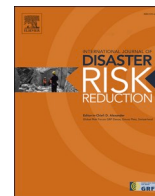


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# The importance of women's roles in adaptive capacity and resilience to flooding in rural Bangladesh

Md Javed Azad<sup>a,b,\*</sup>, Bill Pritchard<sup>a</sup><sup>a</sup> School of Geosciences, Faculty of Science, The University of Sydney, NSW, 2006, Australia<sup>b</sup> Department of Agricultural Extension and Information System, Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka 1207, Bangladesh

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## ABSTRACT

In rural Bangladesh, patriarchal gendered norms aggravate the vulnerability of women to disasters such as floods because of male dominance in access to resources and decision-making. Furthermore, these processes can render invisible women's vital roles in flood preparedness, response, rehabilitation, and recovery. A first step in addressing such gender-based inequalities in disaster contexts is to recognise and acknowledge the varied contributions made by women when a flood strikes. This paper sets out a framework to document women's roles in building adaptive capacity and resilience to floods in rural Bangladesh, using testimony evidence from 20 Focus Group Discussions in the highly flood-prone area of Sirajganj District in north-western Bangladesh. These FGDs consisted of both men and women, providing an inclusive arena for participants to express their perspectives on the roles of women during flood conditions. Responses were coded within the categories of human, social and financial capital, informed by Sustainable Livelihoods Analysis. In human capital terms, women's formal and informal education and skills were identified as critical community assets. With regards to social capital, bonding, bridging and, to a lesser extent, linking forms of social capital were recognised and valued by FGD participants. In terms of financial capital, women were identified as contributing to household capacity in flood times through livelihood diversification and the protection of household financial assets. These results highlight the need for a more formal and prominent acknowledgement of women's role in disaster policy.

## 1. Introduction

Bangladesh is highly prone to disasters associated with climate change, including intensified flooding, drought, tidal surges, and tropical storms. The rural poor are the hardest hit by these events because of their often-minimal resources and lesser adaptive capabilities [1–5]. Further, in Bangladesh and many other countries in the Global South, disaster exposure and adaptive capacities are influentially shaped by deep-rooted structural challenges involving heterogeneous powers and rights among different groups within communities [6,7].

Women have diverse positionings in these disaster contexts. Prevailing social norms in Bangladesh can marginalise women from formal decision-making processes and response actions, increasing their vulnerability [8,9]. All at once, women's agency in the

\* Corresponding author. School of Geosciences, Faculty of Science, The University of Sydney, NSW, 2006, Australia.

E-mail addresses: [javed.azad@sydney.edu.au](mailto:javed.azad@sydney.edu.au) (M.J. Azad), [bill.pritchard@sydney.edu.au](mailto:bill.pritchard@sydney.edu.au) (B. Pritchard).<sup>1</sup> Present Address: Room 422, School of Geosciences, Madsen Building (F09), The University of Sydney, Camperdown, NSW 2006, Australia.<https://doi.org/10.1016/j.ijdr.2023.103660>

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community and household spheres means they cannot be construed as passive victims when disasters strike [10,11]. Developing an enhanced understanding of these constructions provides important knowledge for framing inclusive responses to disasters.

Concerns about how gender (and, indeed, other socio-cultural categories) manifests in disasters have gained increased research attention in recent years. This paper contributes to this scholarship through a study of adaptive capacity to flood in a rural district of Bangladesh. In February–March 2020, twenty village-based Focus Group Discussions (FGDs) were undertaken in Sirajganj District in northern Bangladesh with the objective of documenting how the interactions of different forms of capital (human, social, financial, natural and physical) shaped adaptive capacity to flood. In this paper, we tease out the gender-relevant insights from this wider analysis.

Sirajganj District is home to many communities living in low-lying unprotected floodplains [12,13]. The varied insights from the FGDs relevant to gender were teased out of the FGD testimonies using an analytical coding schema in NVIVO. Methodologically, men and women both participated in the FGDs, providing a setting in which male participants discussed women's roles in their presence, and female participants contributed their perspectives in the presence of men. Consistent with gendered norms in rural Bangladesh, men's voices were more prominent than women's voices in the FGDs, the implications of which are explored later in this paper. Nevertheless, the merit of the approach used here is that it reveals unvarnished accounts by rural Bangladeshi villagers in inclusive research forums of how gender interacts with vulnerability, adaptation, and recovery to flood.

## 2. Literature review

### 2.1. Gender and disaster management

Gender is constructed by socialisation processes embedded in cultural and political contexts. A gender lens recognises the deeply rooted role of patriarchal systems in the creation of gender norms. The culture and norms of household decisions in rural Bangladesh are dominated by the assumed authority of the male household head [14–19].

The aim of disaster management is to reduce or eliminate potential dangerous casualties, ensure appropriate and sufficient assistance to disaster victims and achieve quick and effective recovery [20]. In modern disaster management, the gender perspective is crucial to improving a resilient society. Gender plays an important role in understanding disaster risk and their management. Therefore, it is vital that disaster risk reduction needs to incorporate gender-related influences and decisions [21].

