers of government, development of roadmap for mobilization of resources for the sector, capacity building of government and non-governmental organizations, sustainable use of sanitation infrastructure, ensure recovery of operations and maintenance (O&M) cost. Policy focuses on adoption of successful approaches like component sharing, community led total sanitation and school sanitation.

Punjab Sanitation Strategy (Draft)

Punjab Sanitation Strategy (PSS) is being drafted by Government of Punjab. PSS comprises of institutional reforms in public service provider agencies, adoption of component sharing and community led total sanitation approaches, clarifying roles and responsibilities of various actors, ensure community investment in the sector, legislative improvements and behavioral change and communication for awareness rising.

Institutional Framework

There are more than one utilities working to cater water and sanitation service provision. PHED, WASAs in five major cities, TMAs, private housing schemes, Cantonment boards and private vendors are mainly the entities working in water and sanitation sector. Local Government, through City District Governments and TMAs, are looking after solid waste management. Recently, Lahore Waste Management Company has been established under City District Government to work exclusively on solid waste management in the city by adopting Turkish models. In private sector, few companies are working in solid waste management and recycling. The duplication in roles and responsibilities of sectoral departments are not clear which leads to the overlapping and finally closure of many schemes. Secondly, the tools for planning are either missing or outdated as most of the executing agencies do not have enough maps and documents of their areas of jurisdictions which leads to poor planning and improper allocation of funds.

Public Health Engineering Department (PHED)

PHED is chiefly responsible for provision of water and sanitation services for rural areas. With the promulgation of Punjab Local Government Ordinance (PLGO) 2001 the functions of water and sanitation were devolved to TMAs. This devolution occurred in papers only as PHED's provincial set up continued working under projects and Chief Minister directives throughout the devolution era. Half of the PHED is revived and half of it is yet working under a project mode. In certain areas, the PHED and TMAs perform overlapping roles which needs serious reform by the government of Punjab.

PHED implemented Asian Development Bank Funded Project by the name of Punjab Community Water Supply & Sanitation under which more than seven hundred rural water supply & sanitation schemes were constructed during year 2003-2007. In the period 1997-2002, under phase-Iof this project by the name Punjab Rural Water Supply and Sanitation 335 WSS schemes were constructed. Both the projects ensured community participation in the need assessment, designing planning, construction supervision and finally taking over WSS scheme for operation and maintenance.

Water and Sanitation Community Organizations (WASCOs) formed under the projects are responsible for O&M. Rest of PHED schemes were also handed over to WASCOs in due course of time. WASCOs are operating and maintaining 2556 out of total 4069 schemes constructed by PHED.

Tehsil Municipal Administrations

Tehsil Municipal Administrations (TMAs) formed under the PLGO made responsible for water and sanitation functions of urban as well rural areas falling under the jurisdiction of Tehsil. In pre-devolution era Town Municipalities / Committees were responsible for WSS functions of their respective towns. Without a little change in the structure of town committees TMAs were made responsible to take care of whole Tehsils. The financial and technical capacity of TMAs was limited hence they could not deal with the Tehsil level functions. They are also very reluctant to take up PHED's schemes usually handed over with a legacy of technical flaws.

TMAs are municipal administrative bodies, headed by the Tehsil Nazim and consisting of Town Municipal Officer and other officials of the local administration. According to the Punjab Local Government Ordinance (2001) the Town Officer Infrastructure and Services (TOI&S) and his department are in charge of the operation of the water supply and sanitation

services. The infrastructure and services department prepares annual budgets.

Water & Sanitation Agencies

Water and Sanitation Agencies (WASAs) are working in five major cities of Punjab to provide water and sanitation services. WASA Lahore is the oldest amongst five was created in 1976 under the Lahore Development Authority (LDA). It was created as subsidiary agency for planning, designing, development, maintenance, water supply, and sewerage and drainage system.
Main functions of WASA are as under:

- Forecasting of demand of services of water supply, sewerage and drainage, preparation of plans and design, rehabilitation and replacement.
- Construction, improvement, maintenance and operation of water and sewerage works and main storm water channels along with pumping stations.
- Billing and collection of charges for the services provided.

WASAs are working under City District Governments (CDGs). They are more independent in some fields. They provide annual financial statements. In fact, their autonomy is seriously limited in a number of ways e.g. with regard to investment planning, financing decisions and staffing. The project cities in which water supply and sanitation services are provided by WASA are Lahore, Faisalabad, Gujranwala, Multan and Rawalpindi

Cantonment Boards

Cantonment boards, being one of the local bodies, are other agencies responsible for provision of WSS in cantonment areas. They have their own staff and infrastructure to run the services.

Private Entities

Besides public sector, private entities are carrying out WSS functions. The more organized entities are Private Housing Schemes. They have developed the infrastructure and are responsible for operation and maintenance of the system. In water scare areas private vendors sell water to the dwellers which is another set of private water providers.

Solid Waste Department

Solid waste departments working under the CDGs in major cities of Punjab are responsible for solid waste management. Last year Government of Punjab has established Lahore Waste Management Company (LWMC) to demonstrate successful international approaches to deal with solid waste management. TMAs are responsible for solid waste management in their areas of jurisdiction. Table 5 gives the population of cities and the responsible service providers.

Situation Analysis of Utilities Water and Sanitation Agencies

CITY	POP (million)	SERVICE PROVIDER Water & Sanitation	Solid Waste
Faisalabad	2.8	WASA	CDG
Gujranwala	1.6	WASA	CDG
Multan	2.1	WASA	CDG
Rawalpindi	4.41	WASA	CDG
Lahore	9	WASA	CDG
Bahawalpur	1.2	TMA	TMA
Dera Ghazi Khan	0.27	TMA	TMA
Sargodha	0.6	TMA	TMA
Sialkot	0.51	TMA	TMA

Table-5: Population of Cities Along With Service Providers

(WASAs) working in five major cities are undergoing financial crunch. The working ratios of all these agencies are imbalanced which is reflected in Table 6 below.

This ratio is increasing every year. To put it back on the track, WASAs have to increase tariffs. A committee has been formed by the Chief Minister to review and rationalize tariff structure and propose incremental increase in six years time to bring it to breakeven. WASAs are preparing business development plans around this premise. WASA Lahore with the support of Japan International Cooperation Agency (JICA) has prepared business plan and presented for consultation. Business plan on the one end proposes increase in tariff but on the other end focuses on mega projects which require funds and loans. The community investment in water and sanitation sector is not a focus in this plan. However WASA Lahore has agreed to form citizen liaison committee under the business plan to look into the possibilities of community participation in the infrastructure development. (Detail institutional analysis is placed at annexure 3)

WASA Working	Ratio
Lahore	1.86
Rawalpindi	1.10
Gujranwala	1.50
Faisalabad	1.20
Multan	1.45

Table-6: Working Ratios of WASAs

*Working ratio is the difference between the income and expenditures e.g. 1.86 working ratio mean income is Rs: 1 and expenditures is Rs: 1.86

Tehsil Municipal Administrations

According to PLGO 2001, TMAs were entrusted with the function of planning for land use and its zoning, water and sanitation services and solid waste management for both the urban centers/small towns as well as rural areas falling in their respective jurisdiction. TMAs lacked resources, in-house capacity and adequate human resources to carry out their functions for its entire population. However they have set successful models in urban areas under specific projects; Southern Punjab Basic Urban Services Project implemented in 21 Tehsil headquarters towns. In rural sanitation, nothing visible could be achieved. PHED could not be devolved as per PLGO and continued its working under various projects and CM directives. It has implemented WSS schemes which were to be handed over to TMA for operation and maintenance. TMAs, however, are reluctant to take over these schemes accusing that they were not involved in planning of these schemes. Hence the issue of coordination between the two entities remained a problem throughout the devolution era. So to avoid this phenomenon, it would be more appropriate if the responsibilities of operation and maintenance are given to the entities which have implemented the scheme. A more viable strategy would be that TMAs made responsible for the implementation and operation and maintenance of sanitation schemes in the Tehsil and small towns and PHED works only in rural areas. WASAs are taking care of metropolitan cities. Therefore delineating the realms of all these entities would resolve issues arising in coordination and fixation of responsibility for operation and maintenance.

