



Ministry of Foreign Affairs of the
Netherlands



Participatory Action Research

Water Scarcity and Contamination in Duhok City

Water storage in tanks

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Executive Summary

Aqua hero group, has participated in PAR project as a team that consisted of four students from university of Duhok in collaboration with UNICEF, Duhok, Kurdistan region of Iraq in order to assess the water scarcity and contamination in Duhok City. The group aimed to study the types of water storage tanks and their impact on water quality in order to identify the root causes of water related health problems after people concerns have raised regarding their water the cleanliness which may have led to various water related health problems. The group has conducted different data collection procedures from 222 families including 56 individual interviews, 15 Families Interviews, 6 FGDs of 5 individuals to represent total of 30 families. In addition, the group has received data from 121 participants through an online questionnaire prepared specifically for that purpose. Different types of water storage tanks with different materials and qualities were found which likely to affect the water quality and potentially linked to health problems. 21 percent of interviewed families have reported health problems such as stomach issues, skin irritations, allergies, hair loss, and kidney problems.

Introduction

Water, the blue gold, is the most important element needed for survival. It is a finite, irreplaceable but renewable if well managed, and powerful resource, which sustains the life. It is fundamental to human well-being that cannot afford to live without. It exists naturally on Earth in liquid, solid, and gas form (as physical states of matter) with unique chemical and physical properties that make it essential for life.

Although water covers about 71.4% of the surface of globe, it is hard to believe that less than 1% of it is available for human use as fresh water for drinking, domestic, and agriculture purposes. In fact, 97% of water on the Earth is salty water in the oceans leaving 3% only as fresh water (Datta, 2007) from which over two-thirds (66%) is locked up in glaciers, icecaps and Greenland, while 30% is located underground (as ground water), and only 0.3% of it is on Earth's surface contained in rivers, lakes, and reservoirs.

Global population has grown unprecedentedly in the past 20th century. While current global population is about 8.0, it expects to reach 9.1 billion by 2050 even though the projected decreasing luxuriance rates in the next few decades. Hence, the demand on water will increase rapidly in order to secure human needs for drinking, irrigating, domestic and industrial purposes.

WHO and UNICEF joint program presently estimates 17% of world population (about 1.1 billion of people) lack access to water resources (accessibility to at least 20 liters of improved water

source per person per day within 1 km distance). It also estimates that about 2.6 billion people lack access to simple improved sanitary latrine and about 1.1 billion people missing access to all types of improved drinking source of water (*Bates et. al., 2008*). United Nations reports predict that by 2050, 7 billion people in 60 countries will have to deal with water deficiency

The region (north part of Iraq) has lately witnessed an insufficient surface water runoff and severe reduction in groundwater recharge that prompted the officials to discuss the rising drought potential and its impact on the environment for 1, lack of rain and snow 2, Inefficient municipal, industrial, and agricultural water use as a result of rapid growth of population and rapid urbanization 3, Inefficient municipal sewer system 4, Severe water strategies of neighboring countries.

Recent reports on the depletion of groundwater storage in the Middle East area displays a shocking rate of decrease in total water storage of $\approx 27.2 \pm 0.6$ mm/year (eq. to a volume of 143.6 km^3) (*Voss et al, 2013*). UNICEF have reported that If Turkey and Syria keep implementing their water projects, it will cause Tigris and Euphrates Rivers to dry up by 2040 (*UN, 2010*) and this will lead to the end of Tigris and Euphrates rivers in 2040 because of water scarcity (drought) posing a serious threat to the both human health and to the environment in the region.

The objective of this research was to investigate some community (Duhok city center) practices concerning water storage tanks and its relation with water related human diseases to better understand how households' access and store water for their daily life and how these practices influence by their living conditions.

