Improving Environment

Through Up-Gradation of Basic Civic Facilities in

Katchi Abadis of Lahore

By

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بسم الله الرحمن الرحيم

DEDICATION

Dedicated to life's most valued treasures

that are priceless, my parents, who ran to help

me when I felt, provided me with the best

facilities that they could and my family

who put their feeling into action by being there

and helping me out, when I needed.

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This research thesis would never have been completed but for the benevolence compassion and mercifulness of the Almighty, Omnipresent Allah, whose blessings are shared by all of us. And after Almighty Allah to his prophet Hazrat Muhammad (PBUH), the most perfect and exalted, who is forever a source of guidance and knowledge for humanity as a whole.

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Engr. Sohail Anwar Bajwa

Certificate of Approval

This thesis by Engr. Sohail Anwar Bajwa is hereby approved for submission to the Faculty of the Home and Healthy Sciences, Allama Iqbal Open University, Islamabad for the partial fulfillment of the requirement for the Master degree with specialization in Environmental Design (where applicable).

Viva Voce Committee

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External Examiner

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Internal Examiner

FORWARDING SHEET

The thesis entitled "Improving Environment through Up-Gradation of Basic Civic Facilities in Katchi Abadi of Lahore City" has been completed under my guidance and I am satisfied with the quality of student's research work.

Date: 27th September 2012.

Dr. Kiran Farhan

Abstract

Environment is an envelope which has enclosed all physical and virtual development around the world. Being a common factor for all strata, environment should be given its due worth for any infrastructure, firstly to distinguish it from the rest of spaces and secondly to enhance the quality and use of that particular space. There are several methods of handling the environment in its utmost workable and suitable fashion, up-gradation being the continuous factor for an already defined environment. Though the up-graded technological environments have captured the world, yet more work is left to be done. The result is the technological revolution on one side and degradation of environment on the other. In order to provide a sustainable and naturally sufficient environment to all the inhabitants of the world, some of the problems need to be addressed on priority basis. Environmental degradation is one of them.

Environmental up-gradation of the basic civic facilities in the Katchi Abadis is the need of the day. As mankind is approaching towards the pure mechanical solutions to all problems, environmental up-gradation strategies prove to be realistic, workable and sustainable solution to these problems.

A large proportion of the urban population live in poor quality housing – for instance whole households live in one or two rooms in cramped, overcrowded dwellings such as tenements, cheap broadly-houses or shelters built on illegally occupied or subdivided land. The main objective *as an engineer* or *an environmentalist* is to improve the environmental conditions in Kachi Abadi of Lahore so this research can contribute to some extent.

Improving Environment through Up-Gradation of Basic Civic Facilities in Katchi Abadis of Lahore

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Chapter One

INTRODUCTION

1.1 Historical Background

During 1940s & 1950s due to migration from India following partition, extensive unorganized land invasion led to the establishment of extensive squatter settlements (Katchi Abadis) on the then Karachi periphery and on empty urban lands. Traditional urban institutions based on clan, caste and religion quickly collapsed. The settlements densified over time as political instability prevented coherent urban planning. The 1950s saw sharp urban expansion as infant mortality rates fell and rural-to-urban migration exploded when agricultural production was modernized.

Katchi Abadi is a cluster of houses built unauthorized on government or private land and the term 'Katchi Abadi' is equivalent to the term squatter settlement in Pakistan. First of all, Mr. Zulfiqar Ali Bhutto, who became Prime Minister of Pakistan in December, 1971 announced his housing policy to provide the shelter to the poor. In this regard, Awami Rehaishi Tanzeem (ART) was created in Lahore in 1973. The ART was the first government sponsored organization to activate the residents of squatter areas in order to improve their living condition and to grant them proprietary rights.

According to 1998 census Pakistan's urban population was estimated to be 42.5 million, representing 32.5% of the total national population, and growing at a rate of 3.5% per annum. Pakistan's national population is 130.6 million and is growing at a rate of 2.5% per annum. (Census, 1998)

Over the past thirty years, the urban growth due to migration has varied between 19-20%. This figure has remained nearly constant for the census period 1972-81 and 19981-98. The estimates for the urban population living in Katchi Abadis and low/under-serviced area range from 33-35%. The unchecked growth of Katchi Abadis on public land and the growth of low/under-serviced settlements are the direct result of the shortcomings in the housing delivery system and lack of access to affordable tenure by the poor. In metropolitan cities of Karachi, Lahore, Hyderabad, Peshawar, and Quetta, nearly 40% of the population is living in Katchi Abadis and low/under-serviced areas. (Dept. of KA&UI Punjab, 2011)

The urban population comprises of people living in Katchi Abadis, inner cities and new urban settlements (peri-urban areas and ribbons) which can be categorized into two main groups:-

- Katchi Abadis: low/under-serviced area on public land (existing prior to 1985).
- Settlements on state land: low/under-serviced areas on public land (occupied after, or not listed in, the 1985 policy regarding regularization of Katchi Abadis).

Realizing the basic need of poor urban population the Government of Pakistan decided to recognize Katchi Abadis established on state land and avoid eviction from their shelters. Regularization of Katchi Abadis has been tried twice before, during the regime of General Zia-ul-Haq. The attempt in 1986 declared any informal settlement comprising 40 housing units or more a Katchi Abadis and called for its immediate regularization. This policy was only partially implemented and there are many Katchi Abadis that have yet to gain from this policy. In the meantime, many more low/under-serviced settlements have emerged as the urban planning process across the country continues to be skewed toward the preference of the urban elite.

National Policy on Katchi Abadis, Urban Renewal and Slum Up-gradation was formulated in November 2000 by the Ministry of Environment, Local Government and Rural Development (LG&RD) Department. Development plan for regularization, were prepared under 1985 Policy, through physical and aerial surveys. The Katchi Abadis legislation/regularizations enacted in the provinces of Sindh/Baluchistan (1987) and Punjab (1992), only Khyber Pakhtunkhwa apply other provincial legislation.

The Punjab Government is also committed to alleviate poverty from the Province by providing shelter to the homeless people and civic facilities to the deprived segment of the society living in Katchi Abadis. Therefore, on the consistent demand of the dwellers of Katchi Abadis established after March 23rd 1985, the cutoff date was extended up to December 31st2006 with the continuation of existing policy of March 23rd 1985.

In this regard, the Punjab Katchi Abadis Amendment (Ordinance) 2007 has also been promulgated.

The 1641 Katchi Abadis over an area of 40,180 acres and 0.87 million housing units housing 5.6 million people were regularized between 1985 & 2008 all over Pakistan.

1.2 Administrative Setup in Pakistan

1) Federal Coordination

- Ministry of Local Government & Rural Development (LG&RD).

2) Provincial Agencies

- Sindh Katchi Abadis Authority.
- Punjab Directorate General of Katchi Abadis and Urban Improvement.
- Khyber Pakhtunkhwa Katchi Abadi Cell in Local Government and Rural Development (LG&RD) Department.
- Baluchistan Katchi Abadi Cell in Local Government and Rural Development (LG&RD) Department.

In the province of Punjab, there are 1210 Katchi Abadis in the urban areas. About 900 Katchi Abadis have been declared / notified whereas remaining 310 Katchi Abadis are under process. As regards to Lahore, 152 Katchi Abadis are declared/ notified whereas about 41 Katchi Abadis are under process. The complete detail of Katchi Abadis in Lahore is given in table 1.1

Table 1.1 Reports from LDA, Dec, 2011

Category	Katchi Abadis	Total No.	Dwelling Units	PKR Granted
A	Notified/Declared and Mutated in favour of LDA	152	37,888	8945
B	Non-Transferred	41	Under process	
C	Deleted Katchi Abadis	117	Being Established on Private land	

	Total	310		8945

1.3 Statement of the Problem

People of Katchi Abadis usually occupy a particular location, where pollution levels are highest because these are the only locations where they can find affordable land. People of the Katchi Abadis are living in very poor quality environment which contributes the stress to both physical and mental health. Usually these places are without basic civic facilities such as:

- Roads
- Drains
- Water Supply
- Sewerage
- Street Lights/ Electricity
- Sui Gas
- Sanitation
- Education
- Health Facility
- Social and cultural services etc
- Availability of Emergency Services

1.4 Research Objectives

The study in general is an effort to consider the large and varied range of environmental measures that not only reduce the risk of illness but also make cities, neighbor hoods and shelter more pleasant, safe and valued by their inhabitants. By doing so, these measures in the form of up-gradation of basic facilities will reduce stress that contributes to both physical and mental health of the people of Katchi Abadis.

The following research objectives are put forth to focus and proceed with the study:

1. To study the adopted solutions around the world to address similar issues in Katchi Abadis,

2. To determine the efforts that has been made in the past to examine basic civic facilities in Pakistan.

3. To investigate the existing environmental conditions prevailing in the Katchi Abadis of Lahore regarding supply of drinking water and solid waste management.

4. To find out the best possible solutions / options for the selected Katchi Abadis regarding the improvement in their living environment.

1.5 Research Questions

This research focuses

1, To study the adopted solutions around the world to address similar issues in Katchi Abadis,

2. To determine the efforts that has been made in the past to examine basic civic facilities in Pakistan.

3. To investigate the existing environmental conditions prevailing in the Katchi Abadis of Lahore regarding supply of drinking water and solid waste management.

4. To find out the best possible solutions / options for the selected Katchi Abadis regarding the improvement in their living environment.

1.6 Significance of Study

In Lahore there are total 152 (declared/notified) Katchi Abadis situated in the urban areas of Lahore. The study is limited to two (declared/notified Katchi Abadis namely Sikandar Colony and Marriyam Colony in which people are living in poor Environmental conditions due to lack of basic civic facilities such as drinking water, sewerage, solid waste management, electricity, Sui-Gas, roads and parks etc. However, the Focus of this study is on the following two parameters:

1) Drinking Water Supply
2) Solid Waste Management

1.7 Research Methodology

The research methodology adapted for the study basically follows the case study method. The basic research questions, focused upon, describe the scope of the study as well as methodology itself.

Initially research questions provided the way forward to the adoption of a process. This followed collection of data for which primary and secondary

data collection was involved. Observations and questionnaires as one category whereas documents, government publications, earlier research, census as second category were used for primary and secondary data collections respectively. It is important to mention here that the tools used for data collection through primary sources are closed ended questionnaires and observations by the researcher.

Case studies selected as a part of secondary data collection, were considered relevant to the social, economic and meteorological similarities with the selected area.

After the collection of data through questionnaires the results were analyzed for each and every question to give conclusions and recommendations to produce the final set of proposals.

1.8 Delimitations of the Study

Following are the delimitations of the study

1) The study is limited to two notified Katchi Abadis' of Lahore.

2) The focus of research is on the two parameters i.e. Drinking Water Supply, Solid Waste Management.

1.9 Limitations of the Study

Following are the limitations of the study

1) Time is also limited to cover this vast issue of Katchi Abadis in Lahore.

2) The reluctant attitude of both concerned individuals and community was the major obstacle in the data collection.

Chapter Three

RESEARCH METHODOLOGY

3.1 Research Design

This study was descriptive i.e. survey type in which consecutive field investigations and physical observations were performed to enhance the data accuracy. Close ended questionnaires were used as a tool.

a) For the research purpose questionnaires were developed for drinking water and solid waste management respectively.
b) Field survey was performed to determine the environmental conditions with photographs etc.
c) Sampling for water was made for analysis about the water quality.

3.2 Population

In the Urban Areas of Lahore there are total 152 (declared/notified) Katchi Abadis comprising of 37,888 dwelling units and the total population is 340,000.

3.3 Sample

Following two Katchi Abadis comprising of 822 dwelling units and having population 7,398 were studied for supply of drinking water and solid waste disposal.

- Sikandar Colony
- Marriyam Colony

3.3.1 Reason of Selection

Total notified/ regularize Katchi-Abadis in urban areas of Lahore are152 numbers. Out of these 152 Katchi-Abadis of Lahore, two Katchi-Abadis namely Sikandar Colony and Marriyam colony are selected for

research work. Sikandar Colony is situated near city district bus stand at bund road,

It is nearest to Chuburgy chowk and not far off to mall road whereas, Marriyum colony is loacted at Ghaus-ul-Azam road Township in the periphery of central Lahore.

The Distance between these two Katch-Abadis is about 16km. Sikander is colony lied in union council 92 where as Marriyam colony is lied in union council No. 140 it is observe that problems in almost all the Katchi Abadis of Lahore are of similar nature.

By the relation of these two Katchi Abadis, for my research thesis I think that the results shall be reflected the overall picture of all the Katchi – Abadis of Lahore.

3.3.2 Sikandar Colony

Sikandar Colony is situated at the back of City District Government Bus Stand at Bund Road, Lahore. In the East, Nawank of Police Station is present. Towards West of this Katchi Abadi, City District Bus Terminal and workshop of solid waste management department are located. In the North, Sodiwal Quarters are situated. Rehber Bus Stand and Bund Road are present in the South of this Katchi Abadi.

It is a notified/declared Katchi Abadi. Its area is about 36-Kanal. It lies in the Union Council No. 92 and in the constituency of PP-149. The total numbers of dwelling units in this Katchi Abadi are 340.

About 90% population of this Katchi Abadis earns the livelihood through daily wages whereas remaining 10% people are working in smaller jobs in government or private sector. Since, this Katchi Abadi is situated nearer to the commercial area of Yateem Khana Bazar, Multan Road and Bund Road, so small household commercial are found in this Katchi Abadi.