If provided with adequate funds, TMAs can deal city level sanitation with the use of its existing human resources. There are examples where TMAs have been successful in development of sanitation infrastructure in the Tehsil cities. The human resource management requires a thorough analysis of the TMA staff and their roles and responsibilities. To make the staff more efficient specialized training can be arranged. TMAs also should adopt Component Sharing Model (CSM) to increase community's investment in sanitation system development by making them responsible for laying lane and neighborhood level sewers and TMA focuses on trunk sewers and disposal stations. This would enhance the financial capacity of TMA and reduce its burden on O&M. The money saved from internal sewers can be diverted to street paving or Reinforced Cement Concrete (RCC) as an incentive for that community which invests in internal sewers development. Local NGOs/CBOs can be used for

social mobilization to prepare local communities to build internal infrastructure. TMAs to institutionalize CSM can appoint social mobilizers to build their own capacity in CSM.
TMAs should prepare master plans of their respective towns. They can use the GIS mapping to document existing sewage infrastructure. This will determine the scope of work for TMAs. The plan should be prepared for the external development of sewerage system. Master Plan should also be prepared for street paving and roads and other services to make an integrated development plan. This will also provide an estimation of resources required to complete the development works.

Chief Officer (CO) Unit in Small Towns

Rapid population increase over the period gave birth to numerous small towns inhabiting 50, 000 to 100, 000 population. After abolishment of urban rural divide in devolution laws these towns are a bunch of two to three union councils without having any single administrative body; in past town committees were the administrative bodies for such towns. They are controlled by Chief Officer (CO) Unit which lacks financial and technical capacity to cater needs of these towns. Most of such towns depict a derogatory sanitation scenario. Sewerage is available scarcely and the outlets for disposal of waste water are also missing in most of the small towns. These towns need special focus for the provision of sewerage systems with proper disposal and treatment facilities. Master Plan for the development of sanitation systems for small towns will be prepared. CSM will be adopted for tapping community investment to develop more areas in fewer resources. Government should launch separate sanitation projects with adequate funding arrangements for the development of sanitation system in small towns.

Public Health Engineering Department

PHED has recently surveyed more than 14000 villages in Punjab to assess the sanitation scenario in these villages. It is also planning to conduct water profiling of all the villages of Punjab. These two studies can provide basis for making plans for the province in pragmatic way. The area level mapping / documentation of existing infrastructure would further strengthening the planning tools for the PHED.
Sewerage development is a rare phenomenon in rural areas. The sanitation systems provided by the government mostly consist of open surface drains finally disposing into agriculture fields or existing depressions of the settlement. The sumps made as disposal for open drains are devoid of any treatment facilities. Open drains usually damaged and broken leading to seepage to the houses and structures. The clogging of these drains leads to disputes among the communities. They are causing sever health hazard to the people. Underground sewage is the best possible option to resolve sanitation issues in rural areas. It costs less as compared to open drains and a permanent solution for safe disposal of wastewater. By adopting CSM, low cost sewerage development can be practiced in rural areas where community is held responsible for lane level sewers and government provides main sewer, disposal station and waste water treatment. Lodharn Pilot Project (LPP) has established this model in about 200 villages in southern part of Punjab. The same can be replicated in the rest of Punjab. Executing Agencies should pilot test CSM in villages and on the basis of lessons learned devise a clear-cut strategy for the adoption of CSM for sewage development in rural areas.
There are two aspects of low cost sanitation techniques. One is social i.e. component sharing model should be adopted. Second, technical aspect which describes that planning and development should be done after reviewing ground realities and it needs proper documentation of all the features. All the material required for a scheme should be purchased from the local market while considering local culture and community should be involved at each step of scheme so that they own that scheme.

O&M should be affordable for the people and required training should be provided for proper functioning of schemes. The component sharing model will improve the traditional development methods.
To maximize sustainability of schemes, capacity of CBOs should be strengthened for technical, managerial and financial management issues and post completion monitoring mechanism should be done. PHED officials interviewed for this research made suggestion such as address solid waste and wastewater concurrently with safe supply of water, strengthen existing collaborations and partnerships in water supply and sanitation with other partners in developing member countries, include baseline studies in all the projects and follow-up with relevant agencies so that necessary actions are taken on time to guarantee the sustainability of project benefits.

Private Entities

Private housing schemes work very efficiently as they collect development charges from the allottees before allotment and build complete infrastructure. The tariff structure is high and its collection is ensured. Staff responsible for O&M is well capacitated and capable to look after the service delivery. This is interesting to note that utilities like Defense
Housing Authority, GOR, Model Town Society in Lahore, have properly maintained their water and sanitation systems whereas public sector agencies always have issues in ensuring service delivery performance.

Urban Unit

The Government of Punjab established the Urban Unit in March 2006 as a Project Management Unit, in the Planning and Development Department, Punjab.
The Unit is staffed by highly qualified and experienced professionals in the field of urban sectors such as Urban Planning, Urban Transport, Solid Waste Management, Urban Water & Sanitation and Municipal Finance. It holds conferences and seminars on urban issues. Under its internship program, it provides training to graduate students on urban research.

Lahore Waste Management Company (LWMC)

Local Government Department is responsible for management of solid waste through City District Governments (CDGs) in major cities and Tehsil Municipal Administration (TMA) in Tehsil towns. City District Government Lahore has recently formed Lahore Waste Management Company (LWMC) to deal with issues of solid waste in its entirety. The company is taking technical assistance form Turkish Government. LWMC has initiated solid waste collection and disposal system in six model areas by involving private contractors. More model areas would be developed through private as well government's sanitary workers. The company aims at development of integrated solid waste management plan in eighteen months time. The outcome of this initiative of Government of Punjab has yet to be seen.

Water & Sanitaion in Major Cities

General

To undertake comparative analysis of nine major cities of Punjab, data collected from various resources is analyzed and made part of this paper. The vital statistics related to water, liquid and solid waste, the status of coverage of services, the underpinning issues related to sector and the situations of urban and rural settings are also made part of this chapter. The details are given in the ensuing paragraph.

Drinking Water

Access to piped water in Punjab's cities is about 80%.The average water supply per day is 4 hours which ranges from 5 hours/day in Rawalpindi to 16 hours/day in Lahore. The quality of water is generally not up to the mark in the major cities owing to two reasons, one the absence of proper chlorination and second outlived distribution networks made up of galvanized pipes which due to rusting become porous leaving a room for entering the pollutants in the distribution networks. Due to improper chlorination the water quality suffers as it is an essential element to maintain water quality. The porous pipelines give way to the contaminants into the network. At time of stoppage of turbines a negative pressure builds due to which the contaminants water backflows and pollutants the main pipelines. Water utilities have to use stoppers on the main pipelines to stop backward flow of contaminated water. These stoppers are yet to be placed. According to Dr. Saeed Farooq (Associate Professor Department of Geology, University of the Punjab, Lahore) study 'ON WATER QUALITY OF LAHORE' decline rate of Lahore water table from 1980 to 2000 was 0.65.

Sanitation

Access to sanitation at the domestic level can be measured through the availability and type of sanitary toilet facilities inside the house. In urban areas of the Punjab, 96 percent of households have installed flush latrines. In rural areas, less than one third (31 percent) of the households have same facilities, while the remaining have no toilet facilities within premises of their houses. Additionally, the coverage of sanitary facilities is reported to be maximum in major cities (98%) and other urban areas (92%) and lowest in rural areas (43%). Less than half (43%) of Punjab's population has proper waste water disposal facilities (sewerage system connected with main line, or sewerage connected with open drains or septic tanks), ranging from 95% in major cities to 77% in other urban and 26 % in rural areas.[2]

Solid Waste Management

Collection, transportation and disposal of solid waste is the responsibility of City District Governments in large cities while TMAs in case of other areas. Only 14% of solid waste produced in the province is properly disposed of. The percentage ranges from 66% in major cities to 33% in other urban areas and only 1% in rural settlements. Even waste collected is disposed off in very unhygienic manner as there are no sanitary landfill sites in the Punjab.

Situation Analysis of Water and Sanitation in Urban Punjab

Groundwater is rapidly depleting because of unequal water abstraction in comparison to poor recharge. This is so because of lack of property rights over water usage and an absence of regulation to assign these rights.

Main issues regarding water supply and sanitation in Punjab are:

- Depletion of groundwater resources due to over extraction by domestic, industrial and agricultural users. Recharge of groundwater has been

considerably reduced because of reduction in open spaces due to rapid urbanization.

