

ESTIMATING THE AMOUNT OF THE WASTED WATER DUE TO FAULTY ACTIVITIES IN SOME AREAS IN DHI QAR/ SOUTHERN IRAQ

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Abstract:

Because of the poor water situation in Iraq in general and the southern governorates in particular requires prior consideration to find appropriate solutions. In this study, the researchers sought to estimate the amount of waste water in irrational and irrational ways in five vital areas within Thi-Qar governorate, which are Qalat Soker, Al-Rifai, Al-Shatrah, Sug Al-Shuyukh and Al-Fuhud cities using the questionnaire distributed to citizens. The total amount of water wasted per month in these five areas due to the unemployed faucets is 1752660 liters. Because of the leakage of the water reservoirs without a roving, it is 901906480 liters, because washing the cars with the water hose is 952632 liters and keeping the faucets open during the cleaning of the teeth is 288845180 liters. Khartoum is 23163505 liters. The researchers concluded that very large quantities of drinking water are wasted daily due to erroneous activities by the population in the study areas where 1216620475 (one billion two hundred and sixteen million six hundred and twenty five hundred) liters per month are lost. Given that the average person in developing countries may need about 80 liters per day for all his needs, these amounts would have been wasted if it was used to provide 510000 citizens a day with drinking water

Keywords: WATER, WATER WASTING, TEETH CLEANING, GARDENS WATERING, USELESS FAUCETS

I. INTRODUCTION

Allah almighty explained in the holy glorious book in many ayat such as in “Surat Al-Anbiya 'verse 30” that is water is the cause of life because Allah Almighty made water as the life. Water is important element for the life of human and his daily activities, animals and plant (even with saline water) (Abbas et al., 2018; Hussein, et al., 2019; Al-Khafaji and Al-Janabi, 2020). All Arab countries are depend on rivers flowing in their lands and their sources are located outside their borders, as in Egypt, Sudan, Syria and Iraq, and this threatens the water interests of these countries, and the increase in demand for water from all sides in a way that is not compatible with the serious pursuit of finding new sources of water is a dangerous thing that may happen. A profound imbalance between supply and demand for water, and the truth is that water is not like other commodities, as it is not possible to increase the supply of it to meet the high demand for it, and from here it is necessary to control the demand and rationalize consumption with the development of water sources, and the truth is that pure water is heading towards recession and the Middle East with its Arab countries is a potential conflict focus (Omar, 2006). International reports have indicated that one person out of five individuals in the world (An average of 1.2 billion people are deprived of water, and one of two (about 3 billion people) use impure water (Omar, 2006). Conferences and seminars have been held that dealt with the issue of water, but it is still few when compared to the size and importance of the topic, and the need for awareness about it increases from time to time. Among the studies that have appeared on this topic:

- 1- A study of the dangers of the water crisis by Dr. Nazeer Al-Ansari / 2018 entitled "Risks of the water crisis in Iraq: causes, solutions and ways of treatment" (Al-Ansari, 2018).
- 2- An expanded report by Prof. Haider Hussain Al Tuama, 2018 entitled (The Water Crisis in Iraq: Causes and Solutions), (Al-Tuama, 2018).
- 3- An Iraqi, Swedish and German research team consisting of Professor Nazeer Al-Ansari, Professor Nusrat Admo, Professor Varujian Sisakyan, Professor Sven Kentson, Professor John Lowe and Dr. Sadiq Baqer Al-Jawad, worked on publishing 10 papers on the water resources crisis of the Tigris and Euphrates in Iraq, (Al-Miqdadi, 2018).
- 4-Dr. Salah Abdel Badi Al-Shalabi, (Al-Shalabi, 1999) studied the problem of fresh water within the framework of the new international agreement.
- 5- Abd Al-Hamd Othman explained the Islamic principles in the environment and development, especially in water use rationalizing.
- 6- Qais Al-Obaidi, 2011, indicated that one of the most important methods and of rationalizing water consumption in various fields is a joint relationship between the people and the state, (Al-Obaidi, 2011).
- 7- Many scientific papers and researches were published in last decades which explained the ability of using different sources of water in agriculture such as drainage water (Al-Qasimi and Al-Salhi, 2018),sewage-treatment plant water (Wotaify and Al-Mamuri, 2019). Also, there were many researched had been done to increase the efficiency of water such as using magnetic water in agriculture (Joody, 2016).