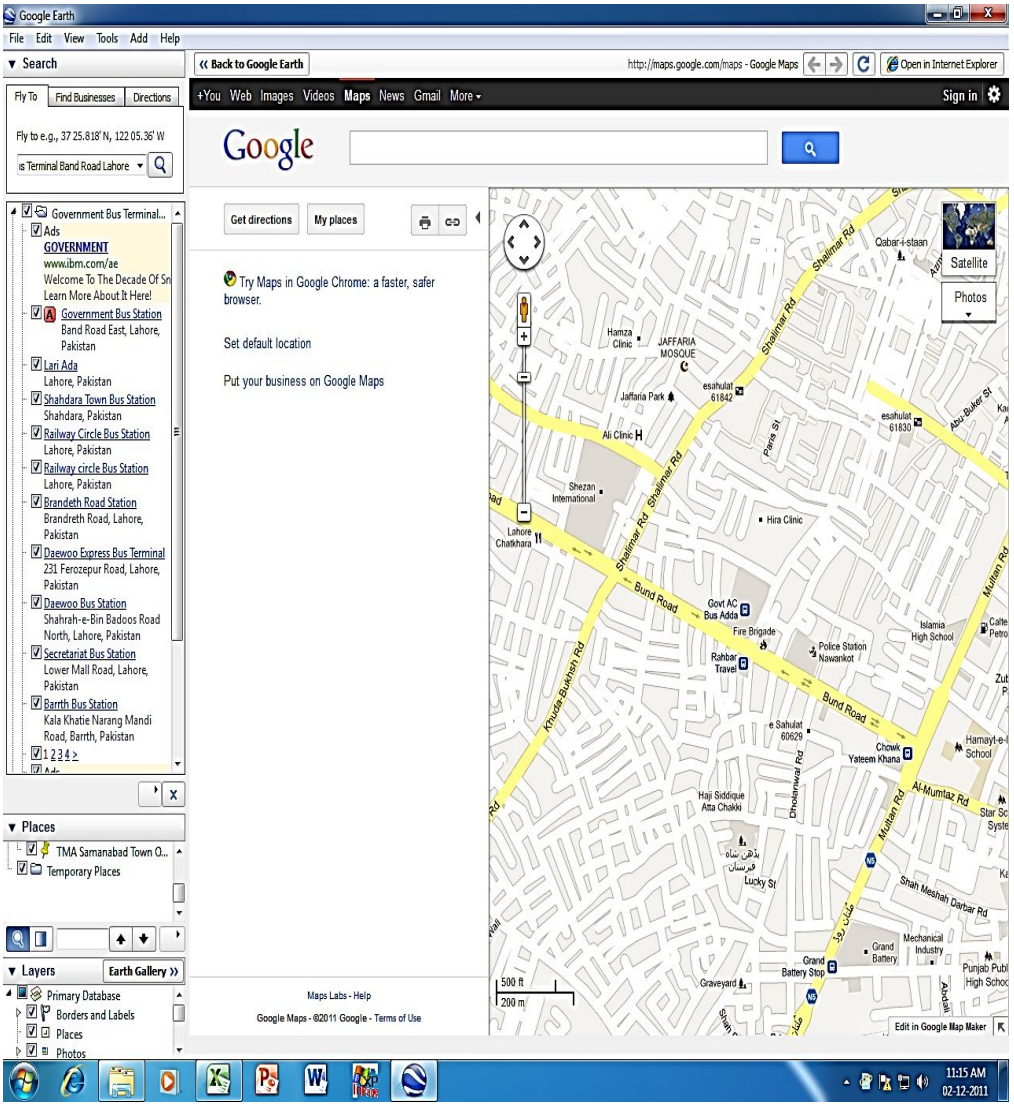


Figure 3.1: Location of Sikandar Colony

3.3.3 Marriyam Colony

Marriyam Colony is situated at Ghaus-ul-Azam Road in the area of Township, in the periphery of the Central Lahore. In the East, chandmari open land of army and office of the Union Council are present. Towards West, Abadis of Baghrian and Ghazi chowks are present. In the North, Green Town Madr-e-Millat road is located. Plot number 1, Niazi Colony is situated in the South of this Katchi Abadi.

It is notified/declared Katchi Abadi. It lies in Union Council No. 140 in the constituency PP-154. Its total area is 36 Kanal and 18 Marlas with total number of 412 dwelling units. Most of the people of Marriyam Colony are labourers either skilled or unskilled and some have a small business to earn their livelihood. Since, this Abadi is situated close to the industrial area of Kot

lakhpat, many people work in the nearby industries. However unemployed young generation is serious problem in this Katchi Abadi. The majority of the population belongs to Christianity. About 240 families are Christian whereas remaining families are associated with Islam. There is a famous **"Saint Marry Church"** at the main road of this Katchi Abadi.

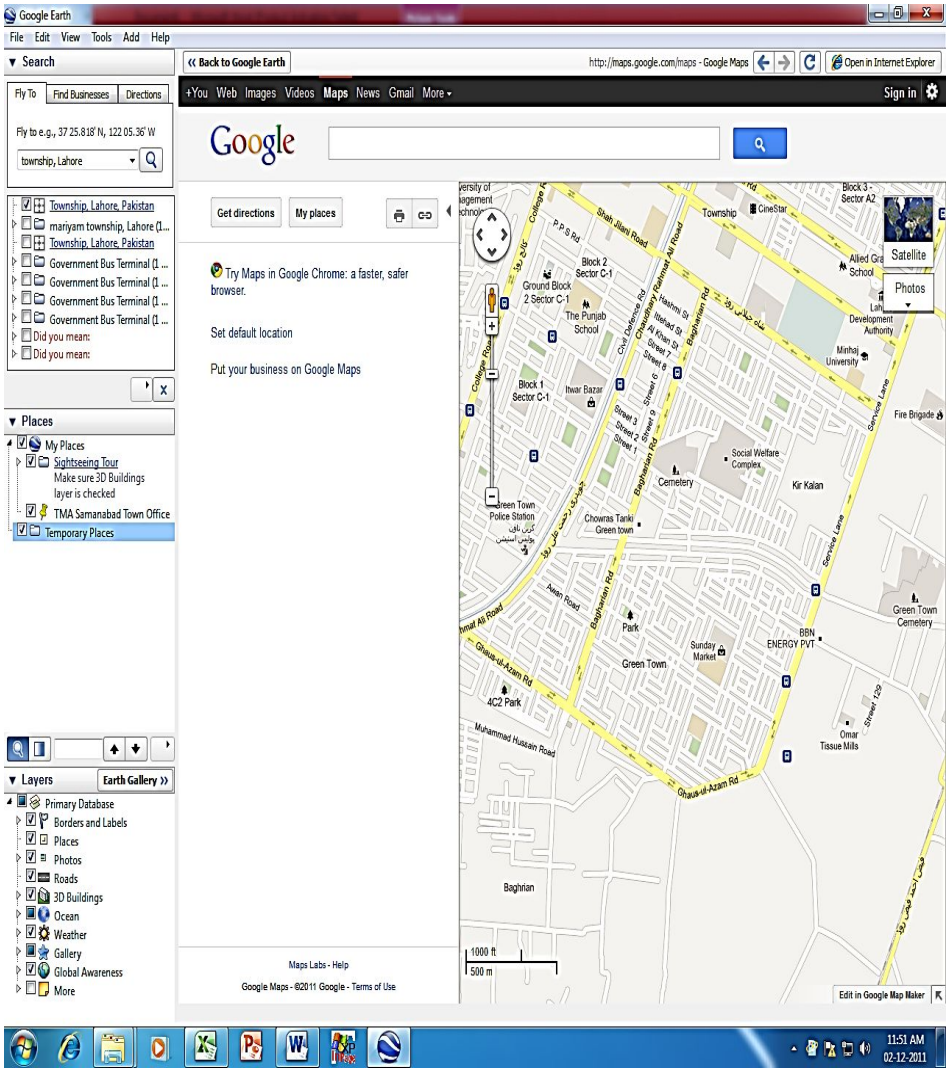
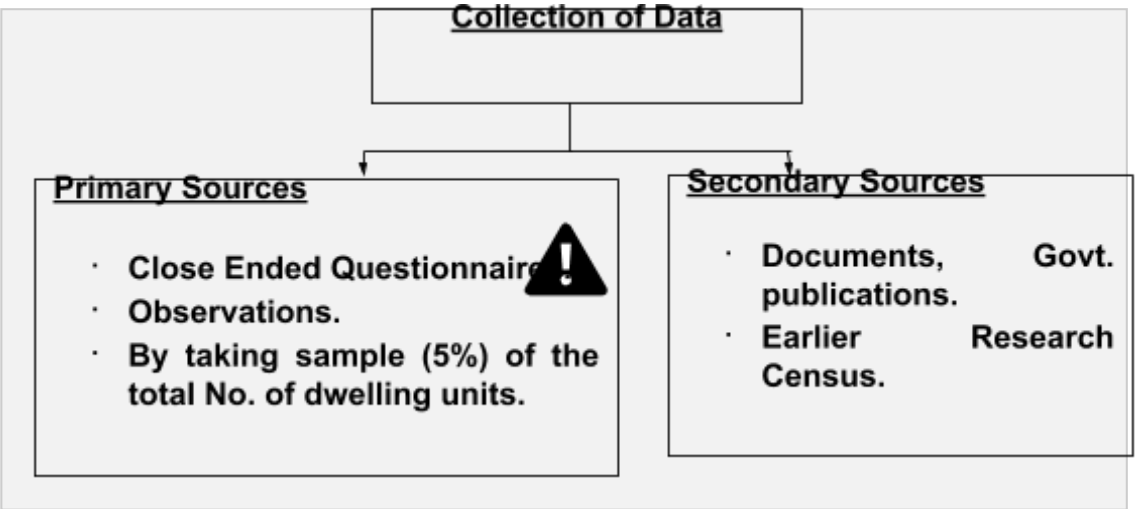


Figure 3.2: Location of Marriyam Colony

3.4 Research Tool and Analysis

The collection of data is carried out by following two major streams:

a. Primary data collection.
b. Secondary data collection.



3.4.1 Tools Used

The tools that were used to carry out the research are as follows;

- **Observations**

  The observations were primarily taken by visiting the area in different times of the year and were recorded in the form of photographs. An important part of observations consisted of taking sample (5%) from dwelling units and then analysed according to the sample report.

- **Questionnaire**

  The content of questionnaire comprised of the queries about the relationship of the user to the area in specific existing environment so that the up-graded environment can be suggested.

The up-gradation of existing services proposed in the responses/reactions of dwellers helped to find the expected improvement.

- **Drinking Water and Solid Waste Sampling**

  Grab samples for drinking water were collected from different points of case study areas. Chemical Analysis was performed for different important parameters in the testing laboratory in order to comply with the Drinking Water NEQS.

The sampling of solid waste generated from the houses of study areas was also carried out in order to determine the physical composition of solid waste.

3.5 Data Analysis

A frame of analysis evolved from the following factors.

- The study of variables for the development of cause and effect relationship.
- Data analysis for qualitative observations assisted by areal and pictorial views.
- Conversion of quantitative data into tabulated form to show more prescribed form of graphs by using Excel application of MS Office.
- Chemical analysis results of drinking water are shown in tables and graphs while for solid waste physical analysis are performed.
- Research conclusions.
- Recommendations.

3.6 Findings

a. Inadequate supplies of safe drinking water
b. The presence within the home and its immediate surrounds of disease-causing agents (pathogens) because of a lack of basic infrastructures and services (e.g. No sewers, no services to collect solid waste and safely dispose of them)
c. Overcrowded, cramped living conditions that increase the transmission of airborne infections and those passed by human contact and increase the risk of accidents.

- **The Inadequacies in Provision of Drinking Water**

Lahore is a big and important city of Pakistan and it is also center of Punjab. These two Katchi Abadis are situated in the urban area of Lahore. It is seen that most of the dwellers have “access to piped supply” but do not have a piped supply into their houses and thus have to rely on standby piped or other communal or public. They receive water through the pipe intermittently and the general perception is that the quality of water is poor. The difficulties in getting water are often much increased by the fact that water is only available in the piped system for a few hours a day, or water pressure is very low, so it takes a long time to fill up each person’s water container.

- **Solid Waste Disposal/ Management**

Removing and safely disposing of excreta and wastewater is also a critical environmental health need. In these Katchi Abadis, it is seen that

there is no proper, regular and safe system of removing and safely disposing of excreta and wastewater. It is observed that the agencies and government have neglected theses areas regarding the management of solid waste and also there is lack of coordination of local dwellers in solid waste management. People are illiterate and are unaware of the environmental problems and risks. Heaps of solid wastes are found in the streets and children play with bare feet in these streets that impose a serious health impacts upon them. The streets are over flooded with the wastewater/sewerage due to the blockage and non-cleanliness of open drains. Flies, mosquitoes and other disease vectors are observed in these areas more prominently. Most of the diseases associated with contaminated water including all the water borne diseases listed below

- **Health Problems associated with inadequate Water supply and Solid Waste Disposal**

A lack of readily available water of sewer (or other systems to safely dispose of human wastes), of drainage systems, rubbish collection and basic measures to prevent disease and provide healthcare result in very large health burdens from easily prevented diseases. They also result in high levels of infant and child death. Many health problems are linked to water- its quality and quantity available. Most of the people were complained that the quality of water is not according to standards. They think that usually water is mixed with sewer-piped water and thus the water is very hazardous to the health of people of these two abadis. Regarding the quantity, most of the people informed that usually water is not available in the pipes or water is provided for a very short time. Following are the important type of diseases due to contaminated water.

- Cholera
- Diarrheal disease
- Enteric fevers
- Infectious jaundice
- Pin worm
- Polio
- Round worm
- Leptospirosis
- Whip worm
- Skin and eye infections
- Scabies
- Impetigo
- Trachoma

- Relapsing typhus
- Malaria
- Filarial
- River blindness
- Yellow fever
- Dengue fever

The safety and accessibility of drinking –water are major concerns throughout the world. Health risks may arise from consumption of water contaminated with infectious agents, toxic chemicals, and radiological hazards. Improving access to safe drinking-water can result in tangible Improvements to health. The quality to drinking-water is a powerful environmental determinant of health. Assurance of drinking-water safety is a foundation for the prevention and control of waterborne diseases.

