PALESTINE POLYTECHNIC UNIVERSITY

HEBRON- WEST BANK

PALESTINE

COLLEGE of ENGINEERING and TECHNOLOGY

CIVIL & ARCHITECTURAL ENGINEERING DEPARTMENT

Impact of lack infrastructure (waste water network) on life situation and possible engineering solution for AL-Obaidia area in Bethlehem

BY

Nedal Adwan **Mohammad Hasasneh**

A PROJECT REPORT SUBMITTED in PARTIAL FULFILLMENT of THE REQUIREMENTS for THE DEGREE of

BACHELOR of ENGINEERING

in

CIVIL & ARCHITECTURAL ENGINEERING DEPARTMENT

Project Supervisor

Eng. Nibal Albatsh

2019, Jul

CERTIFICATION

Palestine Polytechnic University

(PPU)

Hebron- Palestine

The Senior Project Entitled:

Impact of lack infrastructure (waste water network) on life situation and possible engineering solution for AL-Obaidia area in Bethlehem

Prepared By:

Nedal Adwan **Mohammed Hasasneh**

In accordance with the recommendations of the project supervisor, and the acceptance of all examining committee members, this project has been submitted to the Department of Civil and Architectural Engineering in the College of Engineering and Technology in partial fulfillment of the requirements of the department for the degree of Bachelor of Science in Engineering.

الإهداء :

بتوفيق من الله وبتيسير منه تم إنجاز مشروع التخرج، وأهدي هذا الإنجاز المتواضع:

إلى منارة العلم والإمام المصطفى إلى الأمي الذي علم العالمين إلى سيد الخلق إلى رسولنا الكريم سيدنا محمد صلى الله عليه وسلم.

والى من هم أكرم منا جميعا من رووا بدمائهم الزكية ثرى الأرض الطهور فلسطين ، والى الذين قضوا زهرات حياتهم في سجون المحتلين.

إلى من كان دعائهم سر نجاحي وبلسم جراحي... إلى ينبوع الأمل والتفاؤل في حياتي... إلى كل من في الوجود بعد الله ورسوله... أمي وأبي الغاليين.

إلى سندي وقوتي... إلى من أظهروا لي ما هو أجمل من الحياة... إلى حلو الحياة رغم مرارتها... إلى من أفتخر بوجودهم معي... إخوتي الأعزاء.

إلى من لم يبخلوا علي بحبهم وودهم... إلى أشخاص طيبين لن يكررهم التاريخ... إلى أطيب من في الوجود...الأهل والأقارب كل باسمه ولقبه.

إلى من تذوقت معهم أجمل اللحظات... إلى من ولدتهم لي الأيام...الزملاء والزميلات.

فريق العمل :

محمد حساسنة

نضال عدوان

ACKNOWLEDGEMENT

Thanks

Thanksgiving, thanks to the first and last to God, who does not pay the moments except by mentioning, and does not wait for the Hereafter only with his hands, Praise be to God a lot of good praise until the praise of the end.

We wish to express our deep and sincere thanks and gratitude to Palestine Polytechnic University, the Department of Civil & Architectural Engineering, College of Engineering & Technology. We wish to express our thanks to Eng. Nibal Albatsh, for a valuable help, encouragement, supervision and guidance in solving the problems that we faced from time to time during this project.

Work Team :

Mohammed Hasasneh

Nedal Adwan

ABSTRACT

Impact of lack infrastructure (waste water network) on life situation and possible engineering solution for AL-Obaidia area in Bethlehem

Prepared By:

Nedal Adwan **Mohammed Hasasneh**

SUPERVISED BY:

Eng. Nibal Albatsh

Sewage water caused many of diseases like colira, malaria and others. Also it has many issued like bad smell that cause disturbance for the people in the
region. from this point, a sanatiry network should be provide to satisfy a safe place for people without any type of pollution, therefore our project aid to collect & transfer and dispose of these water by using correct
and safe method.
As a result of previous the idea come to plan and design a sanatiry network that serving all the region, in this project we are going to focus on many important things:

- number of people that network serve and avarege person water consumption daily and know time period that network be able to carry water there.
- region topography through which we can determine flow direction of sewage water.
- network servicability for all buildings also low cost for network implementation.

For network design we are going to relies on many programs like Autocad & SewerCad & Excel and SPSS.
We are going to draw profiles for network lines that explain excavation depths & pipes diameter & flow quantity in each line.
Finally, we choose a region for drainage outcome water from network, at lowest point in the region far away where people live.

TAPLE OF CONTENTS

LIST of TABLE

LIST OF FIGURES

Introduction

1.1 Introduction in Urban Wastewater System :

The Council of the European Communities Directive- CEC (1991) defines the urban wastewater as domestic wastewater or that water resulted from mixing domestic with industrial wastewater (and / or) storm water runoff.

In particular, the two expressions “Wastewater” and “Sewage” are perplexing due to 'run-off' entity. The first one (Wastewater) is used in USA; while the second ‘Sewage’ is more common in the UK, but the two expressions are used ultimately as synonyms. Furthermore, the difference between run-off sewage and sanitary sewage is that the latter consists of domestic and industrial wastewater (CEC, 1991).

An Urban Wastewater System (UWwS) is composed mainly of three components; the Sewer Network, the Wastewater Treatment Plant (WwTP) and the Water Receiving System (e.g. Rivers or lakes) as well. The UWwS usually has links with other urban water components such as rural streams, groundwater, drinking water production and supply as well as agricultural runoff (CEC, 1991).

The use of wastewater has the potential both to be used as a good fertilizer, since its considered a source of organic matters and plant nutrients (positive externality), as well as groundwater resources polluter with potentially harmful substances including soluble salts and heavy metals like Cu^{+2}, Fe^{+2}, Pb^{+2}, Zn^{+2}, Mn^{+2}, Cd^{+2} and others (negative externality). Most of these heavy metals such as Cu and Zn contain high concentrations of odor metals and toxicity hazards compared to very low concentrations of required materials for all living organisms (Nouri et.al., 2006).

Using of these heavy metals is undesirable; despite its harmful effects like contamination by heavy metal of soil, crops and different environmental and health negative issues, many farmers using irrigation by wastewater for many reasons like: increasing crop yield, effective way of effluent disposal, low cost source of water, organic matter and nutrient source as well as other reasons (Butt et.al., 2005).

To this extent, the deterioration in water quality is resulted by industrial waste or domestic wastewater, microorganisms in addition to a high concentration of toxic chemical (Khan & Javed, 2007). Other studies reveal that heavy metals resulted from human activities such as industrial activities, automobiles, batteries, tires and wastewater disposal (Miroslav, 2008).

Using wastewater for irrigation contaminates the soil and crops and resulted in plants toxicity and decay of soil (Butt et.al., 2005). One of the most serious polluters that is affecting the fresh water resources is the disposal of domestic and industrial wastewater, it's also affecting human health and agricultural productivity. This problem aggravates in urban and industrial areas, where rapid water quality deterioration may result in different waterborne diseases (Kahlown et.al., 2006).

The fresh water scarcity has resulted in using wastewater for agriculture and related activities in many countries in the arid and semi-arid region. Irrigation by Sewage effluents goes back to 2500 years ago in Iran (Vojdani, 2006). Currently this practice is common in different parts of the world (Hoek et.al., 2002).

Das & Das (2002) found that the natural treatment process of industrial effluent and municipal wastewater could be an innovative process to meet the growing needs of water. The plants' uptake nutrients (nitrate, phosphate, etc.) while soil adsorb the toxic inorganic/organic substances and microbes, this makes it harmless to some extent. However, soil and vegetation have a limit to absorb these contaminants, thus, waste should be given a primary treatment before its disposal. Septic Tanks are widely distributed creating a potential source of ground water pollution in urban settlements.

Enough safe distance should be maintained between drinking water sources and treatment units, to avoid recontamination by accidental discharge. To decide this distance, both soil types and existing hydrogeological conditions should be taken into consideration (Das&Das, 2002). Despite Actions promoting wastewater reuse are common, there is a clear shortage of human health and the environment protection frameworks in most developing countries (Hanjra et.al., 2011).

1.2 Types of wastewater :

The wastewater include: domestic wastewater from households, municipal wastewater from communities and industrial wastewater from industrial activities (World Health Organization, 2006).

domestic wastewater include:

1- Blackwater: is the mixture of Urine, Faeces and Flushwater along with Anal Cleansing Water (if water is used for cleansing) and/or Dry Cleansing Materials, Blackwater contains the pathogens of Faeces and the nutrients of Urine that are diluted in the Flushwater. (Tilley, E.; Ulrich, L.; Lüthi, C.; Reymond, Ph.; Zurbrügg, C. *Compendium of Sanitation Systems and Technologies* (2nd Revised ed.))
2- Greywater: is the mixture of Faeces and Flushwater, and does not contain Urine. It is generated by Urine-Diverting Flush Toilets , therefore, the volume depends on the volume of the Flushwater used. The pathogen and nutrient load of Faeces is not reduced, only diluted by the Flushwater. Brownwater may also include Anal Cleansing Water (if water is used for cleansing) and/or Dry Cleansing Materials. (Tilley, E.; Ulrich, L.; Lüthi, C.; Reymond, Ph.; Zurbrügg, C. *Compendium of Sanitation Systems and Technologies* (2nd Revised ed.))
3- Surplus manufactured liquids from domestic sources (drinks, cooking oil, pesticides, lubricating oil, paint, cleaning liquids, etc.).

industrial wastewater include: (World Health Organization, 2006).

1- Industrial site drainage.
2- Industrial cooling waters.
3- Industrial processing waters. Organic or biodegradable waste including waste from hospitals, abattoirs, creameries, and food factories.
4- Produced water from oil & natural gas production.

1.3Pollutants of Wastewater :

The composition of wastewater varies widely. This is a partial list of pollutants that may be contained in wastewater: (World Health Organization, 2006).

1. **Chemical or physical pollutants :**
   1.1 Heavy metals, including mercury, lead, and chromium.
   1.2 Organic particles such as feces, hairs, food, vomit, paper fibers, plant material, humus.
   1.3 Gases such as hydrogen sulfide, carbon dioxide, methane.
   1.4 Pharmaceuticals and hormones and other hazardous substances.
   1.5 Soluble inorganic material such as ammonia, road-salt, sea-salt, cyanide, hydrogen sulfide, thiocyanates, thiosulfates.

2. **Biological pollutants :**
   1.1 Bacteria (for example Salmonella, Shigella, Campylobacter, Vibrio cholerae).
   1.2 Viruses (for example hepatitis A, rotavirus, enteroviruses).
   1.3 Parasites such as helminths and their eggs (e.g. Ascaris (roundworm), Ancylostoma (hookworm) and Trichuris (whipworm)).

1.4Wastewater in Palestine :

Untreated wastewater is one of the most important sources of water pollution in the West Bank and the Gaza Strip because it flows through open channels through populated areas and agricultural areas.

