IOSR Journal Of Humanities And Social Science (IOSR-JHSS)
Volume 23, Issue 2, Ver. 7 (February. 2018) PP 40-47
e-ISSN: 2279-0837, p-ISSN: 2279-0845.
www.iosrjournals.org

Environmental Impact on Safe Drinking Water and Livelihood in Urban Slum of Barisal Metropolitan City of Bangladesh

Abu Hasan[1] Md. Ohidur Zaman[2]UmmeHabiba Munmum[3]Dewan Abdul Quadir[4]
M. Hasinur Rahman[5]

[1](Department of Environmental Studies, Uttara University, Dhaka, Bangladesh)
2(Department of Sociology, University of Barisal, Barisal, Bangladesh)
[3](Department of Biotechnology and Genetical Engineering, MawlanaBhasani Science & Technology University, Tangali, Bangladesh)
[4](Department of Physic, Uttara University, Dhaka, Bangladesh)
[5](Depatment of Soil and Environmental Science, University of Barisal, Barisal, Bangladesh)
Corresponding Author:Md. Ohidur Zaman

Abstract: Bangladesh is widely recognized as one of the most climate vulnerable countries in the world. Polaspur slum of Barisal city has been selected for the study. The study area is the most vulnerable area to the natural hazards. It is situated in the interior coastal zone of Country. The slum communities carry their livelihood very miserably. Most of the people belong to businessman, day labor and rickshaw driver. The incomes of slum dwellers are not sufficient to maintain their lives and the income extremely various with seasons. Income sources of the dwellers are not sustainable. Most of the people use Deep Tub well (DTW) water for drinking, bathing and cooking. UNDP and Bangladesh Government provided DTW to the slum communities of the area. Drinking water quality of the area is satisfactory. The option of the DTW suffers due to poor management system. The people of the area face different kinds of problem like natural hazards such as cyclone, storm surges, extreme astronomical tides, river bank erosion, water logging and heavy rainfall. Natural disasters are increasing day by day according to the opinion of local people. The study area has no Disaster Management Committee or no Red Crescent members to recover from the impacts of natural hazards during disaster period. Dweller of the area has communicated with government administration for pre- disaster rehabilitation but they did not get any kind of help from government. House Hold survey conducted 66 over House Hold from sector-2 and 64 House Hold from sector-7. 65 male respondents and 65 female respondents conducted by randomly from two sectors. The database was created using the data collected from the field on social status physical condition of the site. The data was analyzed using SPSS 11.5 and Micro Soft Excel. The results are presented in tabulated forms. ArcGIS 9.2 software was also used for preparing map purpose.

Keywords: Environmental Impact, Livelihood, Natural Disaster, *Disaster Preparedness, Disaster* Management, Safe drinking water, Diarrhea

---

Date of Submission: 03-02-2018 Date of acceptance: 19-02-2018

I. INTRODUCTION

Bangladesh is widely knownas one of the most climate vulnerable countries in the world. It is one of the most disasters prone and particularly the worst flood affected countries of the world. About one-third of the country is flooded almost every year. Moreover, it is one of the most densely populated countries in the world, with more than 1000 people per square kilometer. Besides all of this, Bangladesh experiences one of the fastest urbanization rates in Asia;about 7 million people living in urban slums.This huge densely slum dwellers have no access to safe drinking water, sanitary latrines, proper waste disposal systems and adequate sewer drainage. About one-third of the country is flooded almost every year. Safe drinking water and adequate sanitation are the basic right of every citizen and are vital for improving health and alleviating poverty. In adopting the Millennium Development Goals (MDGs) countries pledged to reduce by half the proportion of people without access to safe drinking water and basic sanitation by 2015.Global warming and sea level rise and vulnerability of quality of drinking water in the coastal areas is getting degrade due to high salinity intrusion and water pollution. The global warming and climate change is a new threat for the urban secure drinking water supply and management in the coastal towns of Bangladesh (Islam, 2007; Islam, 2001). Coastal urban area both surface and groundwater have become unfit for human consumption. About 80% of diseases in Bangladesh are

associated with water. Safe water is the greatest challenge to the people of Bangladesh. Health Statistics indicate that approximately 342 children are dying every day for causes which are associated with exposure to contamination risks related to lack of safe drinking water. As about half of the adult population and most of the children defecate in unhygienic latrines and biological pollution is one of the main environmental health management challenges. UNICEF found that 22 million people were drinking arsenic contaminated water (>0.05 mg/l Arsenic) during its 2009 water quality assessment survey. It is a diarrhea endemic country and flood related epidemics are common. Bangladesh is one of the poorest countries in the world. It has an urban population of about 35 million, or just about 23.1 percent of its total population and about 50 percent of them are poor.

