



Article

Impacts of Urban Flooding on Gender in a Slum of Bangladesh

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Abstract: Urban flooding is a frequent disaster during the monsoon period (June–October), hindering the daily lives of city dwellers, especially slum dwellers in Dhaka, Bangladesh. This study assessed the impact of urban flooding on the lives of Baganbari slum dwellers in Dhaka, Bangladesh using Moser analytical tools to explore how urban flooding affects individuals of different genders. Participatory and survey methods involving 50 slum dwellers (25 men, 25 women) were carried out to collect feedback and comments. Additionally, focus group discussions (FGDs) and semi-structured and key informant interviews (KII) were also conducted to express gender-related discrimination (e.g., men vs. women). Women are usually involved in “double day” roles (100% in reproductive and 72% in productive roles) while 92% of men are found to have no contribution in those roles. Moreover, women’s participation in community roles is significantly affected during urban flooding (almost 100%) as it imposes a compulsion for them to stay home and carry out their reproductive work. Thus, women encounter numerous challenges in meeting their practical and strategic needs, including ensuring food supplies, managing diseases and menstrual health, upholding sanitation, restricted movement, education obstacles, and more. The result shows that women in the Baganbari slum are found to have only 35% access and 6% control over resources, benefits, health facilities, and decision-making power during urban flooding. The significant decline in the access and control profile of women during urban flooding aggregates their difficulties and drives them into vulnerable positions in their own households.

Keywords: gender impact; urban flooding; slum dwellers; Moser analytical framework



Citation: Subah, Zarin, Sujit Kumar Bala, and Jae Hyeon Ryu. 2024. Impacts of Urban Flooding on Gender in a Slum of Bangladesh. *Social Sciences* 13: 248. <https://doi.org/10.3390/socsci13050248>

Academic Editors: Anália Maria Cardoso Torres, Paula Campos Pinto and Diana Maciel

Received: 29 February 2024

Revised: 6 April 2024

Accepted: 19 April 2024

Published: 30 April 2024



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1. Introduction

The urban poor living in slums and squatters of Dhaka City consists of more than one-third of the population of Dhaka (Dorélien et al. 2013; Harris 2009; Razzaque et al. 2020). According to the United Nations (UN), a slum household is a group of individuals living under the same roof but lacking amenities like durable housing, secure tenure, adequate living space, and access to fresh drinking water and sanitation (Groves 2007). The Bangladesh government’s census of slum areas and the floating population defines a slum as a cluster of densely packed settlements with at least five households that typically grow in a very unsystematic way and are characterized by poor and unsanitary living conditions on both public and privately owned vacant plots of land (BBS (The Bangladesh Bureau of Statistics) 2015). The slum dwellers in Dhaka city mostly work in the informal sectors, such as hawking, rickshaw pulling, and in home-based employments, such as housemaids, and factories as laborers. The governmental and non-governmental organizations (NGOs) contribute significant contributions to improving living conditions of slum dwellers in Bangladesh by providing services in education, health, sanitation, microcredit, and water supply in collaboration with both local and foreign organizations (Ahmed 2014; Chowdhury and Bhuiya 2004; Habib 2009; Islam 2017; Keivani and Werna 2001).

The wetlands in the eastern and northeastern areas of Dhaka City are encroached due to the high demand for land. This encroachment has led to an increase in urban flooding events, particularly during high-intensity rainfall lasting only a few hours, which in turn has severely impacted the slum dwellers in the city (Subah et al. 2023). As their livelihoods are exceptionally weak and the socioeconomic conditions are poor, they are highly vulnerable to urban flooding (Braun and Aßheuer 2011; Kashem et al. 2023). Furthermore, slum dwellers in the city lack secured tenure and suffer most during flooding due to living in clusters with a high population density, low housing quality, physical location (near water bodies), and limited capacity to tackle disasters. Their livelihood is disrupted due to the spread of contagious diseases, polluted water, and poor sanitation systems (Leya et al. 2021). In the event of urban flooding, they have to abandon their houses and stay on streets, schools, and mosques (Ahmed 2014; Huq 2017; Nithila et al. 2022).

Effects of climate change and land use change are another obstacle because they continue to drive more frequent, longer, and higher floods, which have deteriorated the situation of slum dwellers (Intergovernmental Panel on Climate Change (IPCC) 2007; Subah et al. 2018). About 85% of slum households appear to be vulnerable to flooding in developing countries (Danso and Addo 2017). Most of the urban poor live close to extremely flood-prone areas, such as wetlands, and the banks of canals, lakes, and rivers (Braun and Aßheuer 2011). Slum areas in Bangladesh are highly dense areas where inappropriate and inadequate water and sanitation facilities, often worsened due to flooding (Akther and Ahmad 2021; Haque 2021; Uddin 2018).

The term “gender” here refers to the socially constructed attributes, activities, roles, regulations, and responsibilities that are connected between men and women. Gender identity determines how human beings perceive and are expected to act and think aligning social ideologies (March et al. 1999; Renzetti et al. 2012). Social relation context along with cultural beliefs enacted by people are the core components of maintaining and changing the gender system (Shaw and Lee 2009).

Urban flooding situations are debilitating and disruptive, having a profound gendered dimension in society. Women’s general position in society originates challenges and makes women more vulnerable than men during urban flooding. Vulnerability emanates from disaster and other social paradigms that construct gendered roles for men and women. Essentially, gender imbalance in society is highlighted during any disaster like flooding (UNISDR 2009). A study conducted by Plan International showed that women and children are 14 times more likely to die in a disaster than men, as patriarchal thoughts and beliefs lead people to prioritize saving male members of a family. The ideology that works in this situation is that male members “carry on the family line” and are more valuable in a patriarchal orientation of society (PlanInternational 2013). Besides these societal cultural factors, the socio-economic conditions of women become more vulnerable than men due to damages that occur in urban flooding. During flooding situations, the wage gap between men and women in a family is exacerbated (Mehta 2007).

Among the slums and squatters of Dhaka City, we focus on the Baganbari slum because urban flooding and its consequences significantly affect the lives of the slum dwellers (Seguftah 2009; Subah et al. 2023). Pairwise ranking was conducted to assess the existing water-related issues in the Baganbari slum due to urban flooding (Subah et al. 2023). Several interventions are performed by Dhaka Water Supply and Sewerage Authority (DWASA), and NGOs like Dustha Shastha Kendra (DSK), and Bangladesh Rural Advancement Committee (BRAC) for the provision of water supplies, sanitation, education, and health, although urban flooding remains the major problem for slum dwellers (Seguftah 2009). Floodwater polluted with solid waste enters the houses of dwellers, severely impacting their lives with diseases, health issues, clean water shortage, and household assets (Akther and Ahmad 2021; Mark et al. 2018; Sharma et al. 2016). It appears that among slum residents, women are more vulnerable to urban flooding than men, especially pregnant, teenager, disabled, and elderly women, and also children (Rahman et al. 2014; Rashid et al. 2013) because of the mobility restriction and unhygienic

environment created due to urban flooding. Since a complete analysis of the impact of urban flooding on gender roles is needed and no previous investigation exists, this study aims to assess comprehensive factors contributing to gender issues during urban flooding in the Baganbari slum area. The results will provide useful insight for decision makers to better develop strategic plans to minimize the gendered suffering associated with urban flooding issues in slums, especially those situated in the wetlands of a natural drainage system.

