



Waterlogged lives: A sociological exploration of the human dimensions of urban flooding in Dibrugarh town Assam

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Abstract

This paper aims to explore the sociological aspects of urban flooding in Dibrugarh town, Assam, India, with a specific focus on the human dimensions of this phenomenon. This study takes a sociological perspective to investigate how urban flooding disrupts livelihood activities, children's education, and household chores; it also demonstrates how urban flooding influences religious practices and inhabitants' health. Using qualitative analysis, the study explores the complex interplay between environmental factors, offering insight into the various issues affected communities face.

Keywords: Dibrugarh, urban flooding, vulnerability

Introduction

Urban flooding is the inundation after heavy rainfall events when runoff exceeds the local drainage system's ability (Dasgupta *et al.*, 2015) ^[6]. The increasing trend of urban flooding is a widespread phenomenon that presents a significant challenge for urban planners worldwide (*National Disaster Management Guidelines: Management of Urban Flooding*, 2010). Against this backdrop, this paper aims to provide a comprehensive understanding of the nuanced experience of flooding in Dibrugarh, a town in the northeastern state of Assam, India. The paper undertakes a sociological exploration to uncover the complex and interrelated human aspects associated with the recurring flooding events in Dibrugarh town, which profoundly impact the inhabitants' lives.

Dibrugarh, an important town for commerce, education, and trade in eastern Assam (Barbora, 2017) ^[3], faces the growing threat of urban flooding. Urban flooding in Dibrugarh town has effects beyond the apparent damage to physical infrastructure such as roads, buildings, and offices. It profoundly influences the daily activities of the inhabitants.

This research aims to go beyond conventional evaluations of urban flooding that mainly concentrate on physical damages and infrastructure vulnerabilities. We seek to gain a profound understanding of the inhabitants' challenges by examining the sociological aspects of waterlogged lives. This research aims to uncover the human experiences behind the visible consequences of flooding. By doing so, it hopes to provide valuable insights beyond the immediate effects of flooding. These insights will serve as a basis for developing comprehensive and sustainable strategies to tackle the challenges faced by residents in Dibrugarh town. In addition, it will enrich social science knowledge, particularly environmental and urban sociology, and enhance literature on urban flooding in Dibrugarh town.

To contextualize our paper, we will first give a short overview of research on the factors contributing to urban flooding and its impacts on human lives. Following this, the methodology employed in this research is outlined, detailing our approach to capturing the diverse experience of

inhabitants. Then, the subsequent sections discuss the main findings and analyses, followed by the conclusion.

Factors Contributing to Urban Flooding and Its Impacts

Mendonça (2023) ^[11] analyses the various causes of urban floods, focusing on São Paulo, Brazil. The urbanization process in Brazil, notably the fast and disordered rural departure and following urban population growth, has been highlighted as a contributing cause to the worsening of flooding risks. Kumar (2024) also addresses the complex issue of urban floods, highlighting the cities of Chennai, Mumbai, and Hyderabad. Like Mendonça (2023) ^[11], he discusses similar factors contributing to the increasing risk of urban flooding. Urbanization, population dynamics, expansion, and urban sprawl increase flooding risk in cities. Furthermore, Bansal *et al.* (2015) ^[4] flooding research offers a localized perspective, emphasizing the specific challenges of the city's topographical features and rainfall patterns. The study highlights stormwater drainage, topography, encroachment on river banks, and embankment failure as critical contributors to floods in Dehradun. Importantly, they emphasized how flooding disproportionately affects vulnerable populations such as children, the elderly, and slum residents. Like Bansal *et al.* (2015) ^[4], the study conducted by Das *et al.* (2020) ^[19] also highlights the importance of environmental and human-induced factors in intensifying flood risk. Bansal *et al.* (2015) ^[4] stress the significance of stormwater drainage, topography, encroachment on river beds, and embankment failure as crucial elements leading to flooding. Conversely, Das *et al.* (2020) ^[19] pinpoint excessive rainfall and inadequate drainage management as the primary causes of urban flooding in Dibrugarh. Despite the geographical differences between Dehradun and Dibrugarh, both studies highlight the crucial role of urban planning, drainage infrastructure, and land use management in minimizing the impact of flooding. The research by Akhter and Ahmad (2023) sheds light on how urban flooding intensifies the vulnerability of slum communities in Dhaka. The study provides compelling evidence that flooding has a considerable negative impact on the livelihoods of these communities, causing a decline in assets and income and an increase in expenses.