The selected study area is situated in Barisal city and is vulnerable to tidal inundation, cyclone, storm surges and monsoon floods under the coastal area of the Bangladesh. The people of the area faced different kinds of problem by natural hazards like Cyclone, storm surges, river bank erosion, water logging and heavy rainfall etc. Climate change puts extra burdens on the social and economic challenges that the poorest people already face.

The main objective is to study the environmental hazards and their impact on safe drinking water and livelihood. The specific objectives of the research are: (i) To investigate and describe existing condition of livelihood of the slum community, (ii) To investigate the impact of natural disaster on livelihood of the community, (iii) To assess the status of safe drinking water in the urban slum people, (iv) To relate the water safety with environmental factors and (v) To assess disaster preparedness activities.

II. METHODOLOGY

This study has been done by following descriptive research design. Quantitative method has been used to analyzing and interpreting the field data. The biggest slums of Barisal city named "Palaspur" was chosen purposively as study area. The study area was further divided into nine different sectors according to slums mapping of local and international NGOs. Among nine different sectors of the slums sector 2 and 7are the most populated and poorest slums; therefore, these two sectors of the slums have been selected to collect field data. There are total 64 households live in these two sectors. And every household of this area was included in this study. All the household heads were participant of the Study. To collect data from the participants a questionnaire was designed with both quantitative and qualitative entities. By using face to face data collection technique survey data have been collected directly from the participants. Moreover, for secondary data this study took documents from UNDP, UNESCO, DPHE, DSK, Bangladesh Water Development Board, DoE, Bangladesh Statistical Bureau (BBS), Bangladesh Meteorological Department and BRAC. Online journals and books were also other sources of secondary data. Primary have been organized and analyzed by the SPSS 11.5 and Micro Soft Excel. Percentage analysis and different charts have been used to analyzed and presentation of the data.

III. RESULT

1. Existing condition of livelihood of the slum community

1.1 Ownership of residence/ house

In the study area, among all the respondents 22% families are able to live in self owned house, 60% families live in rented house, 2% families live in their father's house, 13% families live in the Government land and rest of the families live in other ways in the area.

1.2 Main income source of the family member

An estimated 38.5% of sector-2 and sector-7 people have owned small business like tea stall, grocers shop, fish shop etc for earning their livelihoods. Among the participated slum dwellers 56.2% people are day laborers, 22.6% people are Rickshaw puller, 3.1% people are tailors, 8.9% people are service holders and 9.2% people have other sources of income. Field data show, 21.5% of households have income less than BDT 5000 and 25.4% households have expenditure less than BDT 5000, 51.5% of households have income Tk. 5000 to BDT 10, 000 and 56.2% of households have expenditure BDT 5000 to 10000, 22.6% of households have income TK 11000 to BDT 20000 and 16.9% of households have expenditure BDT 11000 to BDT 20000, 4.4% of households have income greater than TK 20,000 and 1.5% of households have expenditure greater than BDT 20,000. According to empirical data, it reflects the livelihood condition of this area is very dejected.

2. Loan and Use Status

According to the household survey, 63.8% respondents received a loan from different NGOs and among that about 21.50% households have received loan less than BDT 10000, 35.40% households have received loan BDT 10000 to BDT 30000, 4.60% households have received loan Tk. 31000 to BDT 50000, 2.30% households have

received loan above Tk. 50000 and 36.20% households did not receive any kinds of loan. An estimated 49% households loan have used for business, 24% households have to repair their house with loan, 8% households have bought rickshaw, 8% households have spent money for study, 4% households have spent for electricity purpose and 7% households have used others activities (payment loan, buying cow and net) with loan.

Table 1: Expected Loan status of study area

N-130	**Percentage**
Business	49.00%
Repairing house	24.00%
Buying Rickshaw	8.00%
Spent for study	8.00%
Spent for electricity	4.00%
Others Activities	7.00%
Total	100%

2.1 Investigate the impact of natural disaster on livelihood of the community

According to house hold survey 43% people answered that water logging is the main disaster of the area. About 23% people answered that heavy rainfall is the major disaster, 14% people answered that seasonal flood is common in most part of the area and 11% people answered that cyclone is the worst type of natural disaster which produces catastrophe.