Control of wastewater discharge and treatment in the West Bank and Gaza Strip is important for the safety of the environment. The untreated wastewater is estimated at 90% of the total quantity of wastewater. (Wafa News Agency, 2/8/2019)

Wastewater in the West Bank:

In the West Bank, sewage networks do not serve more than 30% of the population, while 70% of them rely on special cesspits used to collect wastewater. After filling, these pits are transported through tanks to be delivered in empty areas or valleys. There are no precise sources of wastewater in the West Bank, but some researchers have estimated 8.5 million cubic meters in 1994, and will rise to 92 million cubic meters in 2010, as per capita daily consumption of water will reach 122 liters to increase by 20% annually with the assumption that between 80% to 85% of the amount of waste water goes as waste water. Wastewater in the West Bank is treated only in small quantities. (Wafa News Agency, 2/8/2019)

Wastewater in the Gaza Strip:

Sewage networks in the Gaza Strip cover 60% of the housing, while 40% rely on cesspits, from which wastewater flows into groundwater. 80% of the wastewater goes to the sea, and the remaining 20% leaks. To the groundwater reservoir contaminated with water and soil. This amount is estimated at 30 million cubic meters annually. (Wafa News Agency, 2/8/2019)

Information on water and sanitation in Palestine :

1- The number of Palestinian communities with a sewage network reached 104 in 2015 out of 557, compared with 98 in 2013; while the number of public water networks is 508 in 2015, compared to 458 in 2013. (Palestinian Central Bureau of Statistics, (PCBS) March 2017)

2- According to the 2015 data, 94.9% of Palestinian households live in shelters that receive water from safe sources (as defined by indicators of sustainable development goals). These include public water and domestic well water. In the Palestinian Territory 94.9% Compared with 99.6% in the camps. (Palestinian Central Bureau of Statistics, (PCBS) March 2017)

3- 53.9% of the households in Palestine disposed of their wastewater through the sewage network during the year 2015 (38.4% in the West Bank and 83.5% in the Gaza Strip); 31.8% of households in Palestine use cesspits, 13.5% Of households use deaf drill and 0.8% of households use other means of disposal of wastewater. (Palestinian Central Bureau of Statistics, (PCBS) March 2017)

4- The percentage of economic establishments in Palestine that dispose of wastewater through the sewage network is about 71.3%, compared to 15.2% of the establishments disposing of their wastewater through cesspits. (Palestinian Central Bureau of Statistics, (PCBS) March 2017)

5- 48.1% of the schools discharge their wastewater through the sewage network, compared to 39.4% through cesspits; 58.6% of the kindergartens shed their wastewater through the sewage network; 90.5% of the higher education institutions in Palestine get rid of Of its wastewater through the sewerage system, compared with 7.9% through cesspits, during 2016. (Palestinian Central Bureau of Statistics, (PCBS) March 2017)

6- 82.2 L / day Average consumption of Palestinian water in Palestine. This rate ranges between 84.3 liters / day in the West Bank and 79.2 liters / day in the Gaza Strip during the year 2015. (Palestinian Central Bureau of Statistics, (PCBS) March 2017)

7- The amount of water extracted for domestic use from the coastal basin in the Gaza Strip was 167.2 million cubic meters in 2015. This quantity is an unjustified pump. The amount of safe pumping and sustainable water capacity is only 50-60 million cubic meters, resulting in more than 97% The quality of water pumped from the coastal basin, in line with the standards of the World Health Organization, which in turn depletes the reservoir of groundwater; the groundwater level in the coastal aquifer is 19 meters below sea level. (Palestinian Central Bureau of Statistics, (PCBS) March 2017)

8- The proportion of water abstracted from groundwater and surface water is high, relative to the available water in Palestine; this percentage reached 79.7% for the year 2015. Moreover, Israel has deprived the Palestinians of their right to use the Jordan River since 1967, estimated at 250 million cubic meters annually .
On the other hand, the amount of water extracted from the wells of the aquifers (for the eastern basin, the western basin and the north-eastern basin) in the West Bank for the year 2015 was about 83.3 million m3. (Palestinian Central Bureau of Statistics, (PCBS) March 2017)

1.5Objecives Of The Project :

The objectives of the project are summarized in the following steps:

1. Collecting information about the region in general in terms of area and selecting working area within the scope of the project, which is the most densely populated area.
2. Estimation of population and their densities for the design period for each catchment area.
3. Determination of the water consumption and consequently the wastewater production from the different sources for each catchment area.
4. Know the methods used to dispose of wastewater.
5. The information mentioned above was obtained through a visit to the municipality and a visit to it.
6. in addition to the work of a questionnaire that satisfies all the previous information, The results of this questionnaire will be presented in chapters #3.
7. The establishment of a sewage network serving the region based on what was previously stated.
8. Preparation the profiles of pipes .

1.6 Methodology :

1) We made a visit to the area .
2) Conduct a survey and distribute it to people in the region to fill it.
3) A visit to the Municipality of the town of Al-Obaidiya, where information was obtained about the area in terms of population and area share of water.
4) Viewing to previous studies in the same field of the project.

1.7 expected results :

1- Provision of sewage services to all citizens of the town.
2- Taking into account the preservation of environmental and social aspects.
3- Access to the views of the population on drinking water and sanitation.
4- Provide a map representing the sewage lines in the town.
5- Updating survey of wells number in the town.
6- Assessment of sources, quality and quality of water.
7- Preparing detailed engineering designs for the sewage system.
8- Implementing and operating the sewage system in case if the project is accepted by the competent authorities.

1.8 Organization Of The Project :

The study report has been prepared in accordance with the objectives and scope of work. The report consists of six chapters. The first chapter entitled “Introduction” outlines the problem, project objectives, Methodology, expected result.

Chapter two entitled “study Area ” presents basic background data and information on the project area, Geography, Population, Water Reservoirs …etc.

Chapter three entitled “Questionnaire and its results” deals with municipal sewage system, types of wastewater collection systems, sewer appurtenances, flow in sewers, design of sewer system, and sewer construction and maintenance.

Chapter four entitled “design parameters and calculation” presents the design calculations and maps of the system.

Chapter five entitled “Conclusions” discusses the conclusions of the study.

STUDY AREA

2.1 GENERAL :

Al-Obaidia is a Palestinian town in the West Bank that is located in the Bethlehem governorate. It was occupied under the occupation in the 1967 war.

The name of Al-Obaidia is the same name as grandfather al-Obeidi Fares. The town is located southeast of Jerusalem. Its land reaches the Dead Sea.

The town has more than ten mosques, and more than ten schools, and has several service institutions, including : Municipality, AL-Obaidia Club, AL-Obaidia Agricultural Society and the Charity Association for Development and Expansion .

It also contains a number of ancient monuments and monasteries, including the Monastery of Marsaba, built by Saint Saba. It is said that Christ was born there. The monastery dates back to 1500 years. The monastery of Ibn Ubaid, which dates back to 1600 years, where the Patriarch of Jerusalem, Safronius, who handed over the keys of Jerusalem to the faithful, Omar Ibn al-Khattab.

Al-Ubaidiya Town
Fig (1)

Fig (2) : Monastery of Marsaba

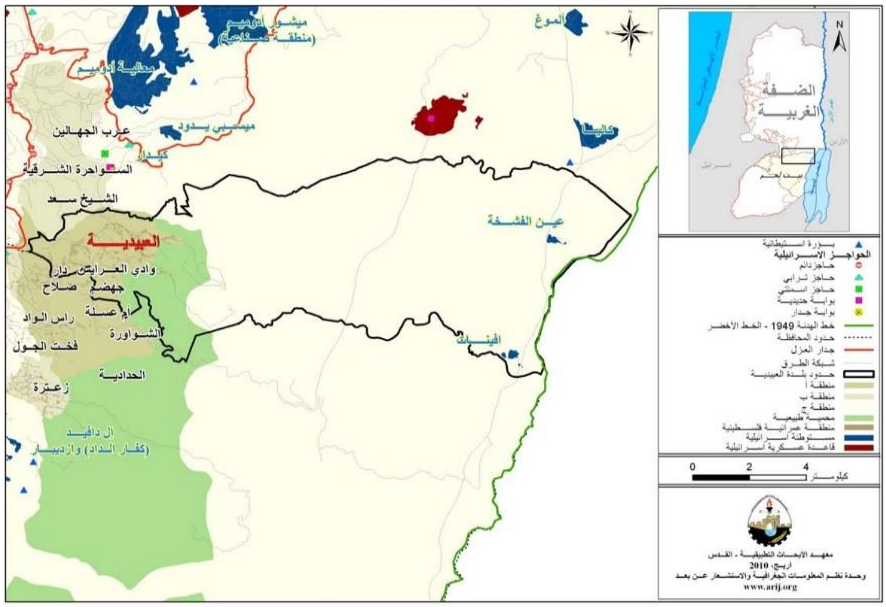
2.2 Geographical location :

The town of AL-Obaidia is one of the towns of Bethlehem governorate. It is located to the east of the city of Bethlehem. It is 4.8 kilometers away (the horizontal distance between the town center and the center of Bethlehem).

It is bordered to the east by the Dead Sea, to the north by the eastern town of Sawahra in the Jerusalem governorate, to the west by the village of Dar Salah, to the south by the town of Taqwa and the village of Dar Salah. See fig (3)

It is located at the town of AL-Obaidia at a height of 532 meters.

From the north of the town passes a valley called Wade Al-Nar . It is famous for its sharp endings and it also runs through the main road linking the northern West Bank and the south.



Location and borders of the town of Obeidiya Fig(3)

2.3 POPULATION :

The population of the town of Al Obeidiya reached 10753 people, of whom 5456 were male, 5297 were women, and the number of households was 1703 families, Wales housing units 1,865 units. (Palestinian Central Bureau of Statistics, (PCBS) 2007.

8.45 % within age group less than 15 years

6.51% among the 15-65 age group

And 4.2% in the plus 65 age group

The data showed that the ratio of males to females in the town is 103: 100 That is the proportion of males is 7.50, and the female ratio is 3.49. (Palestinian Central Bureau of Statistics, (PCBS) 2007.

2.4 WATER RESOURCES :

The water department in the West Bank has provided water to the population of the town of AL-Obaidia through the public water network since 1989. The proportion of housing units connected to the public water network is 5.99% and the percentage of housing units dependent on wells.

Rainwater harvesting to 2.0% and the proportion of housing units dependent on other sources to 2.0%, while 1.0% of the housing units are an unclear source of water supply. (Palestinian Central Bureau of Statistics, 2007)

The town of AL-Obaidia was supplied with water in 2009, about 312,000 cubic meters per year Thus, the average water supply per capita is estimated at 80 liters per day, (Municipality of AL-Obaidia, 2010)

The town of AL-Obaidia has 300 wells to collect rainwater, (Municipality of AL-Obaidia, 2010).

2.5 RAINFALL & TEMPERATURE AND HUMIDITY :

The annual rainfall rate is about 246 mm, (system unit Geographic Information - ARIJ, 2009)

The average temperature is 5.18 ° C and the relative humidity is about 58% . (Geographic Information - ARIJ, 2009)

2.6 ECONOMIC ACTIVITIES :

The economy in the town of AL-Obaidia depends on several sectors, the most important of which is the Israeli labor market, where the sector absorbs 38% of the labor force.

