

Assessment of Domestic Water Consumption Quantity in The Jalalabad City, Afghanistan

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1. Abstract

Access to a suitable water quantity to fulfill daily water needs is right of every human being. Defining the required demanding water quantity is very significant for a water supply department. In case of Jalalabad city, it is still a challenge to The Water Supply Department and supporting donors & organizations that how much optimize and suitable quantity of water to be delivered to each household in the city to satisfy the residents' needs.

General methodology to determine the required water demand for drinking, cooking, bathing, laundry and sanitation purposes, different areas were targeted in Jalalabad city for conducting questionnaire survey base on the type of water sources they have access to. According to the Jalalabad city current situation, access to the domestic water sources were divided into the four different categories, namely PTW, PTW+PW, PHP and Neb. During assessment, various factors were considered for identification and evaluation of domestic water quantity such as: household income level, household size etc. Moreover, some data were collected from the supporting organizations and donor.

The result of the study reveal that the actual optimize average domestic water demand is 49.7 LPCD. In details 50.7, 52.9, 38.1 and 32.3 LPCD for PW, PTW+PW, PHP and Neb respectively. The household water consumption for drinking, cooking and laundry are 4.1, 14.3 and 14 LPCD respectively. Average bathing frequency per week is 3.4 times and cloth washing are 3.3 for all kinds of categories.

Key words: Water, Quantity, consumption, source, assessment.

2. Introduction

The existing city of Jalalabad, the third largest city in Afghanistan was initially established by Jalaludeen Akbar Khan. In Afghanistan, the Ministry of Urban Development (MoUD) is in charge of development and management in urban circumstances for water and sanitation. It has a branch called the Central Authority for Water Supply and Sanitation (CAWSS). Water supply network covered almost 38% of the city area. But, there is no sewerage system in Jalalabad city yet. Unlike other cities.

Water supply department is accountable to evaluate and define the demand of required water for drinking, bathing, dish washing, laundry, cleaning and other purposes to deliver suitable water quantity on time to each connection. Before investigation and accessibility to such kind of data, water supply organizations cannot make any decision regarding quantity of supplying water.

Access to water is inextricably related to other human rights, including the right to health, the right to housing and the right to adequate food. As such, it is part of the assurances essential for human survival. Governmental and non-governmental actors have responsibilities in accomplishing the right to water.

Most of the city people do not have access to water supply network. They receive water from other sources for their domestic uses. During internal conflicts JWSD hasn't only been unable to develop, but also lost its some of the previous fittings due to instances of wars and bombs blast.

Still no investigation and evaluation has been performed for defining water consumption and demand for several purposes in the Jalalabad city. Almost all donors and water supply organizations use various numbers of water quantities in their projects. However, the suitable water demand for different purposes at the Jalalabad city or in Afghanistan is still unknown and remaining as mystery and problems for the most of water supply projects.

The demand for fresh drinking water is increasing mainly because rapid growing population and the return of emigrants to Jalalabad city. The city is expanding and some agriculture and rural areas are included into the municipal area. In addition to that, Jalalabad city has a larger area of informal settlement which is constructed due to various effects of conflict situation in the area. Most of the informal settlement areas are located around the city. The city is almost located at lower area of the province, but southern part of the city is hilly area where the water table is lower than other areas of the city.

2.1 Statement of the problem

Secrecy of fresh and clean water is a major problem between developing countries and around the world. More than 1.1 billion people do not have access to clean water in the world. In Afghanistan 52% of population don't have access to improved drinking water sources Out of which 32% are in urban and 61% live in rural areas. (WHO and UN ICEF, 2010). Jalalabad city with population of 232901 suffer from lack of access to safe drinking water. Urbanization and rapid growth of population are factors which affecting the water demand. Furthermore, returning of refugees who have immigrated to outside the country and as well as Internally Displaced Persons (IDPs) are the other factors creating pressure for demand to safe drinking water.