- Contamination of drinking water sources which are mainly due to physical (Color, odor, turbidity, suspended solids), chemical (pH, heavy metals, inorganic and organic pollutants, oil and grease) and biological (coli forms , Escherichia coli) pollutants.
- Service quality problems such as disruption in water supply, mixing of sewage in drinking water due to leakage and corroded pipelines.
- Coverage of water supply and sanitation is also an important issue throughout Punjab. Table 1 shows coverage of water and sanitation in major cities. Access to piped water in Punjab's cities is likely to be only about 55%, as many urban settlers rely on individual groundwater and other un-secure sources. Access to piped water supply and sanitation service through direct connections to distribution networks exceeds 75% in Lahore, Sialkot and Rawalpindi, but is below 30% in Gujranwala, Bahawalpur, Multan and Dera Ghazi Khan. Several cities have connection ratio to sewers higher than to piped water; for example in Multan, 55% of households are reported to be connected to sewers through 126,000 connections, while less than 20% are said to have access to piped water through 37,000 connections.[1]

Rural Water Supply & Sanitation in Punjab

Established in 1961, Public Health Engineering Department (PHED) is providing water supply and sanitation schemes in rural and urban areas in Punjab. In the year 1997 under Social Action Program (SAP) it was mandatory that all the schemes developed by PHED will be handed over to local water user committees. At the time of devolution all other than SAP schemes were handed over to TMAs as a result of assets transfer, but TMAs operated only few of the PHED completed rural water supply schemes and left the rest schemes unattended. TMAs could not take up rural water supply and sanitation sector and constructed negligible schemes in rural areas during devolution era.

City	Population (In Millions)	Service delivery (Coverage %)	
	Year 2010	Sewerage	Water
Lahore	9	85	89
Faisalabad	2.8	65	60
Gujranwala	1.6	25	55
Multan	2.1	55	50
Rawalpindi	4.41	66	75
Rahim Yar Khan	0.46	85	40
Bahawalpur	0.64	82	3
Sargodha	0.69	85	70
DG Khan	0.42	60	80
Sialkot	0.80	20	35

Table1: Population & Coverage of Water & Sanitation

During 1997 to 2007 PHED completed 1113 rural water supply schemes under two projects namely Punjab Rural Water Supply & Sanitation and Punjab

S. No	District	S. No	District
1	Lahore	11	Attock
2	Kasur	12	Rawalpindi
3	Sheikhupura	13	Chakwal
4	Sialkot	14	Jehlum
5	Narowal	15	Sargodha
6	Gujranwala	16	Khushab
7	Gujarat	17	Mianwali
8	Mandi Bahudin	18	Bhakhar
9	Hafizabad		
10	Nankana Sahib		

Table-2: Districts Falling in North Zone

S. No	District	S. No	District
1	Faisalabad	9	Lodhran
2	Jhang	10	D.G Khan
3	T.T Singh	11	Muzaffargarh
4	Multan	12	Rajanpur
5	Khanewal	13	Layyah
6	Sahiwal	14	Bahawalpur
7	Vehari	15	Bahawalnagar
8	Pakpattan	16	R.Y Khan

Table-3 Districts of South Zone

Community Water Supply & Sanitation Projects implemented with the assistance of Asian Development Bank. The PHED has ensured community participation in both of its projects mentioned above. Punjab Community Water Supply & Sanitation Project introduced 6.5 % cost share of community in which 2% was in cash and 4.5% in kind. This cost sharing is one of key criteria of recent selection of PHED schemes. As per need assessment criteria, WSS schemes are provided to the needy villages only. Responsibility of operation and maintenance was given to Community Based Organizations (CBOs) named as Water and Sanitation Community Organizations (WASCOs). Role of PHED is to design, plan, develop and complete a water supply and sanitation scheme.
For the operational purposes, The PHED has divided the province into two zones i.e. north and south zones. North zone consists of the districts shown in Table.

PHED identifies need based schemes in an area then works on it. Total 4,069 water schemes were launched in north and south zones of Punjab. In these schemes, 1,314 schemes are functional in north zone while 1,390 in south zone. PHED work is based on community involvement. From identification of schemes to its design, planning to completion, community is involved. Most of these schemes are run by CBOs. In north zone, most of the schemes are present in Mianwali, Chakwal, Rawalpindi, Attock, Kasur, Gujrat and Khushab. Total 2,039 schemes have been completed in northern Punjab out of which 35% are non functional while 65% are functional. Major reasons of nonfunctioning are 10% transformers stolen, 33% source failure, 9% over lived schemes, 3% community conflict, 12% WAPDA dues and 32% other engineering problems. From 65% functional schemes, 90% are running by CBOs, 10% by TMAs, 0.3% by Union Councils (UCs).

The districts falling in South Zone are shown in While in south zone, most schemes are concentrated in Bahawalnagar, Dera Ghazi Khan,
Toba Tek Singh, Faisalabad, Bahawalpur and Vehari. Total 2030 schemes have been completed in rural areas of southern Punjab out of which 68% are functional while 32% are nonfunctional.
Major reasons for non functioning are transformer stolen (17%), source failure (11%), schemes outlived (13%), community conflicts (5%), non-payment of WAPDA dues (10%) and engineering flaws (38%). From 68% functional schemes in southern rural Punjab 90% are run by CBO, 9% by TMA and 1% by others.

Process of PHED

PHED has the following procedure:

- First of all, flying visit of the areas where schemes have to be installed is made.
- Need based schemes are identified with the involvement of community.
- Community meeting with the people of the community is conducted to identify their needs, capacity, socioeconomic profile and assessment survey.
- CBO is formed which is run by local people.
- Memorandum of understanding (MOU) is signed between PHED and CBO.
- CBO is involved in designing and planning of the schemes.
- During the construction of scheme, CBO check quality at every point.
- MoU is signed between CBO and PHED at handing over time of the scheme.
- Regular follow-up by PHED is done for proper working of the scheme.

Nature of Schemes and Tariff Structure

Main purpose of PHED is provision of clean drinking water and sanitation services in both urban and rural area. Two types of water schemes are designed. First is distribution system and taps and other is by building low level reservoirs of water. Sanitation schemes are also of two types: sewerage system and construction of open drains. Tariff: ranges from 70 Rupees to 200 Rupees and issue on monthly basis.[19]

Solid Waste Management

Solid waste management is generally poor throughout Punjab. Tons of waste is produced in major cities out of which very little reaches to the dumping sites leaving heaps of solid waste in empty plots, on roads and in grounds. There is no sanitary landfill site in Punjab due to which solid waste is not properly disposed off causing environmental pollution and scenic blight. The burning of solid waste is a common practice although it is legally prohibited. Similarly throwing of waste in sewers and nullahs is practiced causing choking of sewers done and other problems.

Recycling of solid waste is done on a limited scale while other techniques like energy recovery and biogas and leachate collection is not practiced in Punjab.

Waste Generation in Major Cities of Punjab[18]

City	Municipal Waste (Tons/Day)	BUDGET POSITION 2006-2007		FINAL DISPOSAL SITES		Healthcare Waste (tons/day)	Construction Waste (Tons/day)	Industrial Waste (Tons/day)
		Total budget CDG/TMA (mill. Rupees/year)	Total expenditures (mill. Rupees/year)	Official dump sites	Tons/day			
Lahore	6000	9,206	1,459	1	800	3.5	n.a	n.a
Faisalabad	1728	4,803	304	2	n.a	n.a	n.a	n.a
Rawalpindi	1,260	3,350	243	1	600	n.a	n.a	n.a
Multan	960	852	173	1	450	4	20	n.a
Gujranwala	960	3,901	157	0	0	n.a	n.a	n.a
Sargodha	360	370	45	1	200	n.a	n.a	n.a
Sialkot	300	811	30	0	0	n.a	n.a	n.a
Bahawalpur	300	90	39	2	82	1.4	5	n.a
DG Khan	180	515	40	6	n.a	1.3	50	3

Tariff And Recovery Systems

General

As per definition tariff is a pricing structure that has been approved by the government for a certain service or utility. In Punjab, the tariff of water and sanitation is set according to flat rate. In this process, property size is measured and bills are issued according to their sizes. Another way is to set tariff according to type of use, i.e. domestic, industrial and commercial. As water metering is negligibly functional, i.e. only 12% in Lahore, 6% in Rawalpindi and 1.8% in Faisalabad this is not major system of tariff setting. The tariff and billing collection system of major cities of Punjab is given in the ensuing paragraph.