In reference to the results of the field survey for the distribution of labor force, it was found that: (PCBS, 2009, Census of Population and Housing – 2007)

1. The Israeli labor market, which constitutes 38% of the labor force

2. Employees sector, accounting for 26% of the workforce

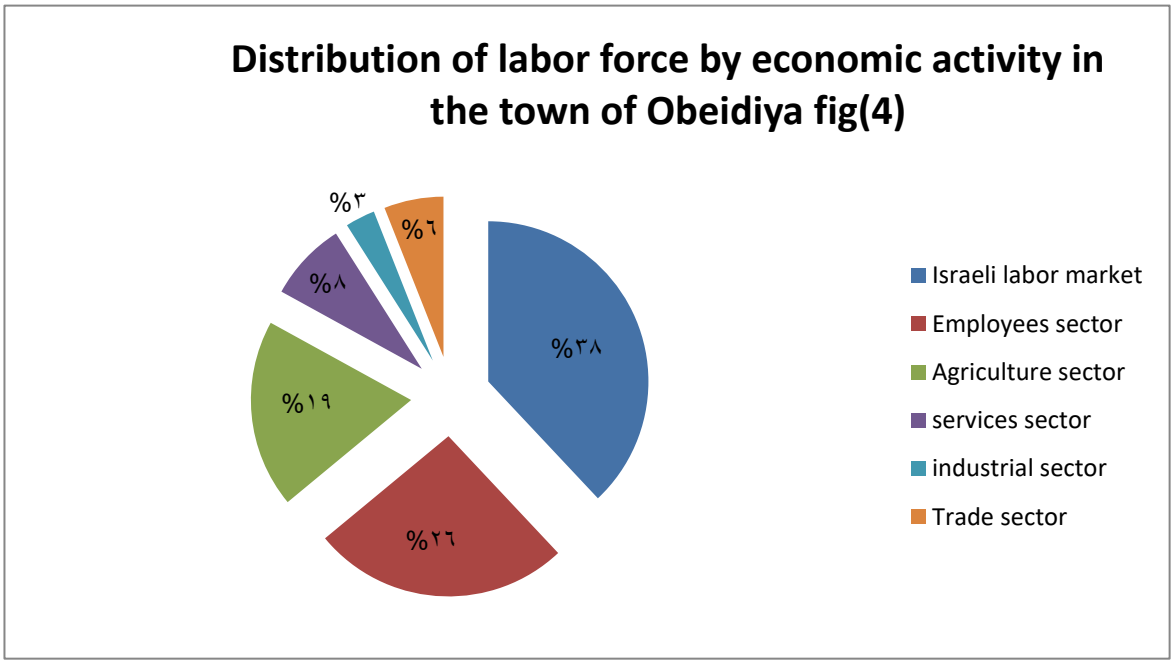
3. Agriculture sector, accounting for 19% of the labor force

4. The services sector, which constitutes 8% of the labor force

5. Trade sector, accounting for 6% of the labor force

6. The industrial sector, which constitutes 3% of the labor force

In addition, the unemployment rate in the town of AL-Obaidia reached 22%



Data from the Palestinian Central Bureau of Statistics (PCBS) showed that 9.30% of the population were economically active (6.72% working) and 9.68% were economically inactive (8.56% were students and 33% were full-time home).

2.7 AGRICULTURAL SECTOR :

The area of the town is about 232.97 dunums, of which 032.96 dunums are arable land and 563 dunums of domestic land

Most of the agriculture in the town of Obeidiya depends on rainfall , (Municipality of Al-Obeidiya, 2010).

Table(2.1) : Land use in the town of Obeidia

Land use in the town of Obeidiya (dunums)							
The total area	Domestic land	Agricultural land area 96,032				Pasture And open land	Industrial and Areas commercial
		Cultivation Seasonal	Cultivation Always	Houses Plastic products	Forestry Forests		
97,232	563	953	4,919	5	27	90,128	416

2.8 SEWAGE NETWORKS :

AL-Obaidia lacks a public sewage network, And according to the results of the population survey carried out by the Central Bureau of Statistics Palestinian conflict in 2007

Most of the housing units in the town of Al-Obeidiya (96%) use cesspits as a main means of disposing of water, and 9.3% of housing units have no means of disposal of ‘wastewater

While 1.0% of housing units are not shown to have a wastewater disposal facility. (Palestinian Central Bureau of Statistics, 2007)

2.9 ENVIRONMENTAL CONDITIONS AND WASTEWATER MANAGEMENT :

AL-Obaidia, like other villages in the governorate, suffers from several environmental problems that need to be addressed and solved The absence of a public sewage network, and therefore the use of cesspits to dispose of wastewater, and the discharge by some citizens of sewage on the public streets, especially in the winter, because they can not cover the high costs necessary to clear them Causing health problems and the spread of epidemics and diseases within the town.

The use of these pits also threatens the contamination of groundwater, springs and water collected in domestic wells (rainwater harvesting wells), where this water mixes with wastewater, making it unsuitable for drinking.

As these pits are built without lining, so as to facilitate the access of wastewater to the layers of the earth

Thus avoiding the use of sump cars to unload the drill from time to time. The untreated wastewater collected from cesspits is also collected by the effluent car

Are disposed of open areas without taking into account the environmental and health .damage resulting there

Results and discussion of the questionnaire

3.1 Socio-economic analysis :

- **Household survey :**

In order to achieve the main objective of the study of assessing the main socio- economic characteristics of the community and the different water aspects, a descriptive study was utilized and a total of 66 questionnaires were filled during 2019.

- **Size and components of the household sample :**

Regardless gender, table (3.1) shows size of families, In families consisting of 1-3 capita whose percentage in the questionnaire was 21.2(n=14), In families consisting of 4-8 capita whose percentage in the questionnaire was 37.9(n=25), In families consisting of >8 capita whose percentage in the questionnaire was 40.9(n=27) .

Table (3.1) : size of families

size of families (capita)	Percentage (%)
LOW (1-3)	21.2
MEDIUM (4-8)	37.9
HIGH (>8)	40.9

Table (3.2) shows ages of member in families, **THE** percentage of member have age {0-18} in low families is 56.1(n=37), in medium families 25.8(n=17) and in high families 1.5(n=1), **THE** percentage of member have age {18-65} in low families is 53(n=35), in medium families 34.8(n=23) and in high families 6.1(n=4), **THE** percentage of member have age {>65} in low families is 25.8(n=17), in medium families 9.1(n=6) and in high families 9.1(n=6).

Table (3.2) : ages of member in families

Age (0-18) year		Percentage (%)
Size of families	No member	16.7
	low	56.1
	medium	25.8
	high	1.5
Age (18-65) year		
Size of families	No member	6.1
	low	53
	medium	34.8
	high	6.1
Age (>65) year		
Size of families	No member	56.1
	low	25.8
	medium	9.1
	high	9.1

- **Income of the household sample :**

As shown in Figure (3.1), the primary source of income varied among the household sample as 31.8% (no. = 21) was found to be working in Israel, 24.2% (no. = 16) were employed by the private sector, 6.1% (no. = 4) in government sector, 1.5% (no. = 1) in civil sector, 19.7% (no. = 13) in industry, 13.6% (no. = 9) were animale, and the remaining 3% (no. = 2) their primary income came from agricultural.

Regarding the average monthly household income New Israeli Shekels (NIS), the 9.1% (no. = 6) of people were earning less than 1000 NIS, 54.5% (no. = 36) were earning 1000-3000 NIS, 31.8% (no. = 21) were earning 3000-5000 NIS, 4.5% (no. = 3) were earning more than 5000 NIS.

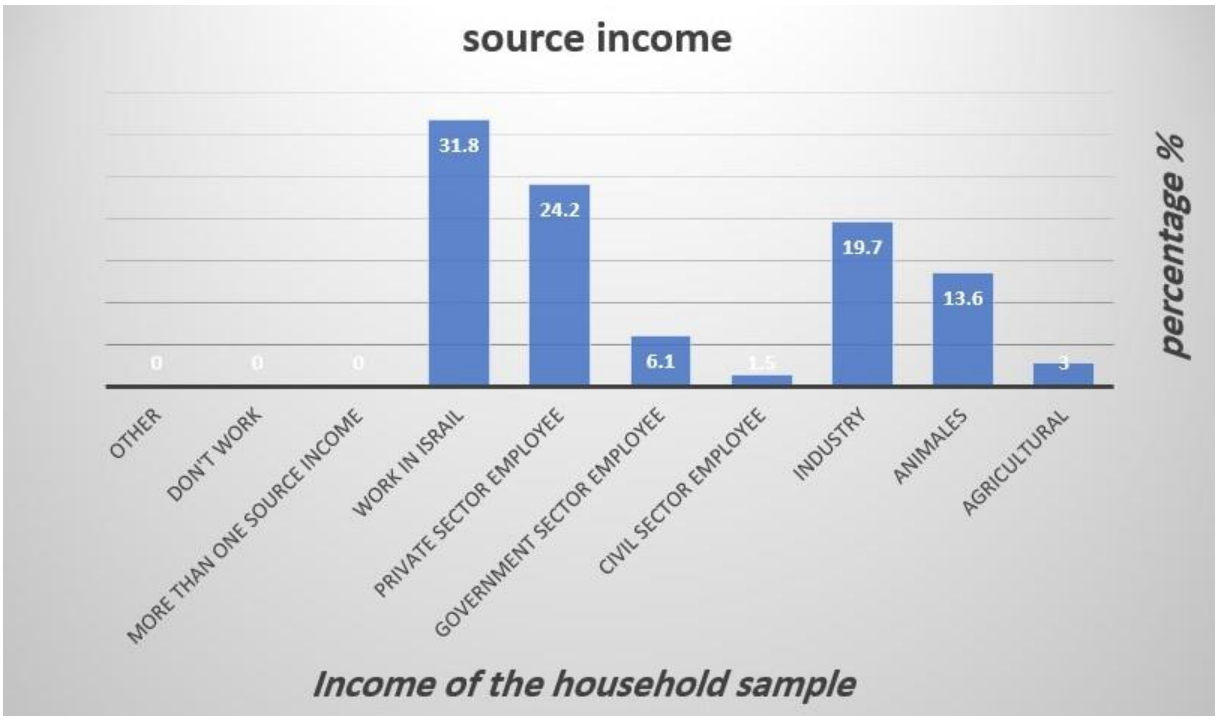
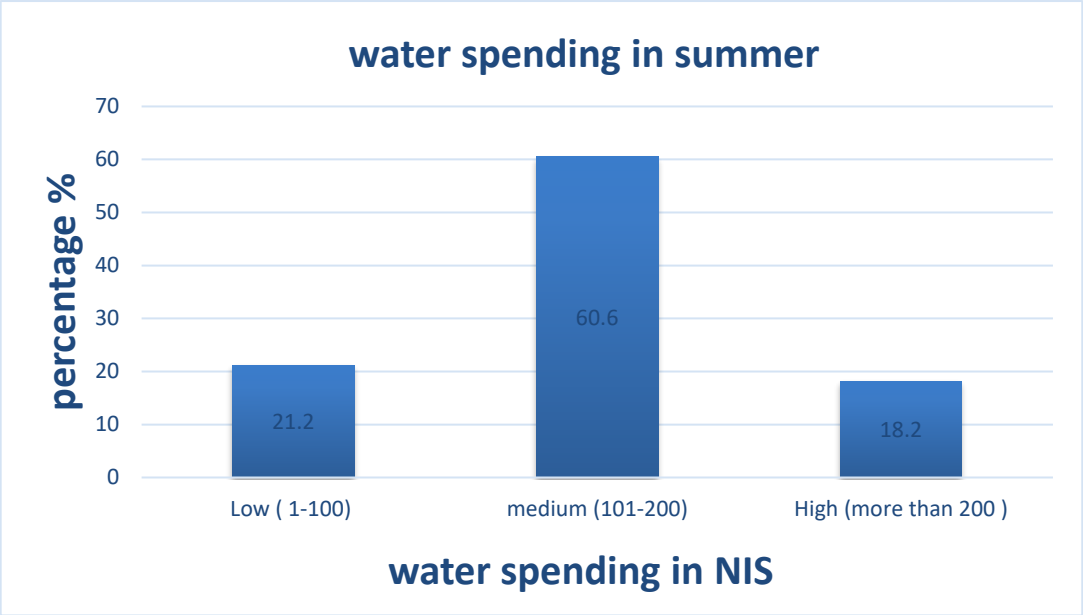