As the service of JWSD is limited consequently people collect water from other sources such as private tube well, hand pumps, from neighbor water source etc. Furthermore, this not known that how much amount of water they receive from pipe water and how much amount of water from they take from their private source where water supply network is distributed for their domestic uses.

However, still JWSD, donors and supporting organizations do not know that how much water quantity and on which frequency is required to be delivered to the consumers. This is somewhat is most significant for development and implementation of water supply projects in the major cities of Afghanistan. Therefore, decision is made to assess and evaluate existing water consumption for various purposes in the Jalalabad city.

2.2 Objectives of the study

The main objective of the study is to assess the current domestic water demand for several purposes. The specific objectives of the study are as follows:

- To assess the existing domestic water consumption for various purposes in the Jalalabad city both in covered and uncovered area.
- To forecast water demand drinking, cooking, bathing, laundry and sanitation

2.3 Restriction of the research:

Following limitations has affected the research accuracy and result reliability:

- Lack of availability of adequate data and information with supporting agencies, donors and JWSD for assessment of existing water consumption and forecasting future demand.
- Low assistance from government and non-government organization and local people during collecting data and performing questionnaire related assignments.

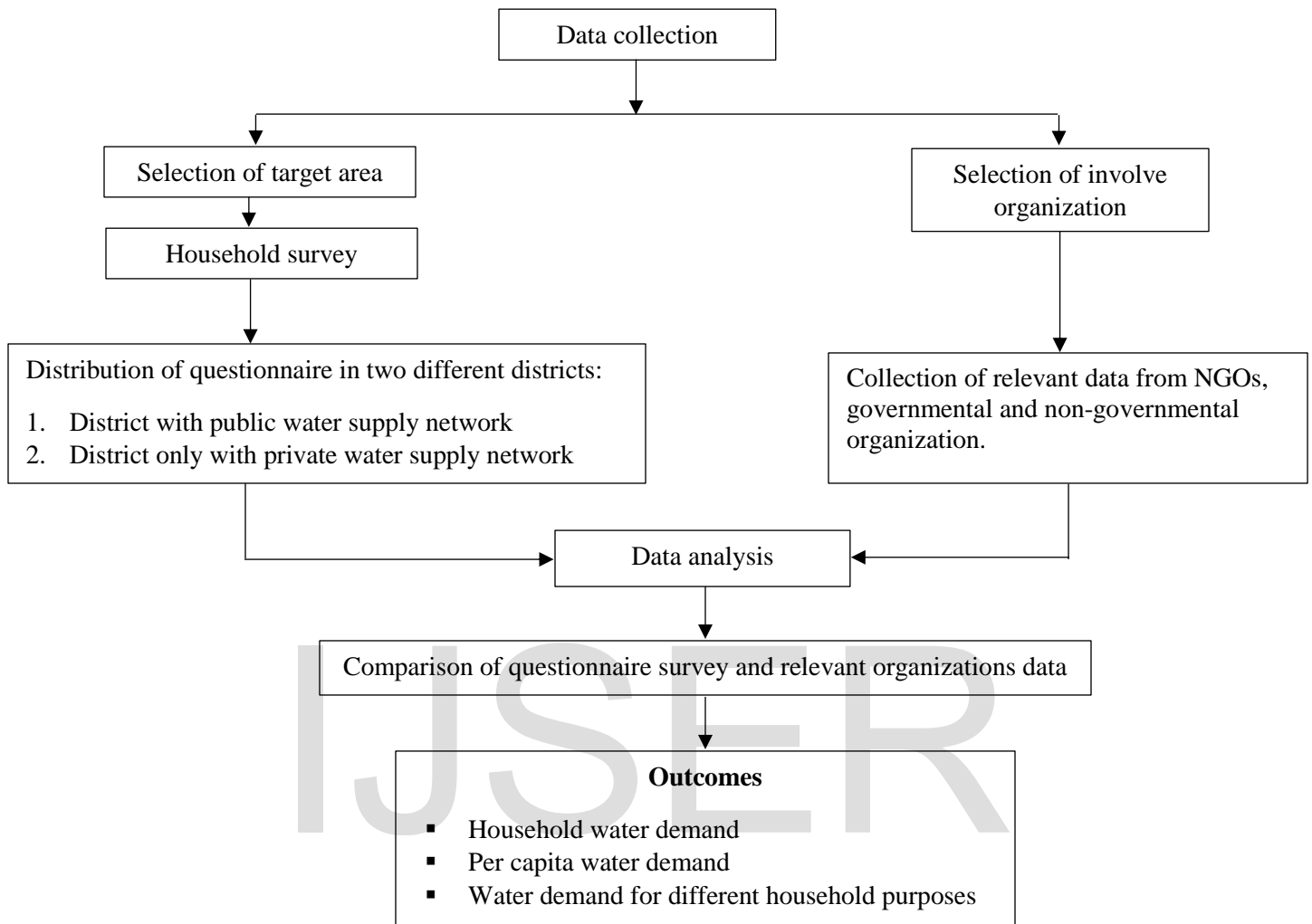
3. Research Methodology

The general framework of methodology will be adopted to achieve the objectives of this study is described in figure 3.1

3.1 Field survey and data collection

The most significant task in a research work is data collection availability and its accessibility. Required data is achieved according to the logical frame work which is shown in figure 4.1. The selection of relevant data is vital and decision should be sensibly made what kind of data within which time series are required to attain the planned objectives of the research.

To obtain the objectives of the research, two kinds of sources were targeted, local people and water supply engaged organizations such as: Jalalabad Municipality, Ministry of Urban Development (MoUD), Irrigation department, Ministry of Water and Energy (MoWE), Ministry of Mining (MoM), Education department, and Central Statistic Office (CSO), Afghanistan Information Management System (AIMS-Jalalabad), etc. Also, we have contacted with some other UN aid agencies and NGOs such as WHO, UN-HABITAT, FAO, UNHCR, DACAAR, USAID, etc.



