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An Analysis of the Quality of Dhaka's Potable Water and Sanitation Services

Abdur Razzak Zubaer
Department of Environmental Sciences, Bangladesh University of Professionals, Dhaka, Bangladesh
*Corresponding author e-mail: zubaer.bup@gmail.com

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Abstract

This study evaluates the current state of Dhaka's potable water and sanitation amenities. Moreover, the study addresses 6.1 and 6.2 of Sustainable Development Goal 6, which calls for optimal sanitation services and present conditions regarding water quality in Dhaka. In addition, the DWASA is the sole provider of potable water in the city, and as such, they are having a hard time keeping up with the demand for potable water. In addition, a significant number of private residences lack access to potable water and sanitary sanitation services on their properties. In order to complete this study, primary data were gathered through the use of questionnaire surveys, and informal interviews with experts; and secondary data were analyzed. The result is analyzed in three sections in which the first section shows the analysis regarding the privileged class, another one shows the underprivileged class analysis and the third one shows the combination of both. By breaking down the results, it is observed that the situation is way better than before in terms of consuming water from the improved sources, though the sanitation amenities need to be improved a lot though the progress is impressive. The study reveals that there is discrimination based on gender, economic capacity, and social standing for access to potable water and sanitary sanitation amenities. In addition, private-public partnerships can significantly enhance the current state of affairs. The report also recommends a number of activities to be taken conducive to outreach of the milestones attained in Dhaka.

1. Introduction

Potable water and sanitation amenities are seen as basic civil rights, although this is not the scenario. Nowadays, hygienic sanitation and safe drinking water are not accessible in the premises of impoverished households since these amenities are now considered business products. In 2015, the UN approved the 2030 program for Sustainable Development, which includes plans for 17 Sustainable Development Goals, 169 objectives, and 232 indicators for all 17 SDGs combined (UN, 2019). SDG target 6.1 focuses on comprehensive and unhindered ingress to economical and potable water for everyone, while SDG target 6.2 emphasizes sanitation, hygiene, and the abolition of open defecation, with a special focus on women and vulnerable groups. Both of these goals are part of the Sustainable Development Goals (Shamsuzzaman & Islam, 2018). DWASA is the city's unchaperoned water supplier. The majority of the distribution framework has been compromised, and it is possible that DWASA is the only source of microbiologically contaminated water (Mahbub et al., 2011; Mahbub et al., 2011). It has been determined that diarrheal diseases take the lives of 100,000 infants under the age of five every year (Hasan et al., 2019). Among the bacterial infections transmitted by water are typhoid fever, cholera, dysentery, salmonellosis, and E. coli infection (Parveen et al., 2008). In terms of consuming drinking water from improved sources and using improved sanitation facilities, the situation is a lot better than before (MICS Survey 2019). Both the poor drinking water distribution infrastructure and the unhealthy sanitation facility impede progress. Environmental degradation from industrial

effluents, excessive water withdrawal for agricultural purposes, and saltwater invasion wholly have consequences on Bangladesh's potable water standards. Furthermore, there is a distinction between solvent and insolvent households regarding access to potable water and the calibre of sanitation facilities available to them. Solvent households have direct access to potable water on their properties, whereas insolvent households do not. Despite the fact that there is gender discrimination in the provision of water for household activities (tolk et al., 2014).

2 Materials and Methods

2.1 Research Method

To collect primary data, the study utilizes a questionnaire survey of the wider public and informal interviews with experts in the field. Secondary data from previously conducted studies are obtained to provide additional support.

2.2 Design

It is planned to conduct a questionnaire survey with the wider populace, as well as informal interviews with experts in the field. Thus, this research is quantitative and applied in nature.

2.3 Data

Primary and secondary data are attained and analyzed for the purposes of this investigation. To collect primary data, questionnaire surveys, and informal interviews are used. Secondary data, on the other hand, are gathered from previously published journals.

Table 1: The categorization of improved and unimproved sources of potable water and sanitation amenities (WHO & UNICEF, 2006).