Data Collection Sample Sizing:

Data from 222 families were collected from different data collection procedures including individual interviews, Families Interviews, FGDs, and online questionnaires as in follow:

- **Interviews:**

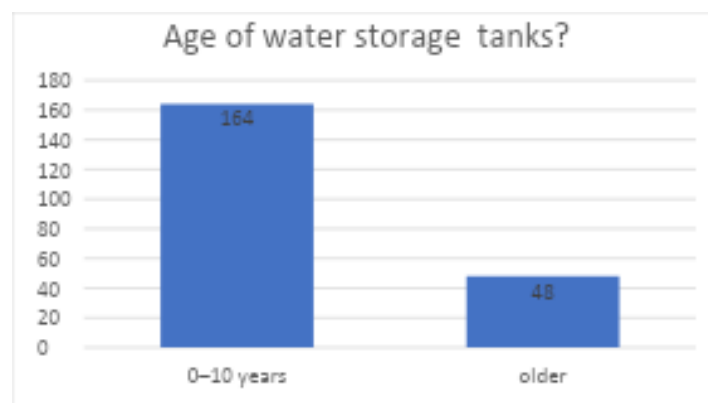
- Number of interviews conducted: [15]
- Number of people: [92]
- Interviewees: 15 head of households were interviewed and necessary data collection were gathered

- **Focus Group Discussions (FGDs):**
 - Number of FGDs conducted: [6]
 - Participants: No. of Participants per FGD [5]
 - Number of people: [231]
 - Locations: Azadi Park, College of Science (Cafeteria & Library), and Local restaurants.
- **Questionnaires:**
 - Number of questionnaires distributed: [121]
 - Type of collecting data: Online data collection
 - Number of questionnaires returned: [121]
 - Target population: [University Students, Academic Staff of Duhok University, One three organization, Environment youth high school / Duhok, Duhok police station, our colleagues, relatives and friends from other colleges].

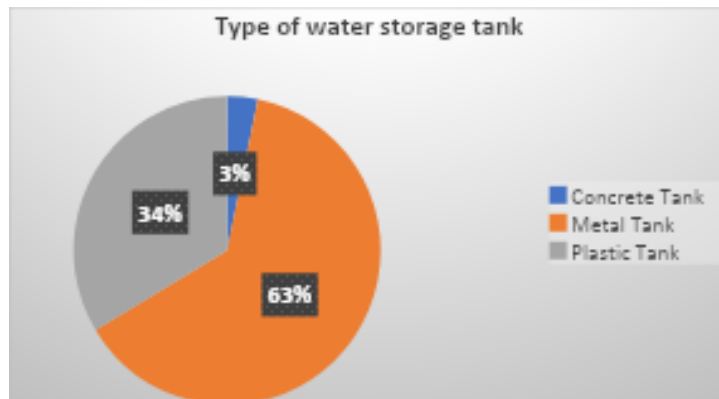
Results

The data we gathered from different procedures believed will allow us to examine the trends and challenges related to water storage systems in the areas we studied.

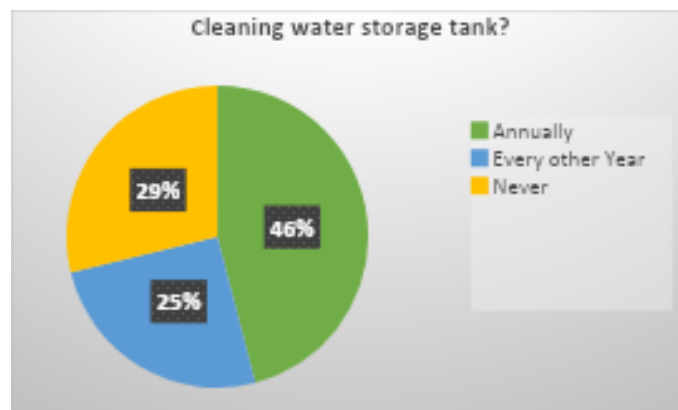
222 households (1,615 individuals) have participated in this survey.