Research objective

Through this study, the researchers seek to estimate the amount of wasted water due to unjustified and irrational ways in five cities within Thi-Qar governorate, which are Qalat Suker, Al-Rifai, Al-Shatrah, Sug Al-Shuyukh and Al-Fuhud. Also, directing recommendations to the relevant government departments and people to reduce this waste according to the estimates concluded by this study.

Study area

The study included five cities within Thi-Qar governorate, which are Qalat Suker, Al-Rifai, Al-Shatrah, Sug Al-Shuyukh and Al-Fuhud cities, Figure 1. Qalat Suker is one of Thi-Qar governorate cities in Iraqi. It is located on the banks of Al-Gharraf River, which branches off the Tigris River at the city of Kut. The population of the city is about 110,000 people. It located about 100 km away from the city of Nasiriyah and 260 km from Baghdad, its climate is moderate. Al-Rifai city is one of the important large cities, and it is about 300 km south of the capital Baghdad, and about 80 km north of Nasiriyah. its population is about 200.000 people. Al-Shatra city is a district center located in Thi-Qar governorate. Its population is 254,000 people according to the 2014 census. Sug Al-Shuyukh is a city located in the south part of Thi-Qar, and has a population of 200.000 people. It was called Souk Al-Nawashi (Najdi, 1912). Al-Fuhud sub-district is affiliated with the administrative district of Al-Chibayish, with a population of 91,000people according to the 2014 census, and it is about 65 km east from its center, Nasiriyah, and about 35 km west of Al-Chibayish.

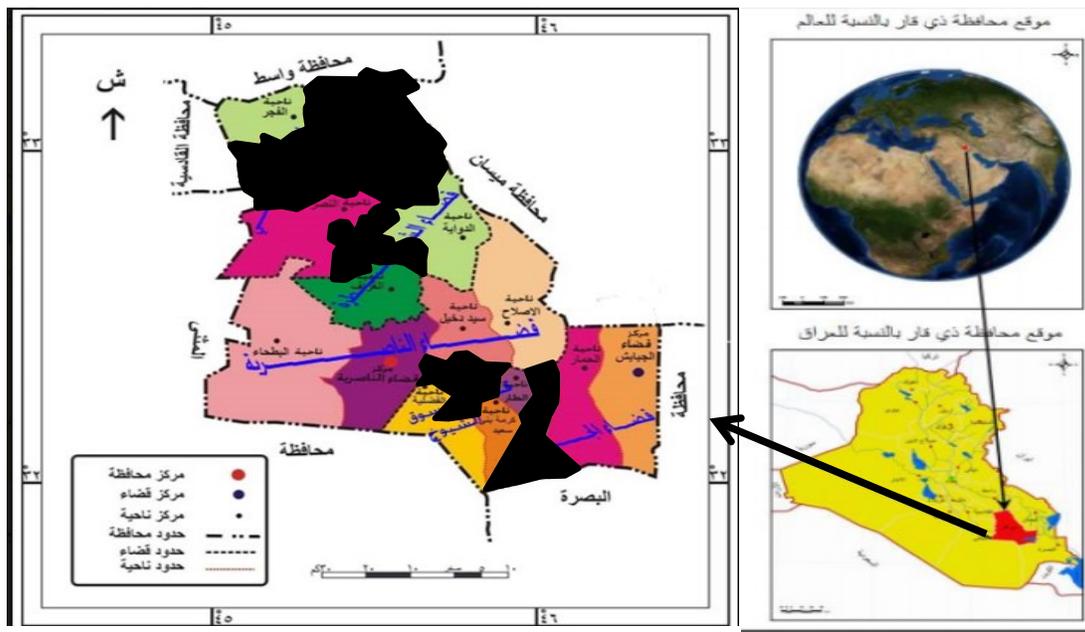


Figure (1) Shows the study areas on Thi-Qar governorate, Iraq and the world maps, which are represented by the black areas.

