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WATER VULNERABILITY AND SUSTAINABILITY SCENARIO OF A TYPICAL POPULUS CITY OF LEAST DEVELOPED COUNTRY

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ABSTRACT

Problems related to water and environmental sector like scarcity of pure and safe water are becoming a major concern particularly in large densely populous cities as a result of rapid growth of population and unplanned urbanization. This research focuses on the present situation of water security and vulnerability scenario in the poor urban area of Sylhet, Bangladesh and finds out the consequences of impure water along with the present and future peoposed role of public and private organizations to improve water security and vulnerability at the study area. Survey data were collected from face to face questionare, telephone interview, mail completion, online survey, observation and focused group discussion. A questionnaire survey was also conducted in 16 wards of Sylhet City Corporation where water crisis is severe. The major environmental problems are inappropriate solid waste disposal system, inadequate water supply, water logging etc. WASA provides water for only 18.87% of total respondents and the role of NGO is not satisfactory too. Almost half of total residents collect water around 10-meter distance from water source, meaning water security management plan is not good enough for urban people. Scarcity of water leads to unhygienic sanitation problem in the city causing degradation of health condition of people day by day. Some organizations are working now to reduce this problem but due to lack of planning, their hard work goes in vain. This research work will help to find out the problem that the people of this zone are facing and what kind of measures are needed to be taken to mitigate this kind of challenging problem.

Keywords: *Vulnerability, WASA, Water, Environment, Sylhet.*

1. INTRODUCTION

Safe drinking water, good sanitation and hygiene are fundamental to people's health, survival, growth and development. Yet, roughly one-sixth of the world's population lacks access to safe water, and around two-fifths lack adequate sanitation (Alam, Nishat, & Siddiqui, 1999). According to a WHO report, around 780 million people globally do not have access to adequate water supply sources (Sakai, Kataoka, & Fukushi, 2013). Use of contaminated water has its health and financial cost. In terms of health cost, it is reported that 80% of all diseases in developing countries may be attributed to the use of contaminated water (Haydar, Nadeem, Hussain, & Rashid, 2016). Industrial waste discharges into the natural environment can deteriorate surface water (Nguyen & Westerhoff, 2019) which is also a major concern regarding urbanization. Access to drinking water which is a global objective of sustainable development is increasingly threatened by the pressure of uses on all resources (Lanmandjèkpogni, Codo & Hountondji, 2019).

Surface and near-surface drinking water in the coastal areas of the mega-deltas in Vietnam and Bangladesh-India are most vulnerable, putting more than 25 million people at risk of drinking 'saline' water (Haque, Vineins, Scheelbeek & Khan, 2016). The country being located on a geotectonically active sedimentary basin; it experiences subsidence almost all over the delta. Subsidence of land, however, not only affects the mean sea level, it might result in changes of water level as a relative measure over the surrounding lands and thus in the depth of inundation (Alam et al., 1999). In most city areas of Bangladesh, people suffer from scarcity of pure and safe water. The difficulties with drinking water collection in normal situations are mainly caused by the spatially varied availability of drinking water sources (Sarkar & Vogt, 2015). Especially in the urban poor area people are affected various waterborne diseases due to impure water. In the rural areas, it has been found that the groundwater extracted by hand tube wells is contaminated with arsenic in many places (Choudhury, Quadir & Ahmed, 1990).

This research work focuses on depicting the overall scenario of Sylhet urban areas where poor people are having trouble finding a safe and hygienic water source for them. Residents of Sylhet city are suffering from acute water crisis as the city corporation is supplying only 2.5 crore liters of water per day while the demand for water is 7.9 crore liters daily. Due to high population density and lack of adequate housing facilities, slums and squatters are increasing every year in Sylhet City. People who live in slums and such other places do not have access to safe drinking water and they are easy casualties to water-borne diseases (Alam et al., 2012). Slums are not homogeneous, and there many diverse vested interests that exist in slums. Slum upgrading is not simply about water or drainage or housing. It is about putting into motion the economic, social, institutional and community activities that are needed to turn around downward trends in an area. These activities should be undertaken cooperatively among all parties involved residents, community groups, businesses as well as local and national authorities if applicable.

