RECYCLING ABLUTION WATER FOR SUSTAINABLE LIVING IN ISLAMABAD

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Dedicated to my beloved Mother,

for their tremendous support throughout my research work!

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I am greatly indebted to Allah Almighty, the beneficent and merciful, whose blessings enabled me to complete this research work in a best manner. I would never able to be at this stage without His will.

"My Lord, indeed I am, for whatever good You would send down to me, in need."

28:24

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Abstract

The ablution process consumes a huge amount of water, especially in mosques for cleaning certain parts of the body before performing prayers. The high quantity of ablution water consumed in mosques and its low stability in quality makes it a possible choice to be reprocessed. It provides a gripping alternative to freshwater, especially in low-water areas. The objective of this study was to measure water quantity produced from the ablution process in Islamabad mosques, personation of ablution water, and judge the system execution to produce a treated emanating quality that meets the wastewater sprinkling reuse standard. In Islamabad, 87 mosques were selected that were under Auqaf Department for study. These mosques were distributed into three categories based on mosque capacity and calculated the number of namazi attending the mosques from Fajar to Isha. Based on the results, average daily ablution water production was equal to 1363.5 m^3/ month and ablution water quality was fairly low strength. The vertical pressure sand filter contributed to the 80% removal of the suspended particles while the overall treatment system efficiently removed up to 90% of the turbidity and TSS. The organic content removal in the form of COD was 80% which is majorly achieved through a granular activated carbon filter. The optimum disinfectant dosage was selected as 11mg/l of chlorine at which residual chlorine was > 1 mg/l after a 30-minute contact time and no total coliform growth was observed for the period of four days. The saved water can be used for irrigation and is considered a potentially sustainable solution to the water shortage experienced in water-stressed countries like Pakistan.

Chapter 1

Introduction

1.1 General Introduction

This chapter demonstrates the background of the analysis to be processed. It covers the analysis upbringing in the area of examine, including an outlook of the genre of ablution water used in the mosques and especially inside mosques that are governed by AUQAF Department in Islamabad. It addresses the point at issue, purposes and targets, and finally describes the analysis queries.

1.2 Research Background

The principal city of Pakistan, Islamabad is situated in the northward of the country on Potohar Plateau. This field has been important in the past for being a section of the passes of the Rawalpindi and NWFP. This area was developed in 1960 to outplace Karachi as Pakistan's Principal City, whichit were from 1963. To the North of the city large Margalla hills are located.

Majority of the population in Islamabad is Muslim, so there are about three thousand mosques in Islamabad where Muslims pray and worship. Muslims perform ablution before offering prayer. The ablution custom exhausts a large quantity of water, particularly in mosques, where the ablution water is permitted to run free and abate. As said in the Hadith, Prophet Muhammad advised Muslims not to do shrinkage, even when doing the purification prior to prayer. The custom, publically known as 'wudhu', behooves a Muslim to wash outer parts with clear water. In Islamabad, many purification systems consist simply of a sequence of taps with a drainage trough to carry the ablution water to main drains. As the tap is usually left open, much water is wasted in ablution process. Taking into account the unnecessary wastage, a simple reprocessing system can be constructed to sum up, process and reuse the purification water within a looped system for non-potable water usage, such as flushing, washing, watering and flowerbed production.

Water in cities is utilized for many activities. Household use, generally, is the basic section of urban waste usage. Pure water outfitted to the urban areas is filtered before delivering to the users. Water use has enhanced constantly to echo more rich communities and expanded economic activities in urban areas. Although the water devoted to urban use is less than that given to the irrigation sector, its social and economic significance is immense. Future challenges in urban water control include production of new technical solutions as well as logistic and organizational ways to turn today issues into future chances. Water also has implemented energy content, between 1,100 and 20,100 KW HPM gallons. Dismal projection about water shortage in the coming decades has increasingly rigid environmental regulations for useful water usage and wastewater disposal, it becomes necessary to adopt a new method to design urban water supply networks. Water supply techniques in Pakistan are persuaded and handled by both state prestige and permit companies following the privatization exercise in year 1987. The water rates vary and are controlled by state rulers.

The main aim of this study was to check the amount and quality of purification water used in Islamabad mosques to reach its capacity for use as reprocessed water.

1.3 Significance and Novelty

Looking from the spiritual point of view, did the Almighty Allah not stated that He does not love the wasters: "O children of Adam, take your adornment (by wearing your clean clothes), while praying and going round (the Tawaf of) the Ka'bah, and eat and drink, but waste not by extravagance, certainly He (Allah) likes not those who waste by extravagance" (The Holy Qu'ran, Al-A'raf, 7:31). This is an indication to Muslims to be moderate and conserve with a lifted sense of grace(shukur). As reported by Ibn Majah, the Prophet, on witnessing a man doing the ablution by a river in a reckless manner, has stated in answer to the man's question of israaf (wastefulness) in 'wudhu': "Yes indeed, (do not waste) even if you perform them on the bank of a flooding river" (Ibn Majah – Book 2, Hadith 425). These proceedings clearly indicate the demand to recheck and make it better, if possible, the current way of doing the ablution, particularly in the way of water control.

Ablution water produced from purification custom is comparatively clean as it has no soap or solid contaminants, but microorganisms basically from rising. Hence by catching this somewhat toxic water and transmitting it through basic analysis, the water can be reprocessed in impure water utilization. The purified water is used for flushing washing in household, while outdoor usage include inundation of flowers, plants as well as car-washing. All these depict how to use the purification water in useful ways with a water reprocessing system.

1.4 Objective of the research

1.4.1 Aim

The main aim of this research is to enable better management of water demand in public buildings, such as mosques. This study quantifies the amount of water used in mosques, when performing ablution, using severe methods and it also points out the savings that can be achieved. The study identifies possible suitable techniques to conserve water, explores the validity for reusing water in irrigation.

1.4.2 Objectives of Study

The objectives of this study are:

1. Calculate water quantity generated from ablution process in Islamabad.
2. Characterize ablution water quality from selected mosques.
3. Investigate treatment technology for recycling ablution water using physiochemical process.

1.5 Scope of Research

In this research, a different kind of ablution is being evaluated and treated. The worth of this work is recognized due to the integrated application of sedimentation, filtration, and disinfection. This work provides useful practical information about ablution gray water and the technical feasibility of

treatment. Therefore, treated ablution gray water should be considered as an important nonconventional source of water that provides strongly to the water demand in arid and semi-arid areas.

Chapter 2

Literature Review

2.1 Water Demand Management in Mosques

It is compulsory for every Muslim to offer prayers five times a day and is the entranceway in Islam. To aid the daily prayers, mosques have been built within all parts of the Muslim world and are depicted as a symbol of Islamic culture. Muslims have faith in the fact that God has ordered and heightened purification before each prayer; hence purification is a necessary action being a Muslim because it is a required to perform a prayer.(Ramlal et al., 2022).

2.2 Water Usage in Mosques

The Muslims believe that God has blessings on measures for water that can be used for purification and that the water should be clear. It can be debated that in modern experimental way water regulations for ablution must be a proposition that was not coming up to the values of drinking water, and so, because of the methods of purification cleansing the mouth and nose (Abu-Rizaiza, 2002).

WDM in mosques announces practical engineering solutions in advancing strategic living, and also it is according to the Islamic rules of using natural resources in an efficient way. This can be got by constructing a simple reprocessing technique for purification water, given that it is not highly polluted (Suratkon et al., 2014) and reusing purified water for flushing, washing, and irrigation. Reprocessing of purification water can lessen more than 40% of the water bill in a mosque, as reported in a study done in Malaysia (Rahman et al., 2016).

2.3 Ablution Process

In the purification process, a Muslim has to wash the outer body parts with clear water. In purification system, there is a row of water taps connected with drainage to carry purification water to the main drains. As taps are mostly left open, so a huge amount of clean water is wasted.

In ablution, one washes hands up to wrists and the entire face and arms to the elbows, then wipes the head and ears and washes the feet to the ankles and cleans the mouth and nose, as pictured below (Ghisi et al., 2009).

Figure 1 Steps to make ablution ('wudu') for prayer

2.4 Water User's Behaviors

In mosques about ninety percent of water is used for ablution process (Suratkon A et al., 2014; Rahman Zaid et. al, 2016; Prathapar et al., 2005). This water used moves toward drain and consider as waste water. A much good water is wasted during purification (Prathapar et al., 2004). As quoted in the Hadith, Prophet Muhammad reminded Muslims to avoid wasting water, even when performing ablution before prayer. Recent studies reveal that a significant amount of water is contaminated in the mosques in universities of Malaysia (Utaberta, 2014) and Oman (Prathapar et al., 2005). However, there is a limited study on reprocessing of this huge quantity of wastewater and WDM specifically; hence, there is a need of an investigation in this aspect.

2.5 Water Types in Islam

The main types of water are given. Islam has also grouped water into three types (Mokhtar, 2012):

1 'Tahur': pure and can purify others. This means pure water which can be used for purification

2 'Tahir': pure but cannot purify others. This means clean greywater which may not be enough for purification.

3 'Najas': impure. It means untreated grey water that cannot be used for purification.

2.6 Global Water Scarcity

Water scarcity is a global challenge that society must address in the 21st century. It is estimated that the population of world will increase from 7.2 billion to 9 billion from 2020 - 30, which is expected to expand to 9.8 billion in 2050. This will create a demand and supply gap of water in many regions of the world. In this case, "one way of facing these global pressures on water resources is the application of water demand management (WDM) concepts". Earlier, increased demands of water were met by increasing water supply capability (Kayaga S and Smot, 2011). Australian governments are now looking to explain the problem by diverse solutions that can be used for water conservation, either by lowering demand or increasing the available quantity (Sontharajah R et al., 2017). It is a problem of many developing countries to provide water to the users, and the solution to meet increasing demand is by increasing the water supply. These problems in delivering potable water have coma because of following reasons: population increase, no suitable water pricing method (low water tax rates), rules, unavailability of capital, absence of economic coordination, less water resources or no water resources with seawater co-generation being the central source, unintentional development and others (Shueili S, 2014). However, little attention has been given to water management and efforts have been done to achieve the supply than the demand (PAEWA, 2015; Al Jamrah et al., 2008; Al Jamrah et al., 2006; Prathapar et 8 al., 2005). The central competency of water sectors is to focus on the supply (PAEW, 2015; Al-Maskati, 2011). Therefore, to come up with this tasks, it is important to work instinctively to find the best solutions. One effective way that needs to be looked upon is unified water reservoirs management (Khatun and Amin, 2011).

2.7 Development and Management of Water

"IWRM explicitly challenges conventional, fractional water development and management systems and places emphasis on integrated approaches with more coordinated decision making across sectors and scales. It recognizes that 9 exclusively top-down, supply-led, technically based and sectoral approaches to water management are imposing unsustainable high economic, social and ecological costs on human societies and on the natural environment. Business as usual is neither environmentally sustainable nor is it sustainable in financial and social terms. As a process of change which seeks to shift water development and management systems from their currently unsustainable forms, IWRM has no fixed beginnings and will probably never end. As the global economy and society are dynamic

and the natural environment is also subject to change, IWRM systems will, therefore, need to be responsive to change and be capable of adapting to new economic, social and environmental conditions and to changing human values" (GWP, 2000)

2.8 Unified Urban Water Resources Management (UUWRM)

"UUWRM is a planning and administration process which resuscitates stakeholders to detect how to meet society's requirements for water and coastal resources while managing essential ecological utilities and economic benefits" (UNEP, 2003).

Chapter 3

Methodology

3.1 Study Area

The study was conducted at the Islamabad mosques which are under Auqaaf department. The ablution water was discharged through covered pipe drains, whereas the open drains around the Masjid were used to collect the storm water. However, there was no separate water meter for the Masjids to determine the exact amount of water used every month of the year. It would be good for the environment and conservation of resources if the used ablution water is recycled and reused.