2. Study Area and Data

2.1. Study Area

The Baganbari slum is situated in Ward no. 04, within Mirpur section 14 of the Dhaka North City Corporation, Bangladesh. The area spans latitudes between $23^{\circ}48'7.38''$ and $23^{\circ}47'58.69''$ N and longitudes between $90^{\circ}23'8.96''$ and $90^{\circ}23'11.25''$ E. This slum occupies public lands under the jurisdiction of the Ministry of Housing and Public Works, as well as DWASA (Masoom 2016). The expansion of built-up areas along the Baunia canal stream, depicted in Figure 1, correlates with the increasing population in Dhaka City. Among the various human settlements in the area, the Baganbari slum, situated adjacent to the Baunia canal within Mirpur section 14, has been selected as the focal point for studying the impacts of urban flooding on its residents.



Figure 1. Photos of the Baganbari slum, Bangladesh: (a) Baunia canal and the Baganbari slum; (b) road conditions of the Baganbari slum; (c) houses situated across the canal; (d) houses built on top of bamboo in swampy soil; and (e) drainage conditions in the Baganbari slum.

According to the “Census of Slum Areas and Floating Population 2014” by the Bangladesh Bureau of Statistics, the total population of the Baganbari slum is 1734 (886 males, 845 females, and 3 third gender individuals) (BBS (The Bangladesh Bureau of Statistics) 2015). This makes up a population breakdown of 51% male and 49% female. Regarding education, 63% are illiterate, and only 30% have primary education. The average income per month for households in the Baganbari slum is BDT 4000 to BDT 5000 (according to slum dwellers), which is USD 36.40 to USD 45.50 (as of 16 February 2024).

A study have conducted in this slum reported a high occurrence of urban flooding in the Baunia Khal watershed along the Baganbari slum (Subah et al. 2023). The previous study mentioned a peak discharge of 3992.30 m³/hour in the area, leading to urban flooding in the Baganbari slum. Encroachment exacerbated the issue, causing rapid inundation after short rainfall. Note that 34.09% of the Baganbari slum was flooded on 21 July 2020, according to Sentinel-1B analysis (Subah et al. 2023).

2.2. Data Collection

To evaluate the gender impact of urban flooding, the Moser framework was employed, utilizing a blend of participatory and survey-based methods (Moser 1989). The Moser framework was selected for the study because it provides a comprehensive approach to analyzing gender relationships in urban settings and offers flexible adaptability to be tailored to the specific context of the Baganbari slum (Moser 2012). The questionnaire survey gathered responses from 50 slum dwellers, comprising 25 men and 25 women, ensuring an equal representation for comparative analysis. This involved four focus group discussions (FGDs)—two with men and two with women, along with eight semi-structured key informant interviews. Additionally, a pair-wise ranking of water-related issues was included in the survey. The average age of the participants in the study, for both men and women, was between 20 and 39 years. It is important to note that separate questionnaire surveys and interviews were conducted for men and women. Essentially, we wanted to foster a safe and comfortable environment for women to articulate the gender-related discrimination they face due to urban flooding. Furthermore, key informant interviews were conducted with four DWASA officers to comprehend their perspectives on the Baganbari slum.

3. Methods

3.1. Moser Analytical Framework

This study utilizes both quantitative and qualitative assessments to comprehend the effects of urban flooding on slum dwellers, particularly women. The Moser framework is employed to conduct a gender impact assessment resulting from urban flooding.

Moser’s method (1993) is a widely recognized urban planning approach that has evolved to address the pragmatic and strategic requirements of integrating gender into intervention projects. The Moser framework offers six tools for executing projects in a gender-sensitive manner (Moser 2012; Moser 1989). For this study, the first three tools from the framework are chosen to evaluate the gender impact caused by flooding. These tools are written below:

Tool 1: Identification of triple gender roles (reproductive, productive, and community management role)

Tool 2: Assessment of gender needs (practical and strategic needs)

Tool 3: Access and control profile of resources, benefits, health facilities, and decision-making power.

A schematic diagram of the method for this analysis is shown in Figure 2.

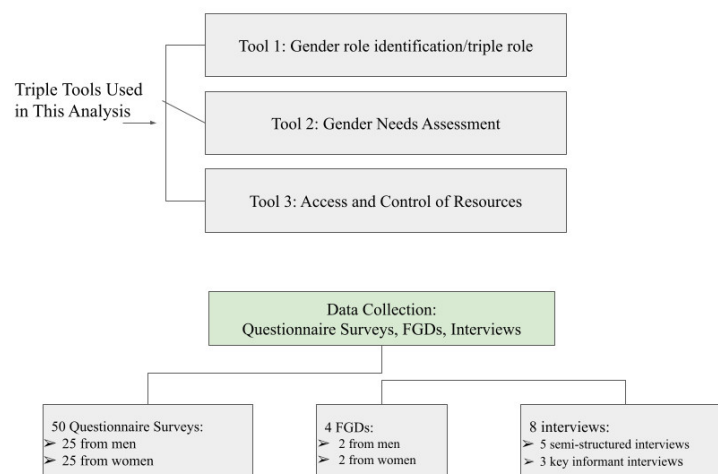


Figure 2. Diagram of Moser framework approach associated with data for analyzing the impact of urban flooding on gender.

3.2. Identification of Triple Gender Roles (Moser Tool 1)

Triple gender roles encompass the reproductive, productive, and community management roles within a society. Reproductive roles entail domestic tasks, while productive roles involve income-generating activities centered on producing goods or services for trade and consumption. Community management roles comprise activities related to organizing collective events and services within society. The indicators were further tailored for Baganbari slum dwellers, as shown in Table 1 below, based on the following FGDs.

Table 1. Indicators for analysis of gender roles.

Gender Roles	Indicators
Reproductive Roles	Cooking and cleaning work, taking care of children and in-laws, helping mother with household chores, other chores in the household.
Productive Roles	Working in industries/factories, working as a guard, rickshaw pulling, working as a housemaid, selling grocery items, selling vegetables, renting out boats, driving taxis, working in tea stalls, working in construction sites.
Community Works	Participating in Community Management Committee (CMC) meetings by Dustha Shastha Kendra (DSK), attending weddings and funerals, teaching Islamic studies to children, participating in local meetings for any issue or dispute (Shalish).

3.3. Assessment of Gender Needs (Moser Tool 2)

The second tool examines the practical and strategic gender needs essential for the adequate livelihood of slum dwellers. Practical needs refer to immediate necessities for living while strategic needs aim to enhance the status of women and to redress existing power imbalances between men and women in society. Meeting strategic needs within a community helps women advance towards gender equality and overcome challenges imposed by socially constructed gender roles in their communities (Moser 1989).

The indicators listed in Table 2 are used to assess the practical and strategic needs of the Baganbari slum dwellers and their impact on flooding.