2. METHODOLOGY

Demographic description of the study area is discussed and then the overall data collection method is described in the methodology section. To understand present situation of water security in the poor urban area of Sylhet and to find out consequence of impure water, and also to know about the role of public and private organization to improve water security at the study area, the study area is surveyed through questionnaire method. After the field work, the primary data that were collected by the questionnaires, were analyzed and well arranged in lists and figures.

2.1 Study Area

Sylhet is located in the north-eastern of Bangladesh at 24°32'0? N, 91°52'0 E, on the northern bank of the Surma River consisting of 27 wards and 210 mahallas. Sylhet experiences a hot, wet and humid tropical climate. The city is within the monsoon climate zone, with annual average highest

temperatures of 23°c (Aug-Oct) and average lowest temperature of 7°c (Jan). Nearly 80% of the annual average rainfall of 3,334 mm occurs between May and September. A total of nine natural drainage channels (locally called chara) are responsible for draining storm water from city area to the Surma and Khushiara River (Rahman, Zafor & Rahman, 2013). The city corporation is supplying 22,500 Gallons of water where the demand is about 65000 Gallons. The major sources of water to the city is the tube wells and the Surma River. Tests of tube wells in Sylhet District by the Bangladesh University of Engineering & Technology in 1997 found that about 27.6% contained more arsenic than the acceptable limit set by Bangladesh of 50 micrograms per litre.

2.2 Data Collection Method

The data collection phase of the survey process is absolutely vital and not only needs careful planning, but careful monitoring as well. Choosing a method of data collection depends on a number of quite complex factors. Such as amount of time, budget of money and the complexity or nature of the question. The collected data during the year of 2017 and 2018 through the survey method will be depicted in this paper.

2.2.1 Social data collection method

There are different ways of collect data from field or other sources. Social data collection work is the primary survey work that is considered the study and various ways of social data collection methods are discussed below.

2.2.1.1 Face to Face Interviews

In face to face data collection; a team of interviewers especially trained to collect data for surveying work are sent out to respondent's residence to conduct the questionnaire. This is preceded by an 'advance letter' sent out by the survey organization to inform the respondents that they have been selected for the survey, what the survey is about, why they have been selected and that an interviewer will be calling.

2.2.1.2 Telephone Interviews

In a telephone survey the interviewer sits in a call center and reads a structured questionnaire to the respondent keying in their answers to a computer screen. Computer Assisted Telephone Interviewing as this is known, allows the researchers to have more complex questions, although the questionnaire must be kept shorter on the telephone than in face to face encounters. In a telephone survey questions need to be short and are generally attitudinal or behavioral. This is because people are much less inclined to answer personal questions over the telephone when they have not met the interviewer. Response categories also need to be short as respondents will not be able to see show cards and are unlikely to remember a long list of responses read out to them.

2.2.2 Mail Surveys

Mail surveys or postal questionnaires which are filled in by respondents and then sent back to the researcher are relatively cheap method of surveying a large sample, especially if that sample is widely geographically dispersed Generally, a questionnaire is sent out with a covering letter and a stamped addressed envelope. Follow up postcards can be sent several times to boost the response rate**.** Self-completion questionnaires can also be given out to certain groups of people at key event.

2.2.3 Observation

Participant observation is the process of learning through exposure to or involvement in the day-to-day or routine activities of participants in the researcher setting. One is expected to become a part of and turn to the observer for information about how the group is operating. It helps the researcher to get the feel for how things are organized and prioritized, how people interrelate, and what are the cultural parameters.

2.2.4 Secondary Data

Secondary data were collected through thorough analysis of previous research work along with proper scrutiny of NGO and Government organization report. All these facts helped to find out to visualize the actual water vulnerability scenario of the regarding area.