3.2 Survey of Mosques

A survey was conducted between March-December 2020 purpose is to know the count of Mosques in the research area.

- Checking total number of Mosques in the study Field
- Determine the capability of every Mosque
- To determinant and utilization of water
- Calculating the water used for Wadu

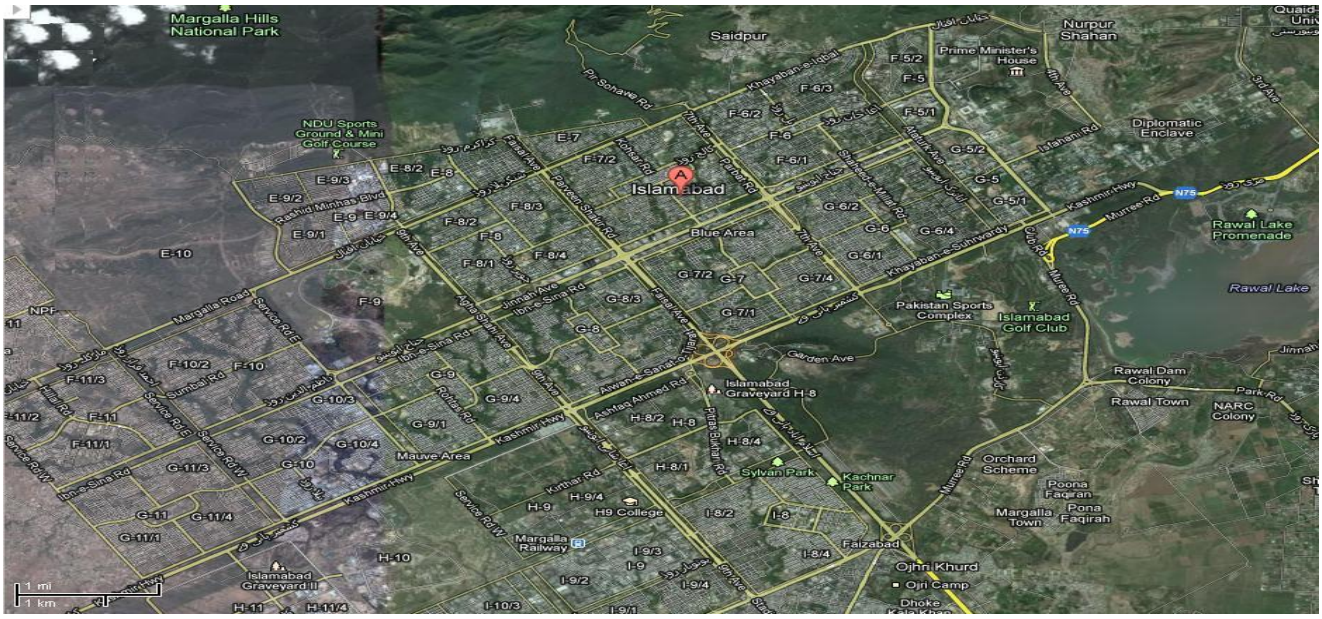

Figure 2 Islamabad Sectors wise Satellite Map

3.3 List of Mosques and Sources of Water

There was 87 number of mosques that were consider for this research. The management of these mosques was under the responsibility of Federal government Auqaaf department. Water source for every Mosque was also taken and it has been found that each Mosque in the study area used ground water for all purposes.

Table 1 Name of mosques and source of water

Sr No	Name Of Mosque	Source of Water	Sr No	Name Of Mosque	Source of Water
1.	Al-Furqan	Ground Water	2.	Allah Wali	Ground Water
3.	Noorani	Ground Water	4.	Usmania	Ground Water
5.	Govt. Hostel	Ground Water	6.	Noor Qadeemi	Ground Water
7.	Federal Lodges	Ground Water	8.	Al-Falah	Ground Water
9.	Faroqia	Ground Water	10.	Tayyeba	Ground Water
11.	Ghousia	Ground Water	12.	Al-Habib	Ground Water
13.	Al-Khizer	Ground Water	14.	Qaderia	Ground Water
15.	Al-Firdous	Ground Water	16.	Amir Moavia	Ground Water
17.	Madni	Ground Water	18.	Al Mustafa	Ground Water
19.	Makki	Ground Water	20.	Al Mubeen	Ground Water
21.	Imdadia	Ground Water	22.	Al Mujtaba	Ground Water
23.	Babul Islam	Ground Water	24.	Al Rasid	Ground Water
25.	Sohaib Roomi	Ground Water	26.	Jilania	Ground Water
27.	Farooq-E-Azam	Ground Water	28.	Al Hilal	Ground Water
29.	Al-Kausar	Ground Water	30.	Ashra Mubrsa	Ground Water
31.	Ashmia	Ground Water	32.	Al Fateh	Ground Water
33.	Rehmania	Ground Water	34.	Al Saddique	Ground Water

Sr No	Name Of Mosque	Source of Water	Sr No	Name Of Mosque	Source of Water
35.	Mujadadia	Ground Water	36.	Zool Noorain	Ground Water
37.	Khalid Bin Walid	Ground Water	38.	Al Mujahid	Ground Water
39.	Al Huda	Ground Water	40.	Hanfia	Ground Water
41.	Mubeen	Ground Water	42.	Taquat Ul Eman	Ground Water
43.	Aula	Ground Water	44.	Haideri Rizvi	Ground Water
45.	Markaz (Lal	Ground Water	46.	Syed Na Ali	Ground Water
47.	Ahle-Hadith	Ground Water	48.	Khlulafa E Rasdeen	Ground Water
49.	Madina	Ground Water	50.	Muhammadi	Ground Water
51.	Rehmania Aabpara	Ground Water	52.	Imam-Us-Sadiq	Ground Water
53.	Al-Shoudha	Ground Water	54.	Baghdadi	Ground Water
55.	Danus Salam	Ground Water	56.	Aleemia	Ground Water
57.	Khiza	Ground Water	58.	Shamsul Arfeen	Ground Water
59.	Asna Ashri	Ground Water	60.	Farooq-E-Azam	Ground Water
61.	Al-Kausan P.Clinic)	Ground Water	62.	Syed Na Hasan	Ground Water
63.	Ibrahim	Ground Water	64.	Quba	Ground Water
65.	Toor	Ground Water	66.	Taqwa	Ground Water
67.	Bilal	Ground Water	68.	Grave Yard	Ground Water
69.	Taqwa	Ground Water	70.	Ghulshan-E-Mustafa	Ground Water
71.	Qutab Shaheed	Ground Water	72.	Al-Rahim	Ground Water
73.	Al-Raza	Ground Water	74.	Talha	Ground Water
75.	Al-Noor	Ground Water	76.	Ghousia	Ground Water
77.	Al-Murtaza	Ground Water	78.	Zahra	Ground Water

Sr No	Name Of Mosque	Source of Water	Sr No	Name Of Mosque	Source of Water
79.	Saad Bin Abi Waqas	Ground Water	80.	Ghousia 1	Ground Water
81.	Fire Brigade	Ground Water	82.	Ghousia 2	Ground Water
83.	Hantia	Ground Water	84.	Madni	Ground Water
85.	Siddiquia	Ground Water	86.	Hanfia	Ground Water
87.	Al-Hira	Ground Water			

3.4 Methodology

The methodology used for collection of data included physical survey of each mosque. The survey performed had helped not only in collection of data pertaining to the number of Mosques in the area, but it also helped to understand the various do's and don'ts related to the Ablution water.

A questionnaire was developed for data collection. The various questions of Mosque related to water had been inquired from imam of Mosques during the survey which had been taken into consideration while calculating the final usage of water. (Questionnaire for survey in Annex. A)

3.4.1 Namazi

The person who offers Salat is called a Namazi. The total number of Namazi is counted by counting the Saaf in each row.

3.4.2 Categories of mosques

The mosques were distributed in three categories based on mosque capacity.

Table 2 Categories of Mosques

Categories of Mosques	No of Mosques
Small mosques	22 numbers (capacity less than 500)
Medium mosques	54 numbers (capacity 500-1000)
Large mosques	11 numbers (capacity greater than 1000)

3.4.3 Storage of Water

Each Mosque had water storage tanks which are filled at least twice a day. The Minimum quantity if water storage tank was found in the study area is of 1000 Liters.

3.4.4 Selection of Mosques

Five mosques were selected form each category and analyze its ablution water.

3.4.5 Source

The source of water for each Mosque was also taken into consideration and it had been found that each Mosque in the study area uses groundwater for all purposes. The various function of the Mosque related to water had also been inquired about during the survey which had been taken into consideration while calculating the final usage of water.

3.5 Data Collection & Analysis

The data was collected Data from 87 mosques that were under the Auqaaf department in Islamabad through questionnaires. After that 5 mosques were selected form each category and analyzed the ablution water.

Table 2 Survey of Namazi and Water Utilization

<table>
<tr><th colspan="4">Ablution Water Calculation from Small Category Mosques</th></tr>
<tr><td>Mosque 01</td><td colspan="3">Al-Furqan Masjid (I-8 Markaz, Islamabad)</td></tr>
<tr><td>Prayer Time</td><td>Prayer Attendance</td><td colspan="2">Water Consumption</td></tr>
<tr><td>Fajar</td><td>30</td><td>Source of water</td><td>Groundwater</td></tr>
<tr><td>Zohar</td><td>80</td><td colspan="2" rowspan="2"></td></tr>
<tr><td>Asar</td><td>100</td><td colspan="2" rowspan="6">Using formula 5 liters per namazi for 20% of total Population of the scheme (CDA guidelines)
<table><tr><td>Namazi that perform wadu in mosques</td><td>=20% × prayer attendance per day
=0.20*350=70</td></tr><tr><td>Per day water used for ablution</td><td>=Namazi that perform wadu in mosques × ablution water volume used per person
= 70 × 5 = 350 Liters</td></tr></table></td></tr>
<tr><td>Maghrib</td><td>100</td></tr>
<tr><td>Isha</td><td>40</td></tr>
<tr><td>Juma</td><td>500</td></tr>
<tr><td>Prayer attendance per day (excluding Juma prayer)</td><td>350</td></tr>
<tr><td colspan="4"></td></tr>
<tr><th colspan="4">Ablution Water Calculation from Medium Category Mosques</th></tr>
<tr><td>Mosque 02</td><td colspan="3">Allah Wali Masjid (Sector F-8/1, Islamabad)</td></tr>
<tr><td>Prayer Time</td><td>Prayer Attendance</td><td colspan="2">Water Consumption</td></tr>
<tr><td>Fajar</td><td>60</td><td>Source of water</td><td>Groundwater</td></tr>
<tr><td>Zohar</td><td>120</td><td colspan="2"></td></tr>
</table>

<table>
<tr><td>Asar</td><td>150</td><td rowspan="6">Using formula 5 liters per namazi for 20% of total Population of the scheme (CDA guidelines)<table><tr><td>Namazi that perform wadu in mosques</td><td>=20% × prayer attendance per day
=0.20*530=106</td></tr><tr><td>Per day water used for ablution</td><td>=Namazi that perform wadu in mosques × ablution water volume used per person
= 106 × 5 = 530 Liters</td></tr></table></td></tr>
<tr><td>Maghrib</td><td>150</td></tr>
<tr><td>Isha</td><td>50</td></tr>
<tr><td>Juma</td><td>800</td></tr>
<tr><td>Prayer attendance per day</td><td>530</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">Ablution Water Calculation from Large Category Mosques</td></tr>
<tr><td>Mosque 03</td><td colspan="2">Noorani Masjid</td></tr>
<tr><td>Prayer Time</td><td>Prayer Attendance</td><td colspan="2">Water Consumption</td></tr>
<tr><td>Fajar</td><td>80</td><td>Source of water</td><td>Groundwater</td></tr>
<tr><td>Zohar</td><td>150</td><td></td><td></td></tr>
<tr><td>Asar</td><td>150</td><td colspan="2">Water Usage(Wadu)</td></tr>
<tr><td>Maghrib</td><td>250</td><td colspan="2" rowspan="6">Using formula 5 liters per namazi for 20% of total Population of the scheme (CDA guidelines)<table><tr><td>Namazi that perform wadu in mosques</td><td>=20% × prayer attendance per day
=0.20*830=166</td></tr><tr><td>Per day water used for ablution</td><td>=Namazi that perform wadu in mosques × ablution water volume used per person
= 166 × 5 = 830 Liters</td></tr></table></td></tr>
<tr><td>Isha</td><td>200</td></tr>
<tr><td>Juma</td><td>1500</td></tr>
<tr><td>Prayer attendance per day</td><td>830</td></tr>
</table>

Looking at the information in the Tables, one-month water consumption in all the 87 mosques can be calculated by using the following equation: (Detailed calculation in Annex. B)

Number of mosques users/month × ablution water volume used/person.= 272700 people /month × 5 liters = 1363500 liters/month = 1363.5 m^3/ month.

