The Impact of Waterlogging on The Daily Lives of Citizens

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ABSTRACT

The northern region of Bangladesh, Sylhet faces heavy difficulties due to heavy rainfall during monsoon. The unplanned spatial development activities are causing encroachment on retention areas and natural drainage paths creating obstacles to properly draining out the urban runoff. Therefore, water logging is taking place as different parts of the city remain inundated for several days. This study explores the Water logging problem in different areas and tries to find out the main causes and impact. This study conducts primary and secondary data taking a purposive sampling method of 50 respondents from most two affected areas according to the newspaper and other evidence. The study focused on qualitative and quantitative approaches and analyses on percentages and themes with the coding process. *It analyses the waterlogged areas, the drainage flow condition, areas affected due to water logging 5-6 times in a year in Sylhet, because of heavy rainfall that came from the Himalayas. The traffic situation increases for waterlogging, on the other hand, 80% of households suffer for interning water from the road, and the number of people affected by the water. This block water causes different health diseases (like skin problems and allergies etc.) nearly 60% responded. The study also found impact on social, economic, health, environmental and insufficient services of Sylhet city corporation. It also explores various suggestions like maintenance of the sewerage system, increasing facilities provided by the City Corporation, etc. which help the people to improve the waterlogging situation of the city.*

Keywords: Waterlogging, rainfall, paths, different, explore, Bangladesh

INTRODUCTION

Urban waterlogging affects millions of people worldwide and is a problem that transcends national boundaries. Even if the specific causes and manifestations may vary from one metropolitan region to another, the disruptions and harms it creates are the universal denominator (Roy et al. 2021). Southeast Asia's urban waterlogging is a serious and growing problem that needs to be addressed right away with all-encompassing solutions (Rahaman et al. 2020). When it rains a lot, water accumulates and stagnates in many Southeast Asian cities due to inadequate drainage systems, poor waste management, and uncontrolled urban growth (Roy et al. 2021). The prognosis for urban waterlogging is dire and poses a threat to economic stability, environmental sustainability, and the welfare of urban residents. (Subrina

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and Chowdhury 2018). Now Water logging is a big problem of the modern world (Faisal et al. 1999). On the other hand, Cities have historically been built close to water sources for trade and transportation, which makes them naturally vulnerable to flooding. But contemporary urban development, with its impermeable surfaces and dearth of green areas, has changed the way water naturally flows, resulting in a situation where extra water gets trapped and builds up. Urban waterlogging in Bangladesh necessitates a multi-modal approach that tackles its root causes and lessens its effects. Reevaluating urban planning and development is necessary to prioritize appropriate storm water drainage systems, sustainable land use, and resilient infrastructure. The effects of waterlogging can be lessened with investments in green urban areas and climate-resilient technologies (Moniruzzaman 2011). Northeastern Bangladesh is also significantly exposed to environmental hazards, such as waterlogging (Sarkar and Rashid 2013). Sylhet is located in the northeastern part of Bangladesh, amid the foothills of the Himalayas. The region has a humid subtropical climate with a typical tropical monsoon. Typically, the monsoon season lasts from May to September. The short dry season, which lasts from the end of October to February, is arid and generally clear, whereas the warmer, more humid weather is accompanied by heavy rains practically every day (Ahmed and Kim 2003). This entire region receives over 80% of the 3334 mm of yearly average precipitation between May and September. (Choudhury et al. 2012). Water-logging severely hampers daily life in Sylhet during the monsoon season. There is evidence that waterlogging and seasonal flooding have a constant impact on the city's socio-economic development and sustainable urban growth. The majority of the population here lives in an area that frequently floods during the monsoon season (Ali 2002). This study aims to do a case study of the current urban water logging problem in Sylhet City Corporation in Bangladesh, trying to highlight the main causes behind it, the influence of undertaken projects, people's perspectives on the effects of water logging in their urban areas and find mitigation strategies to solve this problem.