3.2 Area selection

Jalalabad city is not under full coverage of water supply network. Therefore, both areas were targeted, area with water supply network and area without water supply network. For more precision and attention each respondent was interviewed face to face. Table 4.1 in the annexes shows the number of questionnaires and its locations which were distributed.

3.3 Questionnaire

The questionnaire was arranged in English language and while directing survey it was explained to Pashto language. To collect the relevant data different sources were questioned in Jalalabad city and as well as in Kabul. In addition, some preceding reports published by several NGOs associated to study were found.

4. THE STUDY AREA

This chapter discusses the general information, geographical and socioeconomic information of the study area in order to know the basic features of the research area.

4.1 Nangarhar province/Jalalabad city

Jalalabad city is located at the eastern region of Afghanistan. Jalalabad is the center of Nangarhar province. Jalalabad is the almost third large city in Afghanistan as well as the center of its social and business activity because of its boundary to. It has 6 sub-districts with almost a total land area of 128 square kilometers.

4.2 Population

Jalalabad city population is growing rapidly because of urbanization, returning of refugees, internal displacement persons (IDPs). Jalalabad has a registered population of 232901 (in 2016) as mentioned earlier with 19113 households in the city on an average of 8 members per household.

4.3 Climate

Jalalabad city has a hot desert climate. It has 152 to 203 mm annual rainfall rate which are limited to winter and the months of spring. Ices are not common, and during the summer, the maximum heat temperature can rise up to the 49 °C (120 °F). The north part of the city has lower elevation which is welcoming places to winds from the north and west cooling the parts in summer months. Jalalabad has the highest relative humidity in summer.

4.4 Water Resources:

4.4.1 Surface water: Jalalabad has two foremost rivers as drinking water source and an artificial irrigation canal which is feasible to be utilized as drinking water source: Kabul river, Kunar River and the NVDA Canal.