The average liters of water required for a single Wadu act is 5 liters.

The objective of the data collection is to calculate the water used for ablution in every mosque.

Possible methods of reprocessing of groundwater can be deduced from analysis.

Chapter 04

Results and Discussion

4.1 Parameters Analyzing for Ablution water

Ablution water quality was measured in terms of a few common major parameters (Table 3).

Table 3 Parameters Analyzing for Ablution water

Parameters	Units	Methods
PH		Electrometric
Total dissolved solids	mg/L	Gravimetric
Suspended solids	mg/L	SMWW 2540 D
Chloride	mg/L	Argentometric
Sulfate	mg/L	SMWW 4500-SO4 C
COD	mg/L	SMWW 5220D
Total Coliforms MPN/100ml	MPN/100ml	Membrane Filtration Method
Flouride	mg/L	US EPA 9214
Feacal coliforms	CFU/100ml	Membrane Filtration Method
TSS	mg/L	SMWW 2540 D
Turbidity	NTU	Nephlomertic
EC	(uS/cm)	APHA 23RD EDITION

4.2 Quality Criteria for Irrigation Reuse of Wastewater

After treatment it was necessary to reuse ablution water either for irrigation or toilet flushing. Some countries like China, Saudi Arabia and Oman have developed quality criteria for irrigation reuse of wastewater. The standards for Oman were quite stringent as compare to other countries.

Table 4 Quality Criteria for Irrigation Reuse of Wastewater

Quality Criteria for Irrigation Reuse of Wastewater						
Parameters	**China**		**Saudi Arabia**	**Oman**		**Tunisia**
	Paddy crop	Vegetables	All soils	Vegetables (Eaten raw)	Vegetables (cooked)	All soils
PH	5.5-8.5	5.5-8.5	6.0-8.4	6--9	6--9	6.5-8.5
Total dissolved solids, mg/L	1000-2000	1000-2000	1500	2000		--
Suspended solids, mg/L	150	200	10			30
Chloride, mg/L	250	250	280	650	650	2000
Sulfate, mg/L	--	--	--			400
COD, mg/L	200	150	--	150	200	90
Total Coliforms MPN/100ml	—	—	—	2.2	2.3	
Flouride mg/l	—	—	—	1	2	
Feacal coliforms CFU/100ml	—	—	—	200	1000	
TSS, mg/l	—	—	—	15	30	
Turbidity NTU	—	—	—	5	10	
EC(uS/cm)	—	—	—	2000	2700	

Table 5 Characterization of Ablution Water from Small Category Mosques

Parameters	Units	Average	Maximum	Minimum	Standard Deviation
pH		7	7.5	6.4	0.70
Total dissolved solids	mg/L	489	558	420	97.58
Sodium	mg/L	45	50	40	7.07
Chloride	mg/L	70	80	60	14.14
Sulfate	mg/L	30	40	20	14.14
COD	mg/L	31	45	25	56.56
Total Coliforms	MPN/100ml	65	80	50	21.21
Fluoride	mg/L	0.4	0.5	0.3	0.14
TSS	mg/L	95	120	70	35.35
Turbidity	NTU	41	50	32	12.72
EC	(uS/cm)	900	1100	700	282.84

Table 6 Characterization of Ablution Water from Medium Category Mosques

Parameters	Units	Average	Maximum	Minimum	Standard deviation
pH		7.45	8.2	6.7	1.06
Total dissolved solids	mg/L	456.25	483	429.5	37.83
Sodium	mg/L	42.76	55.52	30	18.04
Chloride	mg/L	32.5	45	20	17.67
Sulfate	mg/L	25	35	15	14.14

COD	mg/L	30	39	27	63.63
Total Coliforms	MPN/100ml	55	70	40	21.21
Flouride	mg/L	0.525	0.6	0.45	0.10
TSS	mg/L	60	80	40	28.28
Turbidity	NTU	37	42	32	7.07
EC	(uS/cm)	795.25	940.5	650	205.41

Table 7 Characterization of Ablution Water from Large Category Mosques

Parameters	Units	Average	Maximum	Minimum	Standard Deviation
pH		6.985	7.43	6.54	0.63
Total dissolved solids	mg/L	458	475	441	24.04
Sodium	mg/L	30.5	40	21	13.43
Chloride	mg/L	32	41	23	12.72
Sulfate	mg/L	30	39	21	12.72
COD	mg/L	40	60	20.1	43.84
Total Coliforms	MPN/100ml	51.38	62.54	40.22	15.78
Fluoride	mg/L	0.43	0.54	0.32	0.15
TSS	mg/L	55	90	20	49.49
Turbidity	NTU	46.3	62.6	30	23.05
EC	(uS/cm)	692.73	965.25	420.21	385.40

4.3 pH of Ablution Water

The pH of ablution water in small category mosques was within the prescribed limits as provided in quality Criteria for Irrigation Reuse of Wastewater. Lowest value of pH was 6.45 from Al Kousar mosque and highest value was 7.5 from Al Firdous mosque.

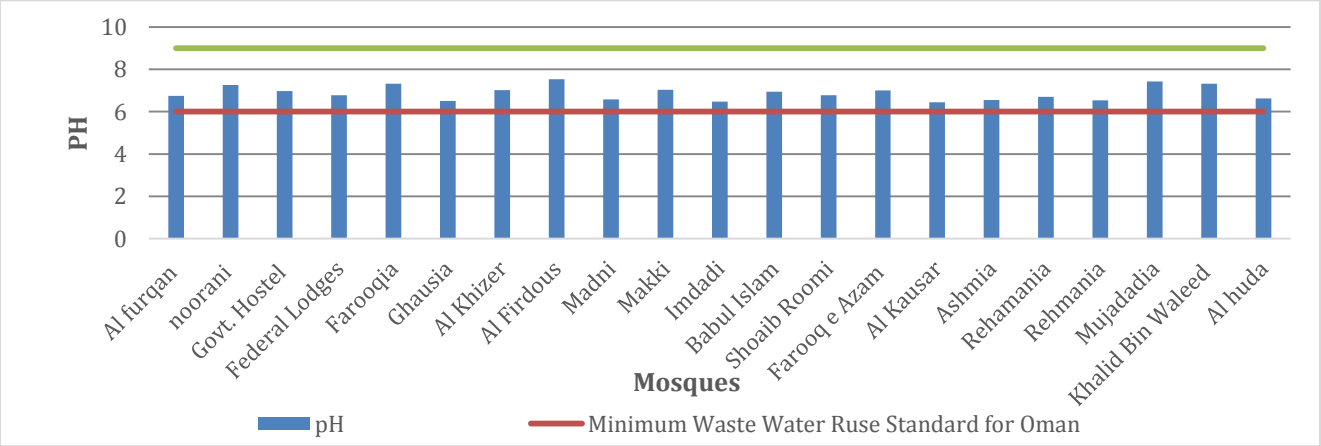

Figure 3 pH of Ablution Water

4.4 Electrical Conductivity

The electrical conductivity of ablution water in small category mosques was within the prescribed limits as provided in quality Criteria for Irrigation Reuse of Wastewater. Lowest value of EC was 749.3 uS/cm from Farooq e Azam mosque and highest value was 1129 uS/cm from Khalid Bin Waleed mosque.

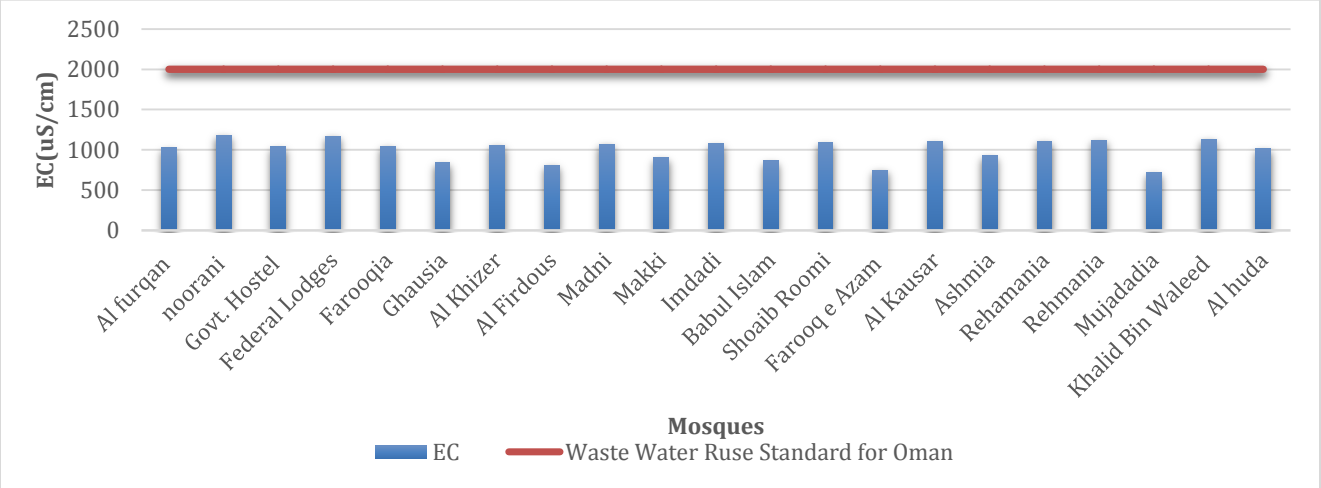

Figure 4 Electrical Conductivity of Ablution Water

4.5 Turbidity

The turbidity of ablution water was exceeding the prescribed limits due to the present of soap and dust and soil particles. Lowest value of turbidity was 32 mg/l from Al Firqous mosque and highest value was 49 mg/l from Noorani mosque.