Table 2. Indicators for analysis of gender needs.

Gender Needs	Indicators
Practical Needs	Food, employment, health and diseases, menstrual health (women), sanitation, safe drinking water, movement.
Strategic Needs	Education, reduction in salary, food preservation problems, entertainment, women's opinion on family expenditures

3.4. Access and Control Profile of Resources, Benefits, Health Facilities, and Decision-Making Power (Moser Tool 3)

The third tool of the Moser framework delves into the gender dynamics concerning access to and control over resources, benefits, health facilities in their vicinity, and decision-making capabilities. This tool poses questions about the gender profile in an area, such as who decides what, who controls which resources, and how they exercise that control. This tool is vital for assessing gender equality in a society by evaluating their status in resource control and decision-making, both within and outside the household. Table 3 illustrates the indicators utilized in this study to examine the access-control profile of men and women in the Baganbari slum.

Table 3. Indicators for analysis of access and control profile.

Access and Control Profile	Indicators
Resources	Canal, labor (for income generation), education, cash, tube well, household assets, chicken/ducks, boat (communication)
Benefits	Training, asset ownership, basic needs (food, shelter, clothing, etc.)
Improved Health Facilities	Drinking water, sanitation
Decision-Making Power	Independence in opinion, independence in spending money, freedom in movement, participation in organizations

4. Results

The result section focuses on the assessment of the three tools of the Moser framework for Baganbari slum dwellers from men and women's points of view about urban flooding and its impact.

4.1. Moser Tool 1: Gender Role Assessment

Gender role assessment is performed on reproductive, productive, and community roles in the Baganbari slum. Significant variance is observed in the percentage of different roles of men and women.

Gender Profile of Reproductive Roles Unaffected by Flooding: The survey reveals that women are significantly engaged in reproductive roles. Primary reproductive responsibilities identified from FGDs and KIIs with female respondents include: (1) cooking and cleaning work, (2) childcare, (3) household duties, and (4) other chores in the household.

An overwhelming 84% of women partake in cooking and cleaning. Married women, responsible for tending to their children and in laws, diligently provide essential support, including food and other necessities. Additionally, 16% perform various other reproductive roles, such as fetching water, taking children to school, and buying groceries for the home. Furthermore, 8% of women contribute to household chores. In contrast, men's contribution to reproductive roles in the Baganbari slum is minimal. Only 8% of men somewhat assist their wives in household tasks. Remarkably, the remaining 92% of men mentioned that they do not contribute to reproductive roles, considering them as 'women's work'.

Urban Flooding Impact on Reproductive Roles: Urban flooding has a great impact on disrupting the reproductive role function in the slum. A total of 76% of women mentioned that they face problems in daily movement, which constrains their reproductive roles such as cooking, cleaning, and other household works. Then, 40% of women responded that they confront difficulties in arranging food for their livelihood, while 16% and 12% of them reported that when their home is submerged by water restricting the daily household chores and children get sick, respectively. Among the women, all mentioned their difficulties in reproductive work due to urban flooding, whereas the men were found to have the opposite opinion of urban flooding not having any impact on reproductive roles (68% of them) (See Figure 3).

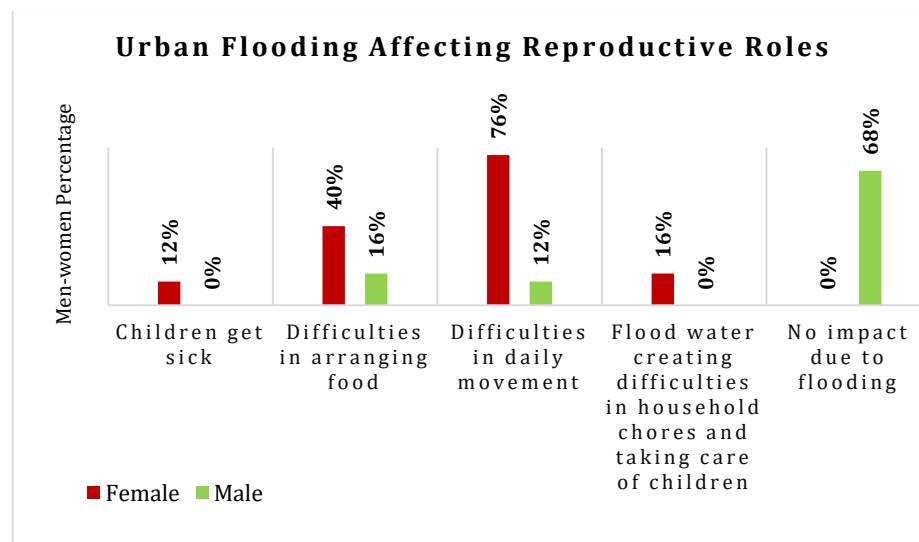


Figure 3. Urban flooding impact on reproductive roles.

Gender Profile of Productive Roles Amidst Non-Flooding Conditions: Women in the Baganbari slum are found to be involved in various productive roles. Almost 72% of women are engaged in different income-generating activities. The primary productive roles in which the women in the Baganbari slum are involved are: (1) working in industries/factories, (2) working as housemaid, (3) selling grocery items, and (4) selling vegetables. Among them, 32% of women are found to work as a housemaid, which is mostly part-time work. Selling grocery items and vegetables appeared to be performed by 24% of women. Besides, 16% of women respondents mentioned that they work in industries/factories that involve different tasks, such as assembling, stitching, and cutting clothes. But 28% of women are found to have no participation in productive roles.

Men respondents in the Baganbari slum are found to be involved in various productive activities. Almost all men respondents mentioned some sort of productive roles, including security guards, shopkeepers, boat renters, rickshaw pullers, tea stall owners and workers, taxi drivers, and factory workers. Men are engaged in diverse productive roles for their livelihood, in which industrial or factory works are most common among men (36%). Also, 20% men are found to be rickshaw pullers in the Baganbari slum. The remaining 44% men are involved in diverse productive works.

Urban Flooding Impact on Productive Roles: Urban flooding brings about disruption in productive roles by increasing travel cost and time, decreasing customers in tea stalls, and making it difficult for slum dwellers to go for work. Almost 30% of men responded that the transportation cost gets increased (See Figure 4) and they become late for work, whereas only 14% of women responded for this category. Men also face more loss (10%) in their stalls than women (4%). In contrast, 24% of women respondents mentioned that their productive roles are not disrupted due to flooding.