	Improved Sources	Unimproved Sources
Drinking Water	Piped Water into the Household	Unprotected Dug Well
	Piped Water to the Plot	Unprotected Spring
	Public Tap	Cart with Small Tank
	Tube-well	Tanker-truck
	Protected Dug Well	Surface Water
	Protected Spring	
	Rainwater Collection	
Sanitation	Flush	Pit Latrine without a Slab
	VIP Latrine	Hanging Toilet
	Pit Latrine with Slab	No Amenities
	Composting Toilet	

Despite the fact that the standard was intended to be generic, it has been encountered that it also pertains to Bangladesh. Furthermore, considering the global standard in order to evaluate the parameters of this study is required due to the very narrow gap between the local and global environments in this particular instance. Table 1 shows the JMP's adopted classification of "improved" and "unimproved" facilities. This classification can be found in Table 2, and it includes the response classifications to the household survey query that are enlightened in this guide.

2.4 Data Collection Methods

- Questionnaire survey for masses;
- Informal interviews with experts;
- Collect secondary data from previous studies and international standards.

2.5 Sample

This study's sample size is 1016 households, of which 500 are solvent and the rest are insolvent. The simple random selection procedure is employed to attain primary data.

3 Results and Discussions

3.1 Findings from Dhaka WASA Laboratory Reports

Table 2 shows the results of the DWASA laboratory tests on the drinking water distributed throughout the study area. The water came from various sources, including deep tube wells, supply lines, and groundwater reservoirs. The pH was determined to be within the allowable range, as outlined by the recommendations of Bangladesh and the WHO. Turbidity is measured to be within the range recommended by both Bangladesh and the WHO. The TDS level is below the threshold established by Bangladesh and the WHO recommendations. The conductivity is higher than the limit set by Bangladesh and WHO recommendations; it also does not satisfy the limit set by Bangladesh. The level of ammonia-n is below the threshold established by the national and the WHO international. The total hardness, measured in milligrams per liter, is lower than the threshold recommended by both Bangladesh and the WHO. Total coliforms were discovered in the water of the Groundwater aquifer at a concentration of N/100 ml. per sample. However, none of it makes its way into the water that comes from the supply line or the water pump.

Table 2: Comparison of Laboratory test report of DWASA with different standards (DWASA, 2019).

Parameter	pH	Turbidity (N.T.U)	TDS (mg/L)	Conductivity (µs/cm)	Ammonia-N (mg/L)	Total Hardness (mg/L)	Residual Chlorine (mg/L)	Total Coliforms (N/100ml)
Drinking Water Standard (WHO, 2011)	6.5 to 8.5	5	1000	-	1.5	-	0.6 to 1	0
Drinking Water Standard (Bangladesh)	6.5 to 8.5	10	1000	-	0.5	200 to 500	0.2 to 0.5	0
DWASA Supplied Water Quality	6.8 to 7.45	1.04 to 3.01	104 to 148	192.2 to 307	0	72 to 120	0 to 0.4	0 to 10

Although the laboratory quality of the water provided by DWASA can be demonstrated, the experience of using the water is quite the opposite. The DWASA authority frequently asserts that the majority of the time, users' water reservoirs are contaminated, resulting in contamination in the water delivered, leading them to believe that the problem is on DWASA's end. Furthermore, the concerned authority acknowledges that, while the quality of the supplied water is generally acceptable, the water may have poor color and smell for a variety of reasons. Though the authority admits that the DWASA's distribution system is deficient.

3.2 Findings from the Questionnaire Analysis

Table 3 provides an overview of this investigation. The summary detections of this study show that there is a notable differentiation between the privileged and underprivileged classes of residents in terms of the conveniences they can access. People's social and economic status contributes to the growing disparity between the two classes of residents. It is unconscionable for a person to have a better quality of life solely because of their social and financial standing. This includes having superior access to basic amenities. This type of barrier frequently causes social instability, which can be observed on occasion. Female children and female adults were found to go to gather water for their families more than male children and male adults.

Table 3: Summary of Key Indicators of this Study.