3. RESULTS AND DISCUSSIONS

Socio-economic status of a slum area is mostly depended on education, income and occupation and this entire trio always influences on the nutritional health of slum dwellers. Water security is a prime issue connecting and ensuring the safety of this trio. Not only health but also lifestyle and livelihood status also been tracked by socio economic condition. Here all socio-economic condition is depicted over a marginalized urban slum area of Sylhet. The results obtained following the outlined methodology are organized into four sub-sections. Section 3.1& 3.2 are for demographic data analysis and water contamination scenarios; Section 3.3 explains role of Government and NGOs and Section 3.4 listed the role that can be played by civil society.

3.1 Demographic Survey

The age of respondents is a major concern of the study as the authors had to rely mostly on the questionare survey and people of young to middle aged were targeted most beacuse they were mostly answering the questions than others. From figure 3.1 it is clear that people of age 18-48 are the main target of the study as they are the person who have idea of the whole area and have connections with almost every member of the locatlity along with the possibility of getting most response from them.

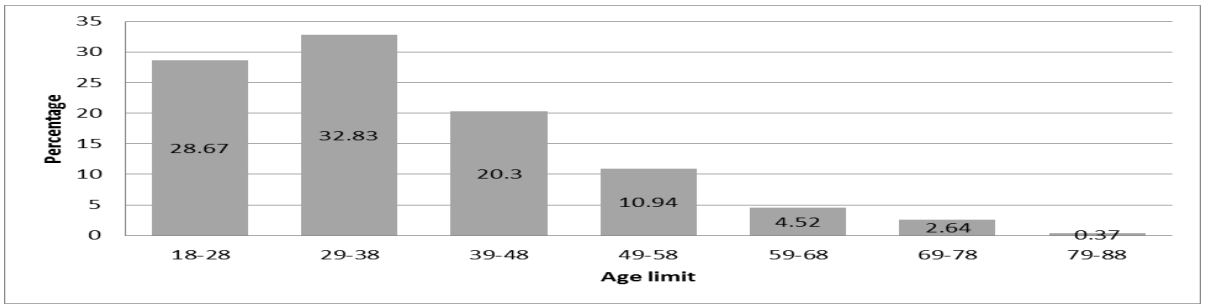

Figure 3.1: Age of the Respondents
Source: Field survey 2017-18

Table 3.1 depicts is the acutal scenario of urbanization happening in Sylhet. Where we found 73% respondents whose actual birthplace is Dhaka but now they are living in the study area. Some of them moved afrter marriage, some of them moved to earn their livelihood. But the fact is they are making the city a much conjusted place which is one of the reasons why the authority is screwing up things.

Table 3.1: Birthplace of Respondents

Area	Sylhet	Chittagong	Dhaka	Khulna	Rajshahi	Rangpur	Barisal
Percentage	58	14	212	2	2	2	1

Occupation of the respondents is clear from figure 3.2. Businessmen and the housewives were asked most questions as the housewives know best about the quality of water they serve to their family and the businessmen were willing to help as well as they were concerned about leading a healthy life. People of other occupation were not asked much as they might not get interested about the water quality due to lack of knowledge.