Incorporating a gender lens in disaster management is crucial for mitigation and adaptive capacity development [22,23]. In Bangladesh, women, children, elderly, peoples with disabilities and adolescent girls are most vulnerable to disasters [18]. A theme in the research scholarship on disasters is to portray women as having disproportionately higher vulnerability [24–26] and suffering more serious consequences when disaster strikes [27–30]. However, focusing solely on vulnerabilities can render invisible women's capabilities and importance in disaster preparedness, response, rehabilitation, and recovery [31–34]. Incorporating a gender lens into disaster research requires simultaneously noting the contexts that generate increased vulnerabilities for women, recognising their key roles in resilience and adaptive capability [35,36], and appreciating that different genders have different vulnerabilities at different points in the disaster cycle [37,38].

### 2.2. Framework to understand women's role in adaptive capacity development

This dual framework is core to the Sendai Framework for Disaster Risk Reduction, recognising women as leaders and change agents instead of essentialist victims [39]. The framework builds on a string of earlier work (UN Women, 2013) that reported the necessity of mainstreaming gender into the development of the community. Gender responsibilities and actions are often influenced by customary norms emphasising village leaders and chiefs, typically male power [40,41]. However, women's experience from various activities at household and community levels, as well as the amount of time they devote to the village atmosphere, makes them a valuable source of knowledge about a range of issues linked to natural resources management, like land and water [42,43]. In addition, women possess experience in conserving natural resources for household and community consumption and have a broad view of their surroundings [44,45]. This extensive expertise in sustainable resource management means that women have particular and important insights for decisions on a range of disaster-related issues [46–48].

In a generalised sense, women are likely to bear the burden of disasters but are regularly found to be the front liners of adaptive capacity development to disaster response and recovery [49,50]. In a study of flood reconstruction in Assam, India, Krishnan (2022) noted these front-line roles in terms of various active roles in reconstructing their homes, lives and livelihood with little to no help from external agencies. Other studies have documented how women strengthen community resilience through their knowledge of food preservation and the use of medicinal plants to treat particular diseases [51–53]. [54] argue that women contribute significantly to resilience across the four dimensions of community resilience: social resilience, economic resilience and ecological resilience. Hence, as argued by Ref. [55], bolstering the capabilities of women as individuals and their role in institutions allows disaster-prone communities 'to pursue a range of resilient futures.

Moreover, if and when these contributions are recognised and realised, the knowledge and assistance of women can challenge or alter traditionally gendered norms. For example, after the devastating tsunami of 2004 in Sri Lanka, several women who ran businesses turned out to be financially independent with no male assistance and challenged gender-stereotypical norms [56]. Their involvement

in disaster planning led to the development of disaster management policies [57]. In China, after the Wenchuan earthquake, women's contribution to leadership and decision-making during the recovery and reconstruction phases helped to promote gender equity [58]. In Nepal, the women's group of Chandragiri Municipality of Kathmandu played a key role in disaster risk reduction after the earthquake [59].

Framing these arguments in the context of the Sustainable Livelihoods Approach (SLA), gendered knowledge represents a key source of *human capital* for communities. In this sense, human capital implies the knowledge, skills, working capacity, and good health circumstances needed to meet livelihood outcomes [60]. Nevertheless, in perspectives where decision-making control is stubbornly patriarchal, such knowledge can be under-valued, overlooked or rejected inside community development [61–63]. According to Tschakert and Machado [64], safeguarding the addition of the distinct perspectives of women in community development may need rights-based perceptions that protect women's roles inside decision-making community settings.

In recent years the international community has acknowledged the necessity of gender viewpoints in Disaster Risk Reduction (DRR), claiming that social constructs of gender lead to structural inequalities, prejudices and biases that articulate people's disaster vulnerabilities and capabilities in all disaster phases. Furthermore, studies showed that women are especially prone to gender-based disaster risks [54,65–67]. Therefore, national governments must identify these vulnerabilities and develop indicators of increased adaptive capacity that could enhance the resilience. These insights emphasise the importance of adopting a gender lens to disaster research, especially in a country like Bangladesh with strongly patriarchal cultural norms. Such an approach can bring to light the capabilities and roles of women in the phases of disaster preparedness, response, rehabilitation and recovery. Given that Bangladesh is a patriarchal society, there is an additional benefit from knowing how men articulate women's contribution to disaster risk management and then critiquing these perspectives through a gender lens. This point is not always present in gender research, and exploring this issue will provide a basis for new insights into disaster and gender in rural Bangladesh.