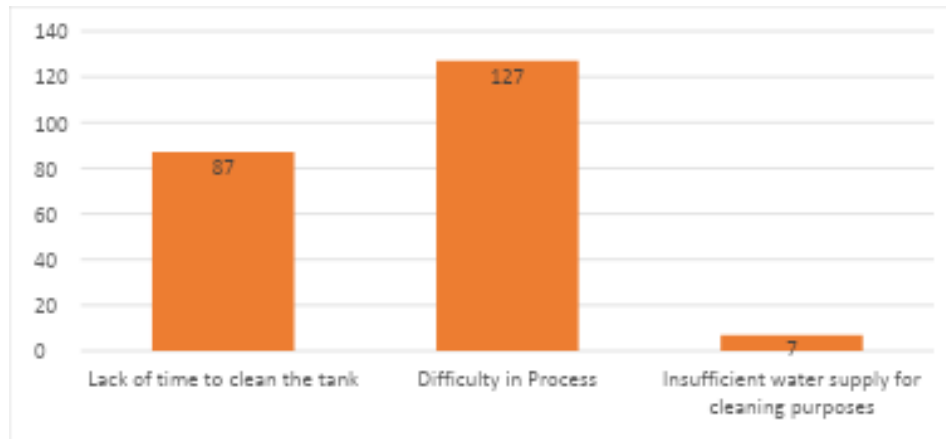
Storage tanks of 164 families were 1-10 years old while at the remaining 48 families were older than 10 years.



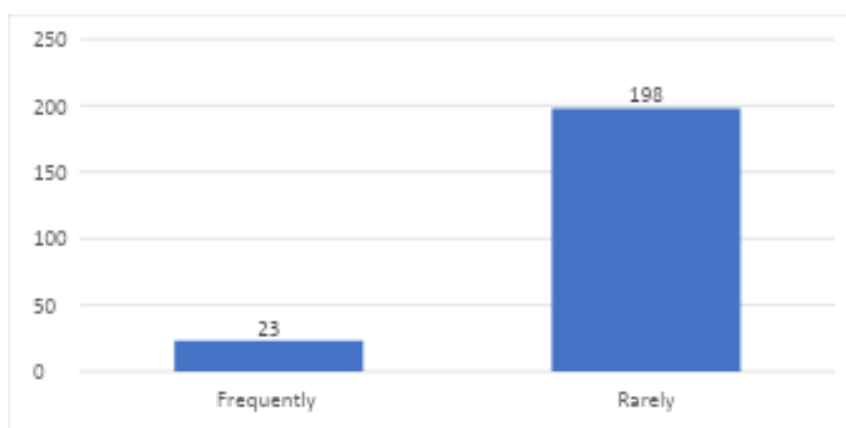
All of these households have water storage tanks which, categorized as: 137 metal tanks, 73 plastic tanks, and 7 concrete tanks.



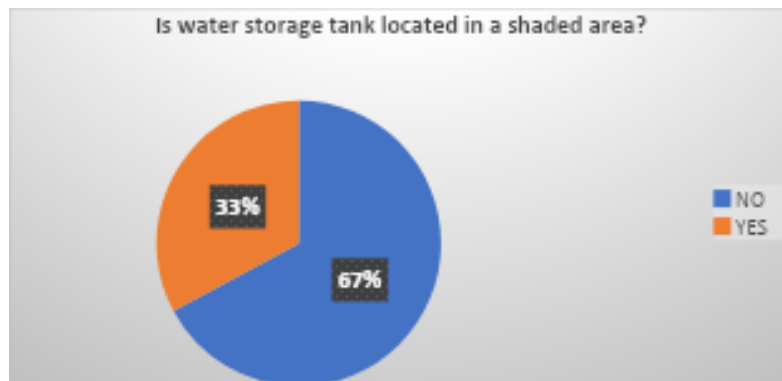
Regarding maintenance, 102 tanks observed cleans once a year, 56 cleans every two years, and 64 have never been cleaned since they were installed.