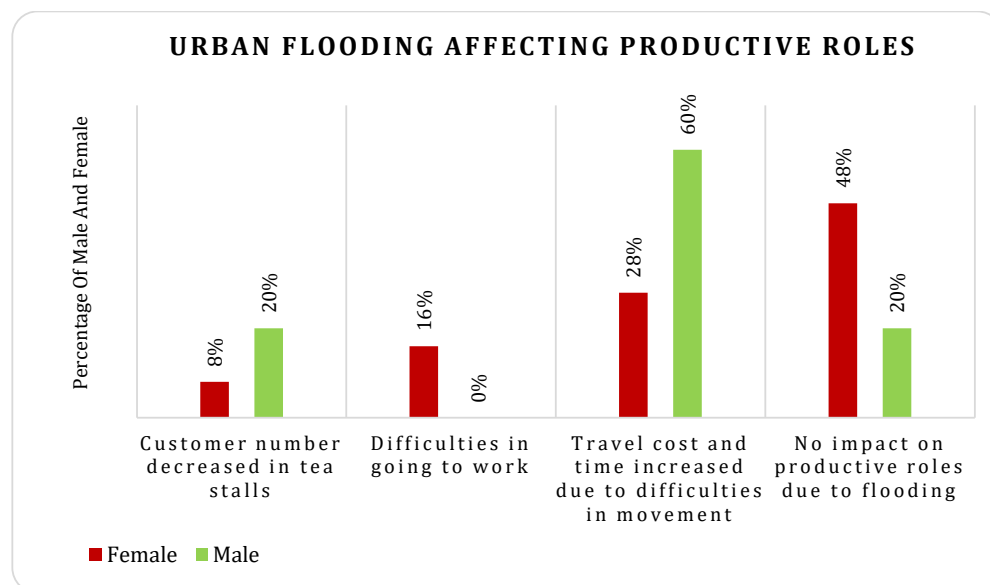


Figure 4. Urban flooding impact on productive roles.

Gender Profile of Community Roles Amidst Non-Flooding Conditions: Baganbari slum dwellers are found to participate in different community roles, including: (1) community Management Committee (CMC) meetings hosted by Dustha Shastha Kendra (DSK), (2) weddings and funerals, (3) teaching Islamic studies to children, and (4) local meetings for any issue or dispute (Shalish). CMC is a community formed among slum dwellers for the operation and management of water points and sanitation facilities. Among the respondents, 30% men and 16% women are members of CMC and participate in their community works. Additionally, almost all slum dwellers are found to attend weddings, whereas many of the women stated that they do not attend funerals due to religious restrictions. A total of 72% of men respondents mentioned that they are usually involved in arguments of dispute meetings, while only 16% women said that they are barely involved in such meetings. Also, 12% men and no women are found to be engaged in teaching Quran and Islamic studies in their community. It shows a major lack of women's participation in management and decision making in the community compared to men.

Urban Flooding Impact on Community Roles: Urban flooding affects the dwellers by creating difficulties in arranging events, such as weddings, funerals, and meetings (CMC and Shalish). The findings show that the community work of women is more impacted by urban flooding than that of men. Figure 5 shows the disruption of community work due to flooding for men and women in the Baganbari slum.

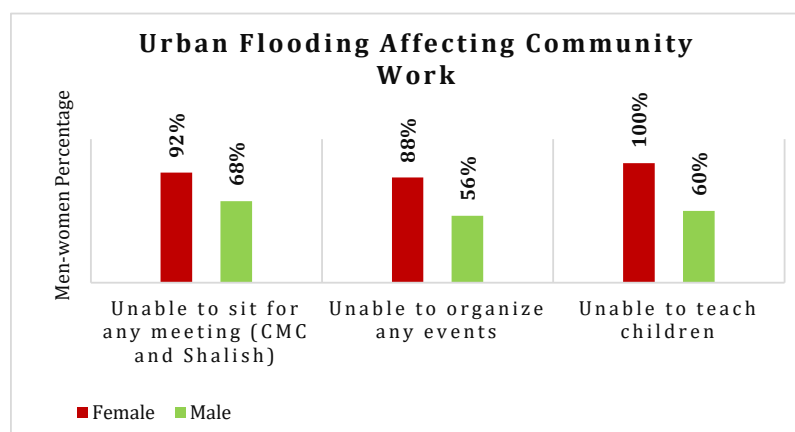


Figure 5. Urban flooding impact on community work.

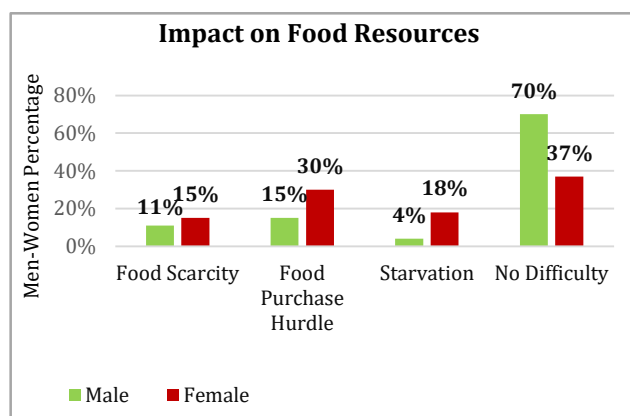
4.2. Moser Tool 2: Gender Needs Assessment during Flooding

Separate FGDs with men and women respondents helped to identify the needs of Baganbari slum dwellers. The practical needs found from surveys are food, employment, proper health, menstrual health (for women only), sanitation, safe drinking water, and free movement. The strategic needs of Baganbari slum dwellers are education, increased salary, entertainment, food preservation, and women's opinion on family expenditures. Urban flooding affects fulfilling these needs and makes their livelihoods difficult.

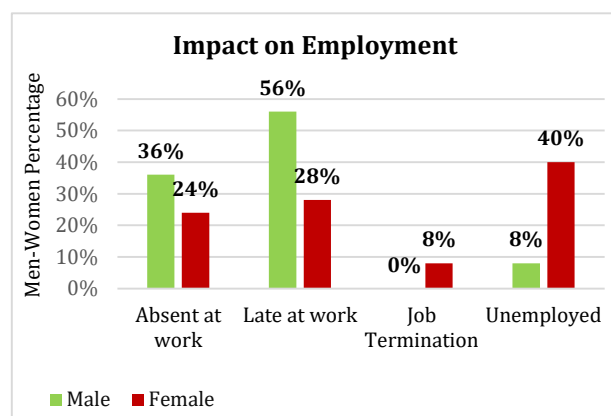
Impact on Food Resources: The impact of urban flooding differs significantly between men and women, particularly evident in their responses regarding food scarcity during these times. According to Figure 6a, women are notably more affected by starvation during floods, with 18% reporting facing starvation compared to only 4% of men. However, both genders face similar challenges in buying food during flooding. Slum dwellers predominantly use clay or gas stoves for cooking, and they encounter immense difficulties when floods hit. The unavailability of firewood and kerosene and the logistical challenge of shifting stoves from outdoors to indoors exacerbate the struggle. Moreover, the closure of shops within the slum due to flooding further complicates food access, creating turmoil for these residents. Shopkeepers in the Baganbari slum confirmed the closure of shops during floods due to impassable streets, intensifying the challenges for residents in procuring and preparing food for their families.

Impact on Employment: A significant proportion of men, approximately 56%, face work-related challenges during floods, reporting lateness or complete inability to reach their workplaces. Conversely, around 40% of women identified themselves as housewives, mentioning no direct employment impact from flooding (See Figure 6b). However, women face substantial mobility issues during monsoon flooding, significantly affecting their income-generating activities. They highlighted difficulties such as wet clothes leading to social embarrassment, necessitating carrying extra attire, and causing disruptions in their daily routines. Additionally, women often resort to boat travel due to flooded streets, incurring extra costs and further complicating their commute.