### 3. Case study: Sirajganj District, northern Bangladesh

The geographical site for this study is rural Bangladesh, where there are strongly embedded patriarchal norms and high vulnerability to disasters. Women in Bangladesh have less education and more limited finances than men. Additionally, Bangladeshi women have less than 10% land ownership, and only 5% of women receive agricultural assistance from Government agencies [68]. They also have less command of power and influence over male household members' decisions [69,70]. Furthermore, due to socio-cultural norms, women have restrictions or face difficulty travelling or entering busy markets alone [71,72]. Few women in rural areas deviate from local gender expectations about conventional family maintenance and childcare [73,74].

At a global level, it has been estimated that if women were provided with the same accessing option to agriculture and related resources as men, farm yields could be increased by 20–30%, and this could contribute to the reduction of world food insecure people by 12–17% [75]. These observations appear relevant to Bangladesh – the way that cultural norms inhibit women's decision-making capacities in agriculture would seem to generate an economic detriment to the country's agricultural productivity.

The general situation relating to women in rural Bangladesh is pertinent for adaption and resilience to floods, a critical environmental hazard for Bangladesh. Approximately one-third of the country's total area is at high risk of floods [76], and the people's suffering from this climatic event is beyond description. The geographical setting of Bangladesh in the confluence of three Asian rivers (the Ganges, Brahmaputra and Meghna) exposes the country to flood events exacerbated by climate change processes, including Himalayan glacial melt and changes in rainfall patterns [77,78]. The northern region of Bangladesh is highly prone to these events; however, impacts are relevant all the way to the Bay of Bengal [79–81]. Floods severely affect the country every year, but since 2000, there has been an increasing trend of catastrophic flooding, with more of the country being immersed (Fig. 1) [82].

Sirajganj District is the study area for this research. This District is located on the bank of the Brahmaputra River, which is locally known as Jamuna in north-western Bangladesh, with four other rivers crosscutting the district: Baral, Ichamati, Karatoya and Phuljuri. This district is considered one of Bangladesh's most severe flood-prone regions [83–86], with many communities sited on low-lying unprotected floodplains [13]. This region's prime cause of the flooding is the transboundary inflow from the upstream catchment carried by the Jamuna River. Approximately 65% of the population of Sirajganj District is vulnerable to floods [87]. Sirajganj is flooded almost every year, with the most severe floods occurring in 1949, 1956, 1961, 1962, 1966, 1968, 1974, 1979, 1987, 1988, 1996, 1998, 2002, 2004, 2007, 2008, 2014, and 2016. The sudden flood of 2007 inundated significant parts of all the nine Upazilas (sub-District administrative areas) in Sirajganj. In 2014, the district was flooded for 15 days [88]. The economic activities in the Sirajganj district are mostly agricultural, meaning that flooding has direct and powerful impacts on livelihoods [89].

The study was conducted in five purposively selected upazilas (sub-districts) from a total of nine upazilas of the Sirajganj district based on flood severity and frequency of flooding in different years [88]. The five upazilas are Belkuchi, Chauhali, Kazipur, Raiganj, and Sirajganj Sadar. These five upazilas, in turn, consist of 45 unions (sub-administrative units of upazilas). A stratified random sampling technique was employed to select ten unions (two from each upazila). Then, by following the same procedure, 20 villages were selected from ten unions (Table 1) (Fig. 2).

**Table 1**  
Sampling procedure of five Upazilas of Sirajganj district.

District	Upazila	Union (Total)	Union Name (Randomly selected two unions)	Village Name
Sirajganj	Sirajganj Sadar	10	Kaoakola	Chondalboyra Berabari Chandidasgati
			Shialkul	Jagotgati
	Raiganj	9	Nalka	Kumajpur Tebaria
			Brahmagachha	Jankigati Dadpur
	Kazipur	12	Sonamukhi	Rouhabari Mallikpara
			Maijbari	Harinathpur Kunkunia
	Chauhali	8	Omarpur	Choubaria Hapania
			Gharjan	Kash Dholai Fulhara
	Belkuchi	6	Rajapur	Kadamtoli Ambaria
			Belkuchi	Dariapur Hatboyra
Total	5	45	10	20

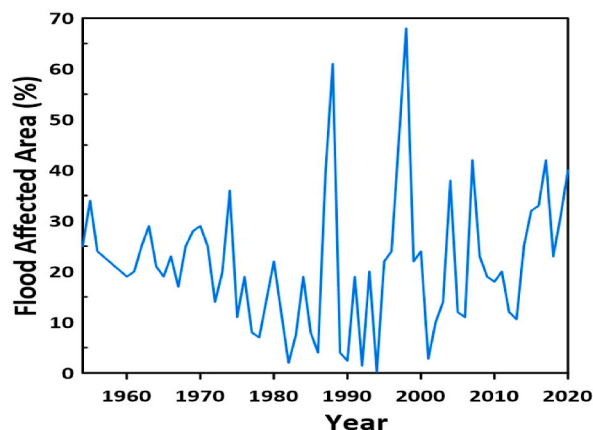


Fig. 1. Year-wise flood-affected area of Bangladesh.