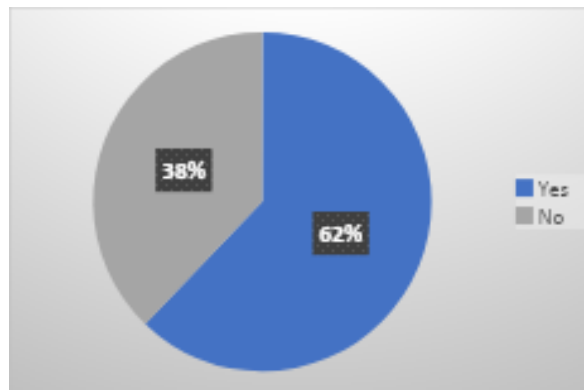
When asking about the challenges in maintaining and cleaning their storage tanks, 127 families reported the process as difficult, 87 reported a lack of time, and 7 attributed it to insufficient water supply.



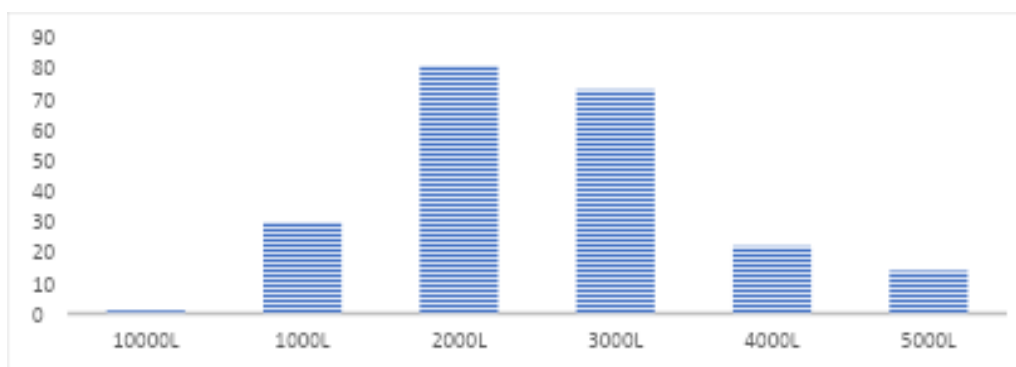
While 198 families reported rarely or never experiencing water shortages, 23 families said they frequently face shortages.



73 families reported their water tanks been covered or placed in shaded areas, whereas 149 families reported neither covered nor shaded.

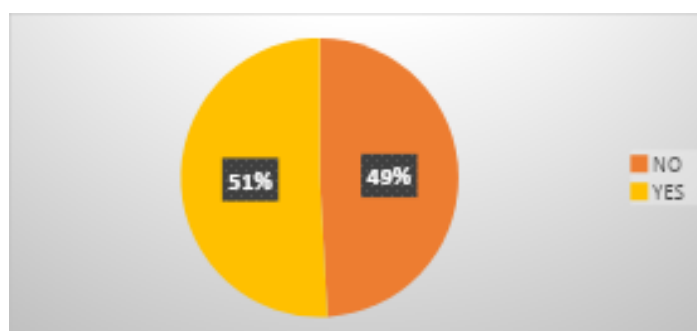


Out of the 222 families, 138 were confident that the water in their storage tanks is always clean and safe for their daily use (such as drinking, cooking, and washing), while 84 families do not

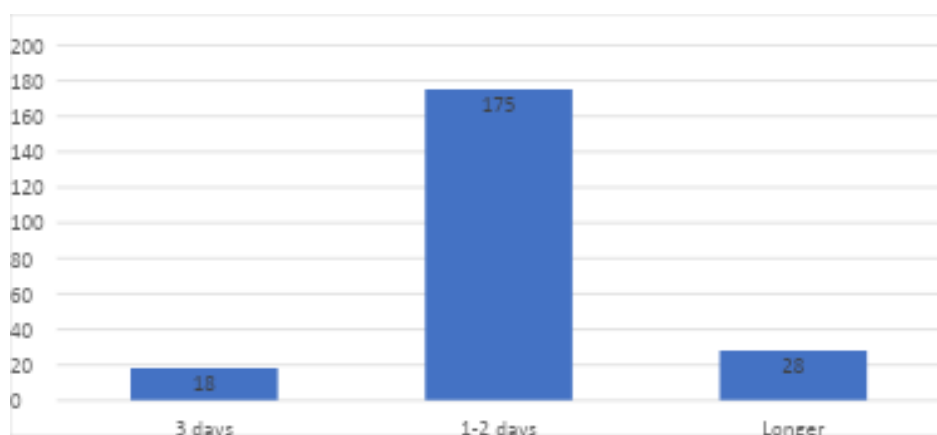


share this belief.