It is very important that waterlogging in Sylhet City likely involves understanding the extent, causes, and impacts of this issue on urban living. By investigating waterlogging, potential solutions can be identified that can contribute to improving urban planning and enhance the city's overall resilience to environmental challenges. This study could contribute valuable insights for policymakers, urban planners, and residents to address and mitigate the impacts of waterlogging. Additionally, the rationale may involve assessing the socio-economic and environmental consequences of waterlogging in Sylhet City and recognizing its implications on infrastructure, public health, and overall quality of life. Understanding the specific factors contributing to waterlogging, such as inadequate drainage systems or urban development practices, can inform targeted interventions. Ultimately, the study likely seeks to provide a comprehensive understanding of the waterlogging problem in Sylhet, offering a foundation for effective strategies to manage and alleviate these challenges in the urban context.

Specific Objectives

1. To examine the root causes of the waterlogging problem in Sylhet city,
2. To identify the impact of the waterlogging on daily lives of citizen,
3. To find some mitigation strategies for the waterlogging problem in Sylhet city.

Conceptual framework

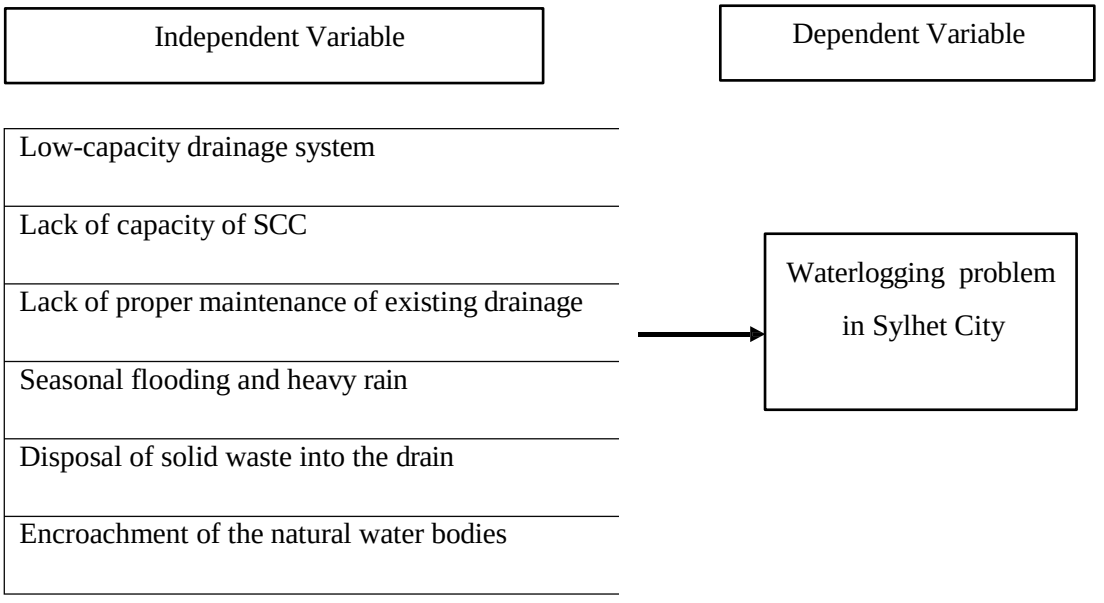

Figure 1: Conceptual framework

RESEARCH METHODOLOGY

The study tried to explore and explain the information and knowledge about the causes of the water logging problem and socio economic impact on urban livelihood people in Sylhet city. Mixed research has been used to collect information from the selected respondents through the survey method has been used, and a structured questionnaire has been prepared for quantitative data collection & interview schedule for qualitative data. We have selected Sylhet Sadar as our study area. The data has been collected from thJe Upashahar (Ward no-22) and Bhaataliya (Ward no-11) areas in Sylhet City Corporation. It was selected because of its high vulnerability to waterlogging and frequent flooding, even after minimal rainfall. As the first area affected by floods in Sylhet, this study provides critical insights into the causes and immediate impacts of urban flooding. The ward's conditions reflect broader urban planning issues, making it representative of similar challenges across the city. Additionally, its prominence in local reports and accessibility to data collection supports comprehensive analysis and policy recommendations. The areas have been selected based on the analysis of various local newspapers and reports of Sylhet which will give an idea of the impact of the