4.4.2 Ground Water

Jalalabad city is positioned in Kabul river basin. There are four main Quaternary and Neocene aquifer systems in the Kabul River Basin. Where the city is located at the Jalalabad Basin.

The main source of drinking water is deep wells. From the DACAAR Eastern Region report, almost 18 percent of DACAAR’s wells (mostly hand dug to 1 to 1.5m below the water table) have dried up over the past 1.5 years (report date April 2002). According to the Shobair report of groundwater use of Kabul river basin, Nangarhar province use its groundwater as described in table 4.1.

Table 4.1

Springs			Karezes			Shallow wells			Total groundwater	
No.	Area (ha)	%	No.	Area (ha)	%	No.	Area (ha)	%	Area (ha)	Percent from GW
210	4,360	10.3	495	9,450	22	15	10	0	13820	33

Source: Shobair 2001

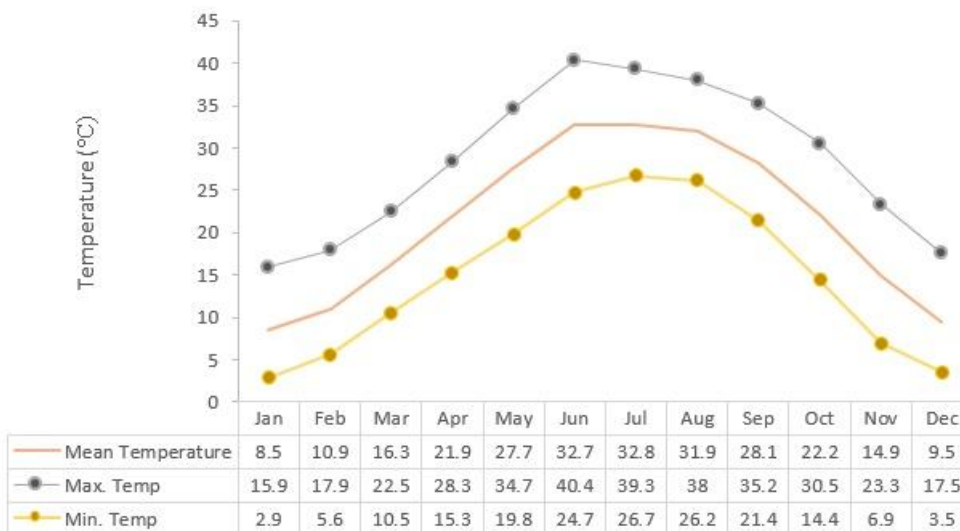


Figure 4.2: Monthly mean, maximum and minimum temperature of Jalalabad. Data Source: WMO, 1961-1990.

5. ASSESSMENT OF DOMESTIC WATER CONSUMPTION

The main objective of the research was to evaluate the present domestic water quantity for various purposes at the city. Additionally, to observe the impact of several factors on domestic water consumption such as household income, household size, household water source accessibility, and domestic water affordability.

5.1 Household Size

The questionnaire was contained information about the socioeconomic, source of water and water use in details. In the study area, eighty (80) households were surveyed and out of them 58 (72.5%) were found single households and 22 (27.5%) multiple households. According to survey 6.1 persons per single house and 12.2 persons per multiple house. To understand the relation between water consumption and household size, the study was performed for four kinds of consumers specifically PW+PTW, PTW, PHP and Neb. The results are shown in figure 6.1. The figure exposes that there is a trend of decreasing water consumption per capita per day with increasing the number of people in a household. In Figure 5.1, people who had household of 7 persons less or equal used 54.4 lpcd which was 1.04 times more than a household who has more than 7 persons which used 52.0 lpcd.

5.2 Household Income

It has been exposed that there is an optimistic relation between water consumption and household income. Household income has a dynamic impact on water consumption quantity. Residents of Jalalabad city have diverse professions and duties. The result of income level is summarized in Appendixes.