Impact on Health and Diseases: Women expressed more worries about skin diseases, malaria, dengue, and waterborne illnesses like diarrhea and typhoid. Figure 6c highlights greater health concerns among women during flooding, showing higher reported instances of illnesses compared to men. While responses regarding skin diseases were similar between genders (36% women, 40% men), a notable contrast emerged in vector-borne diseases (32% women, 20% men). During discussions, women emphasized challenges in accessing clean latrines amid dirty floodwaters, exposing residents, especially children and the elderly, to various health risks from waterborne and vector-borne diseases aggravated by flood-related movement difficulties.

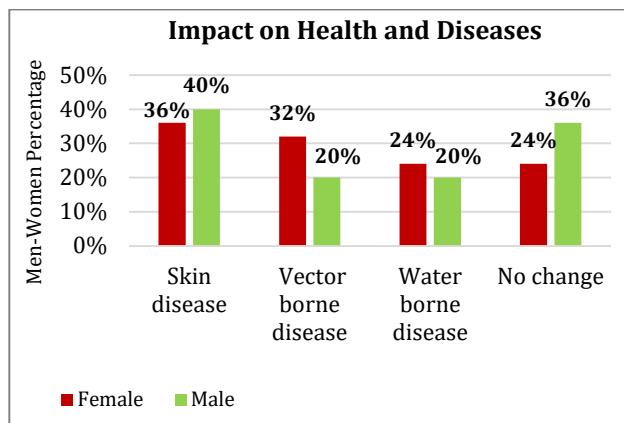


(a)

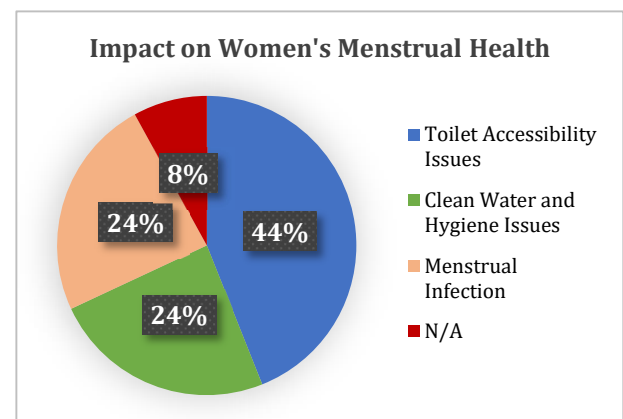


(b)

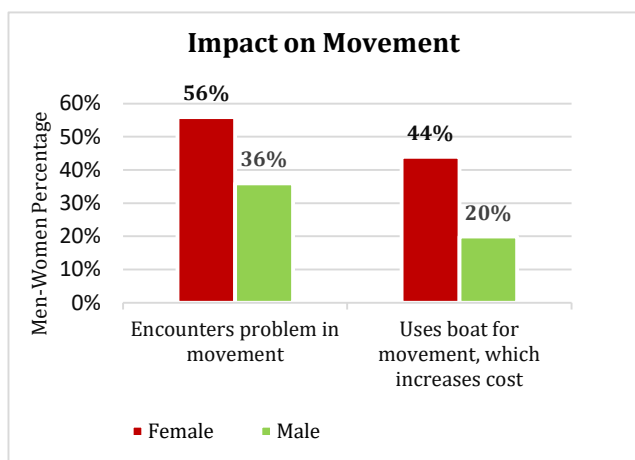
Figure 6. Cont.



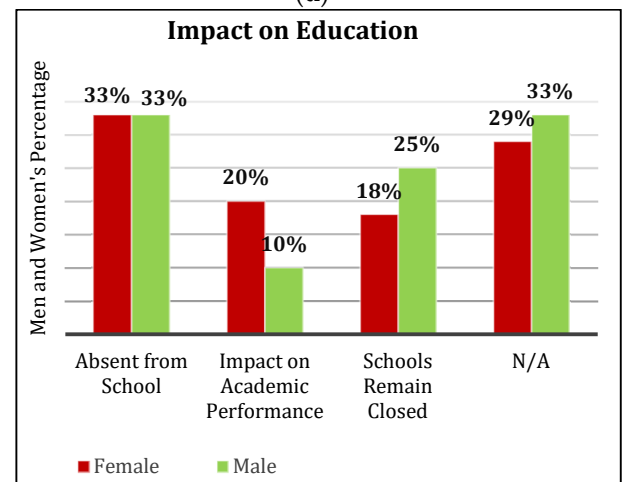
(c)



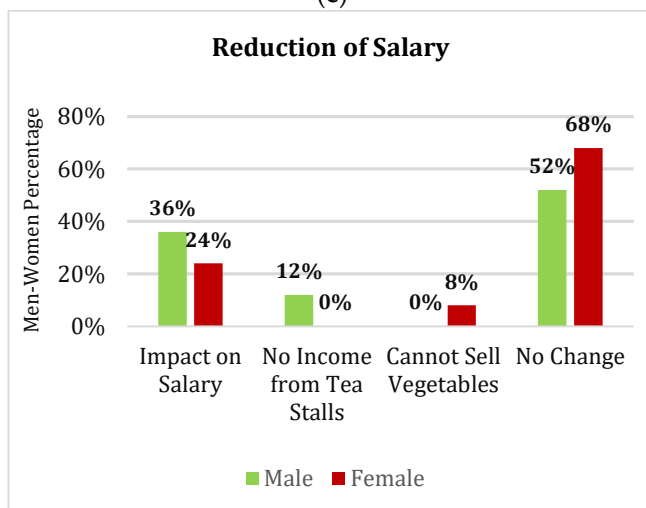
(d)



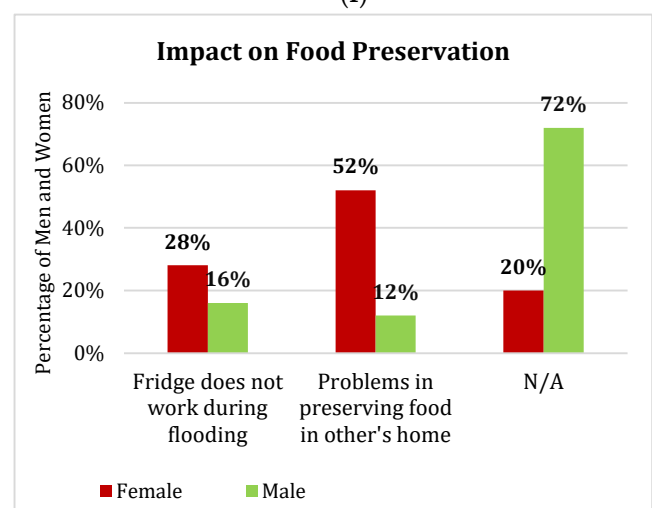
(e)



(f)



(g)



(h)

Figure 6. Cont.