Fig (3.1) : Primary income source of the household sample

3.2 Family spending on water in summer and winter :

❖ **In summer :**

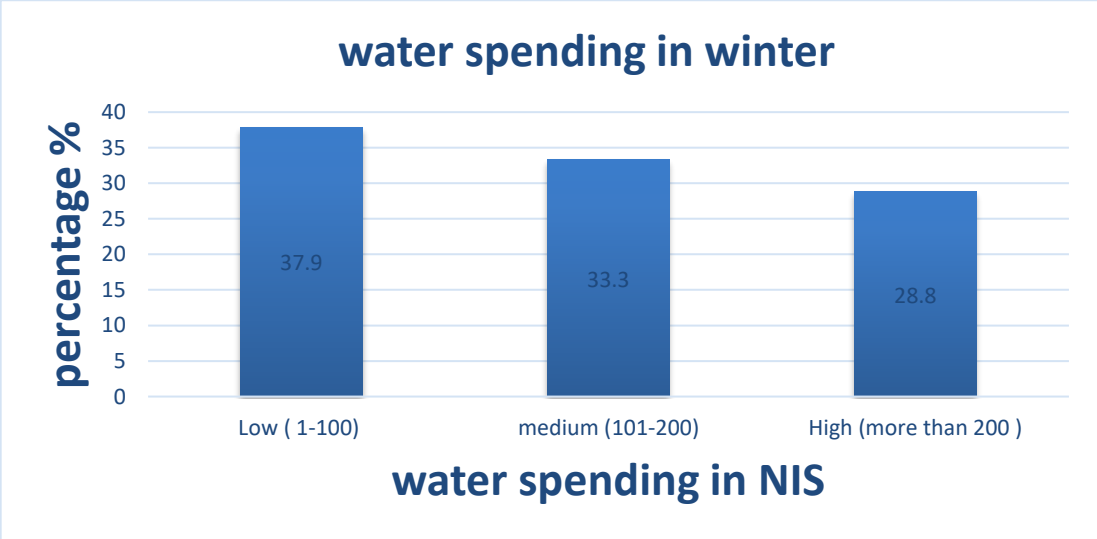
As shown in Figure (3.2), the 21.2% spending 1-100 NIS monthly, the 60.6% spending 101-200 NIS monthly and the 18.2% spending more than 200 NIS monthly



Fig(3.2) : water spending in summer

❖ **In winter :**

As shown in Figure (3.3), the 37.9% spending 1-100 NIS monthly, the 33.3% spending 101-200 NIS monthly and the 28.8% spending more than 200 NIS monthly



Fig(3.2) : water spending in winter

3.3 Type of houses :

As shown in table (3.3), the house of type flat have 36.4%(no. = 24) of total houses in survey, 10.6%(no. = 7) asbestos , 53%(no. = 35) separate house and 0%(no. = 0) tent.

Table (3.3) : Type of houses

Type of hous*es*	Percentage(%)
Flat	**36.4**
Asbestos	**10.6**
Separate house	**53**
tent	**0**

3.4 Inner house area :

As shown in table (3.4), the inner area less than 80 m^2 has 6.1%(no. = 4) , the inner area between 80-160 m^2 has 57.6%(no. = 38) and the inner area more than 160 m^2 has 36.4%(no. = 24).

Table (3.4) : inner area

Inner area (m^2)	***Percentage(%)***
Low(<80)	***6.1***
Medium(80-160)	***57.6***
High (>160)	***36.4***

3.5 Number of house floors :

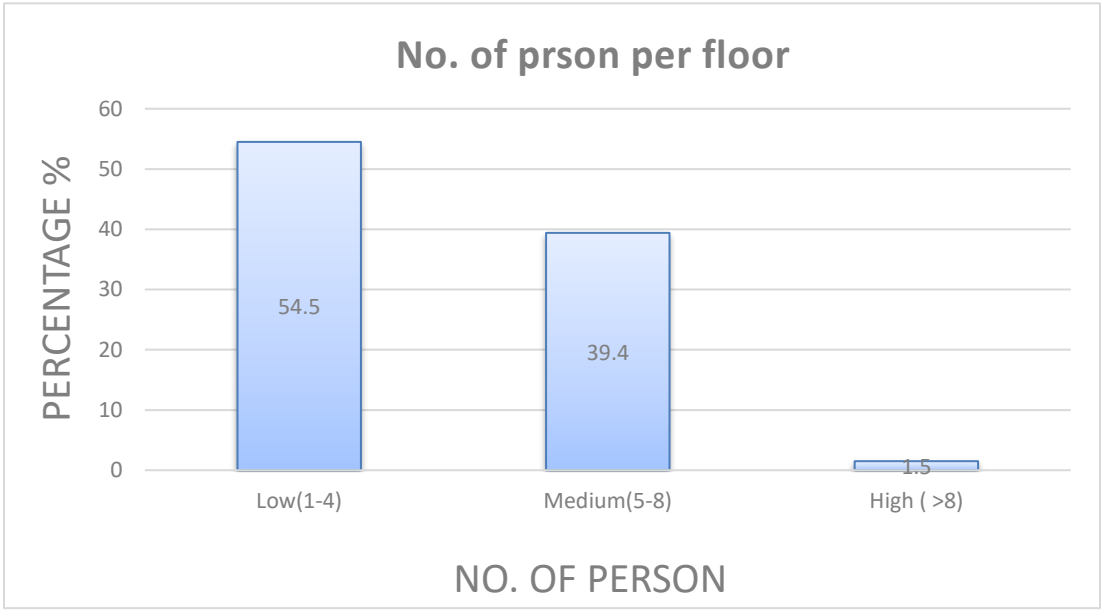
As shown in table (3.5), the house have one floor 42.4%(no. = 28), 2-floor house has 45.5%(no. = 30), three floor has 10.6%(no. = 7), 4-floor has 1.5%(no. = 1), five floor house has 0% in this survey.

Table(3.5) : no. of house floors

No. of floor	Percentage(%)
1	42.4
2	45.5
3	10.6
4	1.5
5	0

3.6 Number of persons for every floor :

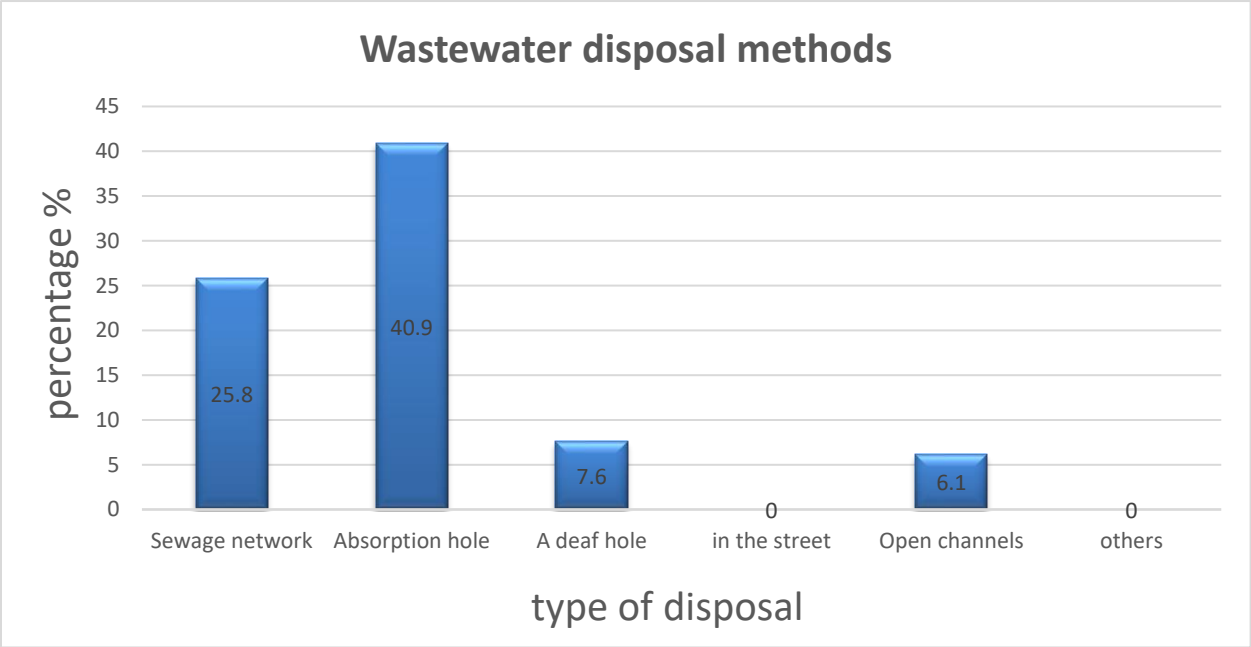
As shown in Figure (3.4), the number of persons (1-4persons) per floor has 54.5%(no. = 36), the number of persons (5-8persons) per floor has 39.4%(no. = 26), the number of persons (more than 8 persons) per floor has 1.5%(no. =1) and there is 3 missing data was found.



Fig(3.4) : number of persons per floor

3.7 Wastewater disposal methods :

As shown in Figure (3.5), 25.8%(no. = 17) of people get rid of wastewater by sewage network, 40.9%(no. = 27) of people get rid of wastewater by absorption hole, 7.6%(no. = 5) of people get rid of wastewater by a deaf hole, 6.1%(no. = 4) of people get rid of wastewater by open channel, 0%(no. = 0) of people get rid of wastewater by the street and we found 13 missing data.



Fig(3.5) : Type of Wastewater disposal methods

3.8 Number of wastewater discharge from the pit / absorber :

As shown in table (3.6), 42.4 %(no. = 28) of families has never been discharging the absorber hole , 42.4%(no. = 28) of families has discharging the absorber hole 1-3 times per month , 6.1 %(no. = 4) of families has discharging the absorber hole 4-8 times per month and 7.6%(no. = 5) of families has discharging the absorber hole more than 8 times per month.