Indicators	Urban		
	Privileged (%)	Underprivileged (%)	Combined (%)
Population Using Improved Drinking Water Sources	98.08	82.82	89.65
Population Using Improved Water Sources for Household Chores	100.00	85.93	92.20
Duration to Collect Drinking Water			
Water on Premises	78.85	1.56	36.21
<30 mins	19.23	30.21	63.79
>30 mins	1.92	7.81	5.17
Gender Perspective to Collect Water			
Adult Woman	9.62	23.44	17.24
Adult Man	7.69	17.19	12.93
Female Child	0.00	32.81	18.10
Male Child	0.00	26.56	14.66
Water on premises	0.00	26.56	14.66
Population Treating Their Drinking Water	75.00	0.00	33.62
Population Using Improved Sanitation Services	100	68.75	82.75
Population Sharing Their Sanitation Facilities	26.92	93.75	63.70
Safe Disposal of Child's Feces	84.61	12.5	44.83

Despite the fact that there were financial and societal barriers, this was the case. These types of cases show that gender racism persists in our culture and that people of different genders are not treated equally. Those who are financially secure have access to water on their premises and do not have to wait in line for the essential facilities they require. Furthermore, the privileged class has a slightly higher percentage of social awareness as well as literacy than the underprivileged class, which gives them an advantage when it comes to implementing proper sanitation practices.

3.3 SWOT Analysis of Experts' Viewpoint

SWOT is the honorific of an analytical framework that can be used to help determine what the most significant challenges are that an organization or activity is facing as well as its most promising areas that need to be addressed. A SWOT analysis is designated in Figure 1 according to the opinion of the experts' viewpoint in order to determine the current situation in the area that is under investigation.

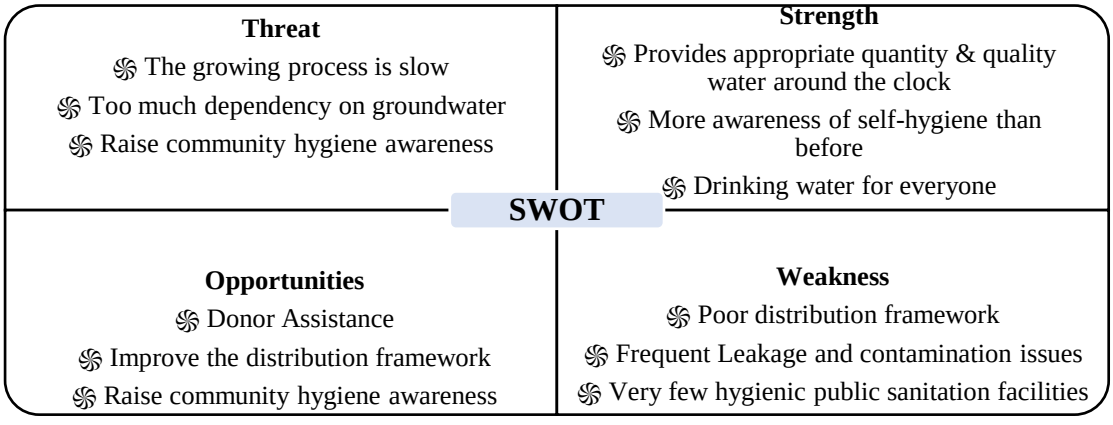

Figure 1: SWOT Analysis of Experts' Viewpoint.

3.4 Current Situation

SDG 6 is about "potable water and sanitation for everyone." The aforesaid analysis only focuses on indicators 6.1 and 6.2 of SDG 6. After the analysis result of the study is divided into three parts, I. Privileged class, II. Underprivileged class, and III. Combination of both. So, from the analysis, it can be seen that more than 80% of every class dweller uses the improved source of water for both drinking water and household chore purposes. However, a notable difference can be seen in terms of water on premises and water need to be fetched from a source on the basis of economic and social status. 78.85% of privileged class dwellers have access to improved sources of water on their premises on the contrary 1.56% of the underprivileged class inhabitants have the same amenity. Moreover, in most cases, adult females or female children have the responsibility to fetch water for their families from improved sources. So, in this scenario, a case of gender discrimination can be seen. All the privileged class dwellers have access to healthy sanitation amenities in their households and only 26.92% of them share their improved practice with another household. On the other hand, 68.75% of inhabitants of the underprivileged class have access to healthy and clean sanitation amenities and the majority of them share their improved sanitation amenities with other households. The majority of the privileged class dump their infants' stool in a healthy manner on the other hand 12.5% of the underprivileged class inhabitants do so (Monkelbaan, 2019).