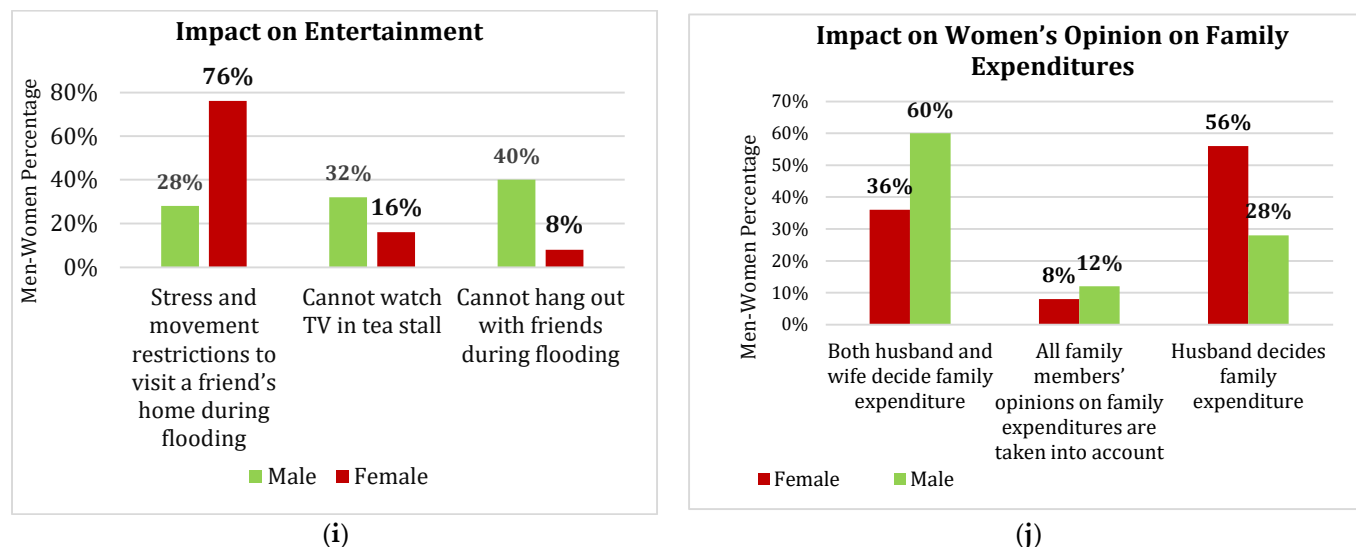


Figure 6. Urban flooding (a) impact on food resources, (b) impact on gender for employment, (c) impact on health and diseases, (d) impact on menstrual health, (e) impact on movement, (f) impact on education, (g) impact on salary, (h) impact on food preservation, (i) impact on entertainment, and (j) impact on women's opinion on family expenditures.

Impact on Menstrual Health: The survey revealed that 40% of women encounter difficulties accessing toilets during floods, while 28% struggle with inadequate clean water supplies (Figure 6d). Additionally, 24% reported infections stemming from unhygienic menstrual management during floods. Discussions with women in the slum underscored the severe challenges faced by those menstruating during floods, as they lack proper toilet facilities until floodwaters recede, leading to vaginal infections, mental stress, gynecological issues, and altered behavior within their families.

Impact on Sanitation: During the FGD involving seven participants, it was revealed that eight latrines are managed by the community, serving 4 to 5 families, each contributing 300 to 400 taka (about USD 3.63) for upkeep. Despite both genders being tasked by DSK with cleaning, women shouldered this responsibility alone, citing insufficient materials leading to unhygienic conditions. Septic tank connections pose issues when full, necessitating costly cleaning, ranging from 1000 to 1500 taka (equivalently to USD 9.12 to USD 14.56) and subsequent waste disposal in the canal by plumbers, worsening the environment. Additionally, certain latrines discharge waste directly into the canal. Urban flooding exacerbates these challenges, inundating the slum with contaminated canal water, affecting latrines and streets. The survey findings highlight men and women (52% and 48%, respectively) noting dirty water supplies during floods, exacerbating an already unhygienic environment with floating debris and feces.

Impact on Mobility: Women experience severe mobility disruptions during urban flooding, as highlighted by all female respondents encountering movement challenges and social issues. Figure 6e indicate that 56% of women face movement restrictions compared to 36% of men. Boat usage during floods escalates daily expenses, with 44% of women and 20% of men resorting to boats for travel amidst flooding.

Impact on Education: The survey revealed the absence of a local school in the slum, prompting children to travel to schools in Mirpur. A mosque serves as an educational space for Arabic and Islamic teachings, overseen by slum residents. Some families opt to send their children outside the slum or back to their villages for better educational environments due to safety concerns. Tragic incidents have occurred with children drowning in the canal during play, exacerbated by urban flooding, and sustaining injuries while navigating high floodwater. Concerns about education disruption due to flooding were expressed by both genders, with women more worried about school closures (25%) and academic impacts (20%) compared to men (28% and 10%, respectively), as shown in Figure 6f. Moreover,

66% of respondents, split equally between genders, noted children's inability to attend school during floods, with some respondents having no children or their children residing elsewhere.

Impact on Salary: Urban flooding significantly affects salary reductions for both men and women. Men tend to report higher impact, possibly due to women's higher involvement in reproductive tasks over productive work. A total of 40% percent of men and 24% of women mentioned their inability to work during flooding. Additionally, 12% of men reported closure of their tea stalls, while 8% of women faced constraints in selling vegetables. However, Figure 6g indicates that 48% of men and 68% of women stated no work-related difficulties due to flooding.

Impact on Food Preservation: Baganbari slum residents employ diverse preservation methods, including refrigeration for food storage, as revealed in interviews and group discussions. While some residents utilize refrigerators to store food, predominantly shared among friends and relatives, women respondents highlighted challenges in food preservation during flooding. By contrast, 72% of men responded that they either do not engage in food preservation or find it inapplicable. Specifically, 28% of women reported non-functional refrigerators during floods, and 52% faced difficulties preserving food at others' homes (See Figure 6h). Men reported significantly lower challenges in these aspects, with only 16% encountering refrigerator issues and 12% facing difficulties in food preservation at others' homes.

Impact on Entertainment: The population surge in the Baganbari slum, coupled with NGO support and no recent eviction records, has strengthened social ties among residents. They engage in various leisure activities, like visiting homes, watching TV, gaming on phones, socializing at tea stalls, and playing indoor games. Some residents keep caged birds, providing entertainment for children, along with cats and dogs. These recreational avenues serve as stress relievers and refreshers for the body and mind. However, flooding significantly disrupts entertainment for both genders. As shown in Figure 6i, the results indicate that 76% of women face challenges in visiting friends due to stress and mobility issues caused by flooding, while only 28% of men mentioned this issue. Women encounter fewer difficulties in watching TV at tea stalls (16%) and socializing with friends (8%) compared to men (32% and 40% respectively).