Faisalabad

The last tariff adjustment was done in October 2004. Tariff is adjusted according to 7 categories of house sizes. The lowest tariff for houses of 2.5 Marlas is about 72 rupees for water and 48 rupees for sewerage to the maximum of 840 rupees for water and 770 rupees for sewerage for houses larger than 40 Marlas. Billing is done for each month and bills are distributed by WASA and can be deposited to the banks. Collection efficiency is only 25%.[6]

Gujranwala

The tariff was changed last time in February 2004. There are three main tariff categories in Gujranwala i.e. domestic, industrial and commercial. Only one bill is issued annually and its can be deposited in banks. 8 water productions are 0.167 m3/d/c. unaccounted for water is 63.3 %. Average tariff is 7.10 rupees/m3. [7]

Multan

There are five categories for tariff according to house sizes in Multan. Average tariff is 9.66 rupees/m3. Last time, tariff was increased in 2001. Bills are issued on monthly basis.[9]

Rawalpindi

Tariff structure is based on the property size in Rawalpindi. It ranges from 50 rupees for water and 25 rupees for sewerage for 0-5 Marlas to the 400 rupees for water supply and 200 rupees for sewerage for houses larger than 2 kanals. Same rate is for industrial and commercial connections. Billing system is computerized and these are made monthly. Billing collection is about 75%.[10]

Bahawalpur

Tariff is based on flat rates for both household and industrial connections. Only 25 % of the bills are collected while rest is not.[11]

Dera Ghazi Khan

Dera Ghazi Khan is the only city where household tariff is based on the size of the pipe line. There are no separate charges for the sewerage service. Also these tariffs are set following political considerations. Collection rate in D G Khan is about 20%. [12]

Sargodha

For 1-2 Marlas, the water supply charges are 300 rupees and for sanitation, 40 rupees. While for houses larger than 5 Marlas, it is 700 for water supply and 50 rupees for the sewerage. Bills are issued annually in Sargodha with the collection rate of about 10-12%.[13]

Sialkot

Tariff is designed by TMA. It ranges from 910 rupees /year for 3/8 “domestic connection to 1508 rupees/ year for domestic connection ½ “. Billing and collection is contracted to Habib Bank which also maintained customer database and bills are paid to the bank. No meters are installed. Bills are issued annually. Collection ratio is only 40%.[14]

Lahore

Average tariff is 5.20 rupees/m3. Tariff is based on flat rates while a very small number of meters are installed. Water bill averages Rupees 314.14 per month per connection in Lahore. Bills are issued monthly or bimonthly.[3]

Key Issues in Major Cities

General

Issues in water and sanitation are almost identical in all the major and minor cities of Punjab. In major cities despite there is more coverage but illegal water connections, uncounted water, and high operational cost. Low tariff collection, partial absence of drainage system and disposal of waste water into water bodies devoid of treatment are some of the key issues being faced by major cities. City wise list of issues is indicated below:

Faisalabad

- As Faisalabad is an industrial city and proper industrial waste or sewerage treatment is not being done so it is causing chemical (heavy metals, chemicals) and biological(E.Coli, coliform) contamination of both surface and ground water

- Only 10% treatment of sewerage is being done
- Water metering ratio is very low (1.8%)
- Unaccounted for water (UFW) is high (29.9%) showing illegal connections and leakages.
- Sewerage system is very poor as industries are discharging their effluents in sewers
- Coverage of sewerage is 50%.
- There is no sanitary landfill site for solid waste in the city.[6]

Gujranwala

- Coverage of water supply is very low that is only 25%.[8]

- Water is generally contamination free at source but become contaminated in distribution system.
- No metered connections are present in Gujranwala.
- Very high unaccounted for water (63.6%)
- There are no water storage reservoirs which could serve in case of power outages.
- No treatment of sewerage is done before disposal
- No sanitary landfill and official dumping site in the city
- Very poor solid waste management causing heaps of solid waste at various places in city.[11]

Multan

- Coverage of water supply and sanitation is low
- Water providing hours are less(8 hours)
- There are total 80 tubewells in the city out of which only 83% are functional.[9]

- Regular monitoring of water quality at tap is not being done
- Arsenic pollution of shallow ground water is happening
- According to Pakistan Council of Research in Water Resources (PCRWR) report, 31% samples were contaminated with coliform bacteria and 88% with high levels of arsenic.
- Water metering is not being practiced throughout the city
- Water storage reservoirs are not built
- Sewerage is only screened at disposal stations and then used for irrigation purposes or discharged into canals causing water pollution.
- There is no sanitary landfill site in the city for safe disposal of solid waste

Rawalpindi

- Water provision hours are very limited(2-3 hours)
- High unaccounted for water (40.7%) in the city showing illegal connections and leakages
- Water is treated before supply but it gets contaminated in distribution system due to contact with sewerage and other pollutants. Also quality of water at tap is not monitored on regularly basis.
- Groundwater is very difficult to extract due to rocky plateau so mainly surface water of Rawal Lake is used for domestic purposes but it is very contaminated and turbid and can't be delivered without treatment.
- Water metering is very low (6%)
- Sewerage system is poor and mainly consists of open drains causing visual pollution and many diseases.
- No treatment of sewerage is being carried out.
- Poor solid waste management system with no sanitary landfill site in the city.[10]

Bahawalpur

- Coverage of water supply is very low (10-30%).
- Very high unaccounted for water(UFW) i.e. 40%
- The major problem of the town is the insufficient system of sewers, open drains and lack of facilities for disposal of effluent.
- No monitoring of drinking water quality is done regularly
- Sewerage is not treated and utilized by farmers for irrigational purposes which could be a potential health hazard.
- No water metering practices in Bahawalpur.
- Poor SWM and no sanitary landfill are present.[11]

D G Khan

- Distribution system of water is very poor, corroded and insufficient to meet demands of growing population
- No monitoring of ground water quality and no laboratory for testing and analysis
- Coverage of water supply (30%) and sewerage (50%) is very low
- Poor sewerage system with blocked sewers is common throughout the city
- Raw sewerage pounding is common
- No water metering
- High unaccounted for water (40%)
- Solid waste management is very poor and also no sanitary landfill site is present for safe disposal of solid waste.[12]

Sargodha

- Low coverage ratio for both water and sanitation services
- TMA of Sargodha has no water quality and monitoring laboratory while some samples are sent to PHED, Lahore for analysis
- According to PCRWR report, 75 % samples of water were contaminated with coliform bacteria, high levels of arsenic were found in one samples along with turbidity and other pollutants.
- Poor sewerage system with blocked sewers is common
- There is no sewerage treatment facility in the city
- No water metering practices
- High unaccounted for water is assumed by TMA because no figures are available
- No sanitary landfill site for safe disposal of solid waste
- There is only one official dumping site which didn't receive all the waste from the city so much waste is left in the city in form of heaps and litter.[13]

Sialkot

- No regular water monitoring is done
- The residents of Cantt area of Sialkot are throwing their sewage directly into groundwater which is badly contaminating the groundwater.
- As Sialkot is an industrialized city so their effluents are not treated before disposal and causing heavy contamination of shallow groundwater
- According to PCRWR, samples from 10 locations form the city were collected. Results show that about 70% of the samples were having coliforms and some samples contained variable concentrations of other pollutants like Ca, Fe, Cr and As.
- No water metering practice
- No sewerage treatment is done
- No sanitary landfill for disposal of solid waste
- Poor sold waste management prevalent in Sialkot.[14]

Lahore

- No water storage reservoirs are constructed by WASA which could serve in power outages.