Necessities like road access, sanitation, and water supply are compromised during flooding, adding to residents' already significant challenges.

Porio (2011) ^[15] studied the vulnerability, adaptation, and resilience to floods and climate change-related risks of 300 low-urban households living in three flood-prone areas in Metro Manila. Porio's (2011) ^[15] findings complement Akhter and Ahmad's (2023) research in Dhaka. Her research shows that floods directly impact the livelihoods of urban poor households in Metro Manila, resulting in significant income and productivity losses. Porio's (2011) ^[15] research, like Akhter and Ahmad's (2023), emphasizes the economic challenges that vulnerable people endure during flood disasters. The loss of workdays and income, as well as damage to household appliances, intensify the socioeconomic issues that these households face.

Similarly, Kashyab's (2019) study in the Guwahati Metropolitan Area highlights the negative impact of flooding on livelihoods. According to the research, household members suffer losses in income-generating activities during flooding episodes. Notably, people working in the private and informal urban sectors are disproportionately affected by flooding, with few adaptation strategies available to reduce the economic consequences.

The studies conducted by Porio (2011) ^[15], Akhter & Ahmad (2023), and Kashyab (2019) present a holistic understanding of the significant implications that flooding has on the livelihoods of individuals residing in urban areas prone to floods, regardless of their geographical location or socio-economic conditions. Despite their divergent circumstances, these studies uncover shared patterns that shed light on the adverse consequences of flooding on their economic well-being.

In a rigorous review conducted by Alderman *et al.* (2012) ^[2], a wide range of articles published from 2004 to 2011 were thoroughly examined to unravel the precise quantitative correlation between floods and their impact on health. They discovered that the long-term health effects of floods are poorly understood, with mortality rates increasing by up to 50% in the first year after a flood. Furthermore, there is an increased risk of disease outbreaks such as hepatitis E, gastrointestinal illnesses, and leptospirosis, especially in places with inadequate hygiene and displaced populations. The study also found that survivors are more likely to experience psychological distress, which can worsen physical illnesses.

In contrast, Saulnier *et al.* (2018) ^[17] examined the short- and long-term effects of seasonal floods on health markers in Cambodia. Using satellite imagery and national health data from 2008 to 2013, the researchers investigated visits to public healthcare institutions for various health conditions in flood-prone areas. They discovered minor to moderate increases in visits for skin diseases, respiratory infections, and diarrhea immediately following floods and three months later. Additionally, access to healthcare did not appear to be significantly impacted.

Shimi *et al.* (2010) ^[5] expand on the findings of Alderman *et al.* (2012) ^[2] and Saulnier *et al.* (2018) ^[17] by explicitly examining the impact of floods on water supply, sanitation, and health in a rural community in Bangladesh. They highlight the significant disruption of water supply and sanitary conditions during floods, emphasizing the contamination of water sources and the inability of tube wells and toilets to function. This is consistent with

Alderman *et al.*'s (2012) ^[2] results of higher risks of disease outbreaks, including gastrointestinal ailments, after flooding, especially in communities with low cleanliness.

These observations from the literature review illustrate the research gap in the current investigation issue. Accordingly, these studies inspired the researcher to research further how urban flooding disrupts livelihood activities, children's education, and household chores and influences religious practices and inhabitants' health in Dibrugarh town, Assam.