#### 4. Data collection method

To gain insight into the intersection of gender and flood in rural Bangladesh, Focus Discussion Groups (FGDs) were employed as a qualitative methodology. Scholars are increasingly applying qualitative research approaches to identify the household and community recovery process [90–94]. Qualitative research methods predominantly lead to the production of rich data [95–97]. FGDs are a popular and relevant qualitative tool because of their convenience, economic benefit, high face validity, and speedy results [98,99]. Furthermore, this makes the method appropriate for livelihoods-related climate change research because it enables deep, context-relevant insight into the detail of how communities respond to disasters [100–105].

All research processes were undertaken following an approved University of Sydney human ethics protocol to ensure informed consent and the maintenance of anonymity in research reporting. The human ethics approval number for this research is 2019/896.

FGDs were conducted from February to March 2020. One FGD was undertaken in each village, creating a total of 20 FGDs. Each focus group consisted at most 12 participants and lasted for one and half hours to two hours. Before FGDs in the respective villages of particular upazila, the researcher met with Upazila Agriculture Officer (UAO) and responsible Sub Assistant Agriculture Officer (SAAO) regarding the recruitment of focus group participants. SAAO works with village-level farmers regarding agricultural technology transfer. Therefore, they have a good relationship with the farmers [106,107]. Then SAAO, with the help of the village head, recruited 10–12 focus group participants for each FGD representing different positions within the village, like men and women, landholders and landless, young and adults and older people. The village head in rural Bangladesh is not an administrative post. However, he has a good relationship with the villagers, offers suggestions, and helps them when needed. In addition, s/he has a good command over the villagers. SAAO and the village head started all the FGDs by familiarising the researcher with the participants and expressing the objective of the FGDs conduction.

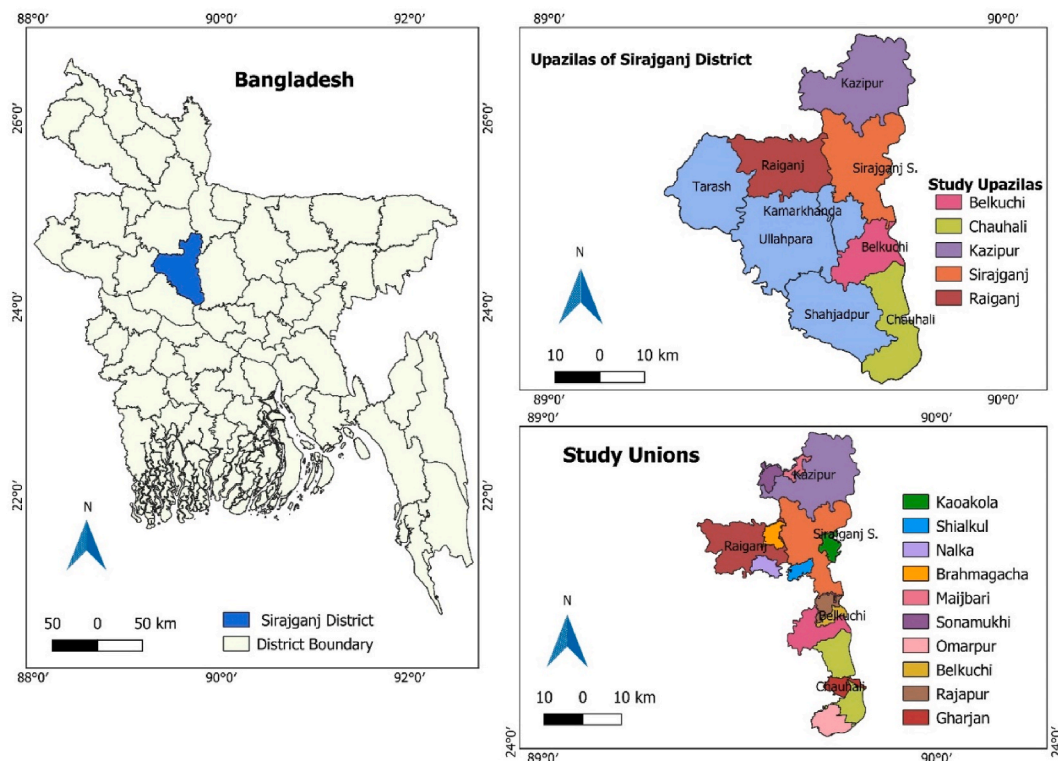


Fig. 2. 1 Study areas: Sirajganj District, study upazilas and study unions.

In the FGDs, both men and women were in the same group during the interviewing. The main reason behind this selection was the appreciation and real contribution of the women's role from the men's side in flood management. When the issue of gender (e.g., women's role) was on the table, in all FGDs, women discussed it fluently, and men also appreciated their contribution and added the value of discussion.