- Contamination of groundwater due to bacteria, arsenic and other pollutants is happening due to sewage mixing with groundwater and seepage of sewage
- Water metering is practicing on a very little level (12%)
- Water treatment is not done at all tubewells
- Water supply and sanitation coverage is not available in surrounding areas of Lahore
- No treatment of sewerage is done before disposal
- Discharging raw sewage directly into rivers and canals is a common practice
- Problem of water supply, open drains and solid waste in rural union councils(UCs) of Lahore is intense
- Solid waste management system is poor leaving tons of waste unattended
- Collection and transfer system is very poor
- A partial engineering landfill site is present with limited recycling and composting services.[15]

Conclusions & Recommendations

1 Although public and private utilities have provided services in urban areas and to some extent in rural areas. But the coverage yet falls behind the actual requirement. Water is available to 97% of Punjab's population but half of it is contaminated owing to mixing of liquid and agriculture waste into the groundwater and water bodies. The management of liquid waste is the prime area government should address immediately. Focus on safe drainage through underground sewers and its disposal after treatment are the main areas where government should spend more than in water sector. Once the drainage of liquid waste is made possible the contamination in water table will decrease and water could be fit again for drinking purposes.

2 Provision of safe water is essential to maintain health of the people. Therefore, all the water utilities should ensure chlorination at water provision points to purify the water from the bugs and made safe for drinking purposes. Outlived pipes need to be replaced to curtail contamination into water networks. For conservation of water, water metering needs to be made mandatory. Water storage should also be ensured to keep 24/7 supply.

3 The unaccounted water and illegal connections are those issues which are affecting functioning of water utilities to a great extent. The study to dig out such illegal connections and uncounted water needs to be connected. The measures then can be devised to curb such malpractices.

4 All WASAs realize that with its own resources they have no capacity to undertake major development works, replacement of old infrastructure, treatment plants and disposal stations. Further there is dire need to expand their network to un-served peripheral areas all around the cities which are now or will soon become part of the cities. For all these works, WASA's are looking towards donors, foreign aid, federal and provincial governments. This is the fact that all these aid resources are unreliable, conditional and non dependable in the long run. These can support for specific projects on certain conditions but will not be able to support the institutional capacity of the organization.

5 Involvement, representation and participation of the citizens who are the basic users of these services are the need of the hour. So ***citizens can be the better donors*** in order to ensure the recovery and prevention from illegal connections community can be the best utilized being the primary stakeholders.

6 Water metering is the best option for the conservation and recovery. Pilot areas can be selected and gradual metering plan can be put in place effectively. Incentives on metered connections can encourage citizens to use the meters. Flat rates need to be increased to discourage the un-metered connections.

7 In order to expand the services to un-served peripheral areas around the city, community participation is essential. **Component Sharing Model** of Orangi Pilot Project is the best approach to involve the community in the development work. WASAs should focus on the provision of external infrastructure which includes main lines, disposal stations and treatment plants while the community should develop internal sewers. Infrastructure on low cost self help model which

includes house level septic tank, street lines etc. This approach will reduce the cost of the development works to a considerable level and dependence of WASA on donors will be reduced. Further it ensures the effective utilization of the facility because citizen will take care of their own investment.

8 Maintenance of the services can be transferred to the community by formulating community organizations which will further reduce the regular cost of the WASA being spent on maintenance.

9 Sewerage is available more in urban areas than that of rural areas. Service providers should focus on sewage development to cover hundred percent areas in the cities. Rural sanitation schemes should also be launched to provide this service in rural areas. Component sharing approach should be adopted to ensure community's investment in sewerage development.

10 Disposal of liquid waste into water bodies is a general practice of most of the utilities. Usually waste water treatment costs high but there are certain low cost techniques available for waste water treatment (e.g. Effective Micro Organism Technology) which should be promoted.

11 Households will be provided with polythene bags to collect waste on monthly basis. They put waste filled bags on the doorsteps on daily basis. Social mobilization of dwellers to for household level waste collection has to be carried out to set out the process of household level waste collection.

12 Waste collection and disposal by sanitary workers as per set standards for waste collection, should be provided for each settlement. The sanitary workers should use hand carts, donkey carts or other vehicles to collect waste from the doorsteps and dispose it to the mini transfer stations/waste enclosures. Temporary storage in containers placed on the streets and roads needs to be discouraged as they give birth to sever environmental and health problems.

13 Final disposal of waste to the landfill sites has to be ensured. Easily accessible dumping places shall be developed. All TMAs shall develop landfill facilities for disposal of solid waste. Composting and other recycling operations should be instituted to make waste a profitable business.

14 Provincial Government should ensure that TMAs implement hospital management disposal rules 2005 notified by ministry of environment;

15 A comprehensive solid waste management strategy, as outlined above, should be developed and implemented. TMAs shall strictly prohibit the overuse of plastic bags and shall invite public sector investment for recycling as well. Separate garbage collection trunks recyclable and non-recyclable items should be established with in the TMAs.

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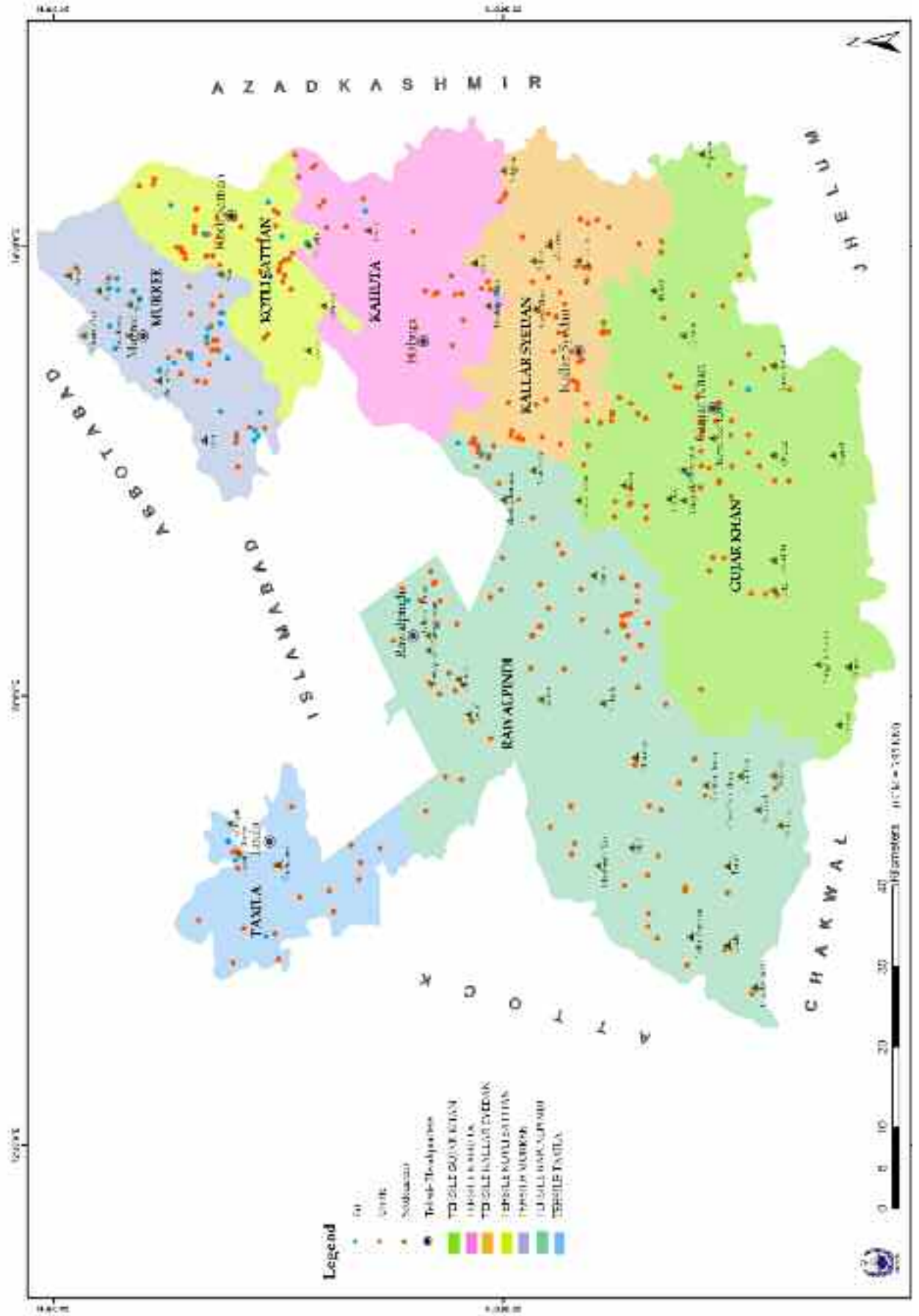
Annexure-1