Chapter Four

DATA ANALYSIS

4.1 Criteria of the Field Research

It is a general observation that environmental conditions and basic civic facilities are sub standard in Katchi Abadis of Lahore. People are living in poor quality environment and they have inadequate access to the basic civic facilities such as water supply, sanitation, sewerage, street sweeping, roads, parks, school, dispensary etc. Environmental up-gradation of the basic facilities in Katchi Abadis of Lahore is the mere need of the time. Environmental up-gradation is the realistic, workable and sustainable approach that will lead to better environment and positive mind change in the area (Katchi Abadis).

In the research questionnaires, we will focus and proceed with study of the existing general ambiance, changes in past in relation to basic civic facilities, quantity as well as quality, adopted solutions and best possible solutions for improving the environment.

There are total 310 Katchi Abadis in Lahore in which 152 have been declared/ notified by the Government of Punjab. We have selected two Notified Katchi Abadis as case studies for our research purpose;

A. Sikandar Colony at Bund road Lahore

B. Marriyam Colony near Township Lahore

Out of various civic facilities two parameters in the selected colonies for our research purpose, keeping in view their Importance and significance. These parameters are;

- Drinking water supply
- Solid waste management

4.2 Existing Environmental Condition of Sikandar Colony and Marriyam Colony

From the field survey following are the photographic view of the two Kachi Abadis which is as follows.



Plate 4.1: Solid Waste in the Street

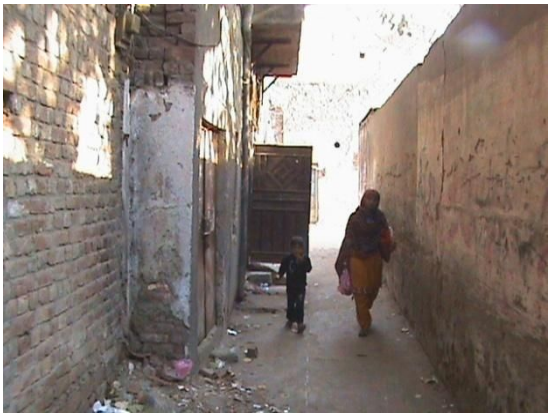


Plate 4.2: Street sweeping

Plate 1 & 2 shows the status of street sweeping and solid waste management in the Sikandar Colony. These plates clearly show that people are living in poor sanitation and substandard civic facilities.





Plate 4.3: Living condition of Sikandar Colony

Plate 4.4: Kabaria Shop in Sikandar Colony

Plate 3 gives us the image of living condition of dwellers in Katchi Abadi. People are living in congested homes. It is clear in plate 4, that recyclable items are collected and segregated at Kabaria shop. Kabaria shop is source of adverse health impacts due to improper handling of waste.





Plate 4.5: Overcrowding in Sikandar colony

Plate 4.6: Vegetable shop in Sikandar colony

Due to over population, overcrowding is a common phenomenon in streets as well as dwellings in the Katchi Abadi which is manifested in plate 5. Plate 6 shows the vegetable shop in street. Vegetables are exposing to smoke and dust and can cause health effects.





Plate 4.7: Condition of Graveyard in Sikandar Colony

Plate 4.8: Commercial Area of Sikandar Colony

It is found that most of the people are poor and their living standard is very low. The roads and streets are bad condition and many interior streets are still unpaved (katchi). People live in housing units which are of poor quality. Houses are made of materials which provide inadequate protection against the extreme temperatures. Since in Lahore, the temperature is either very high in Summer (50-53 °C) or very low in Winter (0- -2 °C). There is insufficient space relative to the number of persons living in a house and inadequate provision for piped water supply, the removal of excreta, household liquids and solid waste etc. Dust pollution and noise pollution are very serious factors of the locality. It is observed that the electricity and sui-gas are also provided in this Katchi Abadi but people made multi-connections from a single connection in order to distribute to different portions of the houses and even to neighbours. In other words most of the people have “access to piped supplies” but do not have a pipe supply into their homes and thus have to rely on stand-by pipes. Similar is the situation in case of the electricity connections. There is no proper, regular and safe system of removing and safely disposing of solid waste, excreta and wastewater.



Plate 4.9: Street conditions in Marriyam Colony

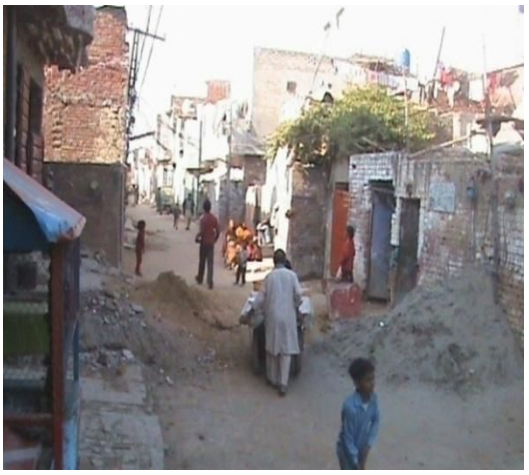


Plate 4.10: Poor condition of dwellings

Plate 9 clearly shows substandard work and poor sanitation condition in the street at marriyam colony. Demolition and construction martial as well as waste is lying in a street which is shown in plate 9 and 12. Plate 10 shows the poor living conditions in this Katchi Abadi. The congested and poor ventilation status in the streets has shown in the plate 11 and 12.

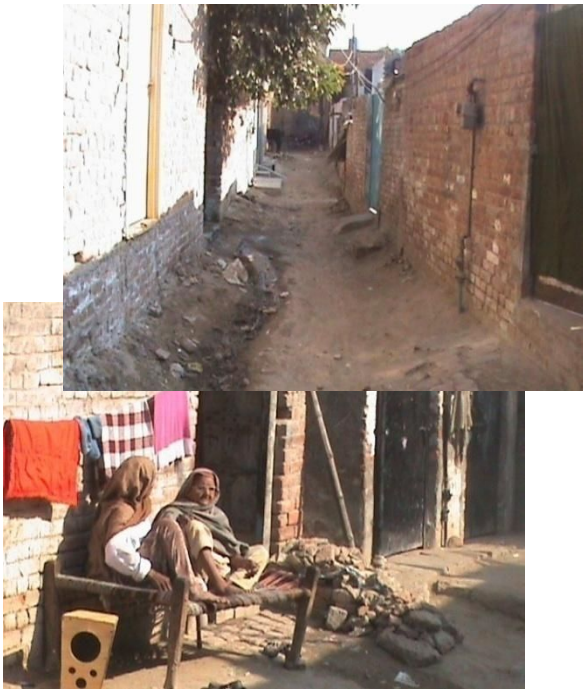


Plate 4.11: Street conditions in Marriyam Colony



Plate 4.12: Unpaived street



Plate 4.13: Life Style of residents

Plate 4.14: Overcrowding in street





Plate 4.15: Inners of Marriyam colony **Plate 4.16: Congested Dwelling**

The overcrowding and congested dwellings in the Marriyam colony are manifested in these pictures. There are small size dwellings in which there is no proper system of ventilation and poor access to the sun light. Large size families are living in congested homes. Poor situation of solid waste management and sanitation is also shown in these pictures

It is observed that most of the people are poor and their living standard is very low. Majority of dwelling units are of size 2.75 marla. There is insufficient space relative to the number of persons living in a house. This abadi is provided with electricity, sui-gas and piped water facilities but the living standard of dwellers needs huge improvement and 20% population is deprived of water connections.

Poor infrastructure is observed in this abadi. The condition of the roads and streets is very bad and some are unpaved. There is inadequate provision for piped water supply, the removal of excreta, household liquid and solid waste etc. It is observed that the electricity and sui-gas are also provided in this Katchi Abadi.

People have “access to piped supplies” but do not have a pipe supply into their homes and thus have to rely on stand-by pipes. Similar is the situation in case of the electricity connections. It is observed that there is no proper collection and disposal of solid waste. People of the area themselves arranged some worker for the collection and disposal of solid waste on daily basis and each house pays 25 rupees for these workers.

4.2.1 Collection of Data through Questionnaires

Two questionnaires were developed for the collection of data of the two Kachi Abadies are attached Annex-I & II. It is observed the environmental conditions are very poor in almost all the Katchi Abadis of Lahore. The

research parameter restricted to drinking water supply of solid waste management.

As regards to these two parameters generally it was observed that most of the people are not satisfied about the quality as well as quantity of water as people of these Katchi Abadis have least access to safe drinking water. With regard to management of solid waste, it was founded that disposal of solid waste that the street and roads of these Katchi Abadis are not satisfied with cleanness.

4.3 Field Survey Results Regarding Population

Table 4.1: Field Survey Results Regarding Population

Name of Katchi Abadis	Total No of Dwellings	Average No. of persons per home.	Percentage of children	Population
Sikandar colony	389	9.73	45.91% (1739)	3788
Marriyam colony	433	8.31	44.33% (1595)	3600
Total	**822**	**9**	**45% (3325)**	**7388**

Keeping in view research objectives, survey visits and interviews were conducted to collect primary data and information about population and especially about population of children.

Sikandira colony is a Katchi Abadi located near Bund road Lahore. . According to LDA this colony is legally declared as Katchi Abadi and total No. of dwellings in this Katchi Abadi are 389. The total Population of this colony is estimated 3788 persons and average 9.73 persons per home. The children population in this colony is estimated 45.91% of the total population.

Marriyam colony is legally declared as a Katchi Abadi and located Township Lahore. According to our questionnaire survey there are 433 No. of dwellings in this Katchi Abadi.

The total Population of this colony is estimated 3600 persons and average 8.31 persons per home. The children population in this colony is

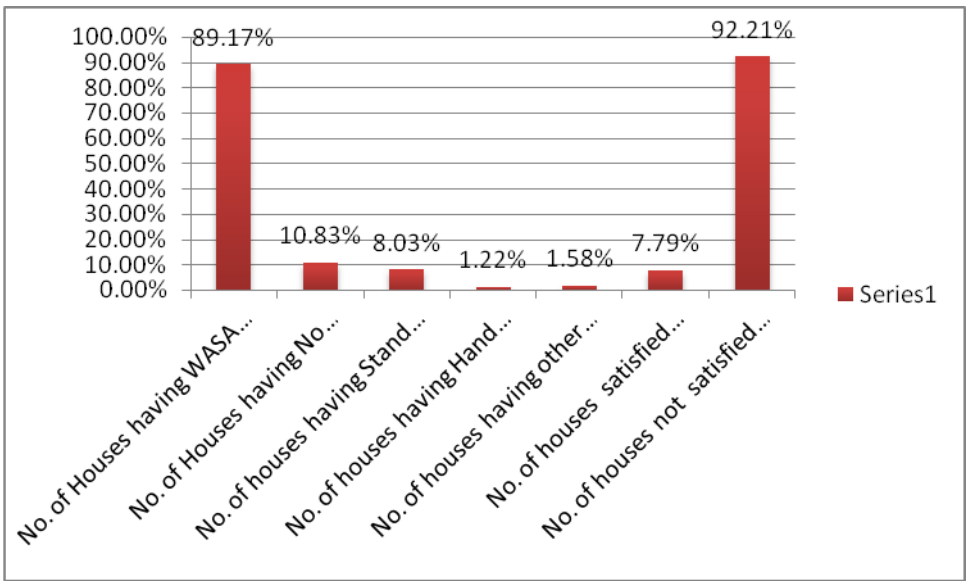
estimated 44.33% of the total population. Majority of population of Marriyam colony belongs to Christianity.

4.4 Field Survey Results of Drinking Water Supply

Table 4.2 Number of WASA Connections, Type of Connections and Satisfaction of Residents of Katchi Abadis.

Name of Katchi Abadis	Total No of Dwellings	No. of Houses having WASA connection	No. of Houses having No WASA connection	No. of houses having Stand By connection	No. of houses having Hand Pump	No. of houses having other temporary arrangement	No. hou satis abo th quar of w
Sikandar Colony	389	352	37	31	2	4	3
Marriyam Colony	433	381	52	35	8	9	2
Total	**822**	**733**	**89**	**66**	**10**	**13**	**6**

Graph 4.1: Graphical Representations of Results



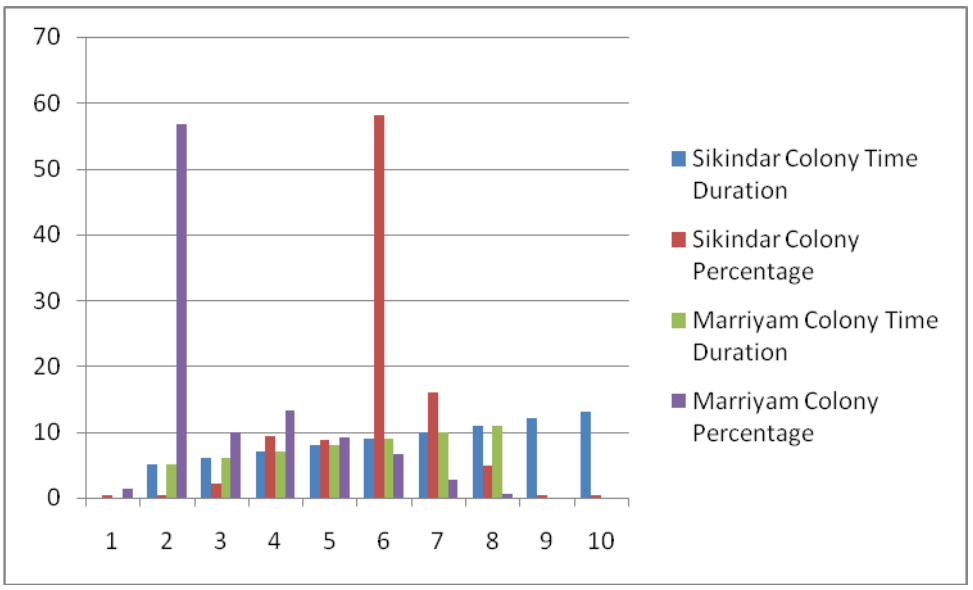
During questionnaires survey it is observed that 89.17% of dwellings have proper connections and 10.83% of dwellings have stand by connections of water supply. On the other hand 1.22% of dwellings use hand pumps and 1.58% dwellings have temporary arrangements.