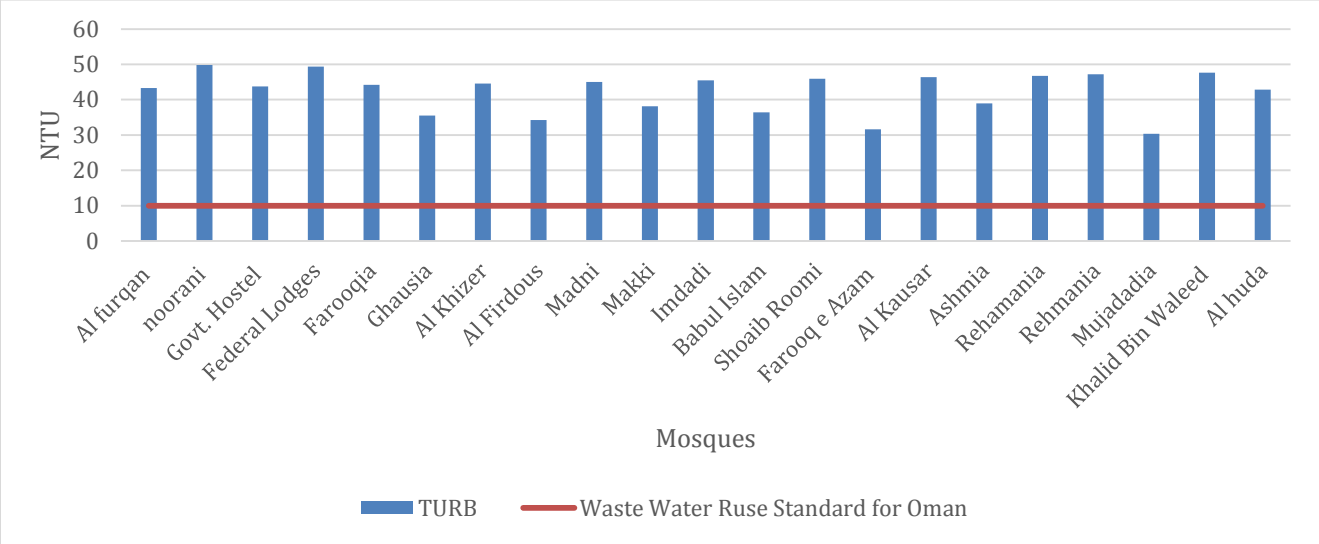

Figure 4' Turbidity of Ablution Water

4.6 Coliform

The Coliform of ablution water was exceeding the prescribed limits as provided in quality Criteria for Irrigation Reuse of Wastewater. The main reason for highly rich coliform concentration was due to the source that was ground water. Lowest value of Coliform was 51.38 MPN/100ml from Mujadadia mosque and highest value was 70 MPN/100ml from Al Kausar mosque.

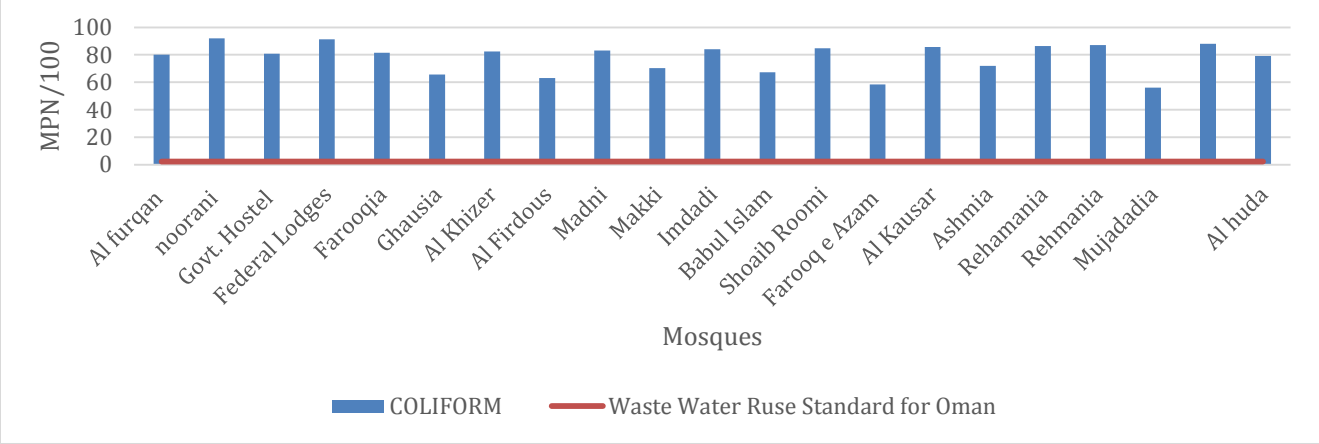

Figure 5 Coliform in Ablution Water

4.7 Chemical Oxygen Demand (COD)

The Chemical oxygen demand (COD) of ablution water was within the prescribed limits as provided in quality Criteria for Irrigation Reuse of Wastewater. Lowest value of COD was 30 mg/l from Farooq Azam mosque and highest value was 110 mg/l from Al Kausar mosque.

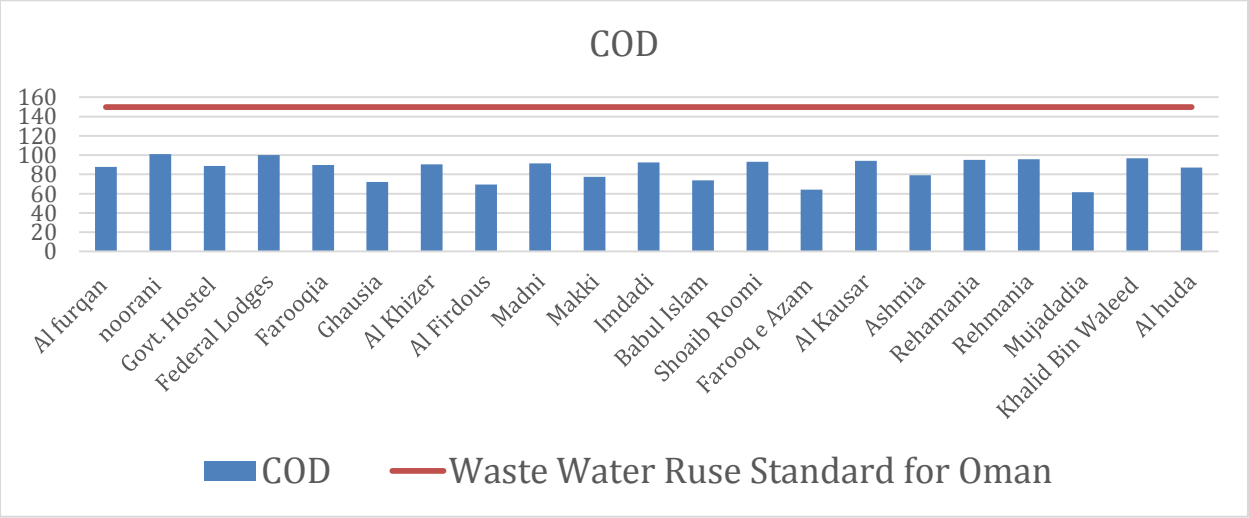

Figure 6 COD of Ablution Water

4.8 Sodium

The sodium of ablution water was within the prescribed limits as provided in quality Criteria for Irrigation Reuse of Wastewater. Lowest value of Na was 34.3 mg/l from Mujadidha mosque and highest value was 52 mg/l from Kasur mosque.

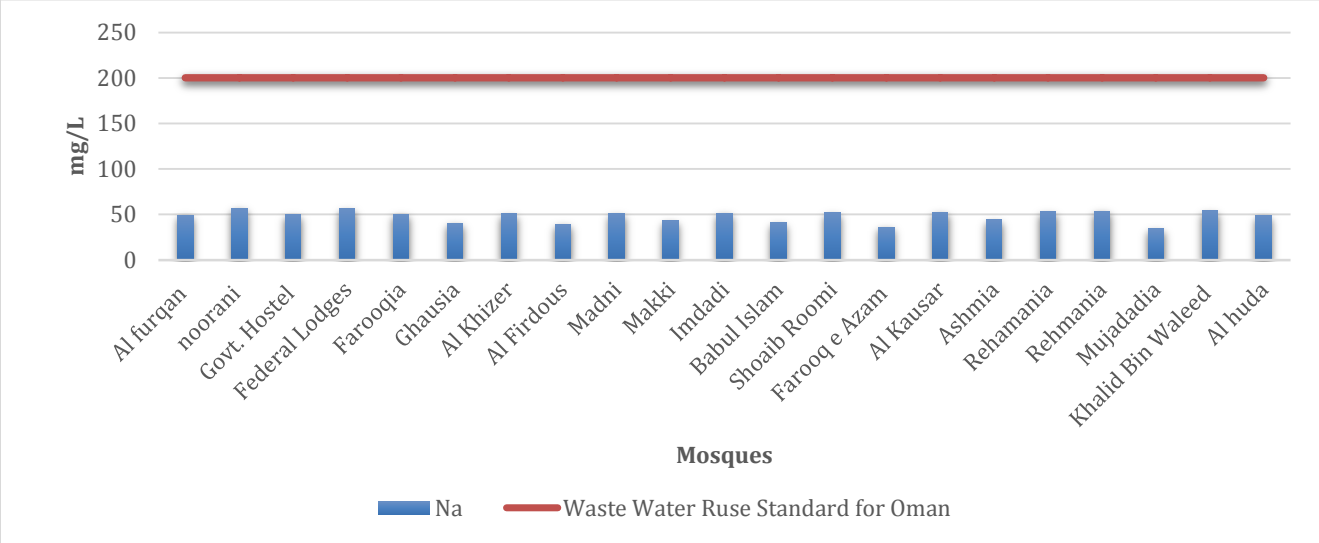

Figure 7 Sodium of Ablution Water

4.9 Magnesium

The Magnesium concentration of ablution water was within the prescribed limits as provided in quality Criteria for Irrigation Reuse of Wastewater. Lowest value of Mg was 24 mg/l from Mujadidha mosque and highest value was 39 mg/l from Noorani mosque.

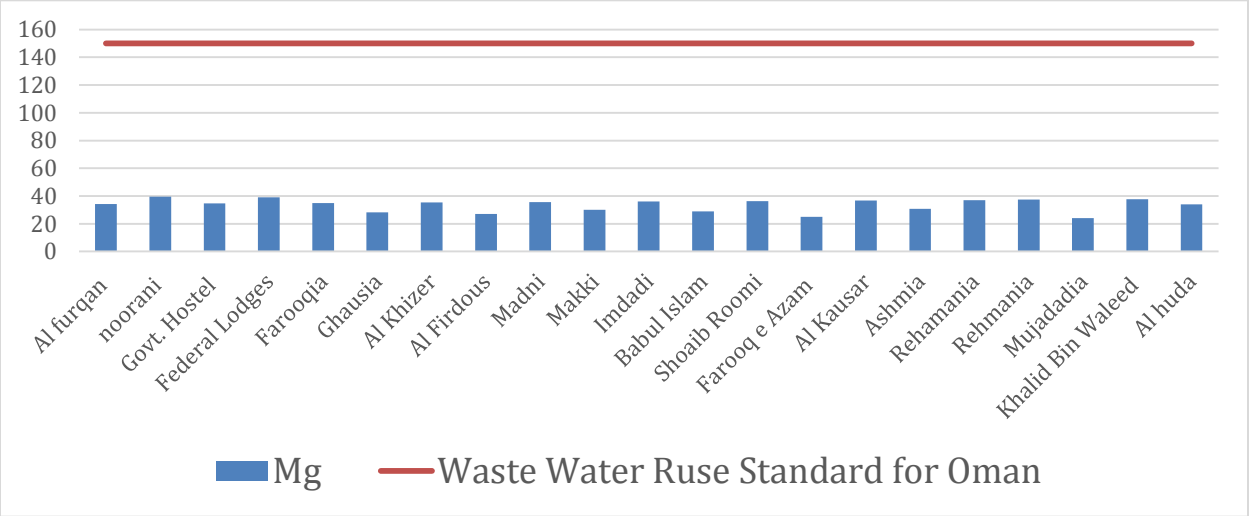

Figure 8 Magnesium of Ablution Water

4.10 Fluorides

The fluoride of ablution water was within the prescribed limits as provided in quality Criteria for Irrigation Reuse of Wastewater. Lowest value of Mg was 24 mg/l from Mujadidha mosque and highest value was 39 mg/l from Noorani mosque.