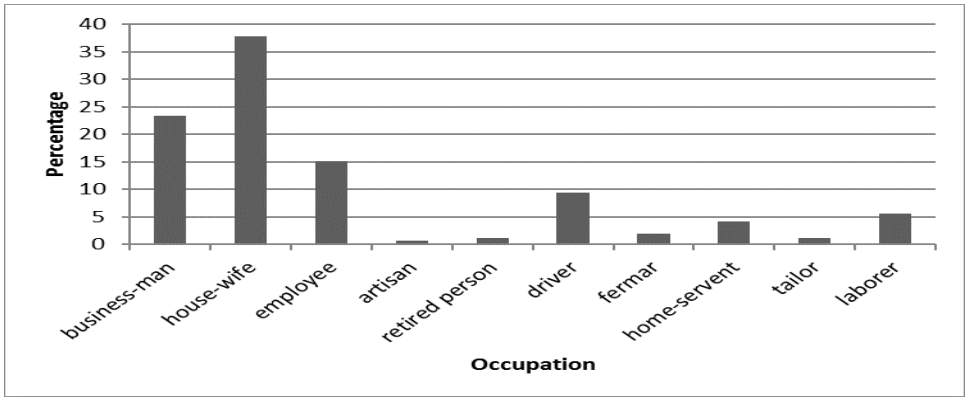

Figure 3.2: Occupation of the Respondents
Source: Field survey 2017-18

Sanitation problem is also a major concern in our regarding study area. Only 17% of the respondents having a cemented house indicates that other 83% of the respondents are having a certain amout of trouble in terms of hygenic questions. People living other than cemented house is causing problems for other people as they are polluting the area which is harmfull for all in the end. This problem needs to taken care of as soon as possible other wise all the steps taken to provide adequate water supply will never be fruitful.

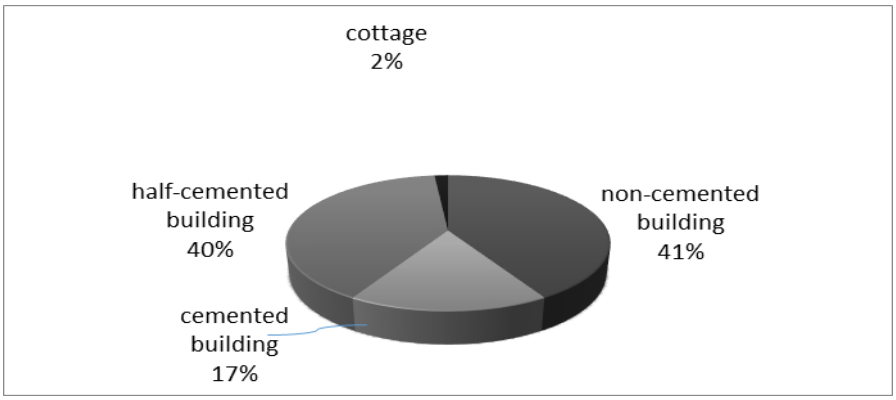

Figure 3.3: Type of Respondent's Houses
Source: Field Survey 2017-18

Table 3.2 and Figure 3.4 represents the distance of water sources from respondent houses and daily amount of household water required. Almost 45% of people collecting water from 5-10 metre indicates that the supply system from the source isn't good enough to reach door to door which creates trouble for the users. On the other hand almost 35% of people having a water demand of 10-20 litre per day indicates that by taking adequate steps in the water supply field will clearly going solve the current problems that the residents are facing as providing supply of 10-20 litre water per day is not an enormous task which cannot be resolved by taking adequate steps. Government along with NGOs and with the help of civil society need to take necessary steps and their perspective steps will be discussed in the upcoming sections.

Table 3.2: Distance of the water sources from respondent houses

Distance(meter)	Frequency	Percentage(%)
5-10	120	45.28
11-15	27	10.188
16-20	22	8.3
21-25	21	7.92
26-30	17	6.42
31-35	0	0
36-40	0	0
41-45	10	3.77
46-50	48	18.11
Total	265	100