Discrimination on the basis of gender, economic and social status can be seen in many scenarios after analyzing the results. Though basic safe water and healthy sanitation amenities should be free for all that is not the case in the current scenario. These basic needs of every common dweller have become very pricy for them due to the modern economy. Somehow the social norms and cultural aspects are also the reason behind the distinguishment on the basis of many factors. However, some recommendations are added to withstand this problem later in the study (Rahman, 2021; Shi et al., 2019).

3.5 Government Efforts

Bangladesh has made significant progress in ensuring that inhabitants have intrusion to potable water and sanitation amenities, and the country's current goal is to ensure that all inhabitants have access to potable water and healthy sanitation amenities. To achieve SDG 6, the government has taken many significant steps in national policies, strategies, and full-fledged guidelines. Climate change, drought, flood, and water surges waste a lot of water in Bangladesh, even though industrial and agricultural development is increasing water demand. The government has developed a policy for the management of water that takes into account all of the water-related phenomena that occur inside the country and places an emphasis on making use of surface water in order to decrease dependency on aquifers. The Bangladesh Delta Plan 2100, which narrates the blueprint for handling water resources for the next century, was also prepared by the government (GED, 2020). The difficulties presented by SDG 6 are now being tackled by a number of active operations. In addition, Bangladesh is working toward the establishment of nationally appropriate sanitation targets that are also aligned with SDG 6. Moreover, the government has also got a message about the fragile distribution network from the sole water supplier DWASA in Dhaka. The government has instructed the organization and other organizations to collaborate with each other to provide better and adequate amenities to the city dwellers. However, to improve by leaps and bounds the government could seek funding from the international funding agency and also public-private partnerships.

3.6 Major Challenges

The attainment of SDG 6 is essential for the attainment of the other SDG. The realization of gender equality is inextricably related to the attainment of the goal of generating everyone with access to water. It can be seen that clean water access and healthy sanitation amenities have available easily who are economically more dominant and socially respected; on the other contrary, dwellers who do not have such recognition in society have to suffer for that same basic need. Those households do not have access to water, and the task of water collection falls on the shoulders of women and girls. Putting people and water sources adjacent together diminishes the schedule required to get water, freeing up time for education, particularly for young women. Parasite infections and diarrhea from poor water, sanitation, and hygiene cause malnutrition. Chronic pathogen ingestion can cause intestinal dysfunction and malnutrition. Bangladesh cannot meet SDG 6 goals by doing business as usual. In order to address

pollution at its root cause and achieve sustainable management of water and sanitation for everybody, policymakers and decision-makers need to undergo a dramatic transformation of their actions. As it advances in the direction of a course that is more sustainable and robust, no one should be allowed to fall behind (Rahman & Savar, 2020). Climate change will continue to worsen freshwater system management. Climate change will mostly affect the hydrological cycle, affecting water availability, quality, and extreme weather (Shamsudduha et al., 2020). Bangladesh faces many challenges, but the biggest is improving the efficiency of its financial resources and securing more public finance and international financing. That is possible to increase the importance of private financing by using domestic and public financial resources to advance innovative forms of financing, such as blended finance and microfinance (Khan & Hassan, 2019; Rashid et al., 2018). To improve services, cost recovery, financial security, and private investment, targeted public financing and modifications are needed. Also required are adjustments to make the industry more appealing to private investors. This can result in a self-sustaining cycle of improved service levels, which in turn attracts greater investment, which continues until the services are profitable on a commercial scale (Sarkar et al., 2022).