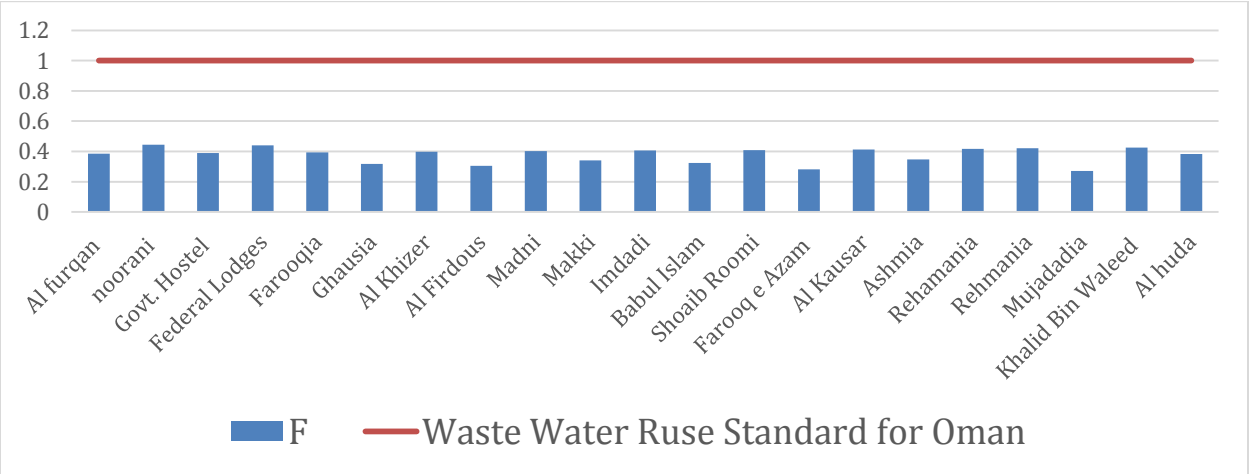

Figure 9 Fluorides of Ablution Water

4.11 Chlorides

The chloride of ablution water was within the prescribed limits as provided in quality Criteria for Irrigation Reuse of Wastewater. Lowest value of Cl is was 10 mg/l from Mujadidha mosque and highest value was 39 mg/l from Noorani mosque.

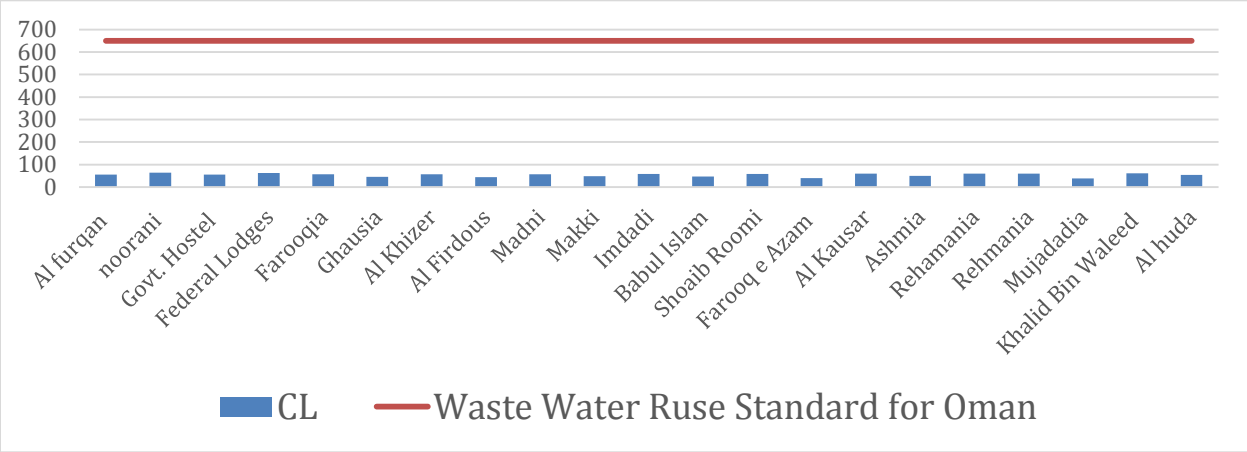

Figure 10 Chlorides in Ablution Water

4.12 Sulphates

The sulphate of ablution water was within the prescribed limits as provided in quality Criteria for Irrigation Reuse of Wastewater. Lowest value of sulfate was 05 mg/l from Mujadidha mosque and highest value was 50 mg/l from Noorani mosque.

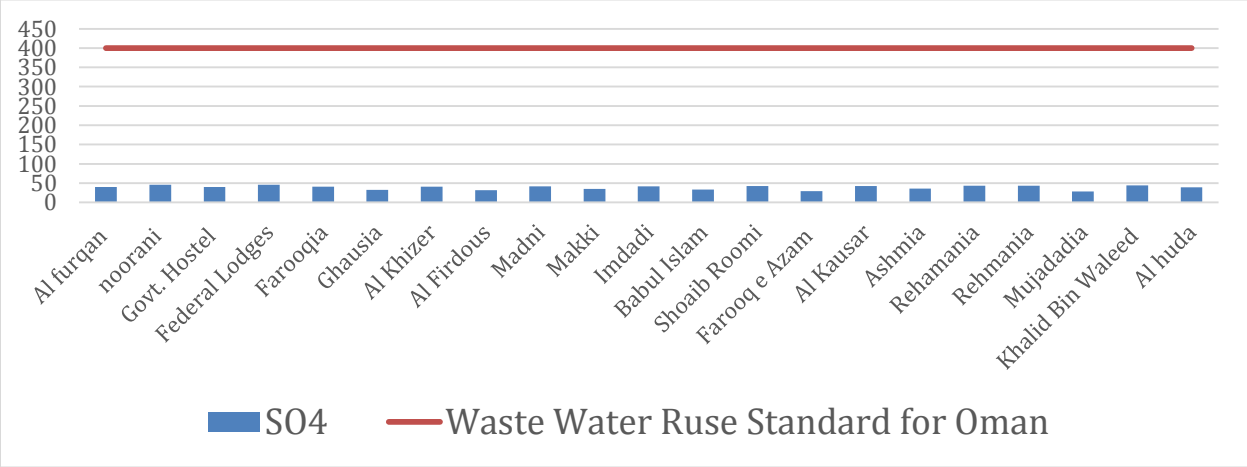

Figure 11 Sulphate in Ablution Water

4.13 Total Suspended Solids (TSS)

As discussed the turbidity value was high in ablution water that's why total suspended solids (TSS) of ablution water were exceeding the prescribed limits as provided in quality Criteria for Irrigation Reuse of Wastewater. Turbidity and TSS are directly related. The trend for the TSS removal was observed to be the same as the turbidity. The lowest value of TSS was 80 mg/l from Farooq e Aazm mosque and highest value was 125 mg/l from Imdadi mosque.

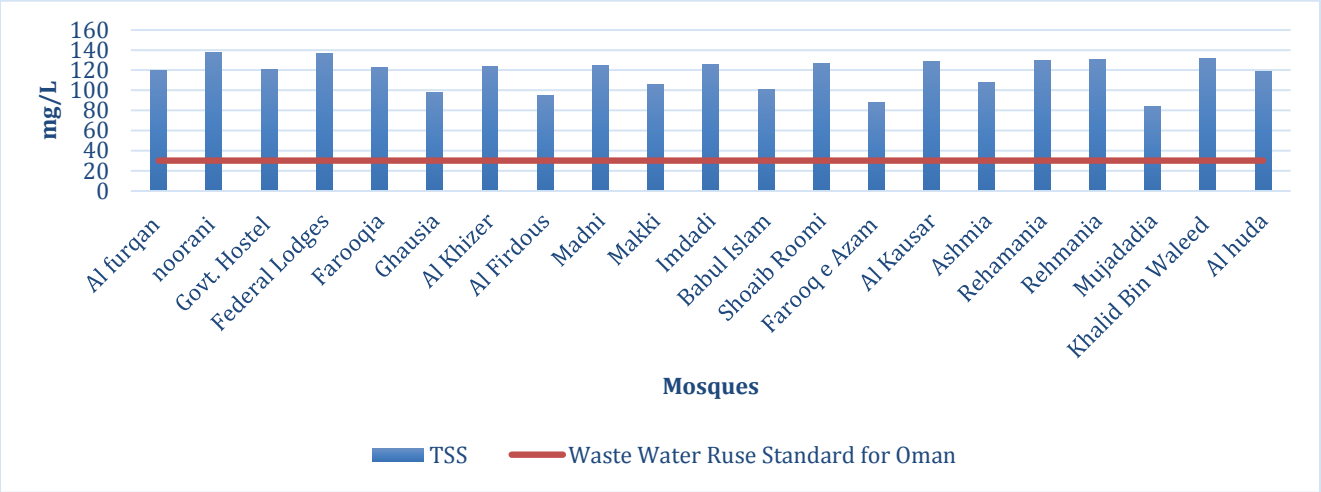

Figure 12 TSS in Ablution Wate

4.14 Designing of the System Components

The ablution water recycling system includes site selection, pipework, treatment unit installation and Commissioning. Figure 12' shows the possible steps for ablution water treatment unit. It can be a single step or a combination of three e.g. pre and post-treatment only depending on the on ablution water composition.

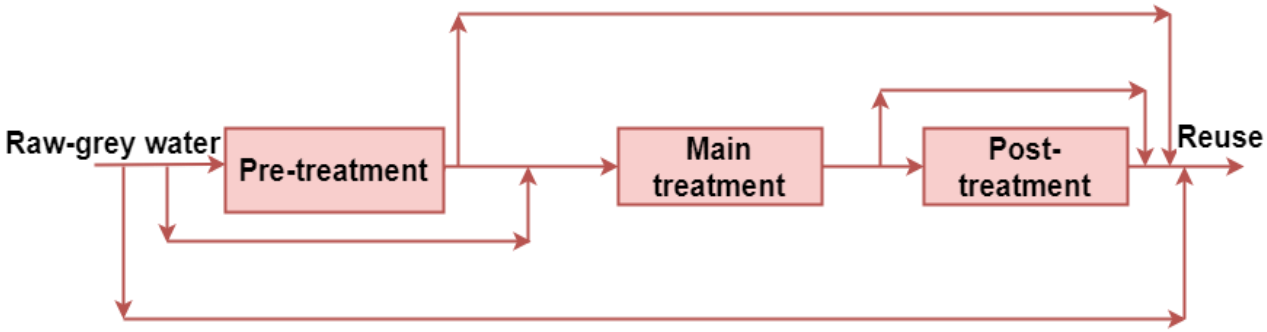

Figure 12' Ablution water Recycling and Treatment Possible Steps and Tracks

The ablution water system for restricted non potable urban use consists of following units:

1. Flow Equalization and Aeration Tank
2. Sand Filtration
3. Granular Activated Carbon Filtration
4. Disinfection by Chlorine
5. Diversion and Piping System

4.15 Equalization Tank

The purpose of the equalization or settling tank is to collect grey water for a certain time and ensure continuous flow to the treatment unit. It is necessary to provide adequate aeration and mixing to prevent odors and solids deposition in equalization tank. Aeration can be provided using the coarse air bubbles that generate enough turbulence to allow the mixing of the influent during the retention period.