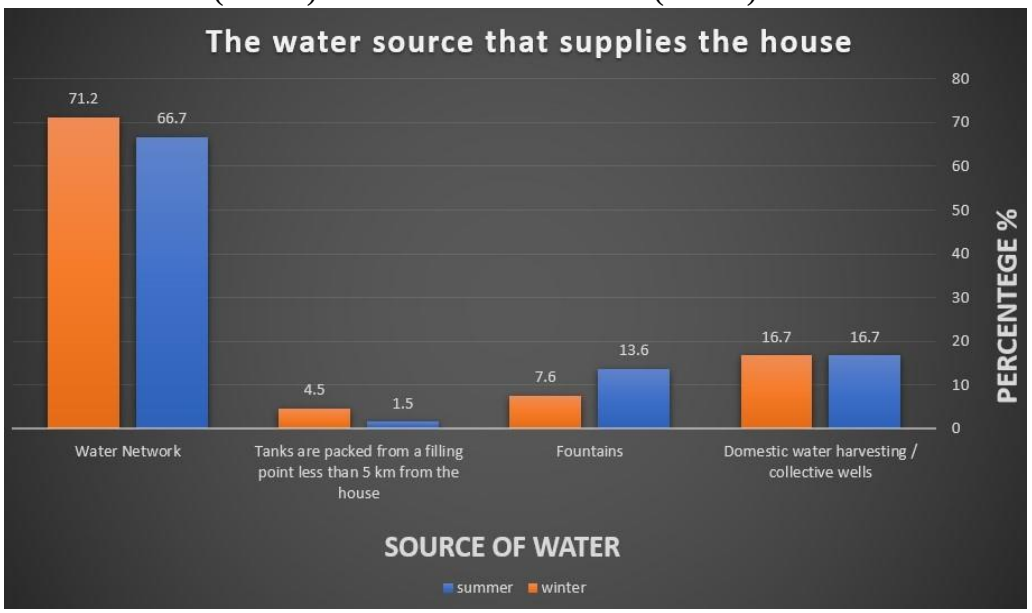
Table(3.6) : number of cleaner absorber

Number of cleaning times per month	Percentage(%)
Never	42.4
(1-3) per month	42.4
(4-8) per month	6.1
More than 8 per month	7.6

3.9 Water issues :

- **The main source of water for the house During the summer and winter :**

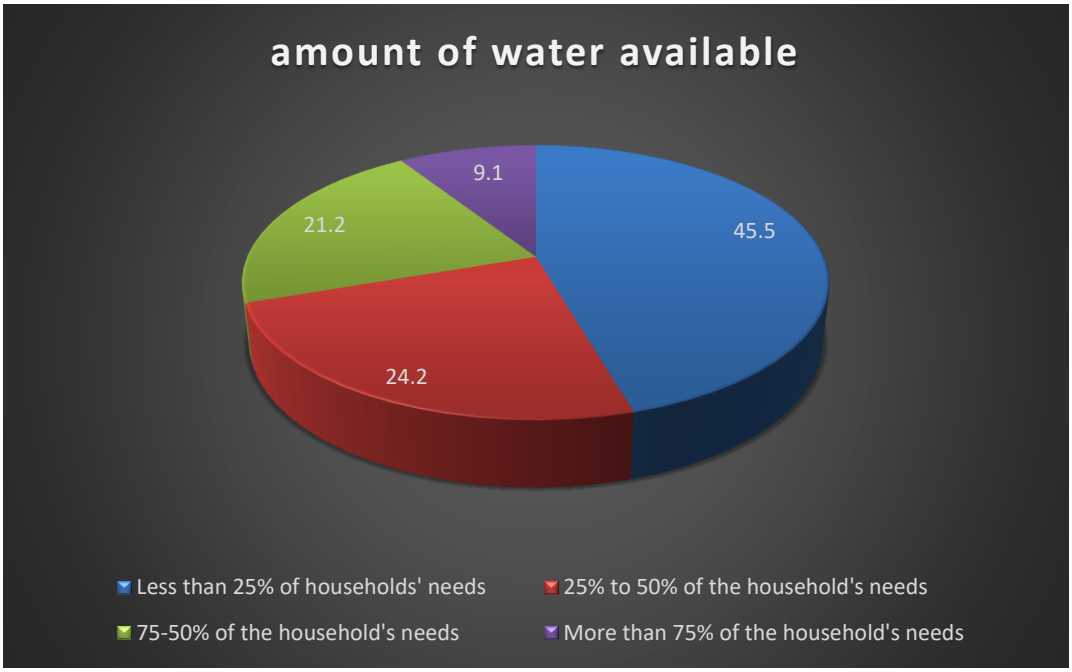
As shown in Figure (3.6), it was noticed that a higher percentage of the households sampled depend on the water network in the winter (71.2%) more than in the summer (66.7%). The 16.7% of the respondents during the summer while 16.7% in the winter depend on the collective wells, 13.6% in the summer and 7.6% in the winter depend on the fountains, About 1.5% use the filling points within 5 km in the summer and 4.5% in the winter.



Fig(3.6) : main source of water for the house

- **sufficiency of water :**

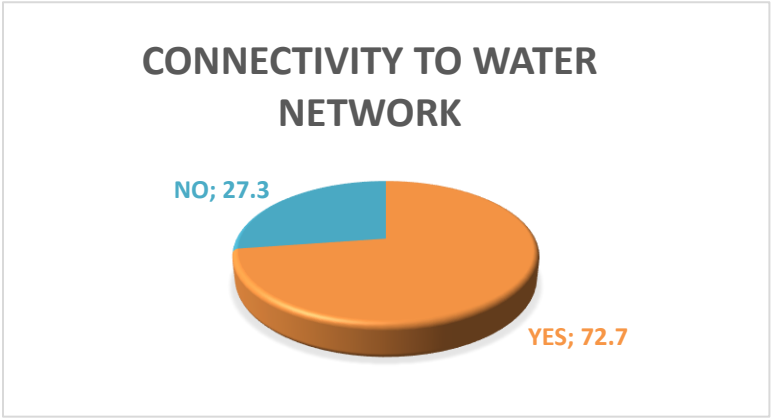
As shown in figure (3.7), Regarding the sufficiency of water from all resurces, half of the household sample (45.5%, no. =30) stated that it covers less than 25% of their actual needs, 24.2% (no. = 16) agreed that it covers 25-50% of their actual needs, 21.2% (no. =14) stated that it covers 50 - 75% of their actual needs, and 9.1% (no. = 6) noted that it covers more than 75% of their actual needs.



Fig(3.7) : sufficiency of water from all resurces

- **Connectivity to water network:**

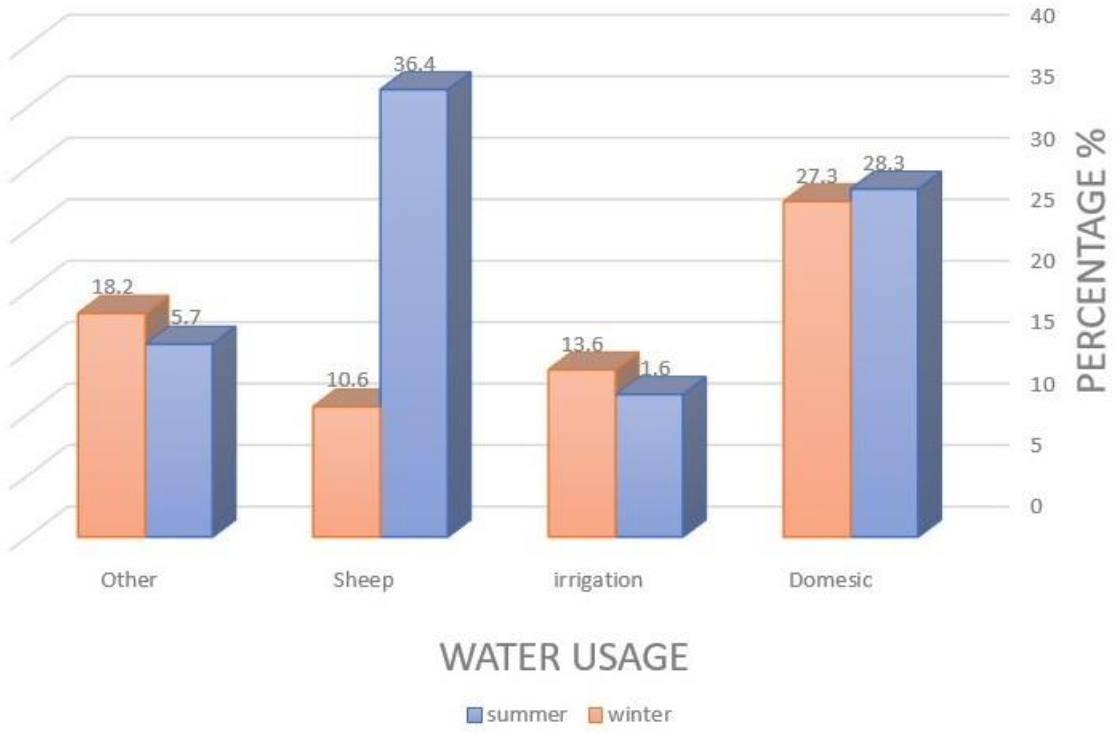
Most of the households responding to the survey (72.7%, no. = 48) were connected to the water network while only 27.3% (no. = 18) were not.



Fig(3.8) : Connectivity of the household sample to a water network

- **Water usage during summer & winter :**

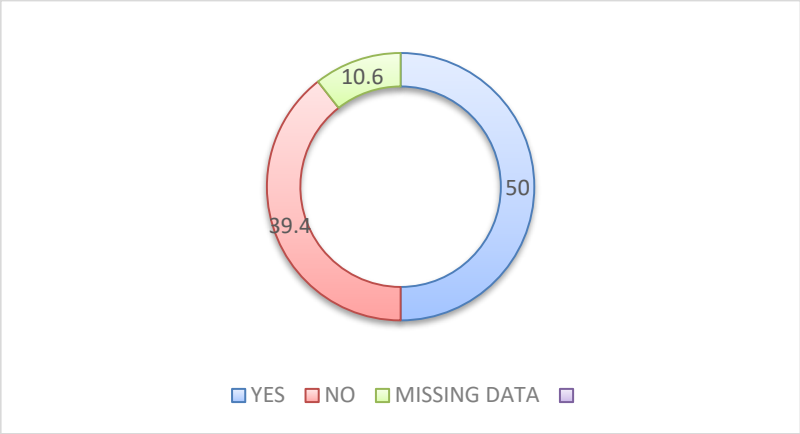
As shown in fig(3.9), domestic in summer(28.3%,no. = 56) and winter(27.3%,no. = 54) is same, irrigation in summer(11.6%,no. = 23) and winter(13.6%,no. = 27) is same, Sheep in summer (36.4%,no. = 24) and winter (10.6%,no. = 21), other usage in winter(18.2%,no. = 36) higher than summer(15.7%,no. = 31).