II. MATERIALS AND METHODS

The questionnaires

This research was based on the questionnaire, as three questionnaires were designed:

1- The first questionnaire includes information about the name of the administrative. Information of three parts, the first part includes general information about the family that includes the number of individuals, the number of water taps (total faucets), the number of broken water taps and the number of water tanks in the housing unit. The second part includes information about the individuals who use the toothbrush and who leave the faucets open while brushing and the approximate period in minutes that a single person takes during the cleaning process. The third part includes information on water wasted due to watering the gardens using drinking water, while the fourth part includes information about the water tanks in the housing units, their numbers and some of their specifications. The questionnaire also included important notes for citizens about the research's importance. The research also included a distribution of a second questionnaire for people who own cars, it included important notes on the research topic and its social importance. The questionnaire also included the answer of two questions:

Do you wash the car using a bucket and roller? Yes or No?

Do you wash the car using a hose? Yes or No?

If the answer is yes, how many hours does the washing process take?

The research also included other additional information about the population of the area covered by the distribution of previous questionnaires, and the number of regular and random housing units in the studied administrative unit.

Calculation formulas used to obtain research information

For the purpose of obtaining the total numbers of idle faucets and the amount of water lost due to them; the total number of careless people who leave the faucets opened during teeth cleaning and the quantities of water wasted because of them; the number of tanks without a raft and the amount of wasted water due to; the amount of water wasted due to washing cars and watering gardens with a hose and all the related numbers, many formulas were obtained.

Note: the partial number is the number studied in the questionnaires.

The careless people are people who leave the faucets running while brushing their teeth.

The partial time is the studied time by the questionnaires.

Equations for calculating the total number of idle taps in the administrative unit and the amount of water lost per month:

The total number of idle taps in the administrative unit = (The partial number of the idle taps * The total number of the administrative units) / The partial number of the administrative unit.....(1)



Formulas for calculating the total number of people who leave the faucets running while brushing the teeth and the monthly amount of water lost due to them.

The total number of the careless people = (The partial number of the careless people * The total number of the people using teeth brush)/The partial number of the people using teeth brush.....(2)

Time with minute daily:

The total consumed time (minute/day) = (The partial time consumed(minute/day) * The total number of the careless people)/The partial number of the careless people.....(3)

Considering that a person uses the brush twice daily, the total consumed time (minute / day) is multiplied by 2 to get the time with minute per day.

To get the consumed time per month, the time is multiplied by 30 days.

Equations for calculating the total number of water tanks in the administrative unit, the number of the studied tanks, the number of tanks without a raft, and the amount of water lost per month due to the absence of floats.

The total number of the tanks without a raft = (The partial number of the tanks without a raft * The total number of the administrative unit)/The partial number studied tanks....(4)

Then we calculate the amount of water seepage from the tank per minute.

The amount of water lost from tank/day = (The amount of water lost from tank/minute * The mean of the water seepage period).....(5)

The total amount of water lost from all tanks/month = (The amount of water lost from tank/day * The total number of the tanks without a raft) * 30(6)

To get the average number of car washes by hose, we used the following equation:

The average of car washing times = (The number of washing in summer + the number of washing in winter)/2.....(7)

To get the washing time per month, we multiply the washing time by 4

To calculate the amount of water lost due to washing cars per month, we use the following equation:

The total amount of lost water /month = washing time (minute/month) * water amount in liter/minute.....(8)

Calculation of water losses in Al-Shatra city:

Water lost due to tank seepage without raft

The partial Number of tanks = 280

The partial number of tanks without a raft = 119

The Total number of tanks = 3840 tanks

The total Number of tanks without raft = 1020 tanks

The partial seepage time from tanks without raft = 1342 min

The total seepage time from tanks without raft= 11053 min

The total seepage time for all tanks = 103527 minutes / day = 3105810 monthly minutes

Amount of water lost as a result of tanks seepage without raft = 37,269,720 liters / month

Water lost due to the idle faucets

Total number of idle faucets = 1,385 faucets

Amount of water lost due to idle faucets = 83,100 liters / month

Water lost from faucets running during the tooth-cleaning

The partial number of people = 1355

The partial number of people using the brush = 882

The partial number of careless individuals = 407

Time for leaving the faucets running during the tooth cleaning= 525 minutes

The total number of users = 227823 people

The total number of careless people = 105,129 people

The total Time of leaving the faucets running during the cleaning teeth by careless = 271217 minutes / day = 8136220 minutes / month