Based on the daily average and peak volumes collected, flows were determined and equalization tank was designed based on criteria presented in Table 8 below:

Table 8 Specifications of equalization tank

Detention Time	1 day
Tank Dimensions	3.5' X 2.5' X2
Material	Mild Steel gauge 18
Total Holding Capacity	115 Gallons
Minimum Operating Volume	15 Gallons
Networking Volume	100 Gallons
Coarse Air Bubbles	8 GPM
Turbulence Generator	100 GPH

For adequate mixing and aeration to prevent microbial activity, coarse air bubbles and in-depth turbulence generator, used in aquariums, were used. Water was pumped to the treatment unit through a centrifugal pump. (Figure 13)

Figure 13 Equalization Tank

4.16 Filter Vessels

For the main treatment through sand filter and Granular Activated Carbon (GAC) filter, the commercially available FRP (Fiber reinforced plastic) vessels were used. The vessels were able to operate in two modes: Forward wash and Backwash. During the forward wash, the incoming ablution water was sprayed over the filter medium at fixed flow rates. The water after passing through the medium was collected through a strainer pipe that allowed the upward movement of the water and filtered water was collected at top. During the backwashing period, the water entered through the strainer tube at the bottom and moved in the upward direction at increased flow rate to remove the clogged particles and moved out through the drain pipe and was discarded through the main sewer line.

4.17 Sand Filtration

A vertical pressure rapid sand filter using sand medium was used for the separation of the Suspended particles and to decrease the turbidity of the system, Figure 14

The specifications of the filter and operating conditions are shown in Table 9:

Table 9 Specifications of Filter Medium and operating

Media	
Fine Silica Sand	0.2 - 0.25 mm
Medium Silica Sand	0.45-0.75 mm
Gravel	2-3 mm
23 inches	Bed depth
Supporting Gravel	12 inches
Operation	
Freeboard depth	20% of bed
Service Flow Rate	5 gpm/ sq ft
Backwash flow rate	15-20 gpm/sq.ft
Backwash bed expansion	20% of bed depth
Operation Mode	Semi-continuous
Driving force	Pressure
Media Replacement	2 years

Figure 14 Sand Filter

4.18 Cartridge Filter

Two cartridge Filters of size 5 and 1 micron were also placed after sand filter and carbon filter respectively. The cartridges were added to increase the media life by preventing the mixing of any media or suspended particles leaving with the effluent. The size of filters was 20" with 1.5" diameter.

4.19 Granular Activated Carbon

After passing through the Sand filer and the Cartridge Filter, the inlet water entered the GAC filter for the removal of organic constituent. GAC was used to ensure that the disinfection process was not affected due to the organic content shielding.

4.20 Overall Process Flow Diagram

The water is collected at the equalization tank from where the ablution water is pumped to the Sand Filter for the suspended particles removal. The effluent enters the cartridge filter of 5 micron to

prevent any media particle and further reduce the turbidity of the influent. After sand filtration, the water passes through the carbon filter and then cartridge filter of 1 micron and enters the chlorination tank. The dosing pump doses the chlorine concentration into the chlorination tank. The water passes through the tank after the contact time of 30 minutes is pumped through the second pump to the overhead storage. Both equalization tank and chlorination tank have been installed with level sensor that start after the preset minimum height of water is reached. The storage tank is also installed with the level sensor for the overflow condition that cuts off the filtration process after it is full to avoid the water wastage. In case of flushing the stored water, the drain pipe is redirected to chlorination tank to disinfect the water again for the storage. The product tank is connected with the level sensor to disconnect the system after the maximum water level is reached.

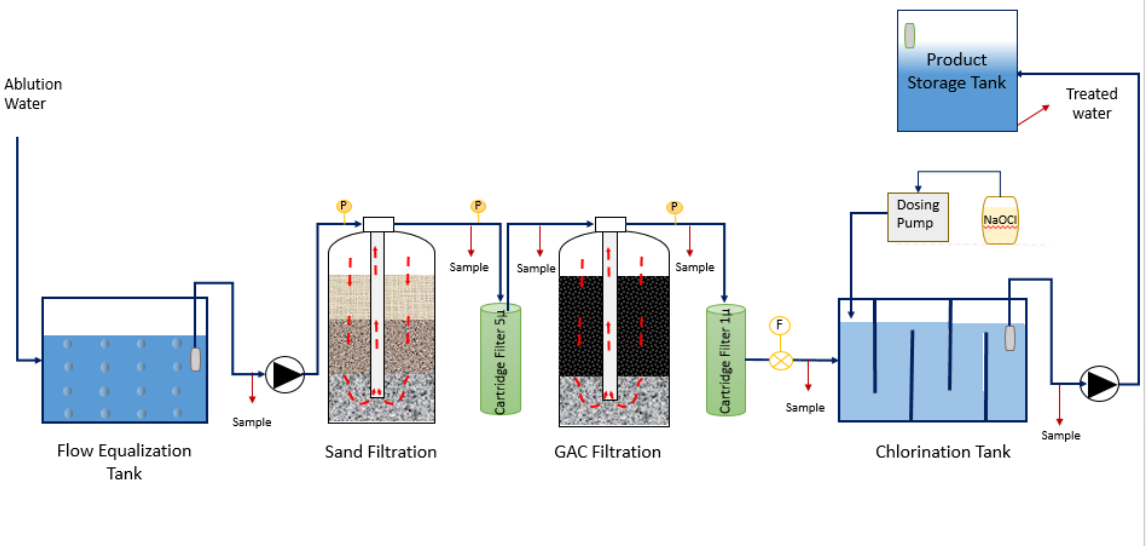

Figure 15 Process Flow Diagram

For backwashing, the treated effluent is pumped to sand filter first where the flow is reversed. Now the water enters from the riser pipe and then the clogged particles leave with the water to the drain. The same procedure is followed with the GAC filter. The drain pipes are connected with the main sewerage lines in case of cleaning or maintenance. The product tank is connected with the chlorine tank to allow re-disinfection of water if stored longer than recommended.

Figure 16 Process Flow Diagram

4.21 Turbidity Removal

Turbidity removal profile in Figure 17 shows the 80% removal by Sand Filtration alone for ablution water sourcs. Cartridge Filter after sand filtration helped in removing the 10% turbidity.

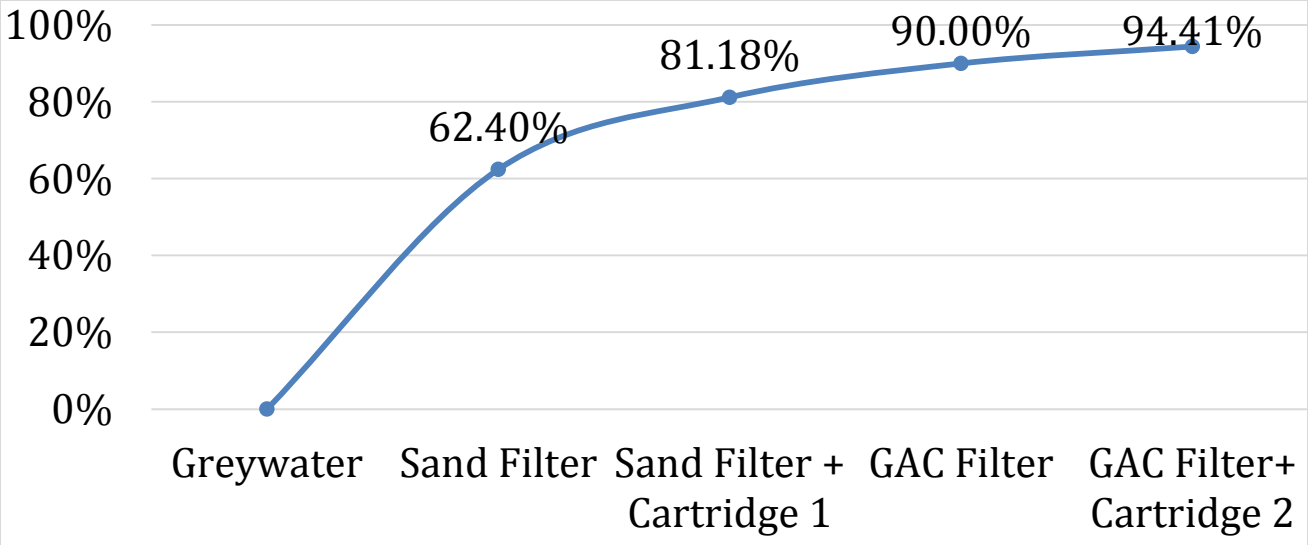

Figure 17 Turbidity removal profile

The system is capable of removing 95% turbidity and product less than 10 NTU, which is the required standard.

4.22 Total Suspended Solids Removal

Turbidity and TSS are directly related. The trend for the TSS removal was observed to be the same as the turbidity removal with overall 95% removal efficiency as shown in Figure 18

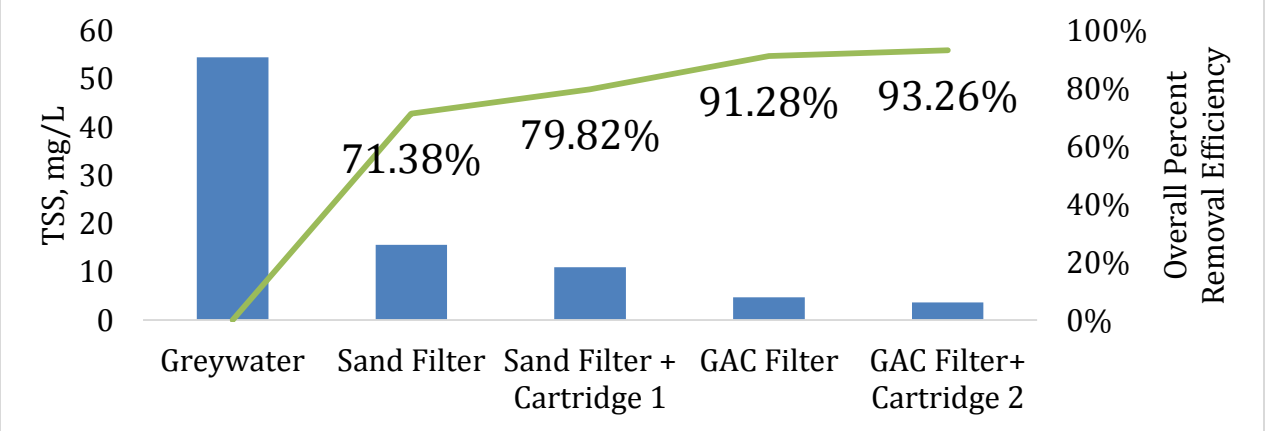

Figure 18 Total Suspended Solids Removal

4.23 COD Removal for Ablution water

The ablution water system effectively removed 80% of the initial COD for the ablution water as shown in Figure 19.