Impact on Women's Opinion on Family Expenditures: The survey in the Baganbari slum highlights the active engagement of 72% of women in various income-generating activities, contributing significantly to their family's finances. However, patriarchal influences limit their autonomy in spending decisions, notably in male-headed households. Discussions revealed issues like domestic violence, husband abandonment, and polygamy. In critical situations like urban flooding, women's decision-making power diminishes as family heads (usually men) dictate expenditures. While 60% of men claim to value both spouses' decisions during floods, only 36% of women concur, as shown in Figure 6j. Contrastingly, 56% of women and 28% of men mentioned that only the husband's decisions matter during expenditures, while a minority (12% men, 8% women) highlighted collective family decision-making during flooding.

4.3. Moser Tool 3: Access and Control Profile

The third tool of the Moser framework is used for the assessment of accessing and controlling several components of life. Access and control profiles for both men and women are hampered due to urban flooding. Table 4 shows the status of men and women in accessing and controlling economic aspects, benefits, improved living, and decision-making power, while Table 5 shows the overall percentage of men and women who have access and control over the aforementioned components.

Table 4. Access and control over resources, benefits, health facilities, and decision-making power of men and women in the Baganbari slum.

Resources/Benefits/Health Facilities/Decision-Making Power	Access				Control			
	Without Flooding		During Flooding		Without Flooding		During Flooding	
	Men	Women	Men	Women	Men	Women	Men	Women
Resources								
Canal	Yes	Yes	Yes	No	N/A			
Labor (for income generation)	Yes	Yes	Yes	Less	Yes	Less	Yes	No
Education	Yes	Less	Less	No	Yes	Less	Yes	No
Cash	Yes	Yes	Yes	Yes	Yes	Less	Yes	Less
Tubewell	Yes	Yes	Yes	No	Yes	Less	Yes	No
Household Assets	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Less
Chicken/Ducks	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Boat (Communication)	Yes	Yes	Yes	Yes	No	No	No	No
Benefits								
Training	Yes	Less	Less	No	N/A			
Asset Ownership	Yes	Less	Yes	Less	Yes	No	Yes	No
Basic needs (Food, Shelter, Clothing, etc.)	Yes	Yes	Yes	Yes	Yes	Less	Yes	Less
Improved Health Facilities								
Drinking Water	Yes	Yes	Yes	Yes	Yes	Less	Yes	Less
Sanitation	Yes	Yes	Yes	Less	Yes	No	Yes	No
Decision-Making Power								
Independence in Opinion	Yes	Less	Yes	No	Yes	No	Yes	No
Independence in Spending Money	Yes	Less	Yes	Less	Yes	Less	Yes	No
Movement Freedom	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Participating in Organizations	Yes	Less	Less	No	Yes	Less	Yes	No

Table 5. “Yes” count percentage for both males and females.

Gender	Access (“Yes” Percentage)		Control (“Yes” Percentage)	
	Without Urban Flooding	During Urban Flooding	Without Urban Flooding	During Urban Flooding
Male	100%	82%	82%	82%
Female	65%	35%	18%	6%

Resources: The Baunia canal stands as a vital resource for Baganbari slum residents, serving several purposes, ranging from transportation to waste disposal. However, access to this resource greatly differs between genders, as depicted in Table 4. While men retain access to the canal throughout flooding and non-flooding periods, women can only utilize it when flooding is not present due to societal expectations that confine them to protecting their homes and families during floods. Managed by DWASA, the canal remains beyond the community’s control. Income-generating activities highlight gender disparities, with men consistently accessing and controlling productive labor, whereas women face reduced access during floods, leading to overall less control. Similarly, educational limitations outside the slum predominantly impact girls, hindering their access and control over education, especially during flooding. Cash, water supply, household assets, and valuable resources like boats showcase similar gendered access and control dynamics, where women face increased barriers during flooding, limiting their control over essential resources.

Benefits: Training programs conducted in the Baganbari slum by NGOs and GOs aim to improve residents’ quality of life and address basic needs, yet access to these programs diminishes during flooding, as indicated in Table 4. Ownership of assets within the slum varies with living conditions, and the table illustrates that men predominantly have access and control over these assets, whether inherited, purchased, or present on their

premises. Contrastingly, women often lack ownership status over assets acquired through income or heritage, a disparity exacerbated during flooding, stripping them of control over their possessions. Despite both genders having access to basic needs like food, shelter, clothing, and sanitation, women consistently face a lack of control over these necessities in both flooding and non-flooding scenarios, further highlighting the gendered disparities in resource control.

Improved Health Facility: Tube wells and toilets are provided by NGOs and DWASA to Baganbari slum dwellers. Both men and women have access and control over drinking water supplies in flooding and non-flooding situations, although women's control over drinking water decreases during flooding due to movement restrictions and environmental hazards. Women also face difficulties in reaching sanitation services during flooding and they have no control over sanitation in both flooding and non-flooding periods.

Decision-Making Power: Gender disparities in decision making intensify during disasters, fostering gender-based violence and impacting disadvantaged individuals. Women face dominance and abuse within families, leading to limited decision-making power, aligning with the findings in the Baganbari slum. Table 4 underscores men's independent opinions and control, contrasting with women's diminished influence, especially during floods, where men's opinions prevail. Despite engagement in income-generating activities, women's spending autonomy diminishes, with men taking control, which is exacerbated during floods. Restricted movement for women during floods disrupts their work and leads to domestic conflicts. Additionally, as listed in Table 5, male participation remains the same in organizational decision making during floods, but women consistently face limited access, heightening gender disparities in decision making and community engagement.

5. Discussion

5.1. Impact on Gender Roles

Gender roles of Baganbari slum dwellers are found to be severely hampered due to urban flooding with women found to suffer more than men. Gender inequality found in productive roles and community engagement in the slum reduces women's decision-making power. The imbalance puts women at a disadvantage during disasters like flooding, making them more vulnerable in society (Carvajal-Escobar et al. 2008). Prolonged urban flooding exacerbates gender role disparities, where women are obliged to be engaged in reproductive activities while men take on income-generating responsibilities (Goh 2012).

During flooding events, men in the study area generally do not have any clearly mentioned reproductive roles, though they engage in childcare and assist their wives or mothers in household activities in leisure time. Their participation in community activities is also different from that of women. They participate mostly in leadership, decision making, and political groups, while women's community roles are related to reproductive roles, collective consumption, and volunteer activities assigned by men. It is because of the social norms that men's participation in community work can occur in any place they want, while women in the Baganbari slum are not allowed to form groups and participate in community work outside the slum. The notion behind it is that men have access to the public world but women's access is limited to the private world (Moser 2012).

Social bindings and traditional roles lead women to be involved in more reproductive roles than productive and community roles. Even among the women who are involved in income-generating activities/productive work, they also need to perform their reproductive work at home, which makes their productive work burdensome. A previous study described women's participation in reproductive and productive roles as "double day," as they are obliged to perform household chores in any means due to social norms and the patriarchy family structure (Peter 2006). Additionally, Moser discussed men and women's roles in third-world societies where men are responsible for all productive work, even though the reality is not always the same as that. Most of the time, it is found in most low-income households that women take part in productive roles besides their reproductive roles of childbearing and rearing responsibilities. Their productive roles are most found as

secondary income-earning work while men's reproductive work in the home is granted as primary income-earning work. This sexual division of labor is rooted in society in a manner that women accept as their gender-ascribed roles due to their nature of gender subordination (Moser 1989).