Fig(3.9) : Water usage

- **satisfaction of quantity and quality of the water :**

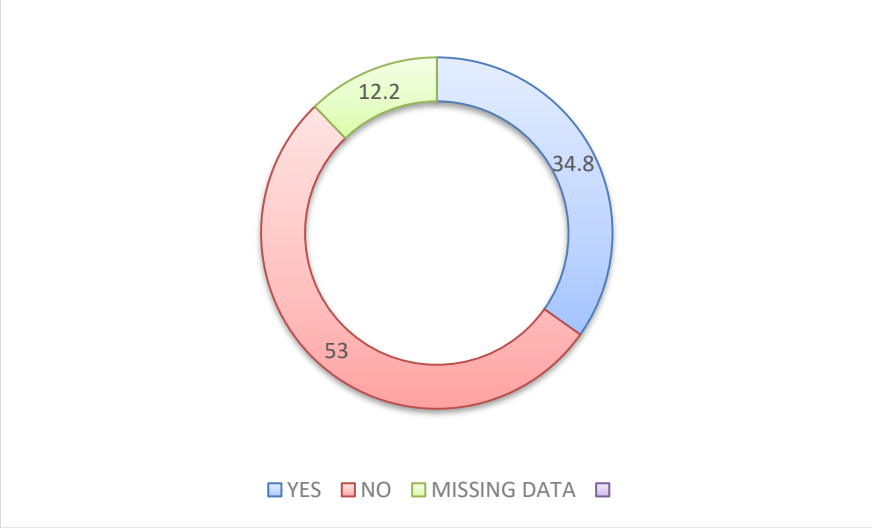
As shown in fig(3.10), 50%(no. = 33) of families are satisfied with the quantity and quality of the water and 39.4%(no. = 27) of families Unsatisfied with the quantity and quality of the water.



Fig(3.10) : satisfaction of quantity and quality of the water

- **Tankers :**

According to Figure (3.11), the majority of the household sample (34.8%, no. = 23) purchase water from tankers while 53% (no. = 53) do not.

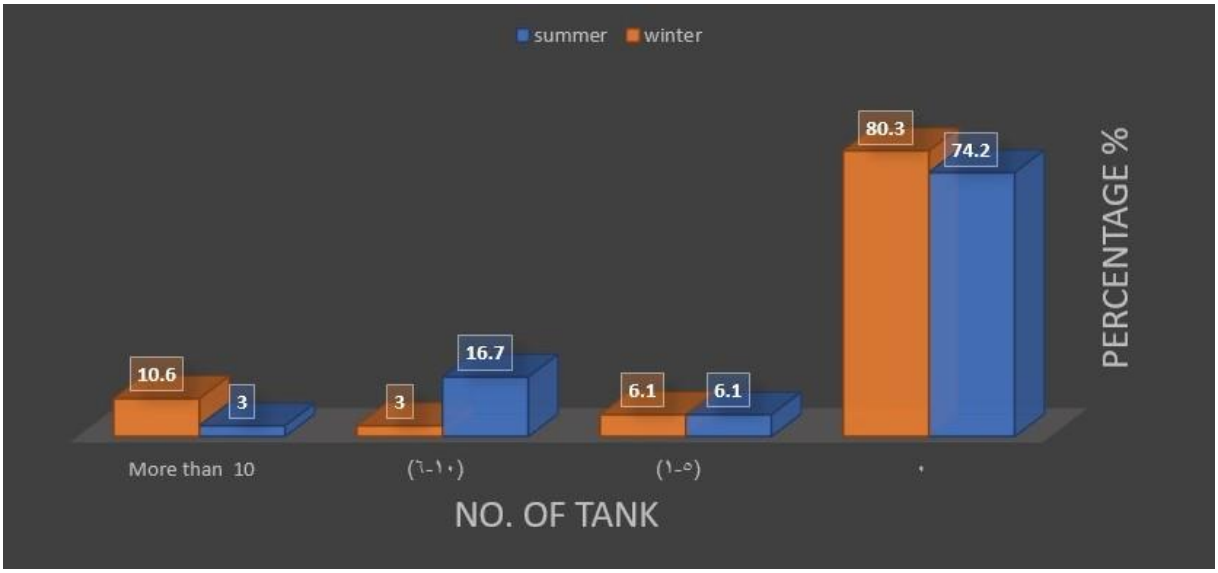


Figure(3.11) : Purchasing water from tankers

- **Number of tanks are consumed :**

According to Figure (3.12), 74%(no. = 49) of families don't buy water tanks , 6.1%(no. = 4) of families buy 1-5 tanks in summer , 16.7%(no. = 11) of families buy 6-10 tanks in summer and 3%(no. = 2) of families buy more than 10 tanks in summer.

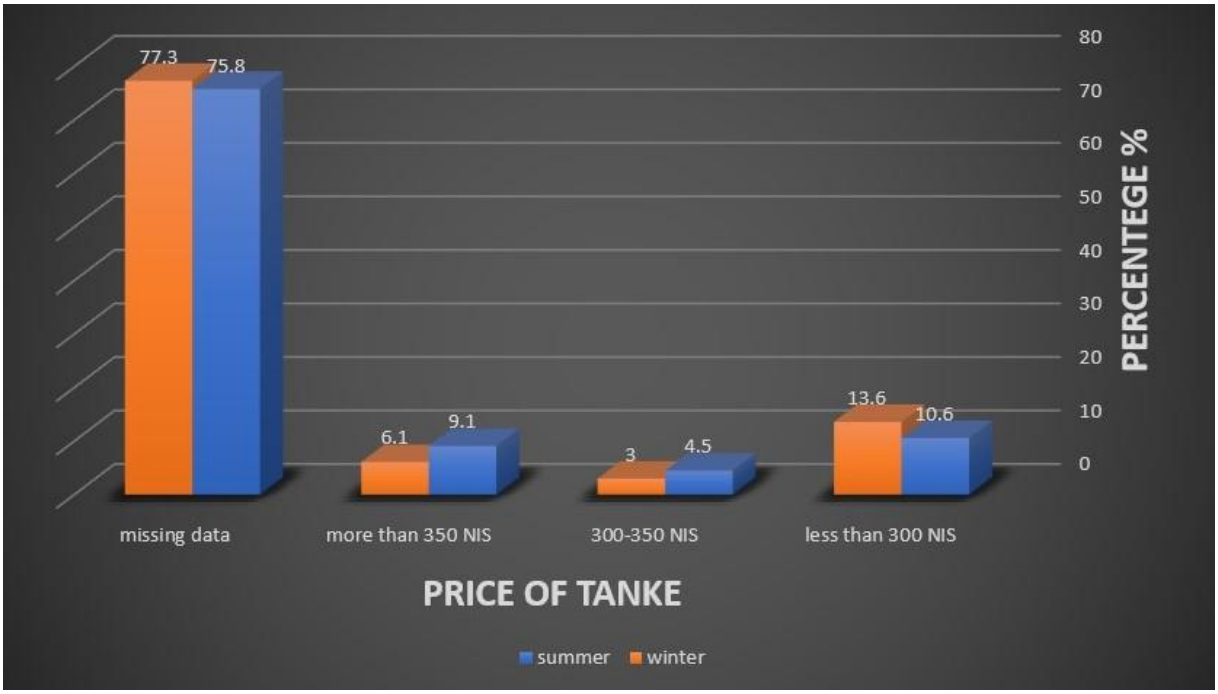
And the 80.3%(no. = 53) of families don't buy water tanks , 6.1%(no. = 4) of families buy 1-5 tanks in winter , 3%(no. = 2) of families buy 6-10 tanks in winter and 10.6%(no. = 7) of families buy more than 10 tanks in winter.



Figure(3.12) : no. of tanks are consumed

- **Price of tank** :

According to Figure (3.13), 10.6% of families by the tank less than 300 NIS in summer , 4.5 % of families by the tank 300-350 NIS in summer and 9.1% of families by the tank more than 350 NIS in summer.
And 13.6% of families by the tank less than 300 NIS in winter , 3 % of families by the tank 300-350 NIS in winter and 6.1% of families by the tank more than 350 NIS in winter



Figure(3.13) : price of tank

- **Water source of tank :**

As shown in table (3.7), 22.7 % of houses get water from fill point , 21.2 % of houses get water from fountains , 27.3 % of houses get water from water network , 10.6 % of houses get water from other sources.

Table (3.7) : Water source of tank

Source	No		Yes	
	%	No.	%	**No.**
Fill point	**71.2**	**47**	**22.7**	**15**
Fountains	**78.8**	**52**	**21.1**	**14**
Water Network	**71.2**	**47**	**27.3**	**18**
Other	**62.1**	**41**	**10.6**	**7**

- **Well to collect and store water at home :**

As shown in table (3.8), most of families didn't own a well and 34.8 % of families owned wells.

Table (3.8) : well collect water

Options	percentage	number
Yes	**34.8**	**23**
No	**65.2**	**43**

- **Method of cleaning the well :**

As shown in table (3.9), 25.8% of families cleaned well by water only, 7.6% of families cleaned well by soap, 7.6% of families cleaned well by Sterilizers such as chlorine, 6.1% of families cleaned well by kerosene, 4.5% of families cleaned well by Others.

Table (3.9) : Method of cleaning the well

The style of cleaning a well	*No*		*Yes*	
	%	No:	%	*No:*
Water only	10.6	7	25.8	17
soap	28.8	19	7.6	5
Sterilizers such as chlorine	28.8	19	7.6	5
Kerosene	30.3	20	6.1	4
Other	31.8	21	4.5	3

- **the quality of harvested water :**

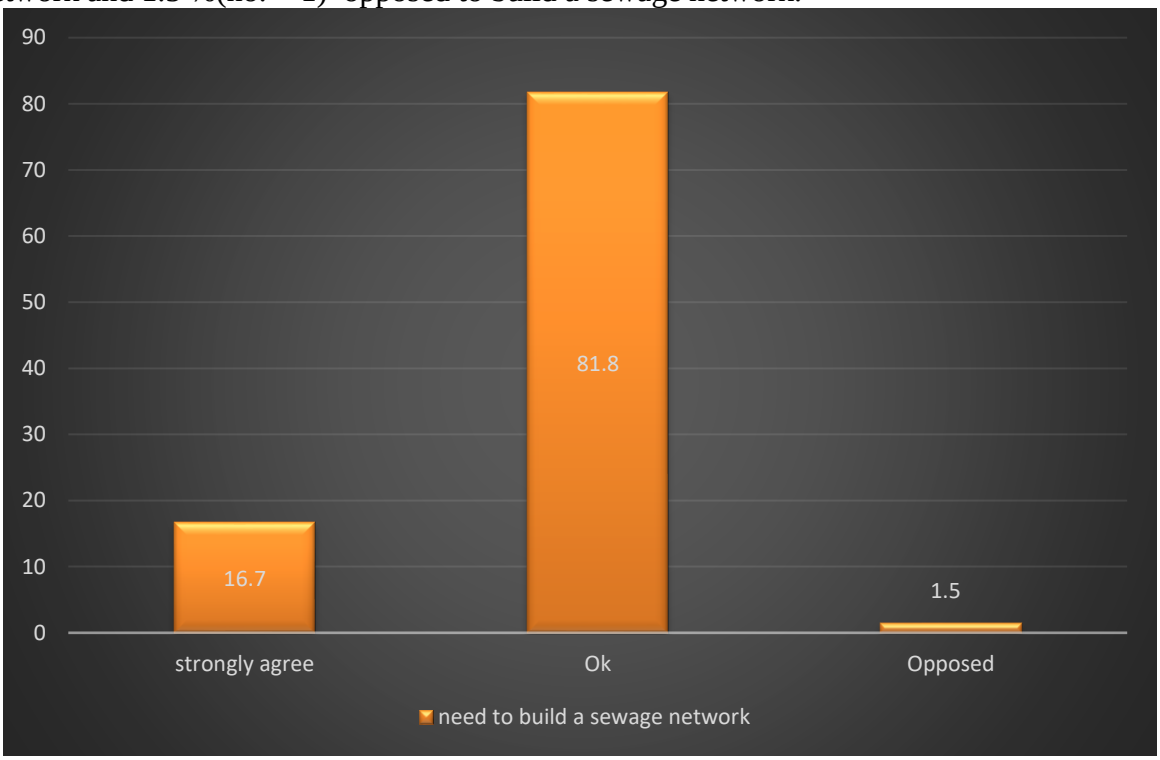
families said that water has an excellent taste and avery good taste & odor .