waterlogging problem on urban living in Sylhet. In this study, data has been collected from both primary and secondary sources. Primary data has been collected from individuals through face-to-face interviews using a questionnaire. It has been collected through a structured interview schedule which includes both close-ended and open- ended questions for gathering information in the area of Upashahar (Ward no-22) and Bhaataliya (Ward no-11) areas in Sylhet City. Secondary data has been collected from published e-books, journals, articles, newspapers, and reports of different organizations that are related to the study. Here target population is the affected urban people of Sylhet and the sample

population is selected from two areas of urban people. In this research, 50 people have been selected from the entire population as the sample size of this study. Among them, data of 25 populations from Upashahar and 25 populations from Bhaataliya has been taken. The sample size was selected by using purposive sampling to select a specific group of individuals or units for analysis. The quantitative data were analyzed with Microsoft Excel as it is cost effective; as this study using a small number of data which provided descriptive statistics, for example, percentages and tables. Whereas coding system and qualitative data for thematic analyses.

Data Analysis

Quantitative Data Analysis

Bangladesh's northern region is located in the city of Sylhet. The monsoon season in Sylhet is known for its intense rainfall from May to September. According to demographic statistics, 62% of men between the ages of 31 and 40 and incomes between 10,000 and 20,000 make up the population. Only 6% of respondents had post-primary education, and 32% had never attended college. These individuals were asked about their experiences with the daily problem of water logging in the Sylhet region during the rainy season**.**

Table 1 Demographic Data

Demographic data	Number of respondents	Percentage
Total	50	100
Gender		
Male	31	62%
Female	19	38%
Age		
21-30	7	14%
31-40	21	42%
41-50	13	26%
50-61	9	9%
Monthly Income		
10000-15000	21	42%
15000-20000	20	40%
20000-30000	9	18%
Education		
Illiterate	11	22%
Primary	16	32%
Secondary	13	26%
Undergraduate	7	14%
Graduate	3	6%

Condition of waterlogging: In Sylhet, water logging is a widespread issue. Every year, there is major water logging as a result of the heavy rainfall. The main purpose of this study is to

examine the root causes of the waterlogging problem in Sylhet City, to identify the impact of the waterlogging problem on people's daily life, to identify the influence of the undertaken projects in Sylhet City, and to find some mitigation strategies for the water logging problem in Sylhet city.