Table 2: Natural disaster of the Area

N-130	**Percentage**
Heavy Rainfall	23.00%
Seasonal flood	14.00%
Coldness	2.00%
Hotness	7.00%
Super Cyclone	11.00%
Water logging	43.00%
Total	100%

An estimated 7% respondent answered that warming severally impact on health and 2% respondents answered that, cold weather affects the people. Extreme astronomical tides pose to be a big problem in rainy season. The study area is near to the river of Kirtankhola as a result river water can enter easily in the area causes floods during high tide. Due to insufficient drainage capacity, the water logging is caused from extreme tidal insurgencies. Through this process, the sanitation system and local water supply system (Tube wells, Pipelines) inundates. In this way, the polluted water is spread which degrades the environment and contamination and infections of various types cause diseases like diarrhea, skin diseases and others etc. Riverbank erosion is one of the greatest problems of the area. Agriculture lands are damaged every year by river bank erosion and the owners lost crops of the area. Some people lost their house and business center. Many shops are situated beside the river and it became affected during the period of the flood. An estimated 52% respondents answered that natural disaster has increased and 42% people answered that natural disaster has not increased. 2% people answered that they experience the change of nature for last 30 years but this change occurred very slowly. 4% people do not have any perception on this issue. The tropical cyclone causes most of the damages by wind and storm surges actions. The surface water and water supply systems are contaminated. The flood water carries water-borne diseases and affects the health of the people. The saline water intrusion causes high salinity of surface and groundwater. The salinity is expected to increase in the state of future climate change and sea level rise, which might affect the human health.

Among all the respondents there are only 4% respondents who changed their profession because of natural disaster and 96% respondents do not change their profession. Out of the 4%, respondents 1.5% respondent became day labor from the small businessman, 1.5% respondents became driver from small businessman and 0.8 % respondents became rickshaw puller from the land cultivator.

Table 3: Status of changing profession for natural disaster period

N-130	**Percentage**
Driver	1.50%
Rickshaw Puller	0.80%
Day Labour	1.50%
Not Change	96.20%
Total	100.00%

About 58% respondents answered that they faced problem for cooking due to natural disaster during and post-disaster period and 48% respondents answered that they did not face problem for cooking. An estimated 50.6% respondents answered that their stoves have damaged during disaster period, 29.9% respondents could not cook because of rising of the water in the Kitchen, 16.9% respondents could not cook because fuel was not available during disaster period and 15.6% had cooked within the living room as kitchen flooded.

Table 4: Problem of Cooking during disaster period

N-130	**Percentage**
Raising of the water in the kitchen	29.90%
Damage Stove	50.60%
Problem of fuel wood	16.90%
Cooking in the living room	15.60%
Others	2.60%
Total	100.00%

3 Assess the status of safe drinking water of the urban slum people

3.1 Source of drinking water

It has been seen that in the selected study area about 99.2% households drink DTW water, 0.8% households drink Supply water presently. In rainy season 97.7% households drink DTW water, 0.8% households drink Supply water and 1.5% households drink Channel water. Moreover, 96.9% households drink DTW water, 0.8% households drink Supply water and 2.3% households drink Cannel water at dry season.

3.2 Number of DTW of the Selected Area

There are 8 DTWs in sector-2 and 9 DTWs in sector-7 and a total of 65 DTWs are in Polaspur slum area. One DTW has allotted for 180 people or 30 families at sector-2 and one DTW for 334 people or 67 families at sector-7.

Table 5: Number of DTW by sector (with select slum area)

Sector	**Number of DTW**
Sector-1	9
Sector-2	8
Sector-3	7
Sector-4	4
Sector-5	9
Sector-6	2
Sector-7	9
Sector-8	12
Sector-9	5
Total	**65**

1.3 Ownership of the Safe drinking water

Most of the safe drinking water supplies have been provided by NGOs and Government of the People's Republic of Bangladesh. 7.7% provided by Government, 8.5% managed by own self and 4.6% DTW are owned by house owner of the selected sectors.