3.7 Way Forward

Reduce, reuse, and recycle are new and sustainable concepts for the future; for instance, using substitute materials for natural goods reduces natural resource depletion (Zubaer et al., 2021). However, both from the findings of this study and from the analysis of society as a whole, people are discriminated against on the basis of their gender, their ability to financially support themselves, and their social status. To avoid the consequences of this scenario, a public awareness campaign must be launched to teach people that fundamental conveniences, such as clean drinking water and sanitary amenities, ought to be accessible to every single person on the earth. If a single household requires water, the responsibility must be divided equally between the male and female members of that household. Even while society has made significant progress in terms of the usage of improved sources of water, there is still a lack of emphasis on maintaining proper cleanliness, which is seen as more of a phenomenon in wealthier households. Residents have a responsibility to educate themselves, and communal hygiene should be established, as well as maintained, to a satisfactory level for their own benefit. The government has a responsibility to help residents of underprivileged classes by meeting their basic needs; the government may even consider seeking international financing to ensure that these conveniences are available to all. Safe water during sanitation amenities is another aspect that is often overlooked, but it is important to use safe water. Though many people believe that using that much water for sanitation is a waste of water. However, changing the habits of the masses will take time. Rainwater harvesting in educational institutions and even residential apartments can provide a good source of safe water for sanitation amenities (Troyee et al., 2022). Furthermore, in comparison to the country's total population, the number of public sanitary services available in public places remains extremely low. Significant problems can be solved through public-private partnerships, and certain start-ups in the neighboring country of India are already addressing these types of challenges. Bangladesh may extend an invitation to those start-ups and provide assistance to facilitate their establishment of operations here, or the government may devise a plan in which new start-ups may obtain government funding and assistance to address the issues at hand. In addition, collaborative partnerships for sustainable development have the potential to make it easier for local communities to adopt new technologies and for knowledge to be shared (Haque et al., 2020). Conducive to meet the rising exigency for water and address the related problems to water security it needs to be used and managed more effectively. In this regard, several actions may be highlighted, some of which include the following: I. Null ejection policies for conserving motion in the significant water bodies and recommending that the government mainstreams water projects; II. Regional confluences on using the plan of action results to support regional cooperation and transboundary issues; III. Capacity building and empowerment. IV. Rebuild or rehabilitate the DWASA distribution framework, and carefully monitor its progress afterward. V. Raise public awareness and make it a priority to ensure that every citizen, regardless of wealth, social status, or gender, is provided with the basic human right of having access to potable water and sanitation (Ahmed & Karim, 2022; Datta & Rabbani, 2016).

4. Conclusions

By identifying the issues that already exist in the study area, this research provides direct assistance in the study region's efforts to meet the goals of SDG 6 (indicators 1 and 2). In addition, the limitations of

this study as well as the new aspects will guide and assist in the conduct of future investigations. Moreover, the results of this study shed light on discrimination in terms of gender, financial soundness, and power for safely maintained drinking water and sanitation facilities. Therefore, finding solutions to the problems that have been found as a result of this study would help to provide the society and the residents with a better balanced and healthier environment to live in; and it will develop citizens of Bangladesh who are more environmentally conscious.

5. Recommendations

It is essential to make water efficiency a top priority across all activities by installing water conservation technology that is considered the industry standard, particularly in regions where water is in short supply. Moreover, educating workers on the significance of water efficiency, including the possibility of linking performance bonuses or other operations-based incentives to water-saving techniques. Correspondingly taking preventative measures against water contamination by using cutting-edge wastewater treatment methods that allow for the release of effluent. The development of innovative manufacturing methods, with the goal of removing substances that have a high potential for contaminating water and replacing them with materials that are simpler to remove from water systems. In a similar manner making investments in water treatment in order to relieve the strain that industrial wastewater places on municipal water treatment systems. Similarly, collect and purify the wastewater from agricultural operations for use as a source of potable water. Recycling the water from the building's sinks and showers can reduce the amount of drinking water used for flushing toilets. Lessen the chances that waste will contaminate the groundwater by ensuring that all waste is handled with extreme caution and is processed in accordance with all applicable local and federal regulations. On the contrary making investments in clean-up efforts when they are required, bringing places back to the quality levels they had before the incident. However, it is also significant to educate consumers about water habits and global water quality and scarcity issues to mitigate the negative effects of the consumer product use phase. For the future make investments in water and sanitation projects or infrastructure in areas that are not currently being served. Ensuring workers and their families have potable water, sanitation, and hygiene education should be fundamental. Additionally, make investments in water ecosystem cleanup and restoration projects to guarantee that water extraction practices are environmentally responsible. In the same way, prohibit the use of chemicals and other materials that, if disposed of incorrectly, could negatively impact the quality of the water. To conclude, ensure that every individual, regardless of wealth, social rank, or gender, has access to clean water and sanitation.

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