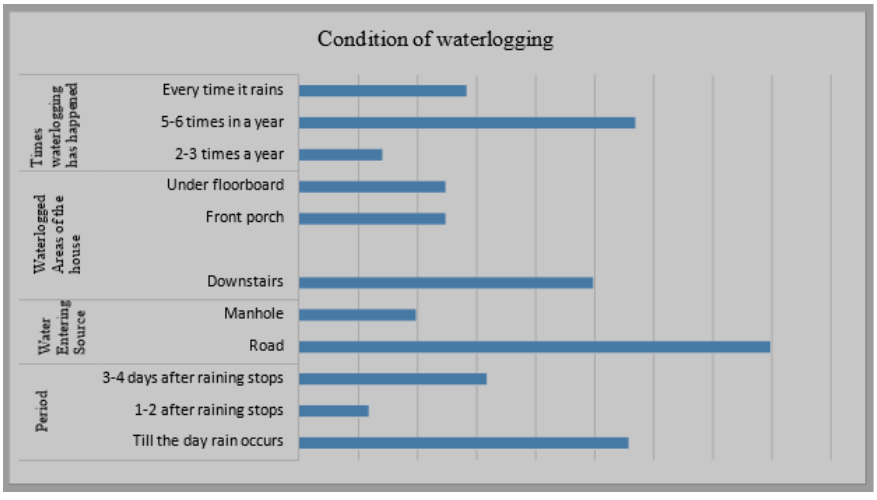

Figure 2 Condition of Waterlogging

About 57% of the respondents responded that waterlogging happens 5-6 times every year. About 28% of the response was it happens every time it rains. All the respondents have responded that the road and footpath are waterlogged and 25% have experienced waterlogging in the building property. Among the respondents, water entered their houses due to waterlogging, every 1 in 2 persons (50%) responded that water was logged in downstairs. The rest of the respondents responded that water was logged on their front porch and under the floorboard. 80% of the respondents responded that the water entered their houses from water, and for the rest of the 20% was from the manhole. After the logging happens, 56% of respondents have responded that the water takes 30 to 60 minutes to drain away. 12% of them have responded that the water has to be pumped out from their house.

Causes of waterlogging: More than half of the respondents (60%) have responded that the Condition of pavement, landscape, or road for running off water is not enough. Heavy rainfall occurs in the Sylhet region because the Himalayas stand in the Northeast of Bangladesh, and the Bay of Bengal lies in the Southern part of the country. According to the questionnaire survey, all the respondents responded during heavy rainfall they experience waterlogging. in every area, there is a domestic waste collection system from the municipality. Still, nearly 28% of the respondents do not use the service. The majority of respondents (57%) dispose of solid waste in the drainage regularly. About 76% of the respondents responded that drainage cleaning does not happen frequently in their neighborhood. The rest of the respondents have respondents have responded that it is cleaned once a year by the municipality. About 71% of the respondents have responded that the manholes around their household are properly covered. The rest of them have responded that some manholes around their households lack

the slabs, and some are left open. water body was converted into a build-up area. Some canal areas are blocked due to the illegal construction of buildings. About 71.42% of respondents responded that the facilities provided by the Sylhet City Corporation are not sufficient. only about 20% of the respondents have contacted the council in the past about your water-logging problem.

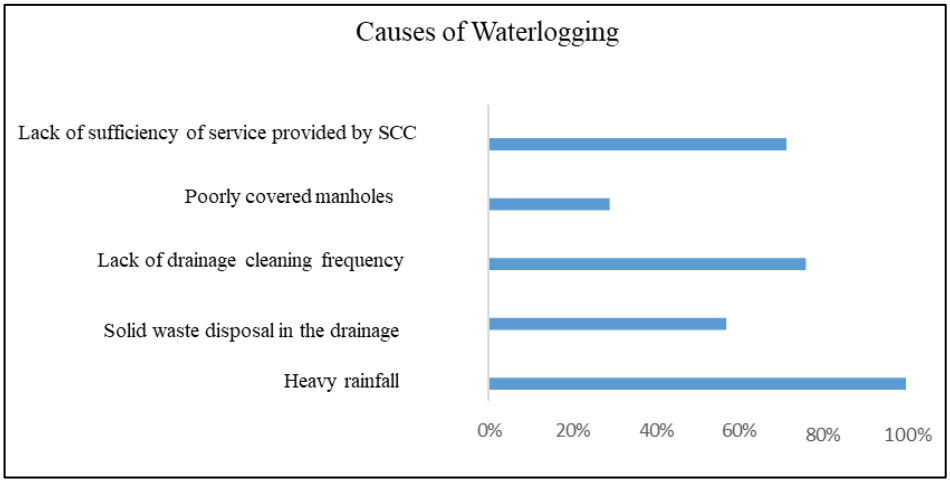

Figure 3 Causes of Waterlogging

Impact of waterlogging

Due to the waterlogging, about 31% of the respondents have lost income from their jobs or livelihoods. About 66.67% of respondents responded that they lost their income for 1 week. The rest 33.33% lost their job for 1-2 weeks. More than 57% of respondents responded that the waterlogging had an impact on their overall health and sanitation conditions.