The amount of water lost as a result of leaving the faucets running during the tooth-washing = 16272440 liters / month

Water lost as a result of watering gardens with drinking water

The partial Number of gardens = 80

The total number of gardens = 1097 gardens

The time of watering the gardens = 7397 minutes

The number of watering times = 245 times / week

Total watering time for gardens = 101431 minutes / week = 405724 minutes / month

The amount of water lost as a result of watering gardens with drinking water = 2434344 liters / month

Water lost as a result of washing cars by hose

The partial number of cars = 104

Average number of washings = 310 times / week

Washing time = 5640 minutes / week

Washing time per month = 22560 minutes / month

The amount of water lost as a result of washing cars with hose = 135 360 liters / month

Water amount losses in Al- Rifai city:

The number of regular housing units is 10,000

The number of random housing units is 5000

Water lost due to water seepage from the tank without a raft

Partial number of studied tanks = 399

partial number of tanks without raft = 332

Total number of tanks = 23,940 tanks

Total number of tanks without a raft = 12481 tanks

The amount of water leaked out per month due to tanks without a raft = 44,241,480 liters / month

Water lost due to idle faucets

Partial number of idle faucets 214

Total number of idle faucets = 12840 faucets

So, the amount of water lost from all the idle faucets = 25680 liters / day

And the waste water per month = 770400 liters / month

Water lost as a result of leaving the faucets running during the washing teeth

Partial number of individuals= 2029

Partial number of people using the brush = 839

Partial number of the careless individuals = 598

Total number of brush users = 82,700

The total number of careless people = 58,945

So the amount of water lost as a result of keeping the faucets open while brushing the teeth = 232,783,200 liters / month

Water lost as a result of watering gardens with drinking water

The partial number of gardens is 124

The partial time of studied watering 7971

The number of studied watering times 358

The total number of gardens = 7440 gardens

So the total water consumed due to watering the gardens with pure water = 11478240 liters / month

Water lost as a result of washing cars by hose

The partial number of cars = 196 cars
The average number of washings = 352 times a week
The amount of water consumed = 76080 liters / month

Calculation of water losses in Qalat Suker city:

The number of housing units is 7000

Water lost due to leakage of faulty faucets

The partial number of idle faucets = 175
The total number of idle faucets = 4454
The amount of water lost due to leaking faucets = 8908 liters / day = 267240 liters / month

Water lost due to tank without float

The partial number of the tanks = 581
The partial number of tanks without float is 392 tank
Total number of tanks without float = 4723 tanks
Water lost due to tank seepage without raft = 1690840 liters / month

Water lost from faucets running during the tooth-cleaning

The partial number of individuals = 2143
The partial number of people using the brush = 1179
The partial number of careless individuals = 829
The total number of careless people = 42,552
Water lost due to leaving the faucets running during the tooth-washing process = 2553120 liters / month

Water lost as a result of watering gardens with drinking water

The number of watering time = 470 times
partial Number of gardens = 123
The total number of gardens = 3131 gardens
The amount of water lost as a result of watering gardens with drinking water = 8247504 liters / month

Water lost as a result of washing cars by hose

The partial number of cars = 288
The amount of water consumed per month = 426240 liters / month

Calculation of water losses in Sug Al-Shuyukh city:

Water lost due to tank seepage without raft

The partial number of tanks = 324
Total number of tanks = 18720 tanks

The partial number of tanks without a raft = 227 tanks

Total number of tanks without raft = 9949 tanks

The amount of water seepage from tanks without a raft = 815817600 liters / month

Water lost due to leakage of idle faucets

The total number of idle faucets = 9062

Water lost due to idle faucets = 543720 liters / month

Water lost as a result of leaving the faucets running during the tooth-cleaning

The partial number of people brushing their teeth = 1050

The partial number of careless and studied individuals = 910

The total number of careless people = 63025

The amount of water lost as a result of leaving the faucets running during the tooth-brushing process = 34906140 liters / month