Source: Field survey 2017-18

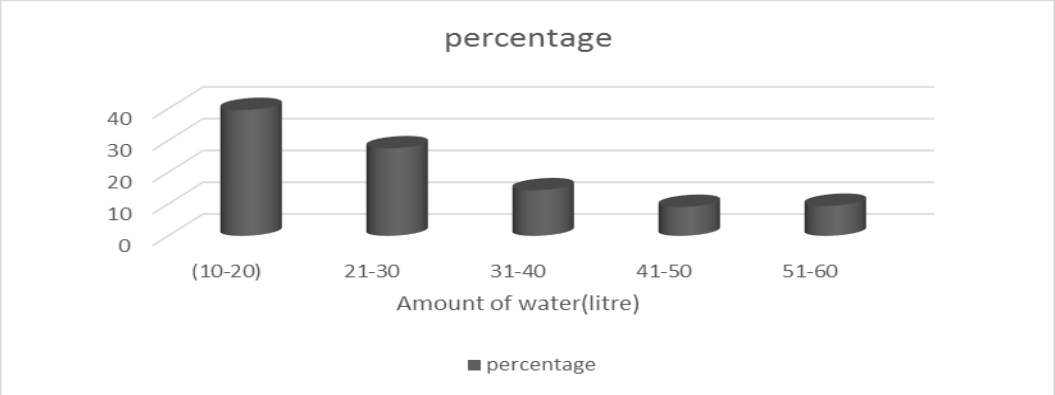

Figure 3.4: Daily amount of water required for cooking and house hold usage
Source: Field survey 2017-18

3.1 Water Contamination Scenario

Household water security will be achieved when reliable and safe household water supply and proper sanitation will be ensured for all communities. It is an essential foundation to support sustainable economic development. Household water security index can be rendered with three sub-indices: access to piped water supply, access to improved sanitation and hygiene condition as indicated by age-standardized Disability Adjusted Life Years (DALY).

Figure 3.5 and table 3.3 shows the water contamination scenario clearly. From figure 3.5 it is clear that more than 50% repondents have no knowledge about their watrer quality which calls for a serious investigation on the water supply management system. And table 3.3 describes the the scenario of disceases regarding water pollution. People are suffering from many water brone diseases like dirraohea, dyscentry etc. 25.08% people affected by diarrohea clearly indicates that the supplied water quality is bad enough to cause problems to human health. Necessary steps should be taken to improve the water quality in the repective area.

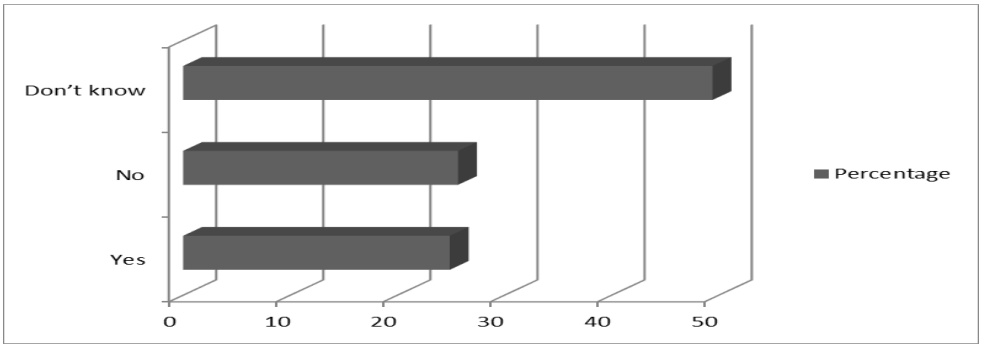

Figure 3.5: Whether the tube well used as a water source by Respondent's family is Examined and Certified as free from Arsenic or not
Source: Field Survey 2017-18

Table 3.3: Problem due to water scarcity and water contamination

Diseases type	Frequency	Percentage(%)
Diarrhoea	66	25.08
Cholera	11	4.1
Jaundice	9	3.3
Dysentery	28	10.64
Skin diseases	19	7.22
Arsenic poisoning	3	1.14
Hair fall	2	0.76
Typhoid	11	4.151
No diseases	74	28.12
No answer	42	15.54
Total	265	100

Source: Field survey 2017-18

3.2 Role of Government

Slum dwellers are part of the urban populace, with the same democratic rights to environmental health and basic living conditions as all residents. These rights are often limited by a government's ability to realize them. Water scarcity is one of the greatest problem in the slum area that Government failure to ensure water security for the poor. Government should take proper steps to reduce this type of problem. 56% of the respondents had no comment on steps taken by the Goverenment; which actually indicates the drastic failure of the authority to provide the sufficient water supply to all its people. Some steps that can be taken by the Government are listed in table 3.4:

Table 3.4: Steps that can be taken by Government to Solve water related problems

Step	Frequency	Percentage (%)
Placement of tube well	70	26.32
Providing water by WASA	50	18.87
No comment	145	54.72
Total	265	100

Source: Field Survey 2017-18

3.3 Role of NGOs

To develop water security, NGOs can help in many ways. NGOos should play a critical part in developing society, improving communities and promoting citizen participation. Local NGOs often have the knowledge and experience needed for practicing good governance. The following steps can be taken by the NGOs to make a sustainable future for the locality:

1. NGOs can help them with money to develop their economic condition.
2. Can help to set up tube well and other equipments required for safe drinking water.
3. NGOs can also create consciousness among poor people.
4. NGO can also contribute in government programs.
5. They can provide water purification tablet and train the illiterate people how contaminated water can be preapared for safe drining purpose.

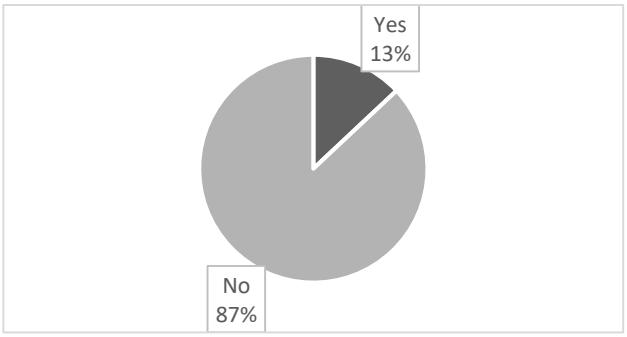

Figure 3.7: Whether any NGO is currently working on water survey at survey area or not
Source: Field survey 2017-18

3.4 Role of Civil Society

Civil society can take valuable steps for poor urban people to make the city more attracted. One important role the city alliance can play, is to help cities or countries share experiences with slum upgradation. Additionally, the city alliances have the ability to access governments and community organizations and can help them to perceive the importance of managing urban development as well as water security for the slum dwellers. The world is becoming increasingly urbanized, and managing urban development must involve identifying strategies to deal with the urban poor. Some noteworthy steps that can be taken by civil society are:

1. To make the poor people conscious about water security.
2. To help them develop their economic condition.
3. To play role with governmental policy.
4. To help slum dwellers understand importance of pure and hygienic water.
5. To supply water if there is no proper water source to use.

4. CONCLUSIONS

This survey work is conducted on water security in urban poor area of Sylhet which indicates the unhealthy, unhygienic, impure, unsafe, contaminated and poisonous supply and source of water which affects the socio economic condition of the poor urban people . The research work will help the policy maker and government to take proper action for future strategy and planning. The demographic survey conducted in this study will help the authorities to get an overall idea on which necessary educational and infrastructural steps can be taken. The water vulnerability study shall help the Government as well as people to be conscious about water security and enjoy their life. It is high time the authority needs to take actions to reduce rural –urban migration. Government should encourage NGOs and other private organizations to play role regarding this matter. Local NGOs can help in various ways such as supplying pure water and giving knowledge on negative impact of unhygienic

water along with arranging semeners for local people on local process of water purification. Lack of knowledge, uncertainties, priorities and reasons for those priorities needs to be identified. Therefore, it is imperative to involve local stakeholders from all levels, ranging from the household to the district and city level, as early on as possible. Civil and alliance society of city area must create consciousness among slum people besides Government and NGOs as stated in the research work. Future study on this topic can include the Strategic Choice Approach (SCA), which can be used to guide efforts to choose sustainable water and wastewater systems in an iterative process that includes: shaping the problem focus, designing potential strategies for addressing problems, comparing those strategies, and finally choosing a strategy to be implemented.

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