Local Bengali language was used in the discussion as it is the mother tongue of Bangladesh. The FGDs addressed a wide range of issues concerning flooding, but the four stages of each FGD were relevant to the concerns of this paper. First, participants were asked to discuss the way human capital is important in flood adaptation. Accordingly, participants started talking about the importance of gender in flood adaptation, especially women's role. Second, participants were requested to elicit their views on women's contribution to flood preparedness, risk, adaptation and resilience. Third, participants were asked how women are important in access to financial, social, physical, and natural capital in flood adaptation. Finally, we employed a moderation session to summarise the key points of FGDs. Data from the FGDs were analysed first by preparing transcripts with ancillary notes and observations and then by coding these within NVIVO. For the results presented in this paper, gender was used as a parent node so that comments from men and women could be distinguished, and women's access to human, social and financial capital were used as child nodes. We did not use natural or physical capital as child nodes, as for the purposes of this research these are better understood as providing the background context shaping adaptation decisions. Within each node, transcripts were coded using a classical content analytical approach. We iteratively read each transcript and assigned chunks of text through inductive category development (Mayring, 2014: 12).

As noted earlier in this paper, both men and women were present in FGDs, presenting important methodological implications for the study. First, there is evidence that men and women frame their perceptions of risk and adaptation differently, reflecting their different social worlds. As argued by Ref. [108]; remaining in the household during the hazard time for reasons of family commitment and emotional ties is considered a form of adaptation that prioritises the persistence of the household. Including both men and women in the FGDs opened the potential for such divergences in perspective to be presented. Second, the inclusion of both men and women provided the potential for them to comment on their perspectives of the roles of the other gender. Each of the FGDs consisted of at least five female participants. Previous research in Bangladesh has observed that men may express admiration and acknowledgement of women's roles; however, rooted in traditional terms of gendered norms [109,110]. Therefore, in a patriarchal society in Bangladesh, hearing the voices of how men think about women's contribution to disaster risk management sheds light on the social norms that position women in particular ways. This point is still not always present in gender research, and exploring it will enhance understanding of gender relations in disaster contexts.

## 5. Results and discussions

In all FGDs, when participants were asked to describe adaptive capacity development against flood risk, the distinctive roles of

women were acknowledged. Notably, in FGDs, it was male members who raised these points. The general tenor of discussion on this issue was that women were both highly vulnerable to flood risk, and their role in flood management was enormous. To tease out the detail of how women's roles were addressed in the FGDs, we frame responses in terms of the Sustainable Livelihoods Approach. This involves three major headings. First, the role of women is assessed in terms of human capital (how their skills, education and activities contribute to addressing disaster situations). Then, we examine women's contributions in terms of social capital (how their actions support intra-community and inter-community networks for building resilience [111] and financial capital (how their activities enhance their families' capacities in monetary terms).

### 5.1. Human capital

Many examples were provided in FGDs of how women's skills, education, and activities were crucial in disaster contexts. We group these under four subheadings and then provide a summary.

#### i) Formal education

The women's literacy rate in Bangladesh is low compared to men's, and formal education participation in rural areas like Sirajganj is unsatisfactory [112–114]. However, participants in FGDs provided numerous examples of how women with formal education played key roles in floods:

"I have no idea about submerged deep tube well water pollution after the flood. However, my brother-in-law's wife (who learnt from a safe water campaign in secondary school) told me that when the flood water inundates the tubewell, sediments accumulate inside the water pipe, and drinking is unsafe." [Focus Group 02, Village: Berabari]

"Earlier, many women didn't want to move to shelter centres. When female members of the local union council came to our village to motivate women, I saw several women come forward who had involvement in primary or secondary education. Now, they are aware of it and move there fluently". [Focus Group 08, Village: Dadpur]

The Government of Bangladesh, through the National Curriculum and Textbook Board (NCTB), assimilated the subject of "disaster risk management" regarding different hazards and disaster management tasks in the education curriculum from grades V to XII in 1994/1995 [115]. The main focus was to involve family and community in disaster risk reduction. Therefore, a woman who participated in the school knows at least disaster management and helped community members make awareness about the importance of shifting to the flood shelter.

A notable example of formal education's role is treating diarrhea, one of the major and widespread water waterborne diseases during floods [116–118]. Children suffer more than others, and the availability of medical access is very limited at this time. Therefore, making oral saline at the correct ratio is an important safeguard, and this is taught in primary school. One of the participants explained:

"My daughter will appear for the SSC (Secondary School Certificate) examination next year. She learned the process of homemade oral saline from school. A few years back, one of my neighbours' eight-month-old son died from diarrhea, and I found that they didn't know how oral saline is made. So after that, my daughter taught most of the neighbours about homemade oral saline and how it serves as lifesaving for diarrhea." [Focus Group: 11, Village: Harinathpur]

The above quotations describe the role of educated women in flood risk management and the way they create awareness among the neighbours and community regarding various aspects of flood adaptation.