Methodology

An exploratory research design has been adopted for this study. The study focuses on urban flooding in Dibrugarh, Assam, for its vulnerability to recurrent urban flooding during the rainy season. The areas such as Gangapara, Seujpur, Naliapool, Santipara, Graham Bazar, Gandhi Nagar, Bishnu Nagar, Durgabari, Boiragimoth, Lachit Nagar, Jibon Phukan Nagar, Milan Nagar, Bagchipara, Padum Nagar, Khalihamari, Boiragimoth, Amolapatty, Khaniagaon, Pathanpatty, and Chowkidinghee were purposively selected because these areas are vulnerable to flooding than other parts of the town (Das *et al.*, 2020) ^[19]. Ten households from each area were chosen by using convenience sampling. Therefore, the total number of households is 200. Field interviews conducted in this study mainly consisted of semi-structured and in-depth interviews. A semi-structured interview was chosen because of its flexibility, which introduced new questions based on the interview's insightful responses (Ruslin *et al.*, 2022) ^[16]. To some extent, non-participatory observation was also used to objectively observe and document the impacts of flooding on their life. For this study, the researcher collected data from primary and secondary sources.

Dibrugarh: Urban Development, Environment and Socio-Economic Characteristics

Dibrugarh, an industrial town in upper Assam, boasts extensive tea gardens that sprawl across the landscape. Situated 435 km East of the state capital of Dispur, this vibrant town serves as the headquarters of Dibrugarh District in the beautiful state of Assam, India (*District at a Glance Details Page | Dibrugarh | Government of Assam, India*, n.d.) The total land area of the town is 15.5 square km, and as per the 2011 census, it has a population of 1,46,122 (City Disaster Management Plan (Dibrugarh), n.d.). The town has a mild climate with low temperatures and high rainfall, and the area's climate can be classified into four seasons- winter, pre-monsoon, monsoon, and retreating monsoon. Winter has fair weather with fog and haze. Pre-monsoon has rising temperatures and northwestern (locally called Bordoichilla), with rainfall between 59 and 160 cm. Monsoon brings heavy rain, low clouds, and thunderstorms, with an average annual rainfall of 300 cm. Retreating monsoon sees a decrease in rainfall and clearer skies with sunny days (Hazarika *et al.*, 2016).

Initially known for its tea industry, Dibrugarh gradually expanded physically and economically when resources like oil and coal were discovered. Around Dibrugarh, many low-lying areas had been filled up to construct a residence and other structures. The rapid urbanization and the gradual filling up of low-lying areas have had the maximum impact on flash floods in the town (Mili & Acharjee, 2014). As a result, when there is heavy rainfall, the overflow of rainwater cannot disperse, resulting in flooding. In addition,

improper drainage is responsible for urban flooding in Dibrugarh (City Disaster Management Plan (Dibrugarh), n.d). A poorly maintained drainage system exacerbates the problem by preventing water from moving and dispersing rapidly enough, resulting in flooding.

Disruption of Livelihood Activities, Children's Education, and Household Chores

Disruption of Livelihood Activities

With floodwater submerging the roads, commuting to work is challenging for town inhabitants. Out of the 200 respondents, 192 (96%) reported difficulty commuting to work because of submerged roads. They mentioned that they sometimes get stuck in traffic due to flooded streets, resulting in delays ranging from 30 minutes to more. One respondent, Jane (anonymous), described his experience of being stuck in traffic due to flooded roads:

"I remember it took me an hour to travel a distance that normally takes me 15 minutes. The roads were entirely flooded, and I felt powerless. I ended up missing important work, which was extremely frustrating."

The flooded roads create traffic congestion and significantly increase commuters' travel time. When roads are flooded, vehicles must slow down or take alternative routes, significantly increasing travel time. Standing water on the streets makes it difficult for cars to maintain their average speed, resulting in slower traffic flow. In addition to the difficulties faced during their daily commutes to work, out of 200 respondents, 176 (88%) stated that they had to take an average of 1 to 3 days off work due to the impassable roads, resulting in significant loss of income and productivity. The considerable loss of income earning is higher among those who rely on daily wage labor to make a living. Out of 200 respondents, 44 (22 % of the daily wage earner) reported losing earnings between 300 to 500 rupees per day because of being unable to work on the day when roads are impassable.

The study's findings on impassable roads align with Porio's (2011) ^[15] research, which emphasizes the impact of environmental challenges on socio-economically disadvantaged individuals, specifically daily wage earners. This group bears an unfair burden, as even a single day without income can be the difference between meeting basic needs and enduring financial hardship.