Table 6: Owner of safe drinking water of study area

N-130	**Percentage**
Own self	8.50%
Neighbour	3.10%
Government	37.70%
NGO	43.80%
House Owner	4.60%
Jointly	2.30%
Total	100%

3.4 Frequency of collecting drinking water from TW

Slum dwellers face more difficulties to collect water during or after the flood and heavy rain. On the average, people collect drinking water 5.82 times at present and 5.53 times during the rainy season and dry season. Minimum No. of time for collecting drinking water is 1 and the maximum number is 20 times daily at present times, rainy season and dry season.

3.5 Storage of Water

Field data show that water storage is one the great problem of this slum area. It has been found that most of the dwellers store water in the Jar. About 84.60% dwellers of this area store drinking water in the Jar, 10.0% families store in bucket, 6.20% families store in Jug, 5.40% families store in the drums and 2.30% families store in the container of the area. Maximum families of the area store water in Mutki (local name of a small jar) for latrine purpose.

IV. RELATION OF WATER SAFETY WITH ENVIRONMENTAL FACTORS

4.1 Status of water purifying and method of water purifying

95% respondents drink DTW water during disaster/post-disaster period, 2% respondents drink supply water, 2% respondents drink purchased water and 1% respondent drink filter water. According to household survey 24% respondents purify water during / post-disaster period and 76% respondents do not purify drinking water. Out of the 24% respondents of these who is purified water 15.4% purify by boiling, 4.6% respondents use alum for purifying and 3.8% respondents drink rainwater during disaster /post-disaster period. 76% respondents do not need to purify drinking water because 32.4% respondents have DTW with safe water. 32.6% respondent answered that they own tube wells, 14.8% respondents answered that water is well, 19.4% respondents do not know the method of purifying and 2.4% respondents say that they are not doing purification.

Table 7: Water purified during disaster period of the Area

N-130	**Percentage**
Bowling	15.40%
Alum	4.60%
Rain water	3.80%
Not Purifying	76.20%
Total	100%

4.2 During/post disaster Illness.

The people of the study area are suffering various diseases during and post-disaster period. According to the household survey, 21.40% respondents are suffering diarrhea, 32.50% respondents are suffering skin diseases, 23.90% respondents are distress fever, 8.50% respondents are the coldness and 6.80% is suffering from a cough. About 29.90% respondents do not distress any diseases. The dwellers of the study area are moving one place to another place into dirty tide wave or heavy rainwater in the rainy season. It would like to mention that tide wave water or heavy rainfall water is contaminated by leakage latrine or open latrine. Diarrhoea is very much related to the sanitation, water and cleanliness and vector-borne diseases are related to cleanliness. Flood makes water sources contaminated and scarce.

Table 8: Diseases status during/post disaster period

N-130	**Percentage**
Diarrhoea	21.40%
Skin diseases	32.50%

Fever	23.90%
Cold diseses	8.50%
No diseases	29.90%
Cough	6.80%
Others	3.40%
Total	100%

4.3 Water quality test

6.5 to 8.5 are standards of pH for Bangladesh. According to water quality test for all the water sources pH of the water of the study area matches with Bangladesh standards. But for STW, supply water, canal water and drain water have the TDS greater than Bangladesh standard and river TDS is lower than 100 ppm. Conductivity standards are also satisfactory according to Bangladesh standards (water quality tested one time in the rainy season).

5 Assess Disaster preparedness activities:

Almost 79% people answered they do not take preparedness in the pre-disaster period and 21% people take preparedness in the pre-disaster period.

In spite of this disaster, the dwellers of the study area do not take to step for reducing damage from the natural disaster. An estimated 26.2% people answered that they do not need to a safe place in pre-disaster period and their house is very safe. 20.8% people answered not taken preparedness in the pre-disaster period. Almost 6.20% people are kept faith on Allah. 11.5% people do not take without any causes. 12.3% people do not know what kinds of preparedness activities in the pre-disaster period.

Table 9: Not taken preparation of pre- disaster period

N-130	**Percentage**
Not Damage	10.00%
Faith On Allah	6.20%
No Need	26.20%
Lossess of Resources	3.10%
Not wise from House	5.40%
Not Security/Not shelter	4.80%
Without any causes	11.5%
Do not know	12.3%
No taken Preparedness	20.8%
Total	100%

An estimated 21% people are engaged in different activities in pre-disaster period.77% people are going to cyclone center, 7% people are keeping safe drinking water,7% people are collecting food for during and post-disaster period, 6% people are fall down soil of ground and 3% people are collected stove for cooking.