Water lost as a result of watering gardens with drinking water

The partial number of studied gardens = 145

The total number of gardens = 5065 gardens

The amount of water lost as a result of watering gardens with drinking water = 618696 liters / month

Water lost as a result of washing cars by hose

The number of washing times = 7675 washings / week

Washing time = 7405 minutes / week = 29620 minutes / month

The amount of water lost as a result of washing cars by hose = 177720 liters / month

Calculating the water lost in Al-Fuhud city:

The number of regular and random housing units is 3500

Water lost due to seepage from tank without a raft

The partial number of tanks = 572

The partial number of tanks without a raft = 480

The total number of tanks without raft = 2937 tanks

The amount of water lost as a result of tanks without a raft = 2886840 liters / month

Water lost due to the idle faucets

The partial number of idle faucets = 105

Total number of idle faucets = 1470 faucets

Amount of water lost due to idle faucets = 88200 liters / month

Water lost as a result of leaving the faucets running during the tooth-cleaning

The partial number of individuals = 2261

The partial number of people using the brush = 1689

Total number of brush users = 36977 people

The partial Number of careless individuals = 651

The total number of careless people = 14,252

The amount of water lost due to leaving the faucets running during the teeth cleaning= 2,330,280 liters / month

Water lost as a result of watering gardens with drinking water

The total number of gardens = 2142 gardens

The amount of water lost as a result of watering gardens with drinking water = 384720 liters / month

Water lost as a result of washing cars by hose

The partial number of cars = 165

The amount of water lost as a result of washing cars by hose = 61152 liters / month

III. RESULTS AND DISCUSSION

The table below shows the quantities of wasted water due to the studied wrong activities of people, while Figure (2) shows the histograms of water quantities losses according to the cause of loss in the study areas. Figure (3) represents the total amount of water lost per month due to all the studied wrong activities.

Table (1) shows the quantities of wasted water due to wrong activities.

Total	The name of the studied city and the quantities of wasted water in (liter / month)					Water waste activities فعاليات هدر المياه
	اسم المدينة المدروسة وكميات المياه المهدورة بـ (لتر/شهر)					
المجموع	Al-Shatra الشطرة	Al-Fuhud الفهود	Sug Al-Shuyukh سوق الشيوخ	Qalaat Suker قلعة سكر	Al-Refae الرفاعي	
1752660	83100	88200	543720	267240	770400	Idle faucets الحنفيات العاطلة
901906480	37269720	2886840	815817600	1690840	44241480	Tanks without a raft الخرانات بدون طوافة
952632	135360	61152	177720	426240	152160	Car wash by

						hose غسل السيارات بالخرطوم
288845180	16272440	2330280	34906140	2553120	232783200	Teeth Cleaning تنظيف الاسنان
23163505	2434344	384720	618696	8247505	11478240	Watering gardens with drinking water سقي الحدائق بمياه الشرب
1216620457	56194964	5751192	852063876	13184945	289425480	Total المجموع

It is clear from table 1 and figures 2 and 3 that the largest amount of wasted water in Al-Rifai city was due to teeth cleaning, while in Qalat Suker, garden watering dominated the largest percentage of wasted water, and in Sug Al- Shuyukh, Al-Fuhud and Al-Shatra, the seepage water from tanks without a raft were the biggest cause of water waste . The total amount of water wasted per month in these five areas due to idle faucets is 1,752,660 liters, and because of the seepage of water tanks without a raft is 901,906,480 liters, and because of washing cars by hose is 952,632 liters, and because of keeping the faucets open while cleaning the teeth is 288,845,180 liters, and because of the garden watering with drinking water is 23,163,505 liters. From the previous table, it can be seen that the largest waste water due to the idle faucets was in the Al-Rifai city and the least waste was in Al-Shatra city. Also, the largest waste water due to the seepage of water from the tanks without a float was in Sug Al-Shuyukh city and the least wastewater was in Qalat Suker city. The biggest waste water of washing cars by hose was in Qalat Suker and the least waste water was in Al-Fuhud city. As for the biggest waste water due to keeping the faucets open during the teeth cleaning it was in Al-Rifai city and the least waste water was in Al-Fuhud city. The largest waste water due to watering gardens by drinking water hose was in Al-Rifai city and the least wasted water was in Sug Al-Shuyukh city. These differences in the quantities of wasted water depend on many factors, including population density, the cultural level and the living levels of people.