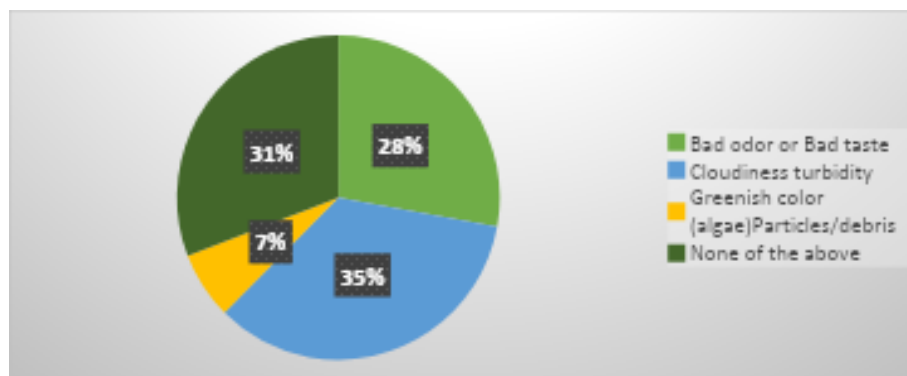
Regarding tank size, 203 families (households) found using tanks ranging from 1,000 to 5,000 liters, while 17 households have larger tanks.



Additionally, 113 families consider water storage tanks essential for ensuring long-term water security, while 109 families do not.



In terms of storage duration, 175 families keep water for 1-2 days, 18 families store water for 3 days, and 28 families store water for even longer.



Issues such as turbidity, unpleasant (bad) odor / bad taste, and algae (greenish color) have been noticed by 167 families in their stored water.

When asking regarding water quality testing, 53 families have conducted tests for contaminants such as bacteria or chemicals, while 169 have not.

Discussion

The data we gathered allowed us to examine the trends and challenges related to water storage systems in the areas we studied. We have first visited the water supply station to ensure water quality, then we started conducting our research.

Different types of water storage tanks with different material and qualities were observed utilizes in the area. Water storage tanks of some houses were relatively new, while in others were older and never been cleaned.

Health problems potentially linked to poor water quality, such as stomach issues, skin irritations, allergies, hair loss, and kidney problems, have been reported by 47 families, while 175 families have not encountered such issues.

As part of the study, our team has conducted PH and TDS (Total Dissolved Solids) tests on the stored water of 15 families. PH levels ranged from 6.0 to 7.3, with an average of 6.53, while TDS levels varied from 139 mg/L to 220 mg/L, with an average value of 175 mg/L.

Recommendations

In general, as we write our research, we have some recommendations that help everyone for better storing water and cleaning the storing tanks, include:

1. We recommend a governmental code of regulations that regulate all municipal, water and health departments and link them together to help people and give them more information about cleaning and storing water in tanks.
2. Education and promotion programs are needed to educate the public how to save and conserve water for sustainable management.
3. All houses to be equipped with water meter to measure the amount of water used and the cost of supplied water to be increased for water conservation.
4. Local government is to improve city sewer lines in order to minimize the losses in discharged wastewater that seeps through the soil.

Implementing these recommendations can significantly contribute to enhancing people effectiveness and improving better water quality.

Conclusion

The supplied water at study area found to be in good quality. When asking interviewees about their interest in learning more about water treatment methods and technologies in order to enhance the quality of their stored water, 91% of them expressed positively.

We have visited some water tank manufactories in the area in order to closely find the procedure of production and their quality. We found that there were no quality control nor governmental regulations and guidelines. Factories are producing water tanks illegally and marketing their products without any governmental observation.

Challenges and Limitations:

One of the obstacles we faced during the project was the timing. As we are students, we were busy in attending the classes and conducting mid-term and final exams.

References:

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Appendix







Acknowledgments

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