There are not any kinds of the committee to communicate with DC or Local MP in pre, during and post-disaster period. The study area has no ward disaster management committee. The alarming system is very poor. They do not get any alarm from the local administration. But slum leader or other people get alarmed through TV or Mobil. The dwellers will not come security place because they have the house, domestic animals, and birds.

V. DISCUSSION

The livelihood conditions are very miserable in the slum communities of the study area. They cannot arrange their daily basic needs for their life especially; children cannot complete primary level education. Extreme weather mainly floods and waterlogging disturbs the slum dwellers to do their daily economic activities. In case of heavy rainfall or flood, the informal sectors are affected significantly. During extreme high temperature, all respondents feel tired and down to do physical activities.

The physical structure like road, culvert and bridge and personal resources are damaged by environmental hazards and water became contaminated in the rainy season. Natural disasters affect the environment of slums which affect significantly in the dweller's health. The study areas have the heap of wastes,

poor sanitation and polluted ditches which are the breeding ground for mosquitoes. Because of the above-mentioned reasons, some respondents face dangerous health problems. The ill health of the main earning person has resulted from diarrhea, cholera, fever etc. has the ultimate impact on income and livelihood of the family. The ill people need medication which many families cannot get because of lack of low income. As a result, the whole family suffers severely. During the flood, the majority of the families were unable to remain in their homes or even on the chals (roofs) of their homes because of high depth of inundation.

During the rainy season, the area is flooded by tide wave or heavy rainfall. As a result, the water is staying minimum 6 hours and maximum 3 days. Even Only 17 DTWs is for 840 families or 4440 people in the area. One DTW is for 49 families or 261 people. Safe drinking water is polluted through leakage of latrine and open latrine by flooding water in rainy season. The water level is got down in summer season. So it is difficult to get safe drinking water of the dwellers of the slum in the summer season. People suffer from various types of diseases propagated through pollution of water. Natural disasters affect the environment of slums which play a significant role in the dweller's health. Flood has been found to cause epidemics of water-borne and vector-borne diseases. Outbreaks of diarrheal illness after floods are thought to result primarily from contamination of water. The study areas have the heap of wastes, poor sanitation and polluted ditches which are the breeding ground for mosquitoes. Because of the above-mentioned diseases, some respondents face same health problem. The investigation shows that water is contaminated during the floods which cause diarrhea, typhoid, skin diseases and virus infection. The increase of temperature causes evaporation which reduces the surface water reserves. Further because of warming the water consumption increases in all sectors such as safe drinking water, households use, production sectors and irrigation. Further, it has been found that the rainfall has decreased in the study area. Because of the above factors, the groundwater extraction is increasing with time. As a result, the dwellers of the area faces acute problem to meet the required of water for drinking, cooking and bathing. Because of hot atmosphere, the people of the area feel tired soon at work in exposed seen.

The study area has no Disaster Management Committee or no Red Crescent members to recover from the impacts of natural hazards during the disaster period. As a result, local administration cannot play a strong contribution in pre, on-set and the post-disaster period for dwellers of the study area.

VI. CONCLUSION

The study area is most vulnerable area to the natural hazards. It is situated in the interior coastal zone of the Country. The government has to take effective decisions to improve the socio-economic condition and livelihood status of the slum people. In the study area, peoples face different problems like natural hazards, lack of safe drinking water, poor knowledge on environmental related factors. The safe drinking water is contaminated by pollution water during rainy season. The water level is got down in summer season. So it is difficult to get safe drinking water of the dwellers of the slum in the summer season. People suffer from various types of diseases propagated through pollution of water. So the government or NGO should provide more sanitary latrine and DTW. The government /non-government organization should arrange training programs on the impact of climate change, disaster pre-activities and health problems. There is no adequate number of cyclone shelters in the area. The government has to build up Cyclone Shelters and the local administration has to ensure gender security for the women during the disaster period. Ward Disaster Management Committee (WDMC) is very weak. The government has to make essential steps to build up strong ward disaster management committee. Female ward commissioner has to be included in the committee. Committee will be continuing their activities according to standing. Local government administration, Local slum leader, and Ward disaster management committee should take responsibility in the pre-disaster period.

ACKNOWLEDGEMENTS

We are grateful to Professor Dr. M. MozzammelHoque who is Professor of BUET and Professor Dr. Bilqis Amin Hoque, Dean, School of Civil Environment and Industrial Engineering, Uttara University for advising me to conduct the study.