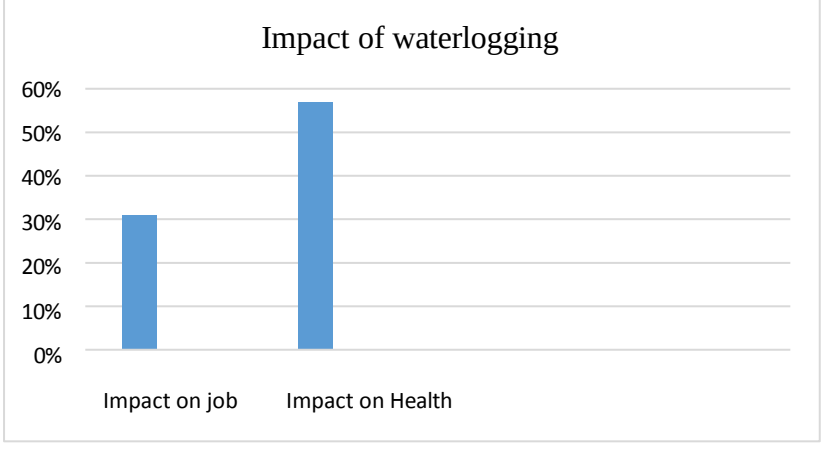

Figure 4 Impact of Waterlogging

Qualitative Data Analysis:

Causes of waterlogging:

Lack of public awareness

Respondents are irresponsible and ignorant of the repercussions of impeding drainage and filling natural drainage wetlands. People fill and empty natural water bodies and dump solid rubbish on the roadways without hesitation because of this. They remove the rubbish after sweeping the roadways.

Lack of Proper Policy Regulation and Implementation

The lack of proper regulations is a big gap in waste disposal, encroachment, and negligence of the authorities for implementation.

Lack of Service Provided by the Sylhet City Corporation

There is a lack of common trash disposal boxes in the area.

Impact of waterlogging:

Impact on health

The reasons for the deterioration of health and sanitation conditions were longer clogging time leading to skin irritation and inflammation, lack of pure water and electricity supply suffered from diarrhea. Flooded septic tanks and leach pits also provide breeding sites for mosquitoes.

Impact on the transportation situation

Waterlogging makes roads unusable for pedestrians and also creates traffic jams. Every 4 out of 5 respondents suffered from poor transportation situations due to waterlogging.

Impact on job

Street sellers, daily workers, rickshaw pullers, and drivers are the ones that directly suffer from the waterlogging issue. Their daily income is significantly reduced by the waterlogging condition.

Impact on infrastructural condition

Because of waterlogging, the substructure of the buildings in the low-lying areas remains submerged. The building foundations lose their longevity by being impacted by dampness. Many buildings are seriously damaged during the period of waterlogging and sometimes it damages household goods and stored food grains.

Mitigation strategies for the waterlogging problem: About 81% of respondents have suggested the implementation of water-logging warning systems. About 9 out of 10 respondents have suggested constructing buildings above the waterlogging level and increasing the regular maintenance of the drainage system. Nearly 80% of the respondents

have agreed upon the revival of the rivers and canals to their natural course. Among them 7 respondents have suggested improvement of the soil condition. They have also suggested putting up more water-logging barriers. In the study, 74% of the respondents have suggested raising the road elevation.