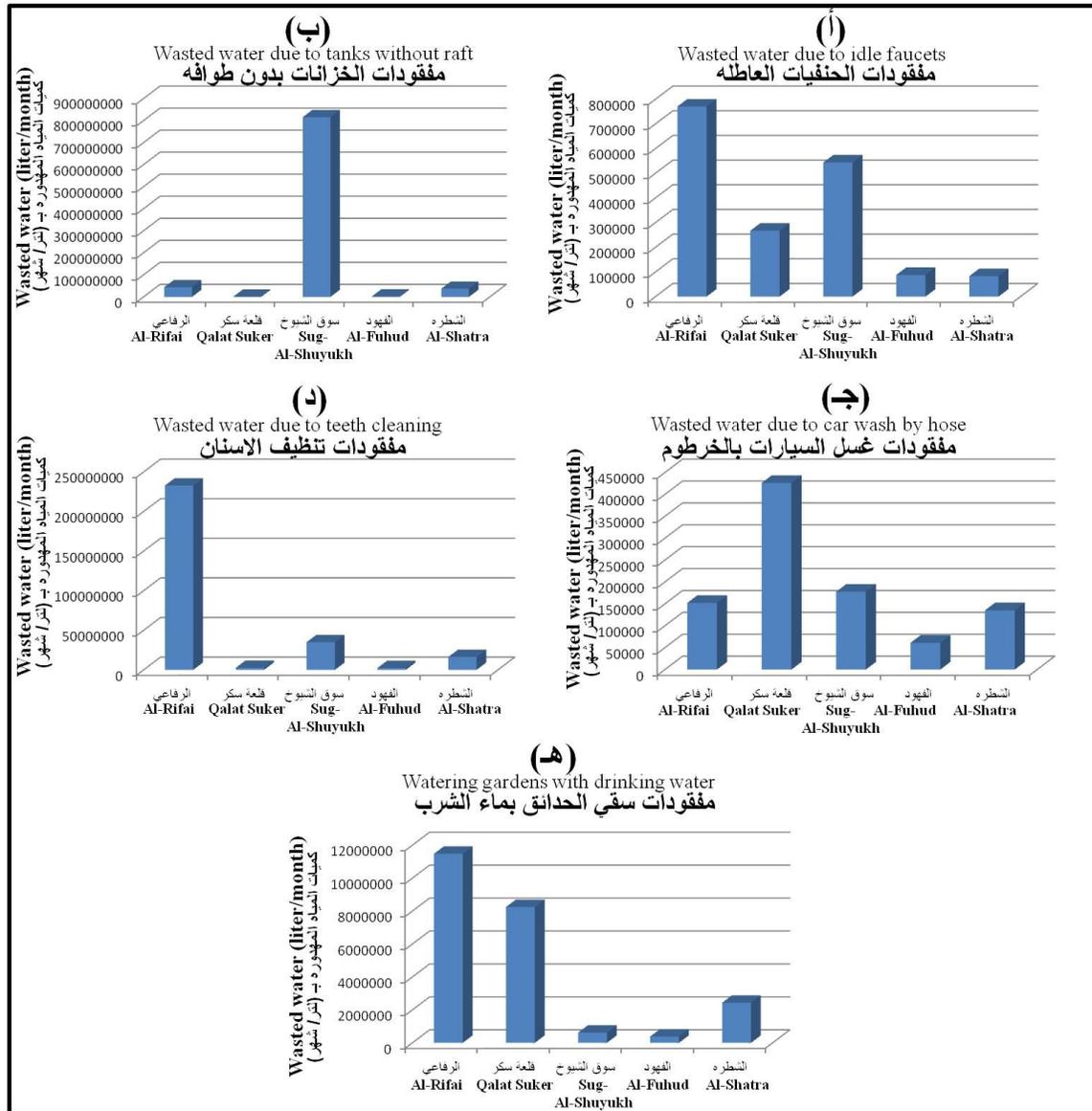


Figure (2) Shows the histograms of water losses according to the cause of loss in the study areas.