Water supply does not meet the household needs of residents in Sikandar colony. 92.21% of people complained that limited water supply does not meet the household needs of family. Due to shortage of water supply, people face difficulties in daily practices like washing, cooking and bathing etc. This is miserable condition of Sikandar colony residents. These results are shown in Graph No: 4.1

Table 4.3: Time Duration of Water supply by WASA to the people of Katchi Abadis

Sikindar Colony		Marriyam Colony	
Time Duration	**Percentage**	**Time Duration**	**Percentage**
1 hour	.3	4 hour	1.4
5	.3	5	56.8
6	2.1	6	9.9
7	9.3	7	13.2
8	8.7	8	9.2
9	58.1	9	6.7
10	15.9	10	2.8
11	4.9	11	0.5
12	.3		
13	.3		

Graph 4.2: Graphical Representation of Time Duration of Water Supply in Both Katchi Abadis.

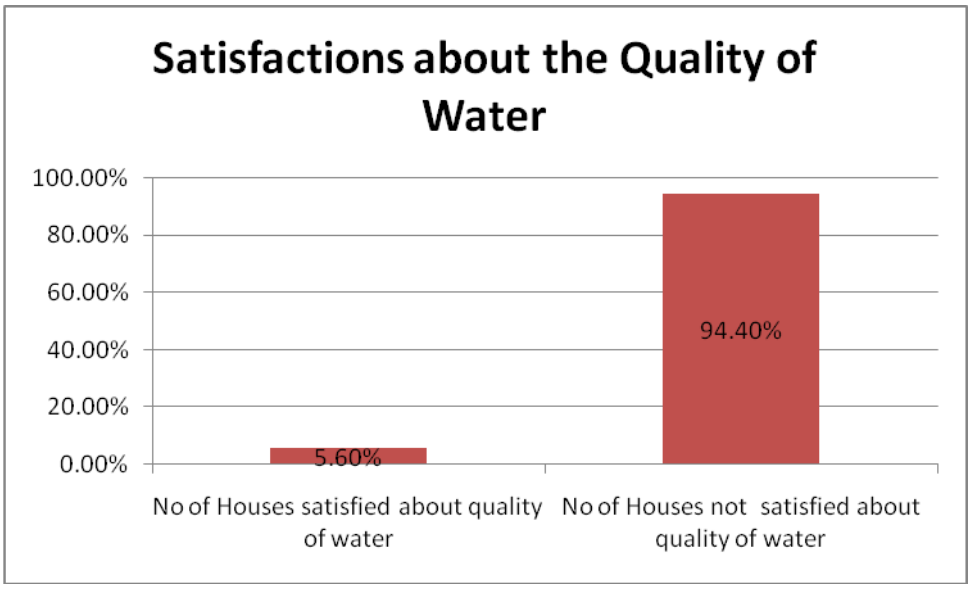


During investigation it is examined that water is available 9-10 per 24 hours in Sikandar colony and 6-7 hour per 24 hour in Marriyam Colony. It was observed at different time interval in a year i.e. summer and winter season. Load-shedding is the main factor for limited water availability in a day. Resultantly residents of these Katchi-Abadis suffer water supply shortage.

Table 4.4: Satisfactions about the Quality of Water

Name of Katchi Abadis	Total No. of Dwellings	No. of Houses satisfied about quality of *water*	No. of Houses not satisfied about quality of water
Sikandar colony	389	18	371
Marriyam colony	433	28	405
TOTAL	**822**	**46**	**776**

Graph 4.3: Graphical Representation of Satisfactions about the Quality of Water

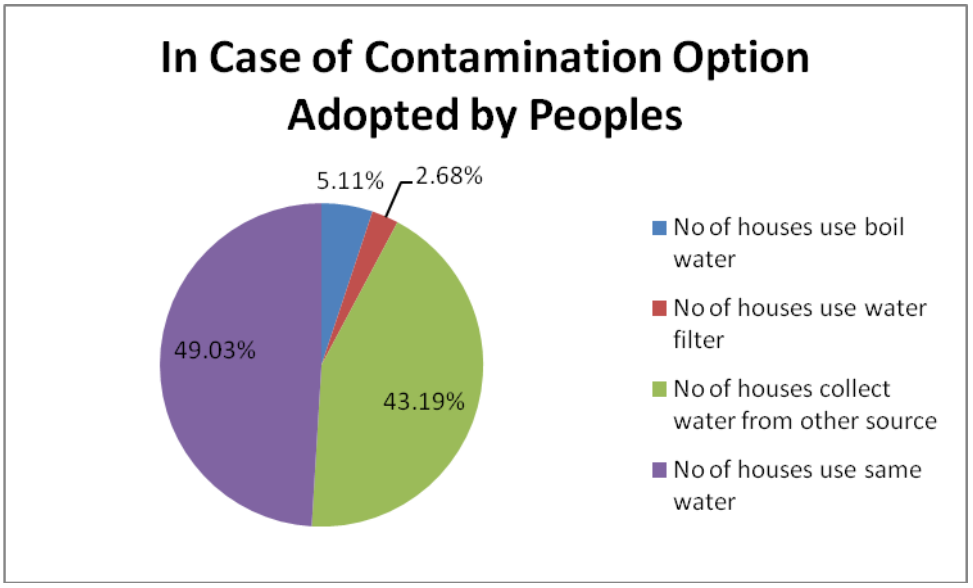


It is observed that 94.40% residents of Katchi Abadis are not satisfied about quality of water and they complained about the poor quality of water supply. Water supply provided by WASA in this colony is contaminated. Due to contamination Water cause smell and bad taste. In contrast only 5.60% residents are satisfied about quality of water. During questionnaires survey, mostly people complained about the old/ rusted water supply pipe lines. These pipe lines have expired their lifetime and become rusty. Due to rusty pipe line, sewerage water is mixed with water supply and cause contamination and smell. No attention had given to repair or change these rusty pipelines to improve the quality of water.

Table 4.5: In Case of Contamination Option Adopted by Peoples

Name of Katchi Abadis	Total No. of dwellings	No. of houses use boil water	No. of houses use water filter	No. of houses collect water from other source	No. of houses use same water
Sikandar colony	389	20	12	160	197
Marriyam colony	433	22	10	195	206
Total	**822**	**42**	**22**	**355**	**403**

Graph 4.4: Graphical Representation in Case of Contamination Option Adopted by the People of Katchi Abadis

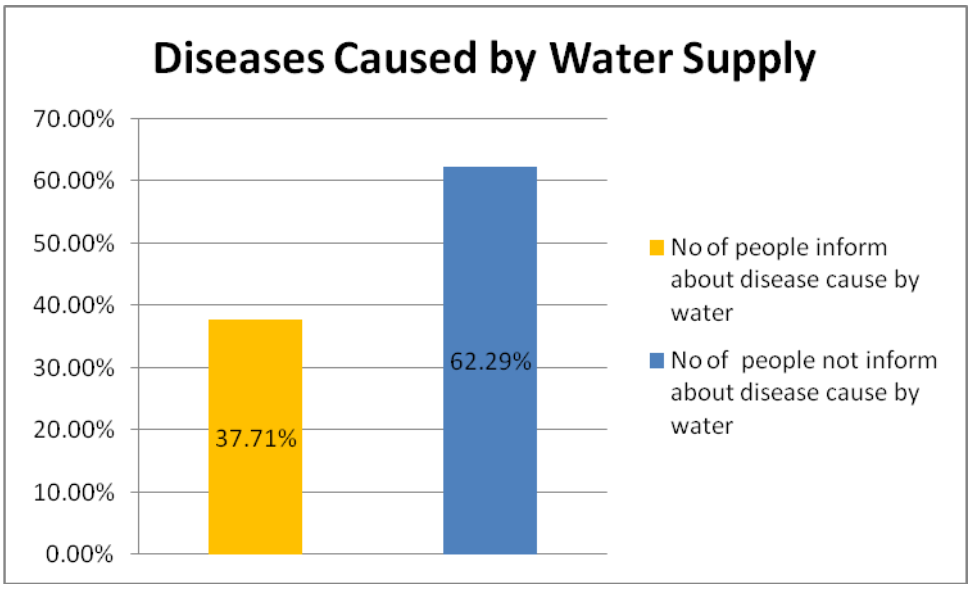


It is observed that 49.03 % of population of Katchi Abadis is using contaminated water for drinking purposes, cooking and other household needs. People are at risk of water born diseases. The 43.19% of population brings water from outside the colony for their drinking purpose. Only 5.11% of population of these colonies drinks water after boiling. Finally people are not satisfied by water supply and they have their considerations. It is need of hour to provide safe and standard quality water to this population. Another factor is that mostly people living in these Katchi Abadis are poor and they cannot afford drinking water filters or buy bottled water.

Table 4.6: Diseases Caused by Water Supply

Name of Katchi Abadis	Total No. of dwellings	No. of people inform about disease cause by water	No. of people not inform about disease cause by water
Sikandar colony	389	130	259
Marriyam colony	433	180	253
Total	**822**	**310**	**512**

Graph 4.5: Graphical Representation of Diseases Caused by Water Supply



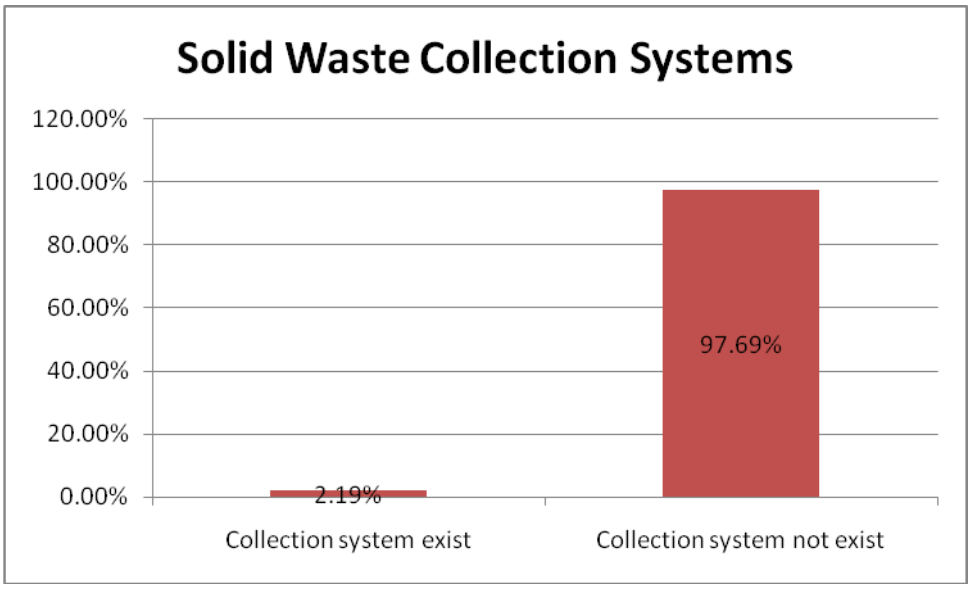
It was examined that 62.29% people are not aware about health risk caused by contaminated water. Child's are most suspected to water born diseases and they are 45% of population of case study. Peoples of these colonies are illiterate and they do not knowledge about disease caused by use of contaminated water and thus they do not adopt precautionary measures.

4.5 Field Survey Results of Solid Waste Management

Table 4.7: Solid Waste Collection Systems

Name of Katchi Abadis	Total no of dwelling	Collection system exist	Collection system not exist
Sikandar colony	389	6	382
Marriyam colony	433	12	421
Total	**822**	**18**	**804**

Graph 4.6: Graphical Representation of Solid Waste Collection Systems

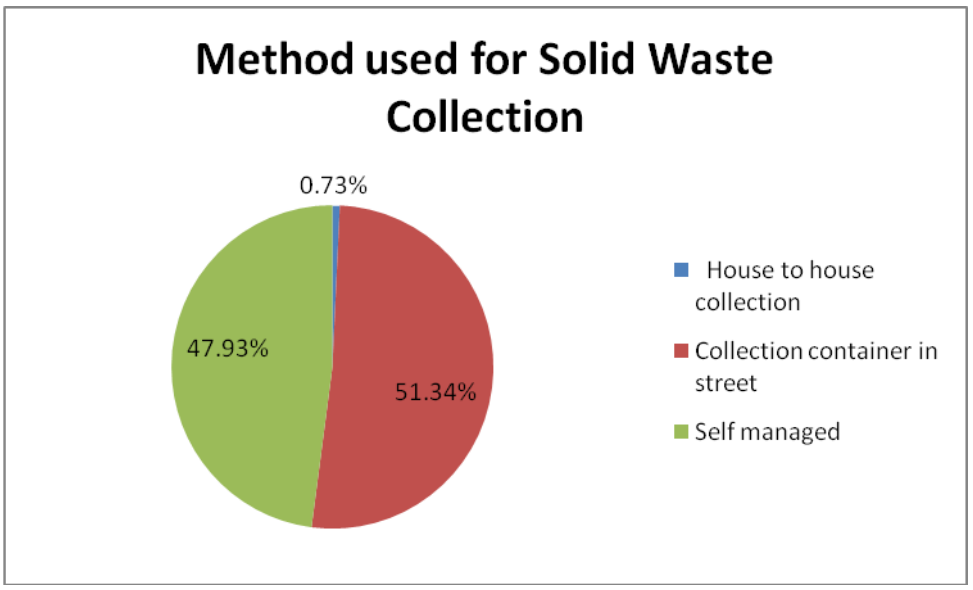


It is observed that Lahore Waste Management Company (LWMC) has responsibility of solid waste collection and management. 97.69% solid waste collection system not existing in these colonies. Waste collection containers are not provided in streets of these colonies.