List of Persons Met

Sr No.	Name	Designation	Department
1	Qadeer Khan	Director Design WASA	Water & Sanitation Agency Lahore
2	Salman Yusuf	Deputy Secretary (Technical)	Public Health Engineering Department Government of Punjab
3	Tariq Mehmood	Deputy Director, Community Development Unit	Public Health Engineering Department Government of Punjab
4	Jawad A Khan	Environmental Engineer	Urban Unit, Planning & Development Department, Government of Punjab
5	Usman Ul Haq	Deputy Director	Environment Protection Department, Government of Punjab, Lahore
6	Asad Islam Mahni	Project Director, CDWA	Local Government & Community Development Department, Government of Punjab, Lahore
7	Mr. Khalid Warriach	Executive Director	Hamat Development Organization, Bahawalpur
8	Mr. Raza Ali	Urban Planner	Punjab Urban Resource Centre
9	Mr. Ashraf Bhutta	Executive Director	Alwatan Forum, Gujranwala

Map of fit and unfit ground water in different Tehsils

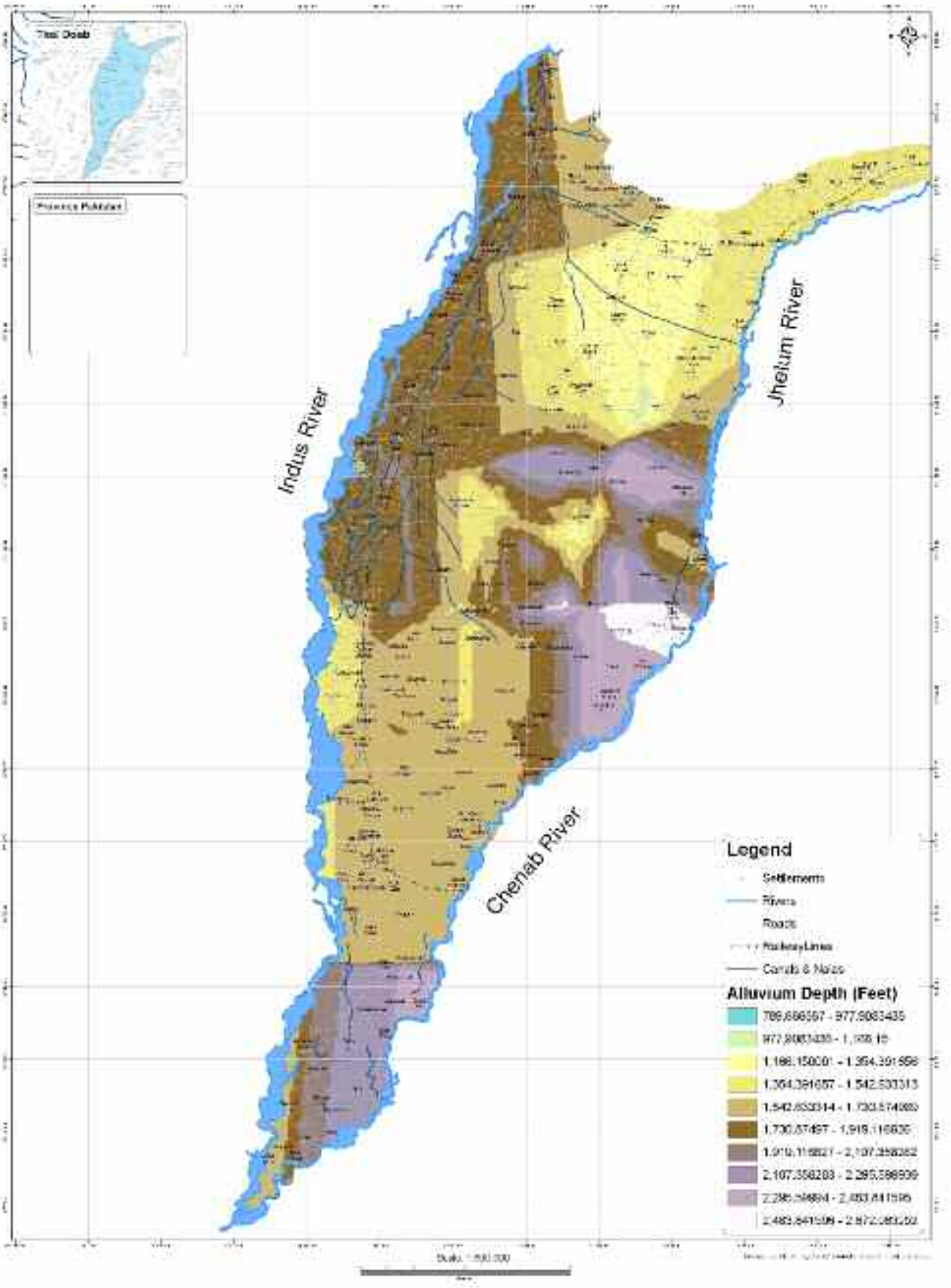


Water supply schemes in different Tehsils

Government of Pakistan
Ministry of Science and Technology
Pakistan Council of Research in Water Resources Islamabad