Children's Education Disruption

According to the research data, out of 200 respondents, 176 (88%) reported their children are missing an average of 1 to 3 days of school during the monsoon season due to impassable roadways. This high absenteeism rate highlights the considerable impact that flooded roads have on students' access to education. Raju (anonymous), a father from Graham Bazar, clearly described his children's educational challenges during the rainy season:

"Heavy rainfall during the monsoon season frequently forces our children to skip school for multiple days. The flooding makes it increasingly challenging for them to reach their educational institution."

This story powerfully depicts a parent's determination to confront the obstacles of flooded roads and their significant effect on her children's education amidst the monsoon season. This exemplifies the intricate intersection of environmental factors, socio-economic conditions, and education. The parent's profound concern for their children's

education transcends mere inconvenience, shedding light on a more profound structural issue: individuals' vulnerabilities in flood-prone regions. Furthermore, the narrative effectively conveys the concept of "reproduction of inequality" within the educational system. According to Pierre Bourdieu's theory, social inequalities persist through several processes, including educational chances (Nash, 1990) ^[13].

Disruption of Household Chores

It has been discovered that urban flooding in the research area profoundly disrupts the regular operation of households, posing substantial challenges to daily life and household routines. Out of 200 respondents, 140 (70%) reported difficulties cooking meals due to floodwater seeping into their kitchens. The seepage of floodwater makes kitchen areas unsafe and unhygienic for food preparation, as floodwater frequently contains various waste materials such as sewage, toxic substances, and debris. Contaminants and pollutants in floodwaters significantly threaten the cleanliness and hygiene of cooking surfaces, utensils, and ingredients.

Furthermore, 56 (28%) of the 200 respondents claimed that drinkable water is frequently jeopardized during flooding since water sources get submerged, rendering them unfit for use, entirely or partially. This causes substantial complications in meal preparation. The limited access to drinking water during floods exposes deep-rooted disparities and vulnerabilities within the communities affected.

Influence on Religious Practices

Flooding does not just disrupt people's livelihoods, their children's education, and their everyday cooking. It also has a profound impact on their religious practices. The floodwaters not only intrude upon sacred spaces but also disrupt important rituals, posing a significant challenge to the continuity of their religious traditions.

Disruption of Sacred Spaces and Religious Rituals/Offering Prayer

Rituals are essential to religion because they allow people to express and reinforce their belief system (George & Park, 2013). However, when nature's fury strikes, as seen in the case of flooding, these profoundly ingrained religious rituals face profound disruptions. Out of 200 respondents, 92 (46%) reported experiencing significant difficulties in participating in religious rituals during the rainy season because of flooding in the places of worship (sacred space). Sacred space holds immense cultural and religious importance, characterized by separating from the ordinary and being deemed forbidden in religion (Ritzer, 2011). They serve as a physical place for religious rituals and ceremonies, representing the idea of values of the community. Sahu (anonymous), among the 92 (46%) of the respondents, stated,

"During the rainy season, when floodwater enters our home, our place of worship (Sacred space) also gets flooded, thus preventing us from performing religious rituals."

Sahu's statement underscores the significant impact of disasters, such as flooding, on religious practices. When places of worship are affected by floods, it disrupts the ordinary course of religious rituals, preventing adherents

from expressing and reinforcing their belief systems as they traditionally would.

Prayer is noteworthy in Muslims' daily lives (Haq *et al.*, 2016). Over one and a half billion Muslims worldwide must participate in the 'Salah' or the daily five prayers. The obligatory prayers are spread throughout, beginning before dawn and ending early at night (Special, 2023). However, 24 % of the respondents who belong to the Muslim community reported that during the rainy season, visiting the mosque becomes challenging because of flooding. Rahim (anonymous), one of the respondents, commented, *"Amidst the rainy season, the presence of floodwater casts a shadow over the usual serenity of attending prayers. Hence, sometimes I find solace in offering Namaz at home instead."* Rahim's statement shows the intersection of religious practice and environmental factors within the community. The rainy season and subsequent flooding affected the physical infrastructure and influenced the residents' social and religious activities. Furthermore, the difficulties Rahim encounters in attending the mosque during the rainy season highlight the importance of environmental factors in molding religious behaviour. Flooded roadways create hurdles that prevent people from participating in collective worship at the mosque. This dynamic underscores the impact of environmental circumstances on religious practice.