The highest average amount of water consumption was 91.0 lpcd with 1492 USD household income (See appendixes). Household size and household income has more impact on water consumption. For instance, their average monthly income of PW+PTW was 610.3 USD. 36.4 percent of them take bath with shower and the rest with bucket. Moreover, 65.0 percent of the

respondent used to wash their cloth by machine and 35.0 percent and the remaining by hand.

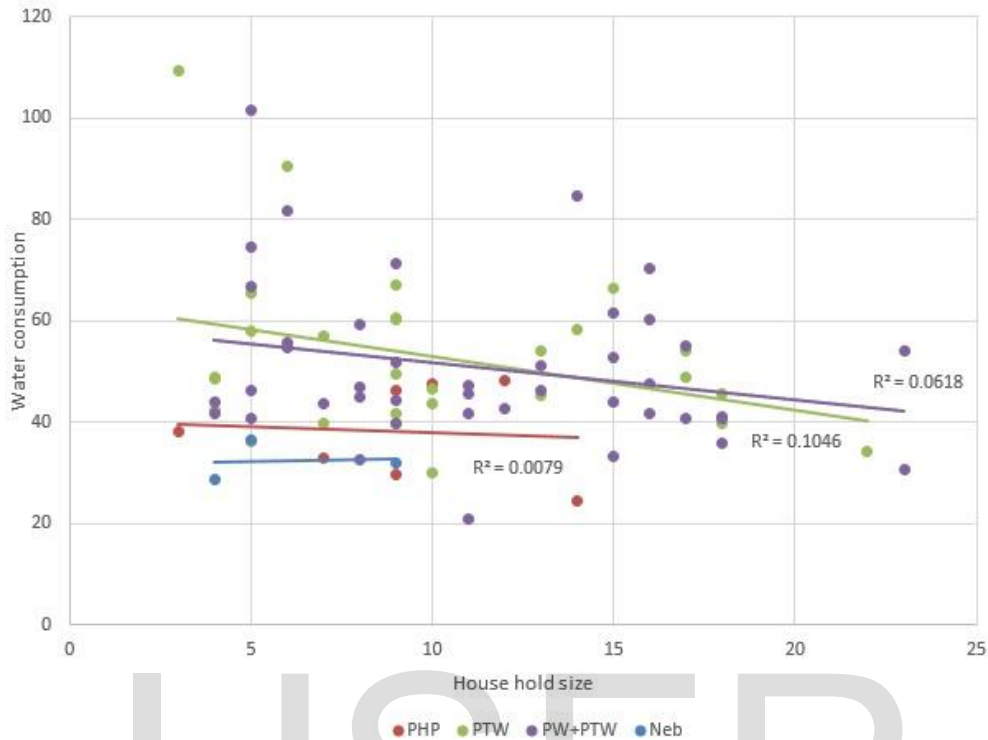


Figure 5. 1 Household water consumption vs household size for three categories: PW+PTW, PTW, PHP, Neb. Vast