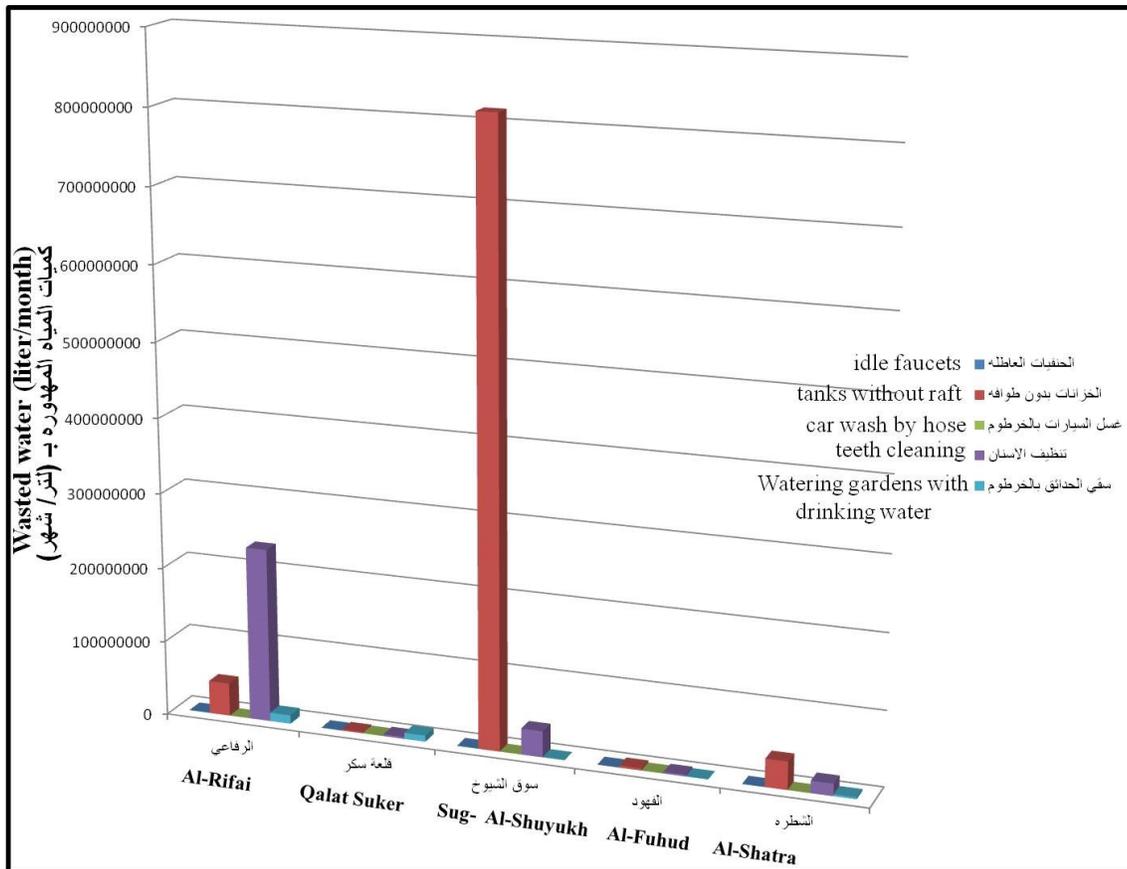


Figure (3) The total amount of water lost per month due to all the studied faulty activities.

IV. CONCLUSION

The researchers conclude from this study that there are very large quantities of water wasted daily due to wrong activities by the population in the study areas, where an amount of approximately 1216620475 (one billion two hundred and sixteen million six hundred twenty thousand four hundred seventy five) liters is lost monthly. Assuming that the average person in developing countries may need approximately 80 liters per day for all his needs (2,400 liters per month), so these calculated wasted quantities of water, if used properly and without waste, would provide 507,000 citizens per day with safe drinking water.

Recommendations

Researchers recommend the following:

- 1- Conducting other studies on other aspects and forms of water waste for the same areas and other areas.
- 2- Conducting awareness programs on the optimal use of water for all population groups.
- 3- Involve an educational subject about the optimal use of water within the curricula of primary and middle school.
- 4- Deliver these results to the relevant authorities to benefit from.

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