Influence on Hygiene, Sanitation, and Health

In addition to disrupting livelihood activities, children's education and cooking activities and influencing religious practices also affect maintaining hygiene, sanitation, and health. According to the World Health Organisation (WHO), hygiene refers to "conditions and practices that help to maintain health and prevent the spread of diseases." It encompasses various aspects, including personal hygiene. Personal hygiene refers to maintaining the body's cleanliness. Sanitation refers to the "safe disposal of human waste and the provision of adequate services and facilities for that." Health is a "state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity." Sanitation and hygiene are critical to health, survival, and development.

Difficulties in Maintaining Personal Hygiene

During flooding events, individuals often face considerable challenges in maintaining personal hygiene standards, mainly when floodwater infiltrates their living rooms. Personal hygiene standards, such as bathing or showering to cleanse the body and wearing clean clothes, become particularly challenging. Moidul (anonymous) explained, *"During the last flood in 2020, our living room was filled with contaminated water, making it difficult to uphold essential personal hygiene practices like bathing and wearing clean clothes. It was distressing to see plastic bags and debris floating in our home."* Similarly, Shwar (anonymous), another inhabitant from Santipara, shared his experience, stating, *"The floodwater brought all sorts of waste materials into our home, including mud, trash, and animal waste. Maintaining our body clean amidst such conditions was a constant struggle for me and my family."*

In addition to Moidul and Shwar, most respondents, accounting for 76% of the total sample size of 200, face similar challenges in maintaining body cleanliness and wearing clean clothes during flooding events. The leading

cause of these problems was the presence of waste materials from floodwaters, such as plastic bags and debris. This contamination not only jeopardizes the cleanliness of living environments but also creates substantial challenges for those trying to follow standard hygiene practices.

The widespread difficulties in maintaining personal hygiene standards among most respondents were attributed primarily to waste materials in floodwater, reflecting broader sociological dynamics related to social vulnerability. The fact that 76% of respondents encountered challenges suggests a more significant issue rather than isolated events. This significant nature points to underlying structural factors, such as inadequate infrastructure, that contribute to the vulnerability of some populations to the impact of flooding. Furthermore, the challenges encountered during flood episodes demonstrate the interplay between environmental and social factors.

A compromised environment and adverse weather conditions led to 52% (104) out of 200 respondents, and their family members reported becoming sick during the monsoon season and floods. The most common complaints of suffering from skin itchiness, fever, cold, and ailments like athlete's foot. The high incidence of illness reported by respondents and their family members during the monsoon season and floods reflects the socio-environmental impacts of adverse weather conditions on health outcomes.

Difficulties in Sanitation Practices

Difficulties in sanitation practices also arise as floodwater infiltrates living spaces. The presence of waste materials, such as plastic bags and debris, compromises personal hygiene and challenges sanitation practices. As highlighted by WHO, poor sanitation is linked to the transmission of diarrhoeal diseases such as cholera and dysentery, as well as typhoid, intestinal worm infections, and polio. It exacerbates stunting and contributes to the spread of antimicrobial resistance. Therefore, proper sanitation facilities are of utmost importance.

Based on the field data, it has been observed that out of 200 respondents, 84 (42%) indicated that their toilets and latrines become inoperable during periods of flooding because of being inundated with floodwater. The inoperability of toilets and latrines due to inundation with floodwater poses a profound challenge to respondents. This disrupts their daily routines and significantly compromises their hygiene and sanitation conditions.

The challenges posed by the inoperability of toilets and latrines due to floodwater inundation are further magnified for female members of their families, which reveals gender-specific vulnerabilities within the broader societal context. The respondents have revealed that their female members often face heightened challenges and vulnerabilities when essential sanitation facilities become inoperable during flooding events. Sociologically, this phenomenon underscores the interconnected nature of gender and environmental challenges.