Table 4.8: Method used for Solid Waste Collection

Name of Katchi Abadis	Total No. of dwelling	House to house collection	Collection container in street	Self managed
Sikandar colony	389	1	2	386
Marriyam colony	433	5	420	8
Total	**822**	**6**	**422**	**394**

Graph 4.7: Graphical Representation of Method used for Solid Waste Collection

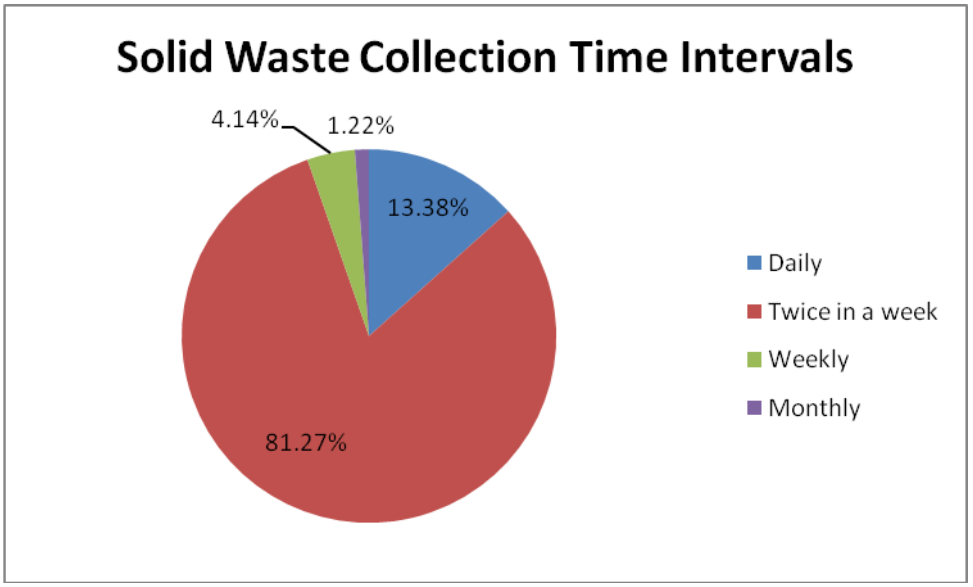


It is observed that that there is no proper collection system of solid waste by LWMC. 51% solid waste collected in streets containers and 47.93% people arrange solid waste collection by self-paid and 0.73% house collection. One poor man/woman has responsibility to collect waste door to door. Owners of dwellings pay them 50-100 Rs per month. After collecting solid waste they transport waste to the storage site out of colony.

Table 4.9: Solid Waste Collection Time Intervals

Name of Katchi Abadis	Daily	Twice in a week	Weekly	Monthly
Sikandar colony	55	318	14	2
Marriyam colony	55	350	20	8
Total	**110**	**668**	**34**	**10**

Graph 4.8: Graphical Representation of Solid Waste Collection Time Intervals

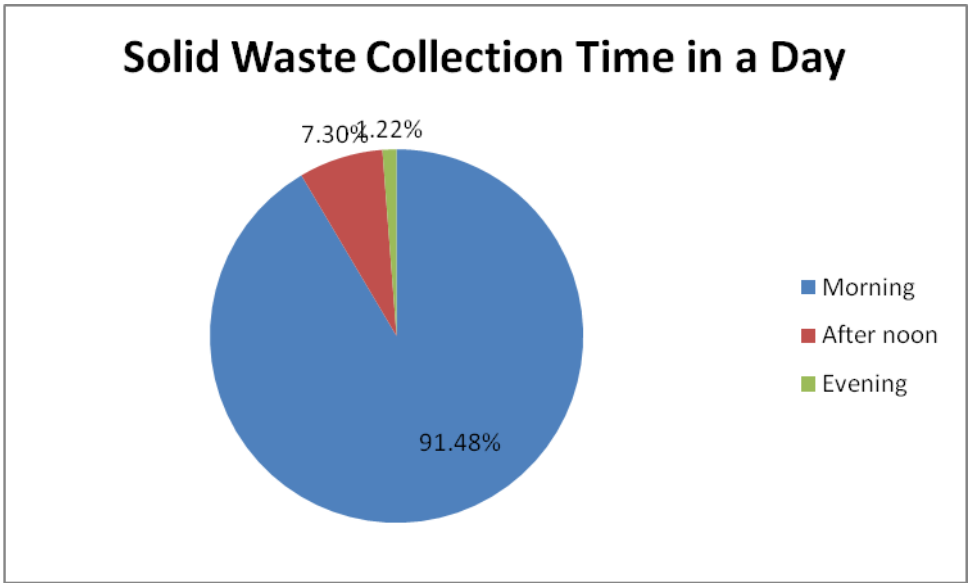


It is observed that 81.27% of solid waste is collected twice in a weak, 13.38% collected daily, 4.14% weekly and 1.22% monthly. These observations are manifested in Graph 4.7. This collection system of solid waste is totally managed by residents themselves and is not effectively controlled.

Table 4.10: Solid Waste Collection Time in a Day

Name of Katchi Abadis	Total No. of dwelling	Morning	After noon	Evening
Sikandar colony	389	362	27	0
Marriyam colony	433	390	33	10
Total	**822**	**752**	**60**	**10**

Graph 4.9: Graphical Representation of Solid Waste Collection Time in a Day

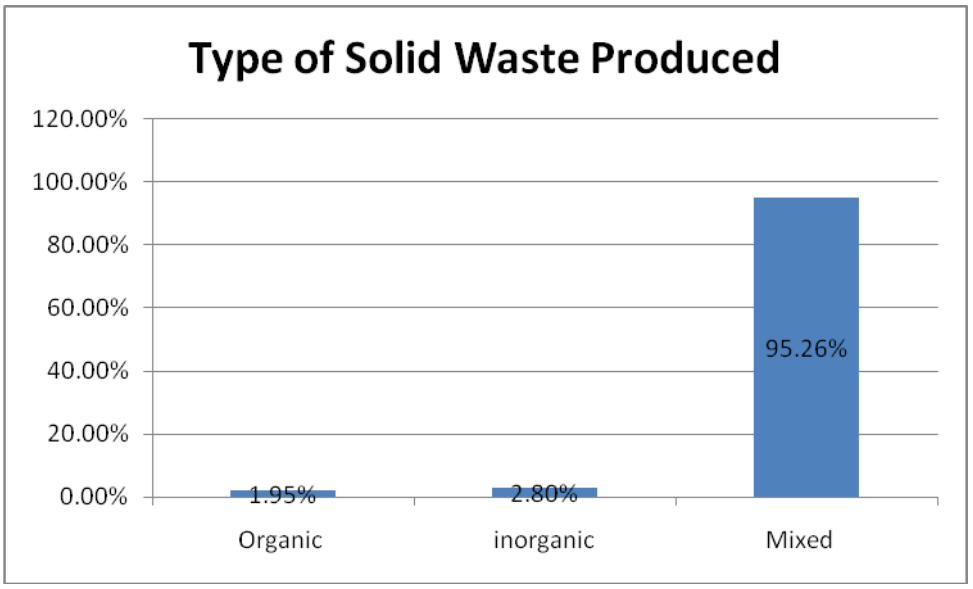


It is observed that 91.48% residents of Katchi Abadis stated that solid waste is collected at morning time, 7.30% at afternoon and 1.22% at evening. The collection of solid waste is done by poor private man/woman by paying him monthly or daily basis. Rest of solid waste is put in streets and along road sides.

Table 4.11: Type of Solid Waste Produced

Name of Katchi Abadis	Total No. of dwelling	Organic	Inorganic	Mixed
Sikandar colony	389	6	8	375
Marriyam colony	433	10	15	408
Total	**822**	**16**	**23**	**783**

Graph 4.10: Graphical Representation of Type of Solid Waste Produced

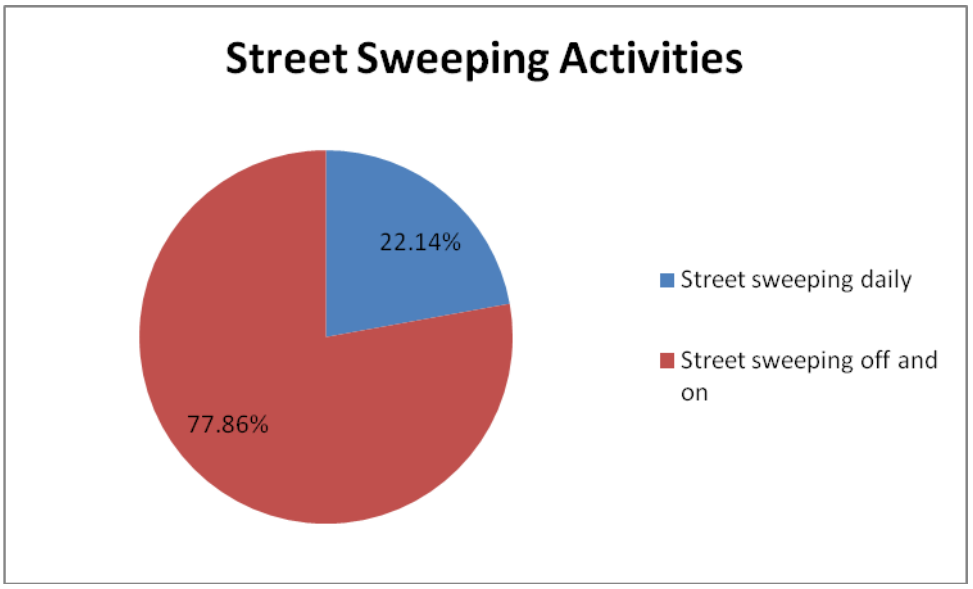


It is observed that 95.26% residents informed that mixed, organic as well as inorganic waste is produced in these Katchi Abadis. Solid waste is consisting of kitchen waste, dust particles, rappers, polythene shoppers, bottles, plastic, paper, vegetables and fruits. People are not aware to segregate the organic and inorganic waste at source. They mix up the waste both organic and inorganic, and it is further difficult to separate the reusable things and recyclables. It is need of hour to aware the people and launch segregated collection system due to increasing environmental pollution.

Table 4.12: Street Sweeping Activities

me of Katchi Abadis	Total No. of dwelling	Street sweeping daily	Street sweeping off and on
ndar colony	389	87	302
yam colony	433	95	338
Total	**822**	**182**	**640**

Graph 4.11: Graphical Representation of Street Sweeping Activities

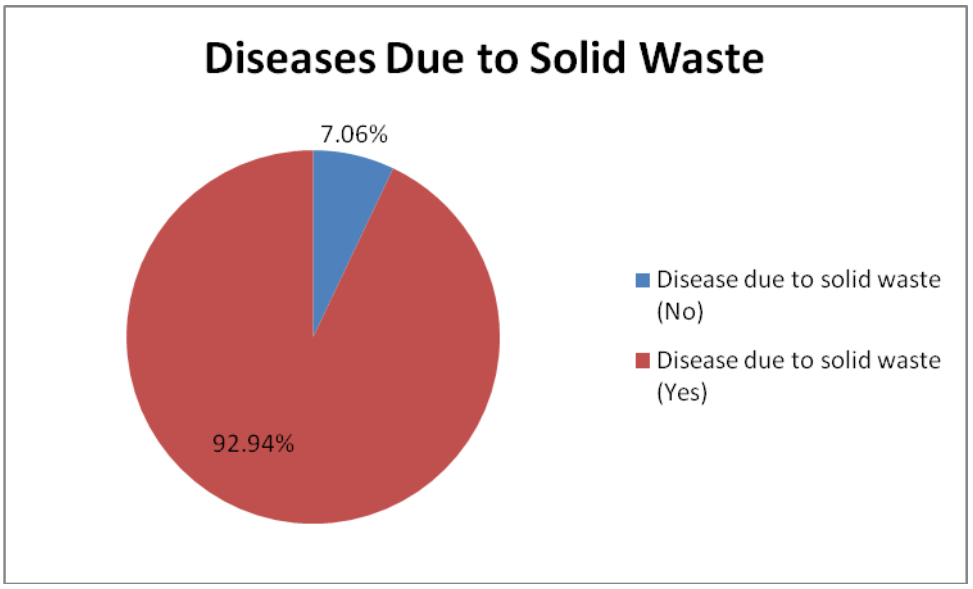


It is examined during questionnaire survey that 77.86% residents responded that street sweeping is off and on basis and 22.14% responded street sweeping daily as mentioned in table illustrates. Solid waste is faltered in streets all the day and produce unhealthy condition. Many infections and communicated diseases are caused by poor due to non collection of solid waste. Resultantly people are suffering by this unhealthy situation and they have their concerns about solid waste management.