#### ii) Household management skills

In rural areas of Bangladesh, gendered cultural norms mean that women are responsible for household activities, for example, housekeeping, caring for dependents, managing the household, and taking care of poultry, birds and livestock. This is similar to other practices in many parts of Asia, where one study has found that women spend ten times more time in household work than men [119]. Women's traditional roles in managing households have acknowledged as providing critical skills relevant to flood response. According to one male participant about women's knowledge and experience:

"Women in a household and our female community members follow many crucial strategies during the flood. Their daily experience and knowledge of the recurrent flood are very effective in managing different stages of the disaster. In addition, it is worth mentioning that they follow various survival and adaptation strategies for floods, like, food preservation, assets and livestock protection". [Focus Group 18, Village: Ambaria]

Food preservation is a good example of this [53,120]. emphasised the importance of women's traditional roles in preserving food during disasters. This was also highlighted by FGD participants:

"Women have a better idea than men regarding the household food and grain. Every year, I see my wife store some dry food like chira (husked rice), muri (puffed rice) and gur (a type of unrefined, solid brown sugar made from boiling sugar cane juice until dry), which are used during the food shortage of flood period". [Focus Group: 10, Village: Mallikpara]

#### iii) Employment on the farm and outside

Women in rural Bangladesh are commonly required to undertake farm work in addition to household chores. During floods, due to

labour scarcity (as other community members are engaged in flood repairs or have migrated away from danger: [121–123], women's farmwork burdens may increase. In these contexts, women may have to assume new roles in disaster preparedness, food security and farm management, for which they are often unprepared. As two participants described:

“When water level started increasing in the river, we had no option other than harvesting the rice from a crop field. Therefore, every household members remain busy with their work. My wife helped me greatly in rice harvesting after completing all her household work, and my elder daughter looked after my other children”. [Focus Group:14, Village: Hapania]

“Several post-harvest activities needed to be done after the rice harvesting, like threshing and drying. It wouldn't have been completed without my wife's support. She worked hard to finish that”. [Focus Group: 16, Village: Fulhara]

Disaster contexts may also produce increased requirements for women to increase paid working activities to help support their family income during or after the flood. Examples include working on rural road construction sites, pond digging, and working in neighbour's houses. Some participants described this as follows:

“After the flood, my wife worked as labour on a road construction site and pond digging to support me. Because it is very difficult for me to continue regular livelihood activities, and my income helps a lot to run our family.” [Focus Group: 17, Village: Dadpur]

“We have only 0.21ha of land. During flood season, there is no income option from the farm. At that time, my wife worked in a school teacher's house (their economic condition was better than ours) to support my family.” [Focus Group: 17, Village: Dadpur]

#### iv) Women as guardians of health and carers of disabled persons

In rural Bangladesh, women bear the burden of caregiving. These activities increase during disasters. As FGD participants described:

“Regarding the disease and solution, women have more knowledge, especially old women. So they use Bel juice (*Aegle marmelos*) for the healing of diarrhea and dysentery, leaf, flower and fruit of *Shastimadu* (*Glycyrrhiza glabra*) for cold and throat pain, leaf of *Tulsi* (*Ocimum sanctum*) and *Basok* (*Adhatoda vasica*) for cough and asthma, leaf of *Durba grass* (*Cynodon dactylon*) for bleeding control and skin disease and leaf extract of *Chirota* (*Swerita chirata*) for stomach disease”. [Focus Group 4, Village: Hatboyra]

Participants also mentioned that the remediation process from these herbal sources is very slow; sometimes, it doesn't work. As flood hinders access to health facilities they are forced to depend on natural and herbal sources of treatments.

Some of the male participants explained the way women take care of disabled members of the household:

“My mother is 81 years old, and she can not move. I am lucky that my wife, Shefali, always cared for her. She carried my mother on her arm to keep her in the shelter. My wife used to travel to the shelter daily for food and sanitation”. [Focus Group 11, Village: Harinathpur]

“I have a handicapped daughter. She is 13 years old and cannot move and feed herself. Most of the flooding time, I go to the city to earn, and my wife takes care of everything”. [Focus Group 11, Village: Harinathpur]

#### 5.1.1.1. Summary: Human capital roles of women in flood disasters

The discussion underlines women's diverse roles during flood emergencies. Traditional roles of housekeeping and caregiving provide key elements of continuity and resilience during flood disasters; women step up to take on income and livelihood enhancement functions through the additional farm and non-farm work, and through their indigenous and formal education, women's roles as primary responders to food security and health care needs become increasingly vital.