Demarcation of Ground Water Quality Zones in Indus Plain and Marginal Areas

Depth of Alluvium

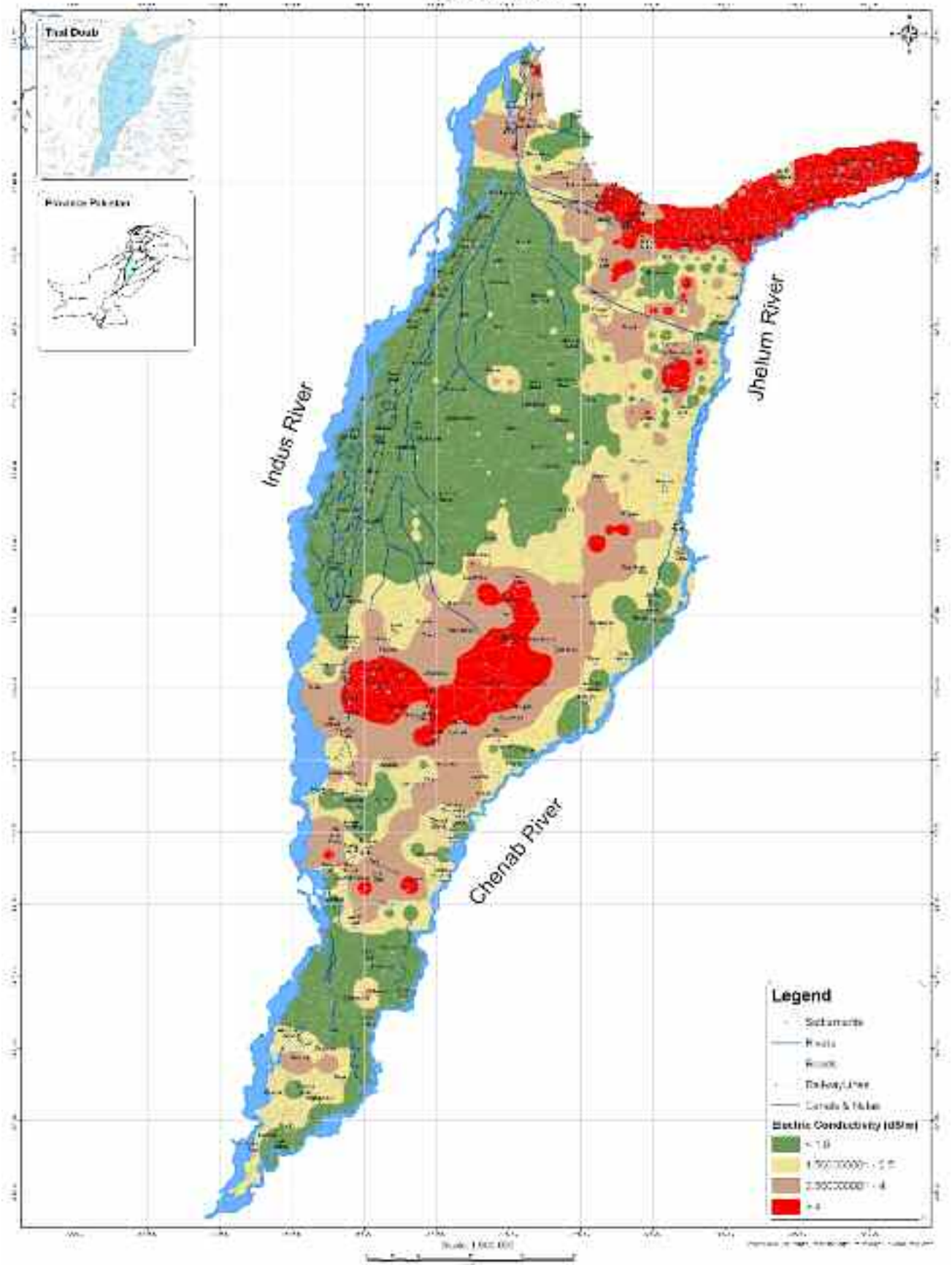


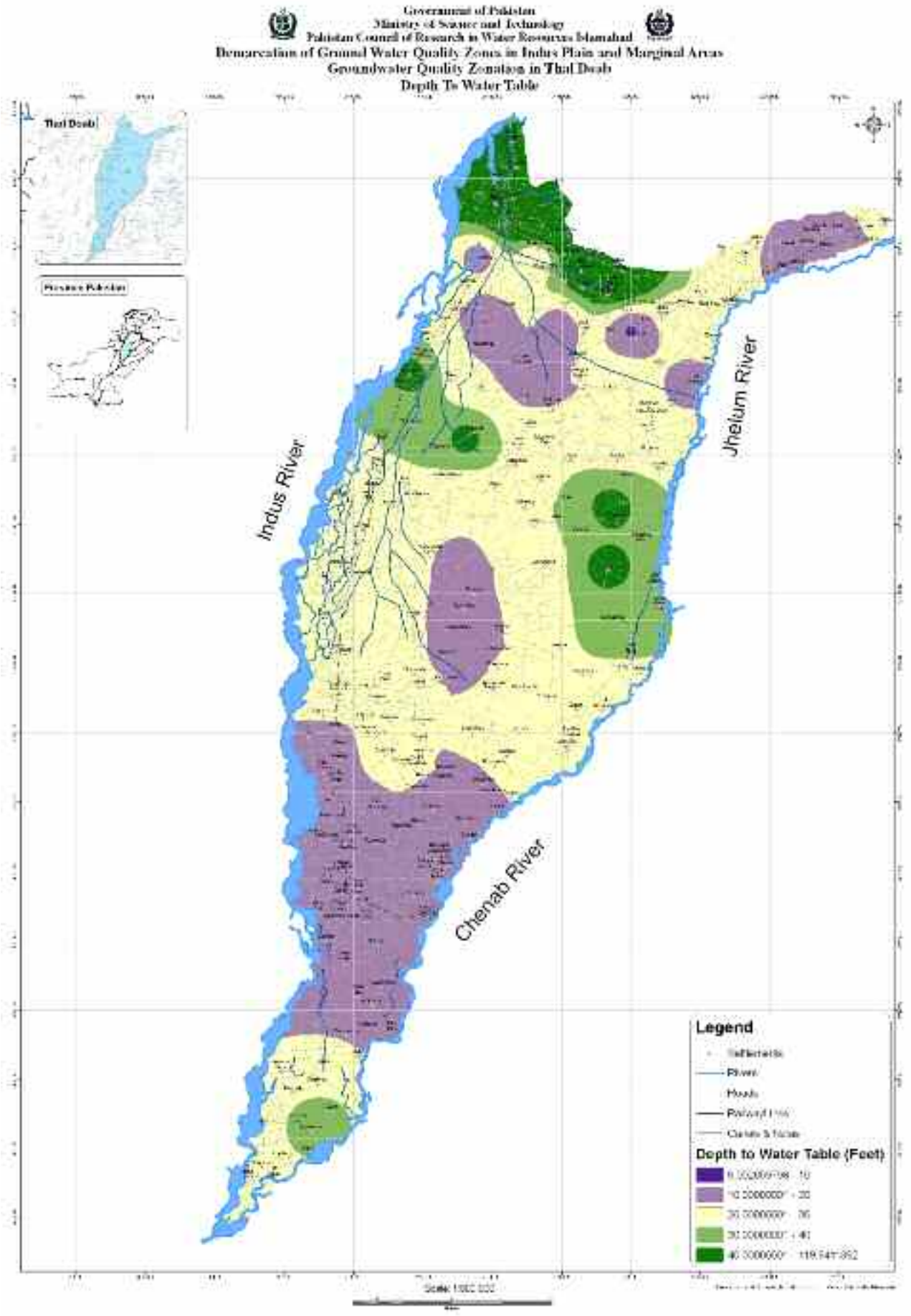
Government of Pakistan
Ministry of Science and Technology
Pakistan Council of Research in Water Resources Islamabad

Demarcation of Ground Water Quality Zones in Indus Plain and Marginal Areas

Groundwater Quality Zonation in Thal Doab

Depth 0-50 Meters




Government of Pakistan
Ministry of Science and Technology
Pakistan Council of Research in Water Resources Islamabad
Demarcation of Ground Water Quality Zones in Indus Plain and Marginal Areas
Groundwater Quality Zonation in Thal Doab
Depth To Water Table
Thal Doab
Indus River
Jhelum River
Chenab River
Legend
Depth to Water Table (Feet)

Summary of WASAs

Aspects	Situation Analysis of five WASAs				
	Multan	Gujranwala	Rawalpindi	Faisalabad	Lahore
Rationalization of tariff	Tariff structure is in place since 1992 (Tariff is as low as Rs 21 for sewerage and Rs. 36 for water supply for 3 marla house). To meet with the operational cost, a plan of four time increase in tariff put up before governing of WASA has recently been rejected. WASA officials are of the view that provincial government with the orders of chief minister, Punjab should take a decisive action in this regard.	Rationalization of tariff is the need of the hour as Gujranwala is facing a huge gap between its income and expenditures. It needs to be rationalized in par to the operational cost	Govt. of Punjab needs to take a decisive role in rationalization of tariff. An increase of 64% tariff is rational.	The production cost of every utility is different from each other as each utility differs in its water supply systems. So tariff should be fixed as per the production cost. If tariff is increased 200% then it can meet production cost of WASA.	Working ratio of the agency is 1:86 at present and would increase up to 3:0 in the year 2015-16. Since 1992, only once in 2004 tariff was increased by 40%, on the contrary operational expenses has increased to 400% which widens the gap between the expenses and the income. Tariff needs to be rationalized gradually.
Reduction in inefficiency cost	At present the recovery of tariff is 50%. The malpractices and inefficiency of WASA staff are the major causes of this default. Managing Director (MD) WASA proposed that recovery part should be privatized with a decentralized mechanism under which one	Recovery of tariff has been increased from 25 to 60% by introducing self devised institutional reforms by Managing Director (MD) WASA. He has shifted the responsibility of recovery from the revenue staff to the engineering staff. He used	Working ratio is 1:36 which is much better than the other WASAs. Improvement in tariff recovery, reduction in O&M cost and updation of machinery would reduce inefficiency cost.	Recovery of tariff is 60% which needs to be improved to reduce inefficiency cost.	Illegal connections, leakages and inefficiency of staff are the main causes. Leak reduction cell is formed. Survey is underway for a pilot to assess illegal connections and a training institute is

	contractor should be hired for one union council. As the bulk meters are already in place on all the 103 tube wells operated by WASA, the water measurement can easily be correlated to the tariffs of areas being served from one tube well. WASA has changed the old galvanized pipes in most of the city and reduced leakages too.	district administration and police to ensure recovery from the consumers and defaulters. He issued notices in person and in news papers to the biggest twenty defaulters and plan to do the same with the rest of defaulters. The O&M cost has been decreased by reducing staff and inspection of works in person by M.D WASA WASA Gujranwala is undertaking an exercise to assess the performance of its tube wells and plan for retrofitting. Keeping in view the fact that people prefer groundwater extracted by motorized pumps over WASA's water, more investment in water sector is not viable.			proposed to build capacity of staff.