Table 4.13: Diseases Due to Solid Waste

ame of Katchi Abadis	Total No. of dwelling	Disease due to solid waste (No)	Disease due to solid waste (Yes)
kandar colony	389	20	369
rriyam colony	433	38	395
Total	**822**	**58**	**764**

Graph 4.12: Graphical Representation of Diseases Due to Solid Waste

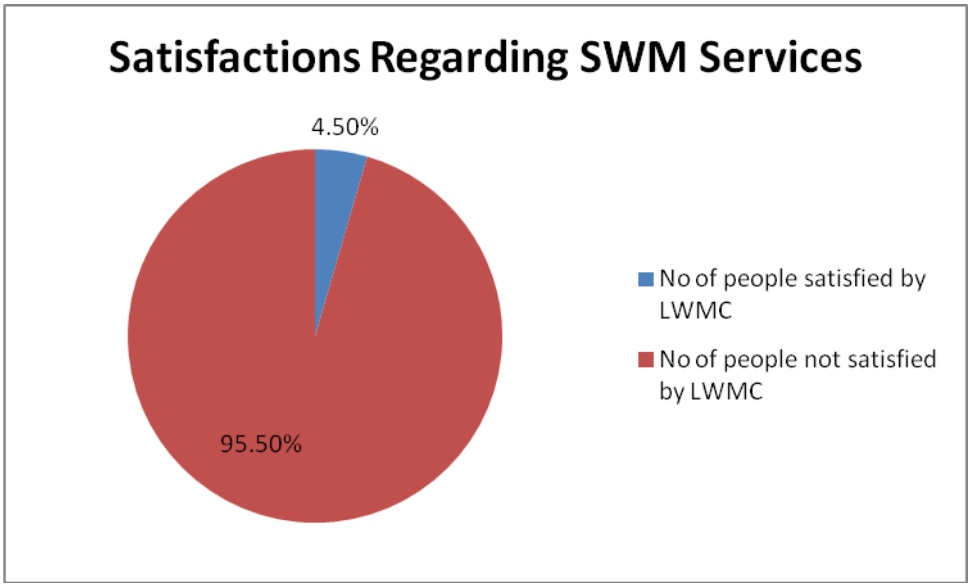


It is examined during questionnaire survey that 92.94% residents responded that diseases caused due to solid waste and 7.06% responded that no diseases caused by solid waste. Lahore Waste Management Company does not address these colonies. Generally the departmental negligence is noticed. It is observed that majority of residents of these colonies are not aware of knowledge about health diseases caused by solid waste.

Table 4.14: Satisfactions Regarding SWM Services

Name of Katchi Abadis	Total No. of dwelling	No of people satisfied by LWMC	No of people not satisfied by LWMC
Sikandar colony	389	12	377
Marriyam colony	433	25	408
Total	**822**	**37**	**785**

Graph 4.13: Graphical Representation of Satisfactions Regarding SWM Services



It is observed during questionnaire survey that 95.50% residents are not satisfied by LWMC services and only 4.50% residents are satisfied. Lahore Waste Management Company does not properly address these Katchi Abadis. people of these Katchi Abadis complained about the departmental negligence. It is noticed that people of these colonies are not satisfied by LWMC services. They have their concerns and considerations for the negligence of this colony from LWMC. Residents are suffering very miserable condition. Lahore Waste Management Company should provide an effective collection system for solid waste for these colonies.

4.6 Collection of DATA through Water Samplings

I have taken about 8 samples (2% of total no. of dwellings) from Sikandar colony and 8 samples(2% of total no. of dwellings) from Marriyam colony and sent these samples to labotories namely PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES (PCRWR) AND PUBLIC HEALTH ENGINEERING DEPARTMENT LAHORE.

The Results of samples are described as below,

Table 4.15: Bacteriological Analysis Report

SrNo	Laboratory No.	Date/ Time of Collection	Description (Sampling Point)	Date of Analysis	RESULTS		Remarks
					No. Coloform Colonies	MPN/100ML	
1.	B-1/12/566	16-05-12	Water Sample from House of Manshia S/O Jaga.	17-05-12	30 Nos.	--	**UNFIT**
2	B-2/12/566	16-05-12	Water Sample from Sadiq	17-05-12	20 Nos.	--	**UNFIT**
3	B-3/12/566	16-05-12	Water Sample from Imanatg S/O Hameed Masih.	17-05-12	40 Nos.	--	**UNFIT**

WHO STANDARD: There should be no colony of Coliform bacterial per 100/ml of sample.

Table 4.16: Chemical Analysis Report of Drinking Water (Sikandar Colony)

Sr. No.	Water Quality Parameter	Permissible Limits	sample 1 Results	Sample 2 Results	Sample 3 Results	Sample 4 Results	Sample 5 Results	Sample 6 Results	Sample 7 Results
01	pH	6.5-8.5 (WHO)	7.35	7.32	7.55	7.37	7.46	7.84	7.77
02	TDS(mg/1)	1000 (WHO)	384	373	552	480	537	367	485
03	Turbidity (NTU)	5 (WHO)	0.5	0.5	0.8	0.7	0.5	0.9	0.8
04	Arsenic (ug/1)	10 (WHO)	20.71			22.46			21.88
05	Lead (ug/1)	10 (WHO)	1.18			1.28			1.43
06	Chromium (ug/1)	50 (WHO)	1.67			0.86			BDL
07	Mercury (ug/1)	1 (WHO)	BDL			BDL			BDL

- Found to be **unfit** for drinking purpose for analyzed parameters(sample 1)
- Found to be **fit** for drinking purpose for analyzed parameters(sample 2)
- Found to be **fit** for drinking purpose for analyzed parameters(sample 3)
- Found to be **unfit** for drinking purpose for analyzed parameters(sample 4)
- Found to be **fit** for drinking purpose for analyzed parameters (sample 5)
- Found to be **fit** for drinking purpose for analyzed parameters (sample 6)

- Found to be **unfit** for drinking purpose for analyzed parameters (sample 7)
- Found to be **fit** for drinking purpose for analyzed parameters (sample 8).

It has been found that samples 2, 4 & 7 are unfit for drinking purpose for analyzed parameters

Table 4.17: Chemical Analysis Report of Drinking Water (Marriyam Colony)

Sr. No.	Water Quality Parameter	Permissible Limits	sample 1 Results	Sample 2 Results	Sample 3 Results	Sample 4 Results	Sample 5 Results	Sample 6 Results
01	pH	7.0-8.5	7.9	8	7.30	8	7.80	7.80
02	Odour	Unobjectionable	Odorless	Odorless	Sewage Smell	Odorless	Odorless	Odorless
03	Colour	5 Units	Colorless	Contain White Particles.	Colorless	Colorless	Colorless	Colorless
04	Taste	Unobjectionable	Tasteless	Tasteless	Tasteless	Tasteless	Tasteless	Tasteless
05	Turbidity ppm Silica Units/NTU	5 Units	0.90 NTU	0.90 NTU	1.80 NTU	0.90 NTU	1.60 NTU	1.70 NTU
06	Total Dissolved Solids	500	475	525	480	475	580	490
07	Calcium	75	25	16	16	20	20	25
08	Magnesium	50	5	15	13	5	20	18
09	Hardness mg/l	100	80	90	90	70	130	80

10	Sulfate	200	95	115	110	115	130	140	
11	Chloride	200	30	45	40	40	40	45	

It has been found that samples 2, 5, 7 & 8 are unfit for drinking purpose for analyzed parameters

Note: All the reports of water sampling are attached at annexure (7upto 20).

It is pertinent to mention here that the 3 samples from each Katchi Abadis were examined on the bases of chemical analysis, it was found that lead, Chromium, and Mercury were under Permissible Limits whereas Arsenic was beyond the Permissible Limits and resultantly water was not safe for drinking purpose. There-for it is alarming situation in these Katchi Abadis of Lahore that about 7400 peoples are drinking contaminated water (polluted by Arsenic) and their lives are at risk. It is important to mention here that 2.5 million peoples are living in about 300 Katchi Abadis in urban area of Lahore.

It is observed from the reports that people are using subjective quality criteria like brackish, foul smelling, bad tasting turbid or coloured water to determine that it is not suitable for drinking. There are several sources to contaminate drinking water.

a. Bacterial contamination
b. Ground Water contamination from irrigated areas.
c. Ground Water contamination from industrial areas.
d. Chemical pollution from toxic substances that is textile dyes, pesticides etc.
e. Pollution from municipal waste etc.
f. Pollution from oil spills etc.
g. Pollution from excessive monsoon rains, floods, herbicides, fungicides etc.
h. Major issue.

Health problems are linked to water, its quality, the quantity available. The ease with it can be obtained and the provisions made for its removal, once used. The health links with sanitation are also obvious; human excreta is an extremely hazardous substance. These diseases account for a high proportion of infant and child deaths. The water related diseases are classified by mechanisms into three categories water borne, water washed, water based and water related insect vector.

Diseases water-borne mostly diarrhoeal diseases- are the most common. Diarrhoeal diseases account for a high proportion of infant, child and adult illnesses, and for most water-related infant and child deaths. When combined with under nutrition they can also so weaken the body’s defense that diseases such as measles and pneumonia become major causes of death. Where water supplies and provision for sanitation are inadequate in these Katchi Abadis, water-borne diseases can remain one of the most serious health problems in these Katchi Abadis. Overcrowding and inadequate food hygiene exacerbate the risks from contaminated water and poor sanitation. There are also water-borne intestinal worms that cause

severe pain and undermine the nutritional status of hundreds of millions of urban dwellers, but only a small proportion of those infected will die of them.

The water-washed diseases are associated with a lack of water supplies for washing in these Katchi Abadis. These include various skin and eye infections such as scabies and trachoma. The number of people who can be affected and the extent to which lower-income groups face greater problems (largely because of poorer quality provision for water) (Mali's capital and largest city). This found the overall prevalence of scabies among the pupils to be 4 percent, ranging from 1.8 percent at the school with the highest socio-economic level to 5 percent at primary schools serving poorer areas. Most water-borne diseases are also 'water-washed', as their incidence is associated with inadequate water supplies as well as with contaminated water.

Diseases spread by water-related insect vectors are among the most pressing environmental problems in these Katchi Abadis. These include malaria. Although commonly considered a 'rural' disease, there are severe problems with malaria in urban areas. The Anopbeles mosquitoes that are the vector for malaria breed in standing water, so good drainage is a critical part of malaria control.

Other kinds (or genera) of mosquito can be the vectors for the other serious diseases. The diseases spread by Aedes mosquitoes (which include dengue, dengue hemorrhagic fever and yellow fever) are serious health problems in many cities. Containers used for storing water in houses lacking regular piped supplies (pots and jars, small tanks, drums and cisterns) can provide breeding habitats for these mosquitoes. Many household with piped supplies are also at risk because of intermittent supplies of water in the piped system, so they store water in tanks, when water is available. Small pools of clean water within residential areas in, for instance, discarded tin cans and rubber tyres can also be breeding grounds. Reliable, steady piped water supplies (so household do not need to store water) and good rubbish collection can greatly reduce the risk of diseases spread by Aedes mosquitoes. Culex mosquito, which can be one of the vectors for bancroftianfilarias is (a debilitating disease affecting millions of people), can breed in open or cracked septic tanks, folded pit latrines and drains but can be controlled through measures as simple as polystyrene balls in septic tanks and latrines. Even where mosquitoes donor pose health threats, they are often a severe nuisance and low-income households may spend a significant proportion of their income in insecticides or repellents.

Disease vectors also have and important role in the transmission of many water-borne or water-washed diseases including diarrhoel diseases, scabies (scabies mites), trachoma (face flies) and typhus (body lice and fleas). Many disease vectors thrive when there is poor drainage and inadequate provision which is normally considered a rural disease, since it is usually caught through contact with irrigation water or stored water in which the aquatic snails that are host to the schist some worms live.

Chapter Five

CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The fact that the high proportion of population are found in these Katchi Abadis, as discussed in chapter 4. It is observed that high proportion that is 9 to 10 person are living in a single dwelling, which shows that it is a densely populated area. People are living and working in very poor condition. Houses are often made of materials which provide inadequate protection against the elements and against the climatic elements like extreme temperatures. There is usually insufficient space relative to the number of people living in a dwelling. The aspect of high proportion of population is very important in these Katchi Abadis and in this context, Government should pay special attention to uplift/ upgrade civic facilities in these Katchi Abadis. In the prospective of all Katchi Abadis of Lahore, it is observed that a high proportion of population (2.4 million) are living in poor quality environment.

5.2 Conclusions

As per findings and results obtained from the analysis of the study and based on the discussions made with the professional experts, following conclusions are drawn:

1. It is concluded that from the field research that average 9 persons are living in a dwelling unit of Katchi Abadi. Overcrowded, cramped living conditions is a serious problem in Katchi Abadis that increase the transmission of airborne infections and those passed by human contact and increase the risk of accidents.
2. It is concluded from the field research that 89.17% residents have proper WASA connection and 10.83% residents have no WASA connection.
3. It is concluded that 92.21% residents are not satisfied about the quantity of Water supply. The residents are not satisfied about the time duration of water supply by WASA. The supplied water does not meet the daily requirements of the residents.
4. It is concluded from examining that 94.40% residents are not satisfied about the quality of water supply. 43.19% residents used water from other sources and 49.03% residents used same water supplied by WASA. The quality of water used by the people of Katchi Abadis are not saved drinking water.
5. It is concluded from examining that 37.71% residents informed about the diseases caused by water supply and 62.71% residents not

informed. Actually majority of people of these Katchi Abadis have no awareness about cause of diseases by water supply.