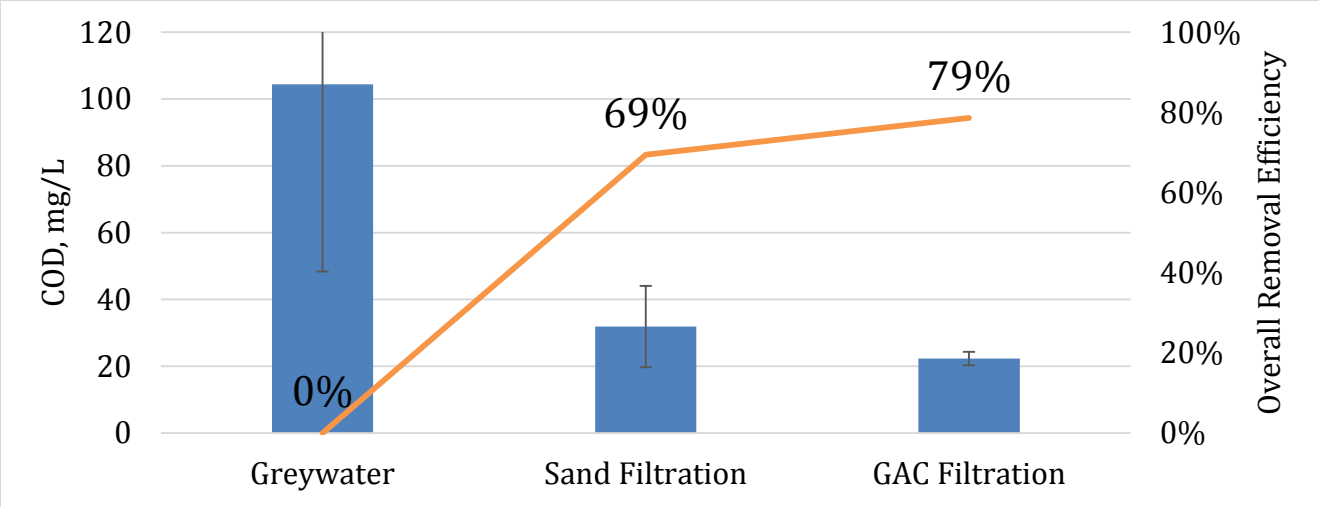

Figure 19 COD Removal for Ablution water

4.24 Sample Results Comparison

The physico-chemical treatment of ablution water reduced the contamination significantly. The value of Turbidity, TSS and Total coliform came under prescribed limit after treatment. Results of Samples before and after treatment is shown in table 10.

Table 10 Sample Results Comparison

Parameter	Unit	Before Treatment	After Treatment	Standard Value for Irrigation
TSS	mg/L	58.5	19.9	30
COD	mg/L	105	21.9	150
pH		7.41	7.92	6-9
Total Coliform	MPN/100ml	>50.00	NIL	2.2
Turbidity	NTU	45	3.2	10
Residue chlorine	mg/L	Nil	0.42	-

Chapter 5

Conclusion and Recommendation

5.1 Conclusion

1. The daily water consumption due to ablution in the Islamabad mosques is about 5 L/Cap.day. As such, the monthly water consumption would range between 150 to 200 m3/month for each mosque.
2. Recycling and reuse of 150 to 200 m3/month from each mosque would be a commended option in terms of conservation of natural resources and energy.
3. Ablution water is relatively clean and only a few parameters such as COD, TSS, TURBIDITY and COLIFORM required treatment.
4. Sand Filter removes around 65-70% of TSS. When combined with Cartridge Filter, the efficiency reaches 80%.
5. Up to 80% removal of COD values is achieved through the physical treatment of water.

5.2 Recommendation

The findings from this research could lead to numerous possible future avenues and questions that could be studied to broaden WDM investigations and implementations one of these include:

1. What is a suitable standard for treating ablution water of the greywater type, as ablution water is cleaner compared to other types of greywater from showers or washing machines?
2. In terms of cost implications, it would help to know, ‘What is the cost of implementing a recycling system to reuse ablution water for flushing toilets?
3. And ‘What is the cost of implementing a recycling system to reuse ablution water for irrigation?’
4. Is separation of greywater and blackwater in mosques economically beneficial in terms of plumbing conversions?
5. Could recycling ablution water in mosques be harmful to human health? Could it cause any harm to public health or the environment? Is there evidence of this?

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Annex A

Survey Form for Ablution (Wudhu) Water Recycling and Treatment

Name of Mosque Talha Masjid **Address** Sector I 9/2 industrial area Islamabad

Focal Person (Imam) M. Idrees **Designation** Imam Masjid

Contact No (If Any) 0300-5380530 **Date** 26-09-2020

1- What is the capacity of the mosque (persons)?

(A) <100 **(B) 100-500**

(C) 500-1000 **(D) 1000-1500**

(E) >1500

Other (Specific figure) _____

2- What is the number of namazis attending the mosque (persons) from Fajr to Isha (including Friday prayers)?

(A) Fajr 100 **(B) Zohar 200**

(C) Asr 200 **(D) Maghreb 300**

(E) Isha 200 **(F) Juma 1500**

Average namazis per day (Specific figure) 200

3- What is the source of water for ablution (Wadhu) in mosque?

(A) Ground water **(B) Surface water (rivers, lakes and streams)**

(C) Rain water **(D) any other _____**

4- Is there water shortage for ablution (Wadhu) in mosque? Yes/No ___
If yes, then why

(A) Ground water depletion **(B) Electricity load shedding**

(C) Unpaid electricity bill **(D) any other NO Shortage**

5- Where the used ablution (wadhu) water is being discharged?

(A) Directly to the drain **(B) Gardening/lawn watering**

(C) Ground water recharge **(D) any other _____**

6- If the ablution (wadhu) water is treated, can it be used for ablution again?

(A) Yes **(B) No**

If No, what other reuse purpose, it can be used for

(A) Gardening/Lawn watering **(B) Toilet flushing**

(C) Ground water recharge **(D) any other _____**

Annex B

<table>
<tr><th colspan="4">Ablution Water Calculation</th></tr>
<tr><td>Mosque 01</td><td colspan="3">Al-Furqan (I-8 Markaz, Islamabad)</td></tr>
<tr><td>Prayer Time</td><td>Prayer Attendance</td><td colspan="2">Water Consumption</td></tr>
<tr><td>Fajar</td><td>30</td><td>Source of water</td><td>Groundwater</td></tr>
<tr><td>Zohar</td><td>80</td><td colspan="2"></td></tr>
<tr><td>Asar</td><td>100</td><td colspan="2" rowspan="5">Using formula 5 liters per namazi for 20% of total Population of the scheme (CDA guidelines)
Namazi that perform wadu in mosques: =20% × prayer attendance per day =0.20*350=70
Per day water used for ablution: =Namazi that perform wadu in mosques × ablution water volume used per person = 70 × 5 = 350 Liters</td></tr>
<tr><td>Maghrib</td><td>100</td></tr>
<tr><td>Isha</td><td>40</td></tr>
<tr><td>Juma</td><td>500</td></tr>
<tr><td>Prayer attendance per day (excluding Juma prayer)</td><td>350</td></tr>
<tr><th colspan="4">Ablution Water Calculation from Medium Category Mosques</th></tr>
<tr><td>Mosque 02</td><td colspan="3">Allah Wali (Sector F-8/1, Islamabad)</td></tr>
<tr><td>Prayer Time</td><td>Prayer Attendance</td><td colspan="2">Water Consumption</td></tr>
<tr><td>Fajar</td><td>60</td><td>Source of water</td><td>Groundwater</td></tr>
<tr><td>Zohar</td><td>120</td><td colspan="2"></td></tr>
<tr><td>Asar</td><td>150</td><td colspan="2" rowspan="5">Using formula 5 liters per namazi for 20% of total Population of the scheme (CDA guidelines)
Namazi that perform wadu in mosques: =20% × prayer attendance per day =0.20*530=106
Per day water used for ablution: =Namazi that perform wadu in mosques × ablution water volume used per person = 106 × 5 = 530 Liters</td></tr>
<tr><td>Maghrib</td><td>150</td></tr>
<tr><td>Isha</td><td>50</td></tr>
<tr><td>Juma</td><td>800</td></tr>
<tr><td>Prayer attendance per day</td><td>530</td></tr>
<tr><th colspan="4">Ablution Water Calculation from Large Category Mosques</th></tr>
<tr><td>Mosque 03</td><td colspan="3">Noorani</td></tr>
<tr><td>Prayer Time</td><td>Prayer Attendance</td><td colspan="2">Water Consumption</td></tr>
<tr><td>Fajar</td><td>80</td><td>Source of water</td><td>Groundwater</td></tr>
<tr><td>Zohar</td><td>150</td><td colspan="2"></td></tr>
<tr><td>Asar</td><td>150</td><td colspan="2">Water Usage(Wadu)</td></tr>
<tr><td>Maghrib</td><td>250</td><td colspan="2" rowspan="3">Using formula 5 liters per namazi for 20% of total Population of the scheme (CDA guidelines)
Namazi that perform wadu in: =20% × prayer attendance per</td></tr>
<tr><td>Isha</td><td>200</td></tr>
<tr><td>Juma</td><td>1500</td></tr>
</table>

<table>
<tr><td>Prayer attendance per day</td><td>830</td><td colspan="2"><table><tr><td>mosques</td><td>day =0.20*830=166</td></tr><tr><td>Per day water used for ablution</td><td>=Namazi that perform wadu in mosques × ablution water volume used per person
= 166 × 5 = 830 Liters</td></tr></table></td></tr>
<tr><td>Mosque 04</td><td colspan="3">Usmania</td></tr>
<tr><td>Prayer Time</td><td>Prayer Attendance</td><td colspan="2">Water Consumption</td></tr>
<tr><td>Fajar</td><td>25</td><td>Source of water</td><td>Groundwater</td></tr>
<tr><td>Zohar</td><td>40</td><td colspan="2">Water usage</td></tr>
<tr><td>Asar</td><td>45</td><td colspan="2">Water Usage(Wadhu)</td></tr>
<tr><td>Maghrib</td><td>50</td><td colspan="2" rowspan="4">Prayer attendance per day × ablution water volume used per person
= 99× 5 = 495 Liters</td></tr>
<tr><td>Isha</td><td>30</td></tr>
<tr><td>Juma</td><td>400</td></tr>
<tr><td>Average</td><td>98.339</td></tr>
<tr><td>Mosque 05</td><td colspan="3">Govt. Hostel</td></tr>
<tr><td>Prayer Time</td><td>Prayer Attendance</td><td colspan="2">Water Consumption</td></tr>
<tr><td>Fajar</td><td>20</td><td>Source of water</td><td>Groundwater</td></tr>
<tr><td>Zohar</td><td>35</td><td colspan="2">Water usage</td></tr>
<tr><td>Asar</td><td>45</td><td colspan="2">Water Usage(Wadhu)</td></tr>
<tr><td>Maghrib</td><td>50</td><td colspan="2" rowspan="4">Prayer attendance per day × ablution water volume used per person
= 95× 5 = 475 Liters</td></tr>
<tr><td>Isha</td><td>70</td></tr>
<tr><td>Juma</td><td>350</td></tr>
<tr><td>Average</td><td>95</td></tr>
<tr><td>Mosque 06</td><td colspan="3">Noor Qadeemi</td></tr>
<tr><td>Prayer Time</td><td>Prayer Attendance</td><td colspan="2">Water Consumption</td></tr>
<tr><td>Fajar</td><td>35</td><td>Source of water</td><td>Groundwater</td></tr>
<tr><td>Zohar</td><td>60</td><td colspan="2">Water usage</td></tr>
<tr><td>Asar</td><td>40</td><td colspan="2">Water Usage(Wadhu)</td></tr>
<tr><td>Maghrib</td><td>55</td><td colspan="2" rowspan="4">Prayer attendance per day × ablution water volume used per person
= 112× 5 = 530 Liters</td></tr>
<tr><td>Isha</td><td>80</td></tr>
<tr><td>Juma</td><td>400</td></tr>
<tr><td>Average</td><td>111.67</td></tr>
<tr><td>Mosque 07</td><td colspan="3">Federal Lodges</td></tr>
<tr><td>Prayer Time</td><td>Prayer Attendance</td><td colspan="2">Water Consumption</td></tr>
<tr><td>Fajar</td><td>40</td><td>Source of water</td><td>Groundwater</td></tr>
<tr><td>Zohar</td><td>25</td><td colspan="2">Water usage</td></tr>
<tr><td>Asar</td><td>45</td><td colspan="2">Water Usage(Wadhu)</td></tr>
<tr><td>Maghrib</td><td>60</td><td colspan="2" rowspan="3">Prayer attendance per day × ablution water volume used per person
= 135× 5 = 675Liters</td></tr>
<tr><td>Isha</td><td>40</td></tr>
<tr><td>Juma</td><td>600</td></tr>
</table>