Conclusion

In conclusion, this paper has explored the intricate human dimension of flooding, shedding light on its profound impacts on various aspects of everyday life. Through an exploration of how flooding disrupts livelihood activities, children's education, and household chores, influences religious practices, and affects the health of communities, a

deeper understanding emerges of the multifaceted challenges posed by this natural phenomenon. By recognizing the interconnectedness between environmental factors and human experiences, policymakers, urban planners, and community leaders can work towards more resilient and adaptive strategies to mitigate the adverse effects of flooding and enhance the well-being of affected populations.

References

1. Akther H, Ahmad MM. Livelihood in the pluvial flood prone slum communities in Dhaka, Bangladesh. *Progress in Disaster Science*,2022;14:100227.
2. Alderman K, Turner LR, Tong S. Floods and human health: a systematic review. *Environment international*,2012;47:37-47.
3. Barbora. Remaking Dibrugarh in contemporary Assam, 2017. <https://www.iias.asia/the-newsletter/article/remaking-dibrugarh-contemporary-assam>. Retrieved February 4, 2024, from <https://www.iias.asia/the-newsletter/article/remaking-dibrugarh-contemporary-assam>
4. Bansal N, Mukherjee M, Gairola A. Causes and impact of urban flooding in Dehradun. *Rorkee: International Journal of Current Research*, 2015.
5. Chanda Shimi A, Ara Parvin G, Biswas C, Shaw R. Impact and adaptation to flood. *Disaster Prevention and Management: An International Journal*,2010;19(3):298–313. <https://doi.org/10.1108/09653561011052484>.
6. Dasgupta S, Zaman A, Roy S, Huq M, Jahan S, Nishat A. *Urban Flooding of Greater Dhaka in a Changing Climate: Building local resilience to disaster risk*. World Bank Publications, 2015.
7. Das D. *Flood in Assam-vulnerability and adaptation*. Mahi Publication, 2019.
8. District at a glance Details Page | Dibrugarh | Government of Assam, India. (n.d.). <https://dibrugarh.assam.gov.in/about-district/district-glance>
9. Kondo H, Seo N, Yasuda T, Hasizume M, Koido Y, Ninomiya N, *et al*. Post-flood—*infectious diseases in Mozambique. Prehospital and disaster medicine*,2002;17(3):126-133.
10. Kumar N. *Urban Flood Mitigation Strategies Using Geo-Spatial Tools: A Practical Approach for Cities and Towns of Developing World*. Taylor & Francis, 2023.
11. Mendonça. *Urban Flooding: Conceptions and Approaches in the Scope of Global Climate Changes*. In *Urban Flooding in Brazil* 1st ed, 2023, 3–20.
12. Mili N, Acharjee S. *Urbanisation in Dibrugarh District: an important driver of environmental degradation*.
13. Nash R. Bourdieu on education and social and cultural reproduction. *British journal of sociology of education*,1990;11(4):431-447.
14. *National Disaster Management Guidelines: Management of Urban Flooding* (ISBN: 978-93-80440-09-5). (2010, September). National Disaster Management Authority, Government of India. Retrieved February 2, 2024, from https://nidm.gov.in/pdf/guidelines/new/management_urban_flooding.pdf
15. Porio E. Vulnerability, adaptation, and resilience to floods and climate change-related risks among marginal, riverine communities in Metro Manila. *Asian Journal of Social Science*,2011;39(4):425-445.
16. Ruslin R, Mashuri S, Rasak MSA, Alhabsyi F, Syam H. Semi-structured Interview: A methodological reflection on the development of a qualitative research instrument in educational studies. *IOSR Journal of Research & Method in Education (IOSR-JRME)*,2022;12(1):22-29.
17. Saulnier DD, Hanson C, Ir P, Mölsted Alvesson H, Von Schreeb J. The effect of seasonal floods on health: analysis of six years of national health data and flood maps. *International journal of environmental research and public health*,2018;15(4):665.
18. Special ES. Why do Muslims pray five times a day and what does it signify? *The Economic Times*, 2023. <https://economictimes.indiatimes.com/news/international/uae/why-do-muslims-pray-five-times-a-day-and-what-does-it-signify/articleshow/94053372.cms?from=mdr>
19. Suntoo Das UM, Bora P. An overview of Urban Flooding in Dibrugarh Town, Assam. *PalArch's Journal of Archaeology of Egypt/Egyptology*,2020;17(9):7825-7836.