Table (3.10) : Water quality

Water quality	**Not accept**		**Good**		**Very good**		**excellent**		**Missed data**
	%	No:	%	No:	%	No:	%	No:	
Taste	**0**	**0**	**3**	**2**	**16.7**	**11**	**16.7**	**11**	**42**
color	**1.5**	**1**	**3**	**2**	**18.2**	**12**	**13.6**	**9**	**42**
Odor	**1.5**	**1**	**1.5**	**1**	**18.2**	**12**	**15.2**	**10**	**42**

- **Town needed for build a sewage network**

According to Figure (3.14), 16.7%(no. = 11) of the families strongly agree to build a sewage network in the town , 81%(no. = 54) of the families they did not oppose to build a sewage network and 1.5 %(no. = 1) opposed to build a sewage network.



Figure(3.14) : Accepting the construction of a sewage network

DESIGN PARAMETERS AND CALCULATION

4.1 General :

Once used for its intended purposes, the water supply of a community is considered to be wastewater. The individual conduits used to collect and transport wastewater to the treatment facilities or to the point of disposal are called sewers.

There are three types of sewers: sanitary, storm, and combined. Sanitary sewers are designed to carry wastewater from residential, commercial, and industrial areas, and a certain amount of infiltration /inflow that may enter the system due to deteriorated conditions of sewers and manholes. Storm sewers are exclusively designed to carry the storm water. Combined sewers are designed to carry both the sanitary and the storm flows.

The network of sewers used to collect wastewater from a community is known as wastewater collection system. The purpose of this chapter is to define the types of sewers used in the collection systems, types of wastewater collection systems that are used, the appurtenances used in conjunction with sewers, the flow in sewers, the design of sewers, and the construction and maintenance of sewers.

4.2 Municipal Sewerage System :

The types and sizes of sewers used in municipal collection system will vary with size of the collection system and the location of the wastewater treatment facilities. The municipal or the community sewerage system consists of (1) building sewers (also called house connections) (2) laterals or branch sewers, (3) main and submain sewers, (4) trunk sewers.

House sewers connect the building plumbing to the laterals or to any other sewer lines mentioned above. Laterals or branch sewers convey the wastewater to the main sewers. Several main sewers connect to the trunk sewers that convey the wastewater to large intercepting sewers or the treatment plant.

The diameter of a sewer line is generally determined from the peak flow that the line must carry and the local sewer regulations, concerning the minimum sizes of the laterals and house connections, The minimum size recommended for gravity sewer is 200 mm (8 in).

4.3 Sewer Materials :

Sewers are made from concrete, reinforced concrete, vitrified clay, asbestos cement, brick masonry, cast iron, ductile iron, corrugated steel, sheet steel, and plastic or polyvinylchloride or ultra polyuinyl chloride. Concrete and ultra polyvinyl chlorides are the most common materials for sewer construction.

4.4 Important Factors Considered for Selecting Material for Sewer :

Following factors should be considered before selecting material for manufacturing sewer pipes:

1. **Resistance to corrosion**

Sewer carries wastewater that releases gases such as H_2S. This gas in contact with moisture can be converted in to sulfuric acid. The formation of acids can lead to the corrosion of sewer pipe. Hence, selection of corrosion resistance material is must for long life of pipe.

2. **Resistance to abrasion**

Sewage contain considerable amount of suspended solids, part of which are inorganic solids such as sand or grit. These particles moving at high velocity can cause wear and tear of sewer material. This abrasion can reduce thickness of pipe and reduces hydraulic efficiency of the sewer by making the interior surface rough.

3. **Strength and durability**

The sewer pipe should have sufficient strength to withstand all the forces that are likely to come on them. Sewers are subjected to considerable external loads of backfill material and traffic load, if any. They are not subjected to internal pressure of water. To withstand external load safely without failure, sufficient wall thickness of pipe or reinforcement is essential. In addition, the material selected should be durable and should have sufficient resistance against natural weathering action to provide longer life to the pipe.

4. **Weight of the material**

The material selected for sewer should have less specific weight, which will make pipe light in weight. The lightweight pipes are easy for handling and transport.

5. **Imperviousness**

To eliminate chances of sewage seepage from sewer to surrounding, the material selected for pipe should be impervious.

6. **Economy and cost**

Sewer should be less costly to make the sewerage scheme economical.

7. **Hydraulically efficient**

The sewer shall have smooth interior surface to have less frictional coefficient.

4.5 Types of Wastewater Collection Systems :

Gravity Sewer System :

Collecting both wastewater and storm water in one conduit (combined system) or in separate conduits (separate system). In this system, the sewers are partially filled. A typical characteristic is that the gradients of the sewers must be sufficient to create self-cleansing velocities for the transportation of sediment. These velocities are 0.6 to 0.7 m/s minimum when sewers are flowing full or half-full. Manholes are provided at regular intervals for the cleaning of sewers.

Pressure Type System :

Collecting wastewater only. The system, which is entirely kept under pressure, can be compared with a water distribution system. Sewage from an individual house connection, which is collected in manhole on the site of the premises, is pumped into the pressure system. There are no requirements with regard to the gradients of the sewer.

Vacuum Type System:

Collecting wastewater only in an airtight system. A vacuum of 5-7 m is maintained in the system for the collection and transportation of the wastewater. There is no special requirement for the gradients of the sewers.

Pressure and vacuum–types systems require a comparatively high degree of mechanization, automation and skilled manpower. They are often more economical than gravity system, when applied in low population density and unstable soil conditions. Piping with flexible joints has to be used in areas with expansive soils.

4.6 Design Parameters :

Important Numbers :

- Maximum velocity = 3 m/s
- Minimum velocity = 0.6 m/s
- Maximum slope = 12%
- Minimum slope = 0.5%
- H/D = 70%
- Minimum diameter 200 mm
- Minimum cover 1.5 m
- Maximum cover 5 m

Flow Rate Projections :

- **The total wastewater flow in sanitary sewers for industrial area is made up of two components:**

(1)Domestic

(2)Infiltration.

Sanitary sewers are designed for peak flows from domestic, and peak infiltration allowance for the entire service area. The flow rate projections are necessary to determine the required capacities of sanitary sewers.

- **The peak coefficient :**

In general, this coefficient increases when the average flow decrease, it will be determined from the practice and experience of the designer. The following relation has been used commonly by the designer and gives satisfactory results:

$$Pf = 1.5 + 2.5 / \sqrt{q} \qquad (4.1)$$

Where, q (in l/s) is the daily average flow rate of the network branch under consideration and Pf is the peak factor.

- **Hydraulic Design :**

As mentioned earlier and according to usual practice, the sewers will be designed for gravity flow using Manning's formula:

$$V = (1/n)\, R^{2/3}\, S^{1/2} \qquad (4.2)$$

Where :

R : hydraulics radius.

S : slop.

n : manning coefficient Depending on pipe materials.(the table below show manning coefficient value depending type of channel)

Channel Surface	Manning Roughness Coefficient, n
Asbestos cement	0.011
Brass	0.011
Brick	0.015
Cast-iron, new	0.012
Concrete, steel forms	0.011
Concrete, wooden forms	0.015
Concrete, centrifugally spun	0.013
Copper	0.011
Corrugated metal	0.022
Galvanized Iron	0.016
Lead	0.011
Plastic	0.009
Steel - Coal-tar enamel	0.01
Steel - New unlined	0.011
Steel - Riveted	0.019
Wood stave	0.012

1. Minimum and Maximum Velocities

   To prevent the settlement of solid matter in the sewer, the literature suggested that the minimum velocity at half or full depth – during the peak flow period – should not be less than 0.6 m/s, Usually, maximum sewer velocities are limited to about 3 m/s in order to limit abrasion and avoid damages which may occur to the sewers and manholes due to high velocities.

2. Pipes and Sewers

   Experience indicates a minimum diameter of 200 mm (8 in) for sewer pipes. For house connections.

   Pipe Materials: Different pipe materials may be recommended for the sewers. Polyvinyl chloride, vitrified clay or polyethylene material for small size pipes (approximately up to the size 400 mm in diameter).Centrifugal cast reinforced concrete pipes may be used for larger diameter.

3. Manholes and Covers

Manholes should be located at changes in size, slope direction or junction with secondary sewer. Manholes spacing generally does not exceed 60 m.

4. Sewer Slope

For a circular sewer pipe, the slope must be between the minimum and maximum slope. Generally the natural ground slope is used because it is the technical and economic solution, the solution is therefore recommended.

5. Depth of Sewer Pipe

The depth of sewers is generally 1.5 m below the ground surface. Depth should be enough to receive the sewage by gravity, avoid excessive traffic loads, and avoid the freezing of the sewer. It is recommended that the top of sewer should not be less than 1.5 m below basement floor.

4.7 Calculation :

1. Calculate the population during the design period:

It is known that the sewage distribution network is designed for a design period of not less than 20 years, so the population within 20 years is larger than the current population (because the birth rate is higher than the mortality rate). Current production Therefore, the population must be calculated for 20 years, for example, and then calculate the population's production of wastewater during this period to design the elements of the network in proportion to this production.(suppose t in our project is 25 years)

$$Pf = Po \times (1 + k)^{t} \qquad (4.3)$$

Pf : Future population

Po : current population

K : Natural growth rate of population.

t : Project design period.

In our project the future population is calculation as follows :

Po = 15000

K = 2.5%

T = 25 years (from 2019 to 2044)

Pf = Po × (1 + k)^t

= 15000 × (1 + 0.025)^25

= 27809 capita.

2. Determination the quantities of water consumption:

In wastewater networks, we will mainly care for the design of drainage networks to serve the population (discharge of wastewater from population buildings). For other types of wastewater, a sewage network is designed for each of them, especially factories and hospitals, because the quality of wastewater from factories is different from Wastewater from homes. Therefore, it is necessary to determine the population consumption of each individual to determine the amount of wastewater through the amount of consumption.