Women's reproductive role during flooding increases due to protecting their family and minimizing the flooding time and property losses. During urban flooding periods, women's health is affected severely, as they do not receive sufficient food, health services, and physical protection, which ultimately increases diseases, health issues, and even fatality rates among women (Chowdhury and Bhuiya 2004; Fothergill 1996; Parasuraman 1996). Moser mentioned that women suffer most during critical situations when basic services such as water, health, and housing are affected, as it is their responsibility to allocate limited resources (food, water, etc.) for the survival of family members, often sacrificing their part of the allocation. They are neglected both by their male partner and society, especially during flooding periods as they are not considered the breadwinner of the household (Mallick et al. 2009).

5.2. Impact on Gender Needs

Baganbari slum dwellers demonstrated their practical and strategic needs which are formulated directly due to the necessity for human survival, as practical needs are related to food, house, health, water, and financial security, which are essential for living (Hovorka 2001). In a disaster situation like urban flooding, the gender group of women and children is the most vulnerable and sufferer due to flooding (Anam 1999). Several caste studies also reported that the practical needs of women and adolescent girls are greatly obstructed due to the difficulties they face in using latrine facilities at night during flooding. Flooding leads them to dispose of human waste while standing in floodwater and using dirty water facilities. Menstrual health is severely impacted in this scenario (Rashid 2000). It was found in a study that adolescent girls use menstrual clothes that are washed by dirty floodwater (Anam 1999). The socially constructed "appropriate way to behave and dress" makes it difficult to receive relief or food provision by any organization, as it is not appropriate, according to norms, to go out of their homes with floodwater-soaked clothes (Rashid 2000).

Women's mobility in the Baganbari slum is affected during flooding, creating a fundamental violation of their human rights. Not only due to child and house asset protection, but women in the Baganbari slum also do not leave their home during flooding due to social and cultural norms. It is due to gender subordination and cultural gender norms that women's movements are restricted during disaster situations. Hossain described an example of socially constructed movement restriction for women and its deadly consequence in disaster (Hossain et al. 1992). In that case study, a woman did not leave her house during a cyclone for the shelter center due to the fact that the shelter center was not sex-segregated (Bern et al. 1993). The woman died inside her house while her husband moved to the shelter and described his wife as a "woman with virtue" for not leaving her home. This patriarchal mindset that "men can go anywhere, but women can't" creates huge difficulties for women during flooding by affecting their health, employment, sanitation, and more.

When intervening any disaster-prone areas, women's participation is still requested to perform duty roles, such as design, construction, and restoration activities. Their strategic needs for safe, functional, and disaster-proof accommodations are required to be addressed in planning to ensure security and women's rights. When the strategic needs of women are not addressed in the formation of a society in a flood-prone area, gender-related violence incidents are frequently observed, leading to women being more submissive and dominated by their mates. Disaster-influenced social norms create gender inequity in societies where gender-sensitive measures are not taken. Consequently, the risk of violence is increased during and after the disaster, i.e., urban flooding, leading women into violent relationships and affecting the physical and mental states of women. Thus, identification and inclusion

of practical and strategic needs is necessary for achieving the empowerment of women through gender-sensitive planning (Enarson and Fordham 2001).

5.3. Impact on Access and Control Profile

Women are the vulnerable gender group who have lack of access and control over resources in daily lives. During disaster periods like urban flooding, their vulnerable condition in society leads to an immediate decrease in accessing and controlling basic resources. Women in the Baganbari slum are found to have great difficulties in accessing and controlling not only resources, but also benefits, health facilities, and decision-making power. This disruption in women's lives amplifies their vulnerable condition and makes it difficult for them to tackle the loss created due to flooding (Tapsell et al. 2002). Socially constructed roles and responsibilities of women negatively impact their mobility, education, employment, social network, access to information and training programs, decision-making power, and ownership of assets. It leads to relatively lower access and control of Baganbari slum women during urban flooding than in non-flooding periods (Al Nahian et al. 2013).

Deere and De Leal argue that property heritance and rights in men's name and lack of credits and services for women leads to a bargaining position for women within their households, decreasing their access and control over resources (Deere and De Leal 2001). Dependency on men, leading to a bargaining position in the home with no title of their own, is one of the reasons behind their deficit of decision-making power. Land, water communication/transportation, and cash are identified as critical resources that are considered to be maintained and controlled by men (Bourque and Warren 2010). Though women in the Baganbari slum have less control over these resources, their control sharply declines during flooding periods, as critical resources need to be controlled by men according to society. Male dominance over controlling resources limits women's access and control over resources, benefits, and services both during flooding and non-flooding periods (Ahlers and Zwarteven 2009).

6. Conclusions

Living alongside a canal in Dhaka City without any embankment brings about enormous suffering due to flooding during the monsoon period (June–October). Both short-term and long-term impacts are visible in the lives of people who live near canals, like Baganbari slum dwellers. Some of the principal outcomes from the study are as follows: Women in the Baganbari slum are found to be more affected than men, as flooding restricts their practical and strategic needs associated with the increased gender gap. Additionally, food provision, protecting children and elderly people from flood-related injuries, fetching water from flooded areas, and accessing sanitation and health facilities become extremely difficult for women and they have to leave their economic activities during flooding periods. Women having menstruation during flooding periods encounter problems in accessing sanitation systems both in the day and at nighttime, which further leads to various health issues among them. Women are more dominated by men during critical situations like urban flooding than in non-flooding periods, as the financial and decision-making power are overtaken by men due to conventional social norms. Therefore, the findings further highlight that urban flooding immensely affects gender equality in slums and increases the gender gap in accessing and controlling resources. Essential steps at multiple levels, including federal/local governmental agencies, cities, and local communities, must be implemented to mitigate urban flooding and minimize its consequences for Baganbari slum dwellers in a changing climate.

Author Contributions: Z.S. investigated the proposed research and conducted urban flooding evaluation and analysis; and is the primary on the manuscript. S.K.B. and J.H.R. proposed the study and contributed to conceptualizing the project (S.K.B.), interpreting the processes in general (J.H.R.) as Z.S.'s advisor. All authors have read and agreed to the published version of the manuscript.

Funding: The study was funded by the International Development Research Center (IDRC), Canada, under the IDRC-South Asian Water (SAWA) Leadership Program on Climate Change (Grant No. 108441-002). This publication is also supported partially by the National Institute of Food and Agriculture, U.S. Department of Agriculture (USDA), under J.R.'s Hatch project 1023305. Any opinions, findings, or recommendations expressed in this publication are those of the authors and do not necessarily reflect the view of the USDA.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Committee for Advanced Studies and Research at Bangladesh University of Engineering and Technology, Dhaka, Bangladesh. The protocol code is waived. The authors took careful steps to ensure the ethical integrity of our study. Author provided informed consent form. The authors guaranteed confidentiality and anonymity to all participants.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data used in the study can be made available upon request to the corresponding author.

Conflicts of Interest: The authors declare no conflicts of interest.

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