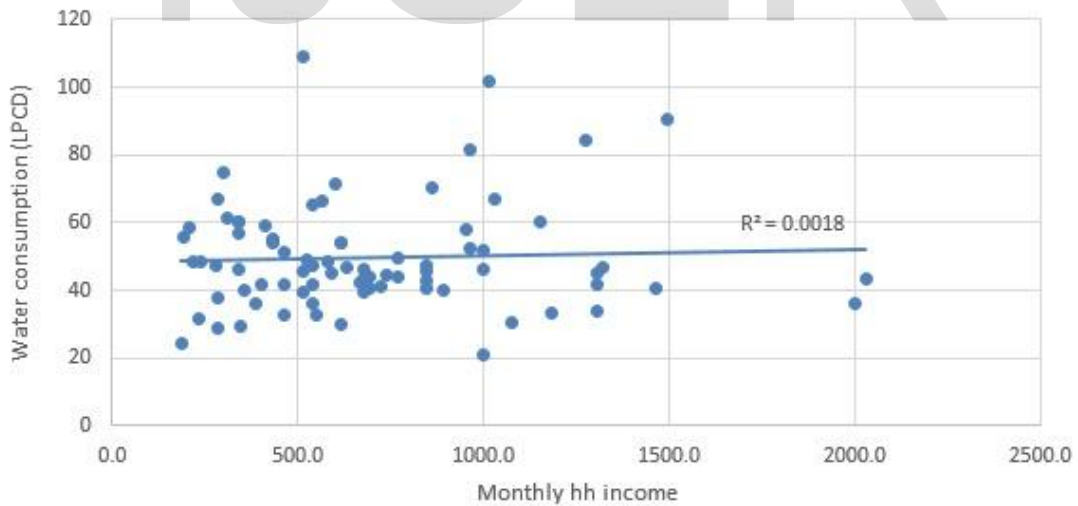


Figure 5.2 Monthly mean household water consumption vs affordability urban income.

To expose the relation two groups were selected, PTW+PW and PTW to be investigated. The relation and result are explored in figure 5.3.

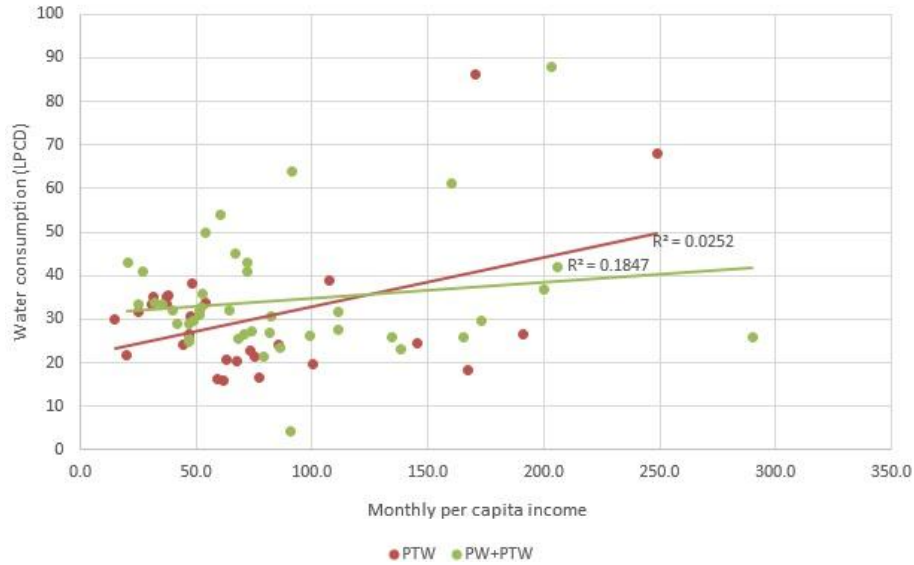


Figure 5.3 Monthly per capita income vs water consumption for 2 categories.

5.3 Household water cost

Most of the city houses have their own tube well and collect most of the water from their own source. The water cost diverse for each group based on source, income and time of water collection for people who collect water from PHP and Neb. People who collect water from PHP and Neb are the poorest group.

5.4 Household water sources and accessibility

Most of the Jalalabad city residents and commercial owners depends up on their own sources. Groundwater is the only source of water for domestic water supply in Jalalabad. But, drought and more water extraction suffered Nangarhar province groundwater and caused water table dropping in the city and surrounding areas. The various sources of water utilized by households in Jalalabad city are mainly are summarized in table 4.3. Over 90 percent of Jalalabad city people has their own water source and No family depends only on pipe water (PW).