The importance of these diverse roles calls to attention the importance of providing women with the educational and training capacities to strengthen their contributions in disaster periods. Although, unfortunately, training opportunities for women were limited in the study area (formal training programs were reported in only six of the twenty FGD villages), however, in those cases where women were able to participate in training, results were identified as very positive:

“My elder daughter participated in a training organised by the NGO. After that, my daughter explained how household income and savings should be used for flood preparedness plans. Although it was tough for us to maintain it, my wife and daughter managed it nicely, which helped me in flood management. In particular, plan for monthly budget and save for future”. [Focus Group 08, Village:Dadpur]

“My wife and I received training on flood risk management. After training, we are very much aware of flood management regarding moving to high ground before the flood water rises to the danger point, preserving drinking water, and taking care of the disabled and children who cannot protect themselves. In addition, my wife takes care of my old mother, three daughters and their sanitation issues. In addition, her help keeps me mentally relieved. Finally, I can easily observe the impact of training by my wife's activities.” [Focus Group: 07, Village: Jankigati]

Furthermore, training was seen to provide women with opportunities for greater independence.

“In past, I only used to work outside during and after the flood. But, in recent years, floods have been devastating, and they don’t leave anything to rely on. Therefore, living only on my income was very hard, and my wife started working with me. Many of my surroundings asked me the same old question, why would a homemaker need to work outside? Which makes me feel uneasy, but the NGO training opened my wife’s eye to the female role in household flood management”. [Focus Group 08, Village: Dadpur]

## 5.2. Social capital

The discussion above addresses how women’s individual skills and education contribute to resilience and adaptive capacity to flood. Attention turns now to social capital: how their individual actions support intra-community and inter-community networks for building resilience [111]. Consistent with the relationship social structure of rural Bangladesh [109,124,125], this study adopted the bonding social capital as the relationship with the immediate household and relatives, bridging social capital with friends and neighbour and linking social capital with Department of Agricultural Extension (DAE), NGOs, other GOs, agriculture input dealers, power and politics [91,126,127]. Themes are considered regarding social capital’s bonding, bridging and linking elements with a final summary section that connects these aspects of the discussion.

### i) Bonding (immediate family members and relatives)

FGD respondents believed bonding social capital was helpful for encouraging quick and short-term recovery. Immediate family members play a vital role in flood adaptation regarding preparedness and moving to shelter. The women’s ability to access help from their relatives was identified as crucial to immediate circumstances and survival. This was especially relevant for women accessing support from relatives not affected by the flood:

“Last year, our river dam broke suddenly, and flood water started to enter very fast, and at that time I was working in the farm field. When I returned home, I saw my wife, with the help of my daughter and son, already caged the chicken and duck, ready to transfer to a safe place. Furthermore, she also moved all the seeds, rice and necessary things into a plastic container. [Focus Group: 03, Village: Chandidasgati]

“We had no food and passed the day by only taking one meal a day, and it was only rice and mashed potato. At that time, my wife called her father by mobile phone and let them know about our misery with kids. After, they sent us cooking oil, dal (pulse seed), rice and vegetables”. [Focus Group: 19, Village: Dariapur]

### ii) Bridging (neighbours and friends)

Participants emphasised the key role of neighbours in rural Bangladesh. The sharing of various consumable products is very common among neighbours. During the flood, friends and neighbours were very effective in adaptation strategies. Neighbourly relations between female household members are a critical, ongoing form of social relationship that has a crucial significance in times of flood:

“My wife and daughter have a good relationship with my neighbour. It helped me to take shelter in their house as it was built on high land”. [Focus Group: 05, Village: Kumajpur]

“I often realise that my wife borrows some cooking materials from my neighbours, and they do the same when in need. It also happens during flood time. So, the relationship between my wife and neighbour’s wife helped greatly during the survival period.” [Focus Group: 20, Village: Kadamtoli]

### iii) Linking Social Capital (NGOs and Govt. relief)

In most cases, men have more access to linking social capital than women. For example, within traditional gendered cultural norms, connections with banks and NGOs for loans are an area of responsibility held by men. In addition, relationships with the agriculture office for subsidies and market access for selling and buying products is a traditionally male domain. However, women can play dominant roles in other fields, such as accessing relief from NGOs. Furthermore, an increasing array of women’s empowerment programs in rural Bangladesh provide avenues for women to link and network outside of the home and neighbourhood. Participation in these networks can play an important role in assisting survival during the flood.

“Sometimes it is easy to receive relief for women rather than men because the government relief distributor prioritises women. In this case, my wife and daughter collect those reliefs”. [Focus Group: 01, Village: Chondalboyra]

“NGOs provide various training on flood management under women empowerment program. From this program, they also received relief as a part of flood adaptation strategies. They not only use this relief but also distribute it to another household as well.” [Focus Group: 18, Village: Ambaria]



### 5.2.1. Summary of social capital themes

Evidence from Focus Group Discussions confirmed that women were effective at building and using social capital relationships as a part of adaptation strategies during the flood. Women depend on and use their social networks and capital as a vital adaptive strategy for sharing limited resources and distributing the risk of investments in uncertain geographies. Different activities were performed, such as accessing food, sharing water sources for drinking, cooking, cleaning, and sometimes sharing latrines. Several cases were found where landless, women-headed, and women-managed families had to rely on their neighbours and relatives for land and livelihood support because men were either absent due to death or migration. Bonding social capital was found to be very crucial, but sometimes bridging social capital (e.g. neighbours) acts as a quick helping hand [128] reported that these social ties are a basic resource in community-level adaptation. 'Linking social capital' was found to be less important for women reflecting the dominance of men in decision-making forums connecting households and villages with wider networks, although there is evidence from some FGDs that women had linking networks with NGOs.