6. It is concluded that due to old/rusty pipe lines, sewerage water mixed with water supply and causes contamination and smell. No attention had given to repair or change these rusty pipelines.
7. From the field research, it is concluded that 97.69% residents stated that there is no solid waste collection system exists, there is a problem of inadequate or no collection of household waste.
8. It is concluded that LWMC has not adopted proper waste collection system in Katchi Abadis.81.27% residents stated that solid waste is collected twice in a week.
9. It is concluded that 95.26% residents informed that mixed, organic as well as inorganic waste is produced in these Katchi Abadis. Peoples are not aware to segregate the organic and inorganic waste at source.
10. Uncollected waste is obviously in pictorial view. It is a serious health hazard in Katchi Abadis especially for children playing in streets around their homes
11. It is important to mention here that Katchi Abadis are the poor areas of the city and generally have the least adequate waste-collection service at all.
12. It is concluded from field research that average 45%(3325) are infant and children out of total population 7388 of two Katchi Abadis (Sikandar & Marriyam colony). It is important to mention here that there are total about 300 Katchi Abadis in Lahore and thus high proportion of infants and children are living in poor quality environment and they are more vulnerable to many serious problems of health.
13. Women are generally far more severely affected than men by poor-quality and overcrowded housing conditions, and by the inadequate provision of water, sanitation and health care (and also schools and nurseries) because they take most responsibility for looking after infants and children, caring for sick family members and managing the household.
14. It is concluded from the field research that there is no quality health care center in the two case study Katchi Abadis. Many health problems are linked to water_ its quality, the quantity available the case with which it can be obtained and the provisions made for its removal, once used. The health links with sanitation are also obvious; human excreta are an extremely hazardous substance. These diseases account for a high proportion for infant and child deaths. Improved water and sanitation can bring great benefits not only in terms of reducing infant and child mortality and improved health, but also in reduced expenditures on water purchased from vendors or kiosks and on treatment for diseases higher real incomes because of less time off work for illness and much reduced physical efforts especially for those who have to collect and carry water from standpipes or other sources far from their shelters. Water-related diseases by the mechanisms by which the disease is transmitted: water-borne, water-washed, water-based and water-related insect vectors.

15. It is concluded from the field research that poor quality environment can contribute to the stress that underlies many diseases. Many physical characteristics of the housing and living environment can influence the incidence and severity of psychosocial disorders through stressors such as noise, overcrowding, poor sanitation and waste collection and in adequate maintenance.
16. It is concluded from the field research that peoples of Katchi Abadis are at higher level of risk, it is only that low-income groups generally face higher levels of risk but also that most have less possibility of getting rapid and appropriate medical treatment.

5.3 Recommendations

From the field study conducted in the two slums, following recommendations have been summarized for uplifting of these areas.

1. The Government may launch low income housing projects for poor by giving them free environment living standard instead of regularization of Katchi Abadis.
2. The poor residential areas (Katchi Abadis) must be given preference as regard to basic civic facilities.
3. Ensure ready availability of water by installing Generators with each tube well for regular supply of water.
4. Improve the water supply system by replacing rusty/old/damage water supply pipe lines.
5. Installation of filtration plant in each Katchi Abadi.
6. Disposal of wastes in the streets, open spaces, in vacant areas or into drains should be banned.
7. Primary collection of wastes, i.e. door-to-door collection of wastes should be implemented.
8. Waste collection should be performed on a regular basis, i.e. daily collection.
9. Street sweepers should be equipped with individual containerized wheelbarrows, metal plate and tray, long handled broom and protective gear.
10. Mechanized containers should be used to enhance storage capacity.
11. Litter bins should be provided in every street of Katchi Abadis.
12. Abolition of open waste storage sites and manual collection.
13. Upgrading of existing dumpsites or disposal sites.
14. Open burning of biomedical wastes should be prohibited.
15. LWMC may launch campaign for awareness of the peoples for cleanliness of the area.
16. Provision of health care centre in each Katchi Abadi.

17. Ensure community participation for safe drinking water, solid waste management and other civic services.

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Annexure: I

Questionnaire Survey for Water Supply of Kachi Abadis

Name of Researcher: Eng. Sohail Anwar Bajwa

Research Supervisor: Dr. Kiran Farhan

Name of Kachi Abadi _____ Location _____

Total No. of Dwellings ____ Total Family Members _____

No. of Childs _____ House No._____ Name of Owner_____

Q. 1 Does WASA provide water supply services in your colony?

a) Yes b) No

c) If No then other sources of water supply? _____

Q. 2 Is there water supply pipe line available at your home?

a) Yes No

b) If not then other source of water supply?

1) hand pump 2) stand by connection 3) other temporary arrangement

Q. 3 Which of following water supply connection have your?

1) proper connection 2) stand by connection 3) other temporary arrangement

Q. 4 For what time water is available in a day? _____

Q. 5 Does water supply meet your household needs? Yes No

Q. 6 Are you use drinking filters at your home? Yes No

Q. 7 Any disease cause by water supply in your family members? Yes No

Q. 8 Are you satisfied by water supply services?

a) Yes b) No

If not give reasons _____

Annexure: II

Questionnaire for Solid Waste Management Survey in Kachi Abadies

Q. 1 Which department has responsibility for Solid Waste Management in this colony?

Q. 2 Is there exist solid waste collection system in this colony? Yes No

Q. 3 Which method is use for solid waste collection?

1) house to house 2) collection containers in street 3) self-management

Q.4 What is solid waste collection time interval?

1) daily 2) twice in a weak 3) weakly 4) monthly

Q. 5 What is solid waste collection time in a day

1) morning 2) afternoon 3) evening

Q. 6 Which type of solid waste is produced?

1) organic 2) inorganic 3) both mixed

Q.7 Does there street sweeping practice daily? Yes No

Q 8 Any your family members have disease due to improper management of solid waste? Yes No

Q. 9 Is there open dumping in this area? Yes No

Q. 10 Are you satisfied by SWM in your colony?

a) Yes No b) If not give reasons

Annexure: III

GOVERNMENT OF PAKISTAN
MINISTRY OF SCIENCE AND TECHNOLOGY
PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES (PCRWR)

Regional Office: 6.4 km, Main Raiwind Road, Lahore Tel. & Fax. 042-35320484

PHYSICO –AESTHETIC AND CHEMICALS ANALYSIS REPORT OF WATER SAMPLE

Sample No.	08	Date of Collection	22-03-2012	Temp. C°	25 C°
Lab. Code	1284	Date of Analysis	24-04-2012	Source	11
Sample Provided By		Client : Mr. Eng Sohail Ahmed Bajwa			

Sr. No.	Water Quality Parameter	Permissible Limits	Results
01	pH	6.5-8.5 (WHO)	7.73
02	TDS (mg/l)	1000 (WHO)	496
03	Turbidity (NTU)	5 (WHO)	0.6

Note: The sample is provided by the client and this report is only for the sample provided in this office.

Abbreviation:

NGVS	No Guideline value set	WHO	world health organization	KSA	Saudi Arabian Standards
BDL	Below Detectable Limit	EC	European Community	cfu	Colony Forming Unit

Terms and Conditions

- The results of the laboratory analysis reported by PCRWR are verified as accurate and authentic only for the parameters tested. Analysis r valid for court use or business publicity. In case of any dispute in connection with authenticity of the report, the laboratory report of the anal considered final.
- PCRWR does not accept any responsibility regarding accuracy of sample collection procedures if collected by the client
- PCRWR will not be responsible for loss or damage to samples in its possession for reasons beyond its control
- PCRWR reserves the right to accept or reject samples for analysis without assigning any reason.

Remarks: ■ Found to be **fit** for drinking purpose for analyzed parameters

☐ Found to be **unfit** for drinking purpose for analyzed parameters

Analyzed By _____ Checked By _____

GOVERNMENT OF PAKISTAN
MINISTRY OF SCIENCE AND TECHNOLOGY
PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES (PCRWR)

Regional Office: 6.4 km, Main Raiwind Road, Lahore Tel. & Fax. 042-35320484

PHYSICO –AESTHETIC AND CHEMICALS ANALYSIS REPORT OF WATER SAMPLE

Sample No.	07	Date of Collection	22-03-2012	Temp. C°	25 C°
Lab. Code	1283	Date of Analysis	23-04-2012	Source	10-B
Sample Provided By		Client : Mr. Eng Sohail Ahmed Bajwa			

Sr. No.	Water Quality Parameter	Permissible Limits	Results
01	pH	6.5-8.5 (WHO)	7.77
02	TDS (mg/l)	1000 (WHO)	485
03	Turbidity (NTU)	5 (WHO)	0.8
04	Arsenic (µg/l)	10 (WHO)	21.88
05	Lead (µg/l)	10 (WHO)	1.43
06	Chromium (µg/l)	50 (WHO)	BDL
07	Mercury (µg/l)	1 (WHO)	BDL

Note: The sample is provided by the client and this report is only for the sample provided in this office.

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- PCRWR reserves the right to accept or reject samples for analysis without assigning any reason

Remarks: ☐ Found to be **fit** for drinking purpose for analyzed parameters

☑ Found to be **unfit** for drinking purpose for analyzed parameters

Analyzed By _____ Checked By _____

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PHYSICO –AESTHETIC AND CHEMICALS ANALYSIS REPORT OF WATER SAMPLE

Sample No.	06	Date of Collection	22-03-2012	Temp. C°	25 C°
Lab. Code	1282	Date of Analysis	24-04-2012	Source	09
Sample Provided By		Client : Mr. Eng Sohail Ahmed Bajwa			

Sr. No.	Water Quality Parameter	Permissible Limits	Results
01	pH	6.5-8.5 (WHO)	7.84
02	TDS (mg/l)	1000 (WHO)	367
03	Turbidity (NTU)	5 (WHO)	0.9

Note: The sample is provided by the client and this report is only for the sample provided in this office.

Abbreviation:

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- PCRWR will not be responsible for loss or damage to samples in its possession for reasons beyond its control.
- PCRWR reserves the right to accept or reject samples for analysis without assigning any reason.

Remarks: ■ Found to be **fit** for drinking purpose for analyzed parameters

☐ Found to be **unfit** for drinking purpose for analyzed parameters

Analyzed By _____

Checked By _____

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PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES (PCRWR)

Regional Office: 6.4 km, Main Raiwind Road, Lahore Tel. & Fax. 042-35320484

PHYSICO –AESTHETIC AND CHEMICALS ANALYSIS REPORT OF WATER SAMPLE

Sample No.	05	Date of Collection	22-03-2012	Temp. C°	25 C°
Lab. Code	1281	Date of Analysis	24-04-2012	Source	08
Sample Provided By		Client : Mr. Eng Sohail Ahmed Bajwa			

Sr. No.	Water Quality Parameter	Permissible Limits	Results
01	pH	6.5-8.5 (WHO)	7.46
02	TDS (mg/l)	1000 (WHO)	537
03	Turbidity (NTU)	5 (WHO)	0.5

Note: The sample is provided by the client and this report is only for the sample provided in this office.

Abbreviation:

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BDL	Below Detectable Limit	EC	European Community	cfu	Colony Forming Unit

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- PCRWR will not be responsible for loss or damage to samples in its possession for reasons beyond its control.
- PCRWR reserves the right to accept or reject samples for analysis without assigning any reason.

Remarks: ■ Found to be **fit** for drinking purpose for analyzed parameters

☐ Found to be **unfit** for drinking purpose for analyzed parameters

Analyzed By _____ Checked By _____

GOVERNMENT OF PAKISTAN
MINISTRY OF SCIENCE AND TECHNOLOGY
PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES (PCRWR)

Regional Office: 6.4 km, Main Raiwind Road, Lahore Tel. & Fax. 042-35320484

PHYSICO –AESTHETIC AND CHEMICALS ANALYSIS REPORT OF WATER SAMPLE

Sample No.	04	Date of Collection	22-03-2012	Temp. C°	25 C°
Lab. Code	1280	Date of Analysis	23-04-2012	Source	07-B
Sample Provided By		Client : Mr. Eng Sohail Ahmed Bajwa			

Sr. No.	Water Quality Parameter	Permissible Limits	Results
01	pH	6.5-8.5 (WHO)	7.37
02	TDS (mg/l)	1000 (WHO)	480
03	Turbidity (NTU)	5 (WHO)	0.7
04	Arsenic (µg/l)	10 (WHO)	22.46
05	Lead (µg/l)	10 (WHO)	1.28
06	Chromium (µg/l)	50 (WHO)	0.86
07	Mercury (µg/l)	1 (WHO)	BDL

Note: The sample is provided by the client and this report is only for the sample provided in this office.

Abbreviation:

NGVS	No Guideline value set	WHO	world health organization	KSA	Saudi Arabian Standards
BDL	Below Detectable Limit	EC	European Community	cfu	Colony Forming Unit

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- PCRWR does not accept any responsibility regarding accuracy of sample collection procedures if collected by the client.
- PCRWR will not be responsible for loss or damage to samples in its possession for reasons beyond its control.
- PCRWR reserves the right to accept or reject samples for analysis without assigning any reason.

Remarks: ☐ Found to be **fit** for drinking purpose for analyzed parameters

☑ Found to be **unfit** for drinking purpose for analyzed parameters

Analyzed By M. Sohail

Checked By

GOVERNMENT OF PAKISTAN
MINISTRY OF SCIENCE AND TECHNOLOGY
PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES (PCRWR)

Regional Office: 6.4 km, Main Raiwind Road, Lahore Tel. & Fax. 042-35320484

PHYSICO –AESTHETIC AND CHEMICALS ANALYSIS REPORT OF WATER SAMPLE

Sample No.	03	Date of Collection	22-03-2012	Temp. C°	25 C°
Lab. Code	1279	Date of Analysis	24-04-2012	Source	04
Sample Provided By		Client : Mr. Eng Sohail Ahmed Bajwa			

Sr. No.	Water Quality Parameter	Permissible Limits	Results
01	pH	6.5-8.5 (WHO)	7.55
02	TDS (mg/l)	1000 (WHO)	552
03	Turbidity (NTU)	5 (WHO)	0.8

Note: The sample is provided by the client and this report is only for the sample provided in this office.

Abbreviation:

NGVS	No Guideline value set	WHO	world health organization	KSA	Saudi Arabian Standards
BDL	Below Detectable Limit	EC	European Community	cfu	Colony Forming Unit

Terms and Conditions

- The results of the laboratory analysis reported by PCRWR are verified as accurate and authentic only for the parameters tested. Analysis report is not valid for court use or business publicity. In case of any dispute in connection with authenticity of the report, the laboratory report of the analysis will be considered final.
- PCRWR does not accept any responsibility regarding accuracy of sample collection procedures if collected by the client.
- PCRWR will not be responsible for loss or damage to samples in its possession for reasons beyond its control.
- PCRWR reserves the right to accept or reject samples for analysis without assigning any reason.