Table 5.2. Details of study area water sources

Source of water	Number	Percentage
PW+PTW	42	52.5%
PTW	28	35.0%
PHP	7	8.75%
Neb	3	3.75%
Total	80	100%

5.5 People utilizing pipe water with private tube well (PW+PTW)

PW+PTW contains almost 52.5 percent of the targeted area who has access to pipe water. This group consume an average of 50.7 lpcd which average cost is 0.25 USD per cubic meter. According to the survey the average monthly household income for this group was 840.8 and their monthly household water costs is 6.1 USD. In terms of income and water consumption this group is the highest among all categories. Moreover, the influence of income which consequently exaggerated the end use water practices at household level. 18 households out of 42 households

had shower and the remaining 24 used to take bath with using water from bucket and averagely they bath 4 days per week. For laundry 62.0 percent used to wash clothes by machine and 38.0 percent by hand.

5.6 Households who utilize water from their private tube well (PTW)

This group received almost 100 percent water from their own private tube well. The daily average water consumption is 52.9 lpcd with an average unit cost of 0.26USD per cubic meter. The average monthly income of this group is 610.3 USD and their average monthly water expenses is 7.7 USD. Outof 28 households of this group 9 households had shower and the rest of them take shower with bucket with four times bath per week. For laundry 50.0 percent used to wash clothes by machine and 50.0 percent by hand.

5.7 People collecting water form public hand pumps (PHP)

Due to new electrical supply to the Jalalabad city, use of hand pump is decreased. Because, this group almost made about 8.75 percent of the of the target area. But, last over 15 years' development of new government the number of household private tube well is increasing and user of public hand is decreasing in the Jalalabad city. The average amount of water consumption for this group is 38.1 lpcd. The average monthly income is 304.4 USD. Outof 7 households of this group 1 household had shower and the rest of them use bucket with three times frequency per week. For laundry only one house use machine for cloths washing and 6 remain use to wash cloths by hands.

5.8 People utilizing water from their neighbor (Neb)

This category type households do not have their own water source or property. They had temporary settlement in the area or do not had affordability for construction of water source. Therefore, most of them relay on their neighbor water source with free cost, whatever it is. This category makes up 3.75 percent of the targeted area. They have a daily average water consumption of 32.3 lpcd. The average monthly income of this group is 304.4 USD with standard deviation of 164USD. Most them use bucket for bathing and had simple latrine.

6. Summary:

Providing of safe potable water with suitable amount to fulfill daily demand is one of the significant responsibilities of a water supply system. Most of developing countries have been suffering from lack of adequate amount of required water and a sufficient system of water supply. The state of drinking water is constrained in Afghanistan.

This research and study has evaluated the domestic water consumption per capita per day and detail water consumption for drinking, cooking, bathing, laundry and sanitation at the Jalalabad city, Afghanistan. A questionnaire survey was performed both areas with JWSD coverage and areas out of JWSD coverage. All targeted areas' houses were categorized in four main groups namely PW+PTW, PTW, PHP and the people who receive water from Neighbor (Neb).

In the study effects of various factors such as household income, household size, household head's education, water price, household water affordability and household water source accessibility were assessed and investigated on water consumption. The most governing factors among above mentioned factors were accessibility to adequate water source and household income. A tendency decreasing water use per capita per day was observed with increase of household size. The study exposed and found that domestic water consumption for PW+PTW,

PTW, PHP and Neb are 50.7, 52.9, 38.1 and 32.3 LPCD respectively with average amount of 49.7 LPCD. The key point was the water cost per liter which is 0.01643 USD for those people who has access to the piped water. This quantity is very low against their income level which is nearly 2 percent of household income. This is important for planning and policy making.

Following outcomes are prepared and stated base on the study results:

Base on study investigation is has been found that people who have access to piped water (PW) use more than 1.4 times water per capita per day compare to the people who have not access to piped water. As the result of study, the most affecting factor on water consumption was household income. Low income household survived only on 32.2 liter per capita per day with higher opportunity cost and the high-income people consume 109 liters per capita per day buy pay less than poor people and consume more water than poor people. Moreover, in some cases it was found that the per capita water consumption is more influenced by the accessibility compared to the household income.

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Note: Annexes are attached with paper which include data and calculation sheet.