Average	135		
Mosque 08	**Al-Falah**		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	30	Source of water	Groundwater
Zohar	65	Water usage	
Asar	42	**Water Usage(Wadhu)**	
Maghrib	62	Prayer attendance per day × ablution water volume used per person = 150× 5 = 750Liters	
Isha	50		
Juma	650		
Average	149.83		
Mosque 09	**Faroqia**		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	25	Source of water	Groundwater
Zohar	60	Water usage	
Asar	70	**Water Usage(Wadhu)**	
Maghrib	60	Prayer attendance per day × ablution water volume used per person = 107× 5 = 662 Liters	
Isha	25		
Juma	400		
Average	106.67		
Mosque 10	**Tayyeba**		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	30	Source of water	Groundwater
Zohar	45	Water usage	
Asar	50	**Water Usage(Wadhu)**	
Maghrib	60	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	
Isha	35		
Juma	550		
Average	105.8		
Mosque 11	**Ghousia**		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	35	Source of water	Groundwater
Zohar	40	Water usage	
Asar	60	**Water Usage(Wadhu)**	
Maghrib	50	Prayer attendance per day × ablution water volume used per person = 89× 5 = 445 Liters	
Isha	80		
Juma	450		
Average	105.8		
Mosque 12	**Al-Habib**		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	150	Source of water	Groundwater
Zohar	200	Water usage	

Asar	250	**Water Usage(Wadhu)**	
Maghrib	400	Prayer attendance per day × ablution water volume used per person = 450× 5 = 2250 Liters	
Isha	200		
Juma	1500		
Average	450		
Mosque 13	**Al-Khizer**		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	45	Source of water	Groundwater
Zohar	80	Water usage	
Asar	100	**Water Usage(Wadhu)**	
Maghrib	100	Prayer attendance per day × ablution water volume used per person = 110× 5 = 540 Liters	
Isha	80		
Juma	800		
Average	105.8		
Mosque 14	**Qaderia**		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	30	Source of water	Groundwater
Zohar	60	Water usage	
Asar	70	**Water Usage(Wadhu)**	
Maghrib	100	Prayer attendance per day × ablution water volume used per person = 150× 5 = 650 Liters	
Isha	80		
Juma	550		
Average	105.8		
Mosque 15	**Al-Firdous**		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	25	Source of water	Groundwater
Zohar	60	Water usage	
Asar	50	**Water Usage(Wadhu)**	
Maghrib	50	Prayer attendance per day × ablution water volume used per person = 140× 5 = 530 Liters	
Isha	40		
Juma	600		
Average	105.8		
Mosque 16	**Amir Moavia**		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 160× 5 = 530 Liters	
Isha	80		
Juma	400		
Average	105.8		
Mosque 17	**Madni**		

Prayer Time	Prayer Attendance	Water Consumption	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person	
Isha	80	= 106× 5 = 530 Liters	
Juma	400		
Average	105.8		
Mosque 18	**Khalid Bin Walid**		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person	
Isha	80	= 140× 5 = 430 Liters	
Juma	400		
Average	105.8		
Mosque 19	**Makki**		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person	
Isha	80	= 160× 5 = 830 Liters	
Juma	400		
Average	105.8		
Mosque 20	**Al Mubeen**		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person	
Isha	80	= 140× 5 = 320 Liters	
Juma	400		
Average	105.8		
Mosque 21	**Imdadia**		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person	

Isha	80	= 160× 5 = 30 Liters	
Juma	400		
Average	105.8		
Mosque 22	**Al Mujtaba**		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person	
Isha	80	= 140× 5 = 530 Liters	
Juma	400		
Average	105.8		
Mosque 23	Babul Islam		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person	
Isha	80	= 140× 5 = 530 Liters	
Juma	400		
Average	105.8		
Mosque 24	Al Rashid		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person	
Isha	80	= 160× 5 = 530 Liters	
Juma	400		
Average	105.8		
Mosque 25	Sohaib Roomi		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person	
Isha	80	= 140× 5 = 530 Liters	
Juma	400		
Average	105.8		
Mosque 26	Jilani		
Prayer Time	**Prayer Attendance**	**Water Consumption**	

Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person	
Isha	80	= 160× 5 = 530 Liters	
Juma	400		
Average	105.8		
Mosque 27	Farooq-E-Azam		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person	
Isha	80	= 106× 5 = 530 Liters	
Juma	400		
Average	220		
Mosque 28	Al Hilal		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person	
Isha	80	= 110× 5 = 530 Liters	
Juma	400		
Average	320		
Mosque 29	Al-Kausar		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person	
Isha	80	= 120× 5 = 520 Liters	
Juma	400		
Average	220		
Mosque 30	Ashra Mubrsa		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person	
Isha	80	= 106× 5 = 530 Liters	
Juma	400		

Average	130		
Mosque 31	Ashmia		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 115× 5 = 575 Liters	
Isha	80		
Juma	400		
Average	115		
Mosque 32	Al Fateh		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	
Mosque 33	Rehmania		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	
Isha	80		
Juma	400		
Mosque 34	Al Saddique		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	
Mosque 35	Mujadadia		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	
Mosque 36	Zool Noorain		
Prayer Time	**Prayer**	**Water Consumption**	

	Attendance		
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 85× 5 = 425 Liters	
Mosque 37	Khalid Bin Walid		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 150× 5 = 750 Liters	
Mosque 38	Al Mujahid		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	
Mosque 39	Al Huda		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 535 Liters	
Mosque 40	Hanfia		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	
Mosque 41			
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	

Mosque 42	Mubeen	
Prayer Time	**Prayer Attendance**	**Water Consumption**
Fajar	20	Source of water | Groundwater
Zohar	35	Water usage
Asar	45	**Water Usage(Wadhu)**
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 180× 5 = 900 Liters
Mosque 43	Taquat Ul Eman	
Prayer Time	**Prayer Attendance**	**Water Consumption**
Fajar	20	Source of water | Groundwater
Zohar	35	Water usage
Asar	45	**Water Usage(Wadhu)**
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 190× 5 =950 Liters
Mosque 44	Aula	
Prayer Time	**Prayer Attendance**	**Water Consumption**
Fajar	20	Source of water | Groundwater
Zohar	35	Water usage
Asar	45	**Water Usage(Wadhu)**
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 90× 5 = 450 Liters
Mosque 45	Markaz (Lal)	
Prayer Time	**Prayer Attendance**	**Water Consumption**
Fajar	20	Source of water | Groundwater
Zohar	35	Water usage
Asar	45	**Water Usage(Wadhu)**
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters
Mosque 46	Syed Na Ali	
Prayer Time	**Prayer Attendance**	**Water Consumption**
Fajar	20	Source of water | Groundwater
Zohar	35	Water usage
Asar	45	**Water Usage(Wadhu)**
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters
Mosque 47	Ahle-Hadith	
Prayer Time	**Prayer Attendance**	**Water Consumption**
Fajar	20	Source of water | Groundwater
Zohar	35	Water usage
Asar	45	**Water Usage(Wadhu)**

Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	
Mosque 48	Khlulafa E Rasdeen		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 170× 5 = 8500 Liters	
Mosque 49	Madina		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 150× 5 = 750 Liters	
Mosque 50	Muhammadi		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	
Mosque 51	Rehmania Aabpara		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	
Mosque 52	Imam-Us-Sadiq		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	
Mosque 53	Al-Shoudha		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater

Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	
Mosque 54	Baghdadi		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 154× 5 = 770 Liters	
Mosque 55	Danus Salam		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	
Mosque 56	Aleemia		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	
Mosque 57	Khiza		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	30	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	
Mosque 58	Shamsul Arfeen		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	40	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	
Mosque 59	Asna Ashri		
Prayer Time	**Prayer**	**Water Consumption**	

	Attendance		
Fajar	60	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 210× 5 = 1050 Liters	
Mosque 60	Farooq-E-Azam		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	35	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 180× 5 = 900 Liters	
Mosque 61	Al-Kausan P.Clinic		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	
Mosque 62	Syed Na Hasan		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	45	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	
Mosque 63	Ibrahim		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	40	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 110× 5 = 550 Liters	
Mosque 64	Quba		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	95	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	

Mosque 65	Toor	
Prayer Time	**Prayer Attendance**	**Water Consumption**
Fajar	20	Source of water | Groundwater
Zohar	35	Water usage
Asar	45	**Water Usage(Wadhu)**
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 200× 5 = 1000 Liters
Mosque 66	Taqwa	
Prayer Time	**Prayer Attendance**	**Water Consumption**
Fajar	20	Source of water | Groundwater
Zohar	35	Water usage
Asar	45	**Water Usage(Wadhu)**
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 120× 5 = 600Liters
Mosque 67	Bilal	
Prayer Time	**Prayer Attendance**	**Water Consumption**
Fajar	20	Source of water | Groundwater
Zohar	35	Water usage
Asar	45	**Water Usage(Wadhu)**
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters
Mosque 68	Grave Yard	
Prayer Time	**Prayer Attendance**	**Water Consumption**
Fajar	20	Source of water | Groundwater
Zohar	35	Water usage
Asar	45	**Water Usage(Wadhu)**
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters
Mosque 69	Taqwa	
Prayer Time	**Prayer Attendance**	**Water Consumption**
Fajar	20	Source of water | Groundwater
Zohar	35	Water usage
Asar	45	**Water Usage(Wadhu)**
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 110× 5 = 550 Liters
Mosque 70	Ghulshan-E-Mustafa	
Prayer Time	**Prayer Attendance**	**Water Consumption**
Fajar	20	Source of water | Groundwater
Zohar	35	Water usage
Asar	45	**Water Usage(Wadhu)**

Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	
Mosque 71	Qutab Shaheed		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 250× 50 = 150 Liters	
Mosque 72	Al-Rahim		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 220× 5 = 1100 Liters	
Mosque 73	Al-Raza		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	
Mosque 74	Talha		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 53 Liters	
Mosque 75	Al-Noor		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	
Mosque 76	Ghousia		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater

Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 106× 5 = 530 Liters	
Mosque 77	Al-Murtaza		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 17× 5 = 875 Liters	
Mosque 78	Zahra		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 225× 5 = 1125 Liters	
Mosque 79	Saad Bin Abi Waqas		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 350× 5 = 1750 Liters	
Mosque 80	Ghousia 1		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 140× 5 = 700 Liters	
Mosque 81	Fire Brigade		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 113× 5 = 565 Liters	
Mosque 82	Ghousia 2		
Prayer Time	**Prayer**	**Water Consumption**	

	Attendance		
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 170× 5 = 850 Liters	
Mosque 83	Hanfia		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 220× 5 = 1100 Liters	
Mosque 84	Madni		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 130× 5 = 650 Liters	
Mosque 85	Siddiquia		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 150× 5 = 750 Liters	
Mosque 86	Hanfia		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 98× 5 = 420 Liters	
Mosque 87	Al-Hira		
Prayer Time	**Prayer Attendance**	**Water Consumption**	
Fajar	20	Source of water	Groundwater
Zohar	35	Water usage	
Asar	45	**Water Usage(Wadhu)**	
Maghrib	55	Prayer attendance per day × ablution water volume used per person = 110× 5 = 550 Liters	

Looking at the information in the Tables, one-month water consumption in all the 87 mosques can be calculated by using the following equation: (Detailed calculation in Annex. B)

Number of mosques users/month × ablution water volume used/person.= 272700 people /month × 5 liters = 1363500 liters/month = 1363.5 m^3/ month.

The average liters of water required for a single Wadu act is 5 liters.

The objective of the data collection is to calculate the water used for ablution in every mosque.

Possible methods of reprocessing of groundwater can be deduced from analysis.