We extend our thanks to the dwellers of Polaspur slum, slum leaders, Ward Commissioner, School Teachers, Secretary of Ward Commissioner and local Community Development Committee (CDC) Members for providing sincere corporation in getting root level information for my study. Thanks are also due to Mr. Kamal Banarji, who is socio-economic expert of the UNDP and other participants who participated in the FGD and interview Session.

REFERENCES

[1]. A. Hassan, Environmental Health and Climate Change and Adaptation Capacity Building among Secondary School in disaster and Arsenic Prone area in Narial- 2013, 5

[2]. A.N. Khan, Impacts on climate Change on the livelihood of the Urban poor : A case of Dhaka city, North South university,MA-2008

[3]. A.N. Khan, Impacts on climate Change on the livelihood of the Urban poor : A case of Dhaka city, North South university,MA-2008

[4]. A.U. Ahmed, S. Neelormi,, N. Adri, M.A. Alam, and K. Nuruzzaman ,Climate Change Adaptation Research: Climate Change, Gender and Vulnerable Groups in Bangladesh-2008

[5]. Ahmed, A. U., and Alam, M. (1999). Development of climate change scenarios with general circulation Models, Vulnerability and adaptation to climate change for Bangladesh-1999.

[6]. Ahmed, Q. K., Towards ensuring food security in Bangladesh, Asia Pacific Journal on Environmental and Development,2001, Vol 8 No. 1, pp -7

[7]. Ali, A., Climate change impacts and adaptation assessment in Bangladesh. In : Climate Research, 1999,Vol.12 :109-116,

[8]. B. A. Haque, S. Khanam and Salam, Action Research and Training Programs on Sustainable Development of Basic Environmental Health, Report of EPRC (Submitted to Tide Foundation, USA)-2011

[9]. Biswas A. K. (2000). Water for urban areas of the developing world in the twenty first century.In :Uitto, J. I. and Biswas, A. K. (eds.,). Water resources management and policy – water for urban area- challenges and perspective. UNU, Tokyo-2008 pp 1-23

[10]. IPCC-(Intergovernmental Panel on Climate Change), (2007). Summary for policymakers, In: climate change 2007: Impact adaptation and vulnerability. Contribution of working group II to the Fourth assessment report of the IPCC, M.L. Parry, O.F. Canziani, Palutikot, P.J. et al., Cambridge university press, UK. 1000

[11]. Islam, M R. and Ahmad, M. ,Living in the Coasts; Problems, Opportunities and Challenges PDO-ICZMP, WARPO, Dhaka, Bangladesh-2004

[12]. Islam, S. N., and Gnauck, A. ,Mangrove wetland ecosystems in Ganges Brahmaputra delta in Bangladesh. In: Frontiers of Earth Science in China. Higer Education Press and Springer Verlag-2008 pp 439-448

[13]. M.. L. Hossain , Dr. M.Kamal, S. R. Das Vulnerability of Bangladesh to Natural and Anthropogenic Disasters-2012,pp-5

[14]. M.A. Hossain, M. Moniruzzaman, and M.AIslam,Urban Environmental Health in Bangladesh Slum. A comparative Study of two Metropolitan City -2010

[15]. Muhammad Anowar Saadat1 and A.K.M. Saiful Islam, Impact of Climate Change on Rural Livelihood: A Case Study,3rd International Conference on Water & Flood Management ICWFM-2011.

[16]. National Plan for Disaster Management 2010-2015 by Government of the People's Republic of Bangladesh -2009

[17]. Noor,S,Gnauck,A.(2010) Climate change versus urban drinking water supply and management: a case analysis on the coastal towns of Bangladesh,hal-00521467,version 1,pp-1-2

[18]. Rahman, M. ,Impact of Climate Change on Command Area Development of Teesta Barrage Project, IWFM, BUET, Dhaka, Bangladesh-2008,pp-1-3

[19]. Sanitation, Hygiene Education and Water Supply in Bangladesh (SHEWA,B)UNICEF Bangladesh-2012 by UNICEF Bangladesh

[20]. Warrick et al., A national assessment of the implications of climate change for Bangladesh-1993

Md. Ohidur Zaman "Environmental Impact on Safe Drinking Water AndLivelihood In Urban Slum of Barisal Metropolitan City ofBangladesh."IOSR Journal Of Humanities And Social Science (IOSR-JHSS). vol. 23 no. 2, 2018, pp. 40-47