Remarks: ■ Found to be **fit** for drinking purpose for analyzed parameters

☐ Found to be **unfit** for drinking purpose for analyzed parameters

Analyzed By M. Sagla

Checked By

GOVERNMENT OF PAKISTAN
MINISTRY OF SCIENCE AND TECHNOLOGY
PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES (PCRWR)

Regional Office: 6.4 km, Main Raiwind Road, Lahore Tel. & Fax. 042-35320484

PHYSICO –AESTHETIC AND CHEMICALS ANALYSIS REPORT OF WATER SAMPLE

Sample No.	02	Date of Collection	22-03-2012	Temp. C°	25 C°
Lab. Code	1278	Date of Analysis	24-04-2012	Source	02
Sample Provided By		Client : Mr. Eng Sohail Ahmed Bajwa			

Sr. No.	Water Quality Parameter	Permissible Limits	Results
01	pH	6.5-8.5 (WHO)	7.32
02	TDS (mg/l)	1000 (WHO)	373
03	Turbidity (NTU)	5 (WHO)	0.5

Note: The sample is provided by the client and this report is only for the sample provided in this office.

Abbreviation:

NGVS	No Guideline value set	WHO	world health organization	KSA	Saudi Arabian Standards
BDL	Below Detectable Limit	EC	European Community	cfu	Colony Forming Unit

Terms and Conditions

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- PCRWR does not accept any responsibility regarding accuracy of sample collection procedures if collected by the client.
- PCRWR will not be responsible for loss or damage to samples in its possession for reasons beyond its control.
- PCRWR reserves the right to accept or reject samples for analysis without assigning any reason.

Remarks: ■ Found to be **fit** for drinking purpose for analyzed parameters

☐ Found to be **unfit** for drinking purpose for analyzed parameters

Analyzed By M. Sanaullah

Checked By

GOVERNMENT OF PAKISTAN
MINISTRY OF SCIENCE AND TECHNOLOGY
PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES (PCRWR)

Regional Office: 6.4 km, Main Raiwind Road, Lahore Tel. & Fax. 042-35320484

PHYSICO –AESTHETIC AND CHEMICALS ANALYSIS REPORT OF WATER SAMPLE

Sample No.	01	Date of Collection	22-03-2012	Temp. C°	25 C°
Lab. Code	1277	Date of Analysis	23-04-2012	Source	01-B
Sample Provided By		Client : Mr. Eng Sohail Ahmed Bajwa			

Sr. No.	Water Quality Parameter	Permissible Limits	Results
01	pH	6.5-8.5 (WHO)	7.35
02	TDS (mg/l)	1000 (WHO)	384
03	Turbidity (NTU)	5 (WHO)	0.5
04	Arsenic (µg/l)	10 (WHO)	20.71
05	Lead (µg/l)	10 (WHO)	1.18
06	Chromium (µg/l)	50 (WHO)	1.67
07	Mercury (µg/l)	1 (WHO)	BDL

Note: The sample is provided by the client and this report is only for the sample provided in this office.

Abbreviation:

NGVS	No Guideline value set	WHO	world health organization	KSA	Saudi Arabian Standards
BDL	Below Detectable Limit	EC	European Community	cfu	Colony Forming Unit

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- PCRWR will not be responsible for loss or damage to samples in its possession for reasons beyond its control.
- PCRWR reserves the right to accept or reject samples for analysis without assigning any reason.

Remarks: ☐ Found to be **fit** for drinking purpose for analyzed parameters

☑ Found to be **unfit** for drinking purpose for analyzed parameters

Analyzed By M. Sanjeev

Checked By

☎ 042-99212679

CENTRAL RESEARCH LABORATORY
PUBLIC HEALTH ENGINEERING DEPARTMENT PUNJAB
2-LAKE ROAD, LAHORE.

CHEMICAL ANALYSIS REPORT OF WATER

Source & Depth: --	**Laboratory No.** C-1/12/566
Location: Water Sample from house of Nasar Ali House No.152	**Place:** Lahore.
	Distt. & Tehsil: Lahore.
	Date of Analysis: 15-05-12
	Date of receipt in Lab. 10-05-12
Date of Collection: --	**Collected By:** Nasar Ali S/O Barkat Ali.

Sl: No:	Parameters.	W.H.O. Desirable Levels	W.H.O. Max: Permissible Levels	Results mg/l
1.	Temperature			33C°
2.	Ph	7.0-8.5	6.5-9.2	7.90
3.	Odour	Unobjectionable	Unobjectionable	Odorless
4.	Colour	5 Units	50 Units	Colorless
5.	Taste	Unobjectionable	Unobjectionable	Tasteless
6.	Turbidity ppm Silica Units or N.T.U.	5 Units	25 Units	0.90 NTU
7.	Total Dissolved Solids	500	1500 on avg. basis	475.00
8.	Calcium	75	200	25.00
9.	Magnesium	50	150	5.00
10.	Total Hardness mg/l as $CaCo_3$	100	500	80.00
11.	Total Alkalinity mg/l as $CaCo_3$			250.00
12.	Sulfate	200	400	95.00
13.	Chloride	200	600	30.00
14.	Conductivity um/cm or us/cm			680
15.				

REMARKS: Chemically **FIT** on the basis of parameters tested.

Note= Authenticity of sample rests with the sending agency.

☎ 042-99212679

CENTRAL RESEARCH LABORATORY
PUBLIC HEALTH ENGINEERING DEPARTMENT PUNJAB
2-LAKE ROAD, LAHORE.

CHEMICAL ANALYSIS REPORT OF WATER

Source & Depth: --	Laboratory No. C-2/12/566
Location: Water Sample from house of Chun Sb.	Place: Lahore.
	Distt. & Tehsil: Lahore.
	Date of Analysis: 15-05-12
	Date of receipt in Lab: 10-05-12
Date of Collection: --	Collected By: Chun Sb.

Sl: No:	Parameters.	W.H.O. Desirable Levels	W.H.O. Max: Permissible Levels	Results mg/l
1.	Temperature			33C°
2.	Ph	7.0-8.5	6.5-9.2	8.00
3.	Odour	Unobjectionable	Unobjectionable	Odorless
4.	Colour	5 Units	50 Units	Contain White Particles.
5.	Taste	Unobjectionable	Unobjectionable	Tasteless
6.	Turbidity ppm Silica Units or N.T.U.	5 Units	25 Units	0.90 NTU
7.	Total Dissolved Solids	500	1500 on avg. basis	525.00
8.	Calcium	75	200	16.00
9.	Magnesium	50	150	15.00
10.	Total Hardness mg/l as $CaCo_3$	100	300	90.00
11.	Total Alkalinity mg/l as $CaCo_3$			200.00
12.	Sulfate	200	400	115.00
13.	Chloride	200	600	45.00
14.	Conductivity um/cm or us/cm			750
15.				

REMARKS: Chemically **FIT** but used after filtration.

Note= Authenticity of sample rests with the sending agency.

Research Officer,
c/o the Chief Engineer Pb (North)
PUBLIC HEALTH Engg. Deptt. Lahore.

☎ 042-99212679

CENTRAL RESEARCH LABORATORY
PUBLIC HEALTH ENGINEERING DEPARTMENT PUNJAB
2-LAKE ROAD, LAHORE.

CHEMICAL ANALYSIS REPORT OF WATER

Source & Depth: --	**Laboratory No.** C-3/12/566
Location: Water Sample from house of Yaqoob.	**Place**: Lahore.
	Distt. & Tehsil: Lahore.
	Date of Analysis: 15-05-12
	Date of receipt in Lab: 10-05-12
Date of Collection: --	**Collected By**: Yaqoob Sb.

Sl: No:	Parameters.	W.H.O. Desirable Levels	W.H.O. Max: Permissible Levels	Results mg/l
1.	Temperature			33C°
2.	Ph	7.0-8.5	6.5 9.2	7.30
3.	Odour	Unobjectionable	Unobjectionable	Sewage Smell
4.	Colour	5 Units	50 Units	Colorless
5.	Taste	Unobjectionable	Unobjectionable	Tasteless
6.	Turbidity ppm Silica Units or N.T.U.	5 Units	25 Units	1.80 NTU
7.	Total Dissolved Solids	500	1500 on avg. basis	480.00
8.	Calcium	75	200	16.00
9.	Magnesium	50	150	13.00
10.	Total Hardness mg/l as $CaCo_3$	100	500	90.00
11.	Total Alkalinity mg/l as $CaCo_3$			200.00
12.	Sulfate	200	400	110.00
13.	Chloride	200	600	40.00
14.	Conductivity um/cm or us/cm			690
15.				

REMARKS: Chemically **UNFIT** Sewage Like Smell.

Note:- Authenticity of sample rests with the sending agency.

Research Officer,
c/o the RESEARCH OFFICER
Public Health Engg. Dept. Lahore

☎ 042-99212679

CENTRAL RESEARCH LABORATORY
PUBLIC HEALTH ENGINEERING DEPARTMENT PUNJAB
2-LAKE ROAD, LAHORE.

CHEMICAL ANALYSIS REPORT OF WATER

Source & Depth: --	Laboratory No. C-4/12/566
Location: Water Sample from house of Rafiq Bashir.	Place Lahore
	Distt. & Tehsil: Lahore.
	Date of Analysis: 15-05-12
	Date of receipt in Lab: 10-05-12
Date of Collection: --	Collected By: Rafiq Sb.

Sl: No:	Parameters.	W.H.O. Desirable Levels	W.H.O. Max: Permissible Levels	Results mg/l
1.	Temperature			33C°
2.	Ph	7.0-8.5	6.5-9.2	8.00
3.	Odour	Unobjectionable	Unobjectionable	Odorless
4.	Colour	5 Units	50 Units	Colorless
5.	Taste	Unobjectionable	Unobjectionable	Tasteless
6.	Turbidity ppm Silica Units or N.T.U.	5 Units	25 Units	0.90 NTU
7.	Total Dissolved Solids	500	1500 on avg. basis	475.00
8.	Calcium	75	200	20.00
9.	Magnesium	50	150	5.00
10.	Total Hardness mg/l as $CaCo_3$	100	500	70.00
11.	Total Alkalinity mg/l as $CaCo_3$			200.00
12.	Sulfate	200	400	115.00
13.	Chloride	200	600	40.00
14.	Conductivity um/cm or us/cm			680
15.				

REMARKS: Chemically FIT on the basis of parameters tested.

Note= Authenticity of sample rests with the sending agency.

Research Officer,
o/o the Chief Engineer Pb (North)
Public Health Engg. Deptt. Lahore

RESEARCH OFFICER

☎ 042-99212679

CENTRAL RESEARCH LABORATORY
PUBLIC HEALTH ENGINEERING DEPARTMENT PUNJAB
2-LAKE ROAD, LAHORE.

CHEMICAL ANALYSIS REPORT OF WATER

Source & Depth: --	**Laboratory No**. C-5/12/566
Location: Water Sample from house of Anwar Sb.	**Place**: Lahore.
	Distt. & Tehsil: Lahore.
	Date of Analysis: 15-05-12
	Date of receipt in Lab: 10-05-12
Date of Collection: --	**Collected By**: Anwar Sb.

Sl: No:	Parameters.	W.H.O. Desirable Levels	W.H.O. Max: Permissible Levels	Results mg/l
1.	Temperature			33C°
2.	Ph	7.0-8.5	6.5-9.2	7.80
3.	Odour	Unobjectionable	Unobjectionable	Odorless
4.	Colour	5 Units	50 Units	Colorless
5.	Taste	Unobjectionable	Unobjectionable	Tasteless
6.	Turbidity ppm Silica Units or N.T.U.	5 Units	25 Units	1.60 NTU
7.	Total Dissolved Solids	500	1500 on avg. basis	580.00
8.	Calcium	75	200	20.00
9.	Magnesium	50	150	20.00
10.	Total Hardness mg/l as $CaCo_3$	100	500	130.00
11.	Total Alkalinity mg/l as $CaCo_3$			250.00
12.	Sulfate	200	400	130.00
13.	Chloride	200	600	40.00
14.	Conductivity um/cm or us/cm			830
15.				

REMARKS: Chemically **FIT** on the basis of parameters tested.

Note= Authenticity of sample rests with the sending agency.

Research Officer,
c/o the Chief Engineer Pb (North)
PUBLIC HEALTH OFFICER
Research Deptt. Lahore.

☎ 042-99212679

CENTRAL RESEARCH LABORATORY

Annexure:

PUBLIC HEALTH ENGINEERING DEPARTMENT PUNJAB
2-LAKE ROAD, LAHORE.

BACTERIOLOGICAL ANALYSIS REPORT

Tehsil & District: Lahore.

Place: Lahore.

Collected by: T.O (I&S) Samanabad Town Lahore.

Sr. No.	Laboratory No.	Date of Collection	Time of Collection	Source & Depth	Description(Sampling Point)	Date of Analysis	Residual Chlorine	RESULT		Remarks
								No. of Coliform Colonies/100ml	MPN/100 ml	
1.	B-1/12/566	--	--	--	Water Sample from House of Manshia S/O Jaga.	11-05-12	--	30 Nos.	--	UNFIT
2.	B-2/12/566	--	--	--	Water Sample from Sadiq	11-05-12	--	20 Nos.	--	UNFIT
3.	B-3/12/566	--	--	--	Water Sample from Imanatg S/O Hameed Masih.	11-05-12	--	40 Nos.	--	UNFIT

- WHO STANDARD: There should be no colony of Coliform bacterial per 100/ml of sample

Research Officer,
o/o the Chief Engineer Pb (North)
Public Health Engg: Deptt, Lahore.

RESEARCH OFFICER
O/O THE CHIEF ENGINEER (NORTH) PUNJAB
PUBLIC HEALTH ENGINEERING DEPARTMENT
LAHORE.