		Change of old galvanized pipes is in process however WASA is facing difficulty in replacement of such pipes laid in downtown where it is difficult to find out water network amongst so many other service networks due to very narrow streets.			
Improvement in management structure	According to M.D WASA the agency is understaffed. To cover the city 1,500 sewer men are required while only 500 are taking care of the whole city at the moment. The availability of sewer men is an issue as people do not opt for this profession eagerly. The capacity building of existing staff is required to improve the efficiency. M.D wants to declare WASA as essential services to improve the overall management of the agency.	According to M.D WASA a number of technical positions are lying vacant. M.D has fired about 162 daily wagers to reduce its operational cost. This resulted in about 12% increase in the load of work on the remaining staff. However it helped WASA financially. The capacity building of existing staff is required to improve the efficiency.	According to M.D WASA overstaffing is not an issue rather technical update of the staff is required. Autonomy should be granted to management. The head of the organization should have powers of hiring and firing wherein political entities should not interfere into employees affairs. Training institute should be formed to build capacity of WASA staff.	Capacity building of WASA staff is required.	Staff training is required
Monitoring and	The complaints are registered at SDO	Six complaint cells are established	Management information system	Monitoring of complaint cells	Complaint cells

service delivery	office and being dealt thereon. If some compliant is not attended it comes forward to M.D who forwards it to the concerned SDO for redressal.	where receipt is issued to each complainant. The mobile phone number of each complainant is printed on each receipt. M.D WASA himself visits these cells and randomly check the service delivery by making calls to the complainant.	(MIS) is in place. The complaints are recorded. The organization is decentralized into districts where powers are given to the district officers to deal with the complaints and ensure service delivery. Consumer survey is conducted every year to update consumer data.	should be given to third party to ensure service delivery.	are working.
Water metering	Water metering has not been practiced in Multan yet. However M.D agreed with its importance and ready to do a pilot.	Water metering has not been practiced yet. However M.D agreed with its importance and ready to do a pilot.	To undertake water metering separate metering directorate needs to be formed so that this wing work only on one aspect and make it successful. Pilot of water metering is proposed. Bulk metering is in place on 50% water systems.	Bulk water metering is in place. WASA in collaboration with Anjuman Samaji Behbood piloting water metering in three settlements by following Changa Pani model.	Pilot testing is essential in new areas.
Storage	There are 18 storage tanks in the city which are reported operational. However they are closed owing to threats of terrorism.	There are 11 storage tanks in the city in which ten are functional and one is kept as stand by.	There are thirty six storage tanks in the city in which 9 are non-functional. M.D WASA is in favor of Ground Storage Tanks (GST) instead of Over head Reservoir (OHR).	There are 33 storage tanks. More are required.	Most of the storage tanks are not functional.
Rain harvesting	There is meager rainfall in Multan,	Rain harvesting is not practiced in	Pilot can be tested.	Not feasible.	Not feasible

	Hence rain harvesting is not a feasible option for development of water sources.	Gujranwala.			
Regulation of private entities	WASA takes aquifer charges and sewerage connection charges form the private housing schemes approved by Multan Development Authority (MDA).	Notifications for aquifer charges and sewage connection charges have recently been approved for Gujranwala.	WASA is in various agreements with Cantonment and Capital Development Authority (CDA). The regulation of private entities yet to be streamlined.	Regulations are in place.	Regulations are in place.
Community Participation	WASA has not tested any community participation techniques for involvement of community.	On Water and sanitation few NGOs are already working in Gujranwala and they have an informal relationship with WASA. However keeping in a bigger scope of sewerage development component sharing model can be strengthened in Gujranwala by evolving community participation. WASA is eager to have partnership with the civil society to undertake this initiative.	In UC Rahmatabad, Water and Sanitation Community Organisation (WASCO) operate and maintain water supply scheme which is a successful model. Ways of community participation can further be explored.	WASA is launching three community participation models with the assistance of Anjmani Samaji Behbood following ChangaPani model.	Community participation is missing in the six year development plan, which would be incorporated.

Water Contamination	Water is contaminated in various parts of the city due to negative pressure and old pipe lines	Underground Water in Gujranwala is contaminated up to 200 feet deep due to absence of safe disposal of liquid waste facilities in major part of the city.	Contamination of Rawal Dam is taken up by Supreme Court.	Not an issue here.	Water contamination is prevalent.
Water recharge	The water recharge is not an issue in Multan as for the last ten years, decrease in the level of water table has not been observed. Water is available at all places at 60 feet depth. The issue of arsenic is also minimal.	Water acuqifier is considered depleting. However scientific studies are yet to be conducted.	In 1985-86 there were only 86 tube wells in the city. This figure has grown upto 450 now. Water table was 30-70 feet which has lowered down to 130-280 feet now. Further water extraction is not feasible hence water should be taken either from River Indus or River Jehlum.	Study is required.	Study on water recharging is required.
Planning	The water recharge is not an issue in Multan as for the last ten years, decrease in the level of water table has not been observed. Water is available at all places at 60 feet depth. The issue of arsenic is also minimal.	WASA with the help of Jerrs has developed Geographic Information (GIS) mapping system reflecting existing sanitation infrastructure of Gujranwala. This is an instrument which clearly determines the scope of work for sanitation. WASA is in the process of	There is not master plan of Rawalpnidi. Number of agencies like towns and MPAs, MNAs grants are working in water sector in the city due to which duplication of services occur. Master planning is essential to resolve this situation.	Master plan was formed in the year 1992 which needs to be revised. However GIS mapping of Faisalabad is completed by WASA which is in use for planning purposes.	Mapping/documentation is in place.

		developing similar maps for water supply. The planning of sanitation as well as for water should be made on these maps.			
Finances	The agency has not received any funds from Provisional Finance Commission (PFC) award. The current Annual Development Plan (ADP) amounting to 584 million and Prime Minister Package of Rs 378 million have been approved by the government but releases are yet to be made.	The operating income of Gujranwala WASA is 11.9 million per month if the agency ensures 100% recovery. On the contrary 25.5 million rupees are required to meet operational expenses. Every month the agency needs 13.6 million rupees to achieve break even. The current ADP amounts to 326 million. The utilization of last ADP was more than 95%.	PFC award ADP and other liabilities of the Government if cleared to WASA Rawalpindi, the organization can considerably lower down its deficit.	Annual expenditure is 999 million, while annual income is 390 million.	Deficit has to be curtailed to save WASA.

Source: Draft Punjab Drinking Water Strategy, Government of Punjab, February2011

Punjab Urban Resource Centre

Punjab Urban Resource Centre (PURC) was established in October 2001 by a group of individuals comprising development professionals, community activists, architects, sociologists and teachers. In general, urban development planning in Pakistan is top down and takes place without consultation with interest groups, especially poor communities. For this reason, development is often non-representative and unable to effectively meet the needs of the citizens. PURC seeks the involvement of citizens and communities in the planning and decision-making process in order to make development more responsive to the needs of people. Through research, PURC attempts to understand urban and development-related issues, and with advocacy influences these in the light of a pro-poor approach. The objectives of PURC include promoting dialogue between the broad range of urban actors, advocating for the participation of citizens and academia in all stages of development, encouraging transparency and accountability of government and private bodies in the development, planning, and policy making processes, and eventually providing alternatives to projects which are likely to have adverse environmental, social, technical or economic effects on the city and its vulnerable communities. PURC's current activities include issue-based information collection, research, documentation and publication, discussion forums, networking and liaison with the actors of the urban development process, publications, and monthly newsletter Urban News.

WaterAid

WaterAid is an international NGO formed to transform lives by improving access to safe water, hygiene and sanitation in the world's poorest communities. WaterAid envisions a world where everyone has access to safe water and sanitation. The organization works with partners and influence decision-makers to maximize efforts to enable the world's poorest people to gain access to safe water and sanitation coupled with improved hygiene and resultantly uplifting their health, education and livelihoods. The organization works with local partners, who understand local issues, and provide them with the skills and support to help communities set up and manage practical and sustainable projects that meet their real needs. The organization also influences policy makers and implementers to form viable policies and institutional frameworks to meet the actual needs of the target groups. It focuses on collaboration of various stakeholders to get engage into the sustainable, innovative, relevant and effective interventions. WaterAid used to supervise Pakistan from its regional offices prior to year 2004 when it opened its country office in Islamabad. The primary aim of establishing its country office was to facilitate its partners more directly. WaterAid Pakistan (WAP) works with number of its partner organization in three provinces (Punjab, KPK and Sindh).

Punjab Urban Resource Centre

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Dharampura, Lahore