The current water consumption in our project is 87 l/c.d

The future water consumption in our project is 150 l/c.d

After determining the amount of consumption, the percentage of wastewater from the consumed water is estimated at about 80%, that is, clean water after use, 80% of which turns into waste water need to be discharged.

Future wastewater production = 80% * future water consumption * Future population

= (0.8 * 150 * 27809) / (1000*24*60*60)

= 0.039 m^3/s

CONCLUSIONS

In this part of the project, a theoretical study was conducted on wastewater in general and then on the study area. A questionnaire was also distributed and distributed to a sample of the town's population, we explane design parameter and some simple calculation.

In the second part of the project we will design a sewage network covering the entire area of the town, the flow within the lines will be by gravity, and we will use the SewerCad program in the design.

REFERANCES :

1- AL-Obaidia Municipality, Bethlehem, West Bank, Palestine.
2- Wafa News Agency (http://www.wafainfo.ps/ar_page.aspx?id=2323) , 2/8/2019, 6:01PM.
3- Palestinian Central Bureau of Statistics, (PCBS) March 2017 & 2009.
4- World Health Organization (2006). Guidelines for the safe use of wastewater, excreta, and greywater. World Health Organization.
5- Compendium of Sanitation Systems and Technologies (2nd Revised ed.).
6- Nouri, J.; Mahvi, A. H.; Babaei, A.; Ahmadpour, E., (2006). Regional pattern distribution of groundwater fluoride in the Shush aquifer of Khuzestan County Iran. Fluoride.
7- Abushkhedem, S , 2018 “Design of Waste water collection system for Ain Derbaha region”, Palestine Polytechnic University, Hebron, Palestine.

Appendix

تقييم الاثار السلبية الناجمة عن انعدام شبكة الصرف الصحي في منطقة العبيدية قضاء بيت لحم والحلول الهندسية الممكنة لها

أخي المواطن، أختي المواطنة:

يقوم طلاب من جامعة بوليتكنك فلسطين بدراسة حول مصادر المياه المستهلكة من قبل الافراد ومدي الحاجة لانشاء شبكة الصرف الصحي في منطقة العبيدية، ونأمل منكم التعاون مع فريق العمل الميداني في الإجابة على الأسئلة التالية، علما بأن هذه المعلومات هي لأغراض البحث العلمي ولن يطلع عليها أحد غير فريق البحث، وبالتالي فإن مشاركتكم قد تسهم في إلقاء الضوء على واقع المياه في المنطقة وبالتالي المساعدة في حل المشاكل ذات العلاقة .

معلومات عامة						
تاريخ تعبئة الاستمارة _____/____/_____				الموقع _____ المحافظة _____		
اسم المجيب: _____				رقم التلفون/الجوال (ان امكن): _____		
معلومات عن الاسرة						
حجم الاسرة وتكوينها						
	عدد أفراد الاسرة		الجنس	الفئة العمرية		
				٠- ١٨ سنة	١٨ -٦٥ سنة	أكثر من ٦٥ سنة
			ذكور			
			اناث			
دخل الأسرة						
	مصدر الدخل الرئيسي لرب الاسرة			الزراعة ☐	موظف - قطاع خاص ☐	
				رعاية الاغنام ☐	يعمل في اسرائيل ☐	
				الصناعة ☐	أكثر من مصدر دخل _____	
				موظف - قطاع أهلي ☐	لا يعمل _____	
				موظف – قطاع حكومي ☐	مجالات عمل اخرى _____	
	معدل دخل الاسرة شهرياً		1000 > NIS ☐	1000 - 3000 NIS ☐	3000- 5000 NIS ☐	>5000 NIS ☐
	بالمتوسط، ما هو إنفاق الأسرة على المياه بالصيف والشتاء؟				الصيف (شيكل/شهر)	الشتاء (شيكل/شهر)

معلومات عن وضع المسكن

	نوع السكن	شقة ☐	بيت منفصل ☐		
		بيت زينكو/اسبست ☐	خيمة ☐		
	المساحة	مساحة المنزل الداخلية بالمتر المربع _____			
		مساحة سطح المنزل بالمتر المربع _____			
	عدد طوابق المنزل	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
	عدد الافراد داخل كل طابق					
	كيف تتخلص من المياه العادمة في المنزل	شبكة صرف صحي	حفرة امتصاصية	حفرة صماء	في الشارع	قنوات مفتوحة	() اخرى / حدد _____
	عدد مرات نضح المياه العادمة من الحفرة الصماء/الإمتصاصية	كل_____شهر					

التزود بالمياه

مصدر المياه

	ما هو مصدر المياه الرئيسي للمنزل	المصدر	خلال فصل الصيف (%)	خلال فصل الشتاء (%)
		شبكة مياه ☐		
		حصاد مياه منزلي/أبار جماعية ☐		
		ينابيع ☐		
		تنكات تعبأ من نقطة تعبئة تبعد أقل من ٥ كم عن المنزل. ☐		
	هل كمية المياه المتوفرة من جميع المصادر كافية لتلبية احتياجات الاسرة؟	أقل من ٢٥% من أحتياج الاسر ☐		
		من ٢٥% - ٥٠% من أحتياج الاسرة ☐		
		من ٥٠% - ٧٥% من أحتياج الاسرة ☐		
		أكثر من ٧٥% من أحتياج الاسرة ☐		

	شبكة المياه	هل أنت موصول مع شبكة مياه؟		نعم ☐	لا ☐
		كم تدفع بالمعدل شهرياً ثمناً للمياه؟		الصيف (شيكل/شهر)	الشتاء (شيكل/شهر)
		ما هي المدة الزمنية التي تكون فيها المياه متوفرة بالشبكة؟		الصيف	الشتاء
				كل☐ ساعة	☐ ساعة كل
		ما هي مجالات استخدام المياه؟		خلال فصل الصيف (%)	خلال فصل الشتاء (%)
			منزلي		
			ري		
			أغنام		
			أخرى		

		هل أنت راضي عن جودة ونوعية المياه؟			نعم ☐	لا ☐	
C1.3	**التنكات**	هل تشتري المياه بواسطة تنكات ؟			نعم ☐	لا ☐	
		ما هو عدد التنكات المشتراة؟			الصيف	الشتاء	
		سعة التنك بالمتر المكعب					
		السعر لكل تنك			الصيف (شيكل)	الشتاء (شيكل)	
		ما هي مجالات استخدام المياه؟			الصيف (شيكل/شهر)	الشتاء (شيكل/شهر)	
				منزلي			
				ري			
				أغنام			
				أخرى			
		مصدر المياه		نقطة تعبئة	نعم ☐	لا ☐	
				ينابيع	نعم ☐	لا ☐	
				شبكة مياه	نعم ☐	لا ☐	
				أخرى	نعم ☐	لا ☐	
	أبار جمع المياه	هل يوجد بئر لجمع وتخزين المياه في المنزل؟			نعم ☐	لا ☐	
	إذا كانت الإجابة نعم، أجب ما يلي لكل من الابار						
	النوع (خزان/أجاصة)	السعة (m^3)	نوع مساحة التجميع: (سطح منزل، طريق، أرض مجاورة، مدة ارضية،.الخ)	مساحة التجميع (m^2)	سنة الانشاء	تكلفة الانشاء بالشيكل في حال التمويل الخارجي لا تعبئ هذه الخانة	
1							
2							
3							
4							
	لكل بئر ارجو تعبئة انماط الاستخدام						
No.	نسبة الاستخدام للاغراض المنزلية %	نسبة الاستخدام للاغراض الزراعية %	نسبة الاستخدام للاغراض سقاية الحيوانات %	نسبة الاستخدام للاغراض اخرى %	سنة الترميم	تكلفة الترميم (NIS)	
1							
2							
3							
4							

		هل يتم تخزين المياه من مصادر اخرى داخل البئر		نعم ☐	لا ☐
		هل يتم استخدام المياه المحصودة في الحمام ؟		نعم ☐	لا ☐
		هل يتم تنظيف البئر؟		نعم ☐	لا ☐
		الفترة الزمنية الضرورية لتنظيف البئر		كل _____سنوات	
		كيف تقوم بتنظيف البئر؟	مياه فقط	نعم ☐	لا ☐
			صابون	نعم ☐	لا ☐
			معقمات مثل الكلور	نعم ☐	لا ☐
			الكاز	نعم ☐	لا ☐
			اخرى، حدد _____	نعم ☐	لا ☐
		هل تقوم بتنظيف ساحة جمع المياه قبل عملية الحصاد المائي؟		نعم ☐	لا ☐
		هل أنت راضي عن جودة ونوعية المياه؟		نعم ☐	لا ☐
		هل تقوم باستخدام المياه المحصودة لاغراض الري؟		نعم ☐	لا ☐
		ما هو معدل المصروف على المياه قبل وبعد انشاء البئر ؟		قبل شيكل/سنة	بعد شيكل/سنة
جودة المياه /ما هي مواصفات المياه المستخدمة؟					
	هل يوجد عندك أي شكوك بالنسبة لنوعية المياه المحصودة؟	الطعم		اللون	الرائحة
		ممتاز ☐		ممتاز ☐	ممتاز ☐
		جيد ☐		جيد ☐	جيد ☐
		مقبول ☐		مقبول ☐	مقبول ☐
		غير مقبول ☐		غير مقبول ☐	غير مقبول ☐
	هل يتم اغلاق البئر؟			نعم ☐	لا ☐
	كيف يتم اغلاق البئر؟ ما هي المسافة بين الأرض والباب (إرتفاع باب البئر عن الأرض)؟	قفل		نعم ☐	لا ☐
	هل أثر البئر على ممارسات العائلة؟			نعم ☐	لا ☐
C2.٩	كيف أثر البئر على ممارسات العائلة؟	١. التنظيف		نعم ☐	لا ☐
		٢. الاستحمام		نعم ☐	لا ☐
		٣. زيادة استهلاك		نعم ☐	لا ☐
		٤. اخرى		نعم حدد _____ ☐	لا ☐

هل فاضت الحفرة الامتصاصية خلال ال ١٢ شهر الماضية؟	نعم ☐	لا ☐	
في حالة استعمال الصرف الصحي ، هل يحدث فيضان للمجاري في المنطقة القريبة من منزلك ؟	نعم ☐	لا ☐	
ذا كانت الاجابة نعم . متى يحدث الفيضان ؟	في الصيف ☐	في الشتاء ☐	غير ذلك ☐
ما هي عدد المرات التي يحدث فيها الفيضان سنويا؟.			

هل باب بئر التجميع ؟	مفتوح ☐	مغلق ☐	غير ذلك ☐	حدد :
في حالة استعمال حفرة امتصاصية اذكر بعدها عن البئر بالمتر.....				
هل مستوى الحفرة الامتصاصية؟	أعلى من مستوى البئر ☐		أهبط من مستوى البئر ☐	نفس المستوى ☐
كل كم من الوقت تقومون بنضح الحفرة الامتصاصية؟	كل اسبوعين ☐	شهريا ☐	كل ٦ اشهر ☐	سنويا ☐ / لا يتم نضحها ☐ / حدد:
برايك الشخصي ما مدى حاجة البلدة لانشاء شبكة صرف صحي ؟	موافق بشدة	موافق	معارض	راي اخر:_____