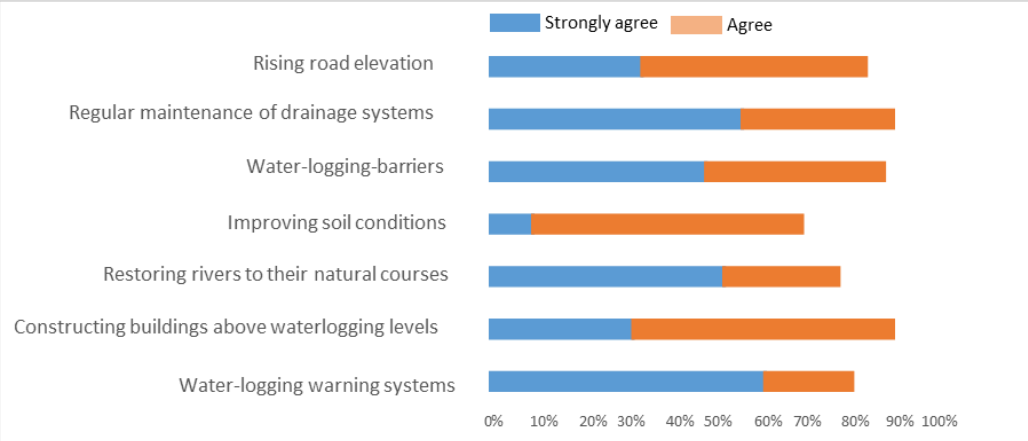

Figure 5- Mitigation Strategies for Waterlogging

DISCUSSION

By studying two areas of Sylhet City Corporation, the study identified the heavy rainfall, Disposal of solid waste in the drainage, Drainage cleaning frequency, and properly covered manholes as the cause of water logging. About 60% of the respondents have responded that the condition of pavement, landscape, or road for running off water is not enough. Similar findings were also observed in studies of Tran et al., 2020; Gebrehiwot, 2017; Bijeker et al., 2022 conducted in developing countries. There is a lack of awareness among the people about solid disposal that block drainage system, like polybag waste are not damage and bad smell come from water which polluted air and water whereas it's impact on environment. About 57% of the respondents dispose of solid waste in the drainage regularly. When the respondents were asked whether they are getting proper facilities from the government in terms of reducing waterlogging. Most of them replied that they were not enough.

Also, by studying the effect of waterlogging on people, we have come to know it affects their jobs, health sanitation, and transportation. Waterlogging poses serious economic and health risks in developing cities lacking adequate drainage and waste management infrastructure (Nepal et al., 2022). It hinders progress towards Sustainable Development Goals and creates challenges for urban planning and flood mitigation (Zhu et al., 2024). Waterlogging severely affects people's daily incomes. About 66.67% of respondents responded that they lost their income for 1 week as well as increasing transport cost and economical loss. Waterlogging also increases the cost of maintenance of roads, houses, and other vulnerable infrastructures. On the other hand, the polluted stagnant water acts as a different health problems like- skin issues, mosquito born, lack of pure drinking, diarrhea

etc. health situation very much vulnerable for the reason of waterlogging system. Besides, waterlogging increases traffic problems and waste of time that impact on socially.

As a result, waterlogging problems create adverse social, economic, environmental and health impact on the city dwellers in Sylhet. To mitigate the waterlogging problem, the drainage system regular cleaning of the drains and awareness of the in habitants are urgently required to achieve the goal of livable city. About 90% of the respondents have suggested to construct buildings above the waterlogging level and to increase the regular maintenance of the drainage system. There are also suggestions about water logging warning systems, restoring rivers to their natural courses, improving soil conditions, water- logging barriers, and rising road elevation.

CONCLUSION

The northeastern region of Bangladesh, in particular the Sylhet City Corporation, has high levels of rainfall during the monsoon season. This is caused by steep geology, poor drainage system management, and unplanned, fast development. Planning and implementing remediation measures for the best possible use of the land and water resources as well as sustainable urban growth depend heavily on the thorough and dependable inspection of areas that have been flooded. In addition, clearing silted-up rivers, canals, and sewage channels should be done as short-term and urgent measures to address the waterlogging issue. Long-term or permanent solutions may involve building sustainable water discharge and drainage systems.

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