### 5.3. Financial capital

Financial capital is critically important in flood adaptation [129]. outline the different ways financial capital plays a role in flood adaptation and how important it is in combination with other forms of capital. In our study, we found that household women contributed to family income and savings through livelihood diversification and through various sacrifices, safeguarded their household financial assets from theft.

#### i) Livelihood diversification by homestead farming provides opportunities for family consumption and household savings

In Bangladesh, most of the land is cultivated more than twice a year [130,131], but in the study district, one cropping season is hampered by the flood. Therefore, households typically engage in alternative livelihood options outside the one cropping season. In this regard, women undertake many micro-level activities such as homestead gardening, small-scale savings, and poultry and livestock farming to support their families. These activities parallel what some studies have reported about how women use their household-level knowledge and experience to adapt to climate change threats [132–134].

The following quotations provide examples of women's alternative livelihood strategies to support their families by ensuring food security during the flood.

"In our village, most households have homestead farming, and this is practised and maintained by the women. For example, chicken and duck farming is one of them, which is not for commercial purposes—most of the parts are used for family consumption. But sometimes, they sell chicken, duck and egg with a surplus to the neighbours, contributing to our family savings. Women help their husbands during the disaster period with this savings". [Focus Groups: 13, Village: Mallikpara]

"All year round, my wife cultivated various vegetables in my homestead arena. Most importantly, I don't have to invest single money in that. At the end of each cropping season, they preserve some seeds for the next year. Manure and compost from cooking leftovers and cow dung are applied in vegetable farming. These activities support our family. In addition, food preservation activities are also followed through the year of experience to use it during flood". [Focus Groups: 08, Village: Dadpur]

It was also observed in the focus groups that some women play important roles in commercial vermicompost preparation, significant economic activity in the study area. This is an easy and quick way of transforming organic waste into compost [135]. In addition, participants mentioned that vermicompost farming greatly helped the family's earnings for those who participated.

#### ii) Safeguarding household assets

During the daytime, male household members go to the market or do other jobs, while women tend to stay at home tending cattle, goats and poultry. During the floods, theft and robbery increase, and this fear keeps the flood victims awake [136,137]. One male participant explained,

"A few years back, one night, my boat engine was stolen while we were sleeping. It was frustrating because the whole day, we had to pass with hunger, and it was my only earning option during the flood. So my wife and I used to guard our assets by, in turn, a process that means one is awake when the other is sleeping." [Focus Groups: 17, Village: Kadamtoli]

"I had two big cattle and five goats and kept them on the temporary roadside shelter. I used to work in Sirajganj town as a construction worker. My wife couldn't sleep the whole night because of fear of theft and let me sleep because of work during the daytime. I am grateful to my wife for her hard-earned sacrifice for my family". [Focus Groups: 15, Village: Kash Dholai]

### 5.3.1. Summary of the financial capital themes

Women are critical for economic recovery after disasters as they take on leadership roles in sourcing and maintaining post-disaster income flows for their households. Consistent with this idea, women in the study area are found to be crucial in adaptation through alternative livelihood activities after maintaining all household responsibilities. They also take care of their household assets through their hard-earned sacrifice of daily basic facilities [138] found that while men demanded embankments to secure their future, women preferred to have a safe house, education and basic facilities for their children and themselves. Additionally [108], reported that those who remain in the household during the hazard time based on family commitment, livelihood opportunities, financial constraints and emotional ties are considered the adaptation.

## 6. Conclusion

Bangladesh is highly vulnerable to recurrent flooding, and this threat is increasing in severity due to climate change. Using insights from 20 FGDs in the highly flood-prone Sirajganj District, the objective of this paper has been to document how women are positioned within processes of resilience and adaptation to this hazard. The analysis found that women are highly vulnerable to flood yet also provide critically important roles in resilience and adaptation when these disasters strike. These contributions are typically poorly recognised in mainstream policy, but as evidence from this paper attests, they are understood at village scales.

Our analysis of narratives from Focus Group Discussions shows that male respondents were able to enunciate a wide variety of contributions made by women to flood adaptive capacity and resilience. This includes aspects of human capital, social capital and financial capital. The findings of the study make a key contribution to understanding the role of women in flood contexts in rural Bangladesh, where otherwise, gendered norms may encourage these activities to be rendered invisible. Specifically, the narratives from the FGDs revealed that: (i) the inclusion of disaster management in formal education curriculum was found to be very important, and the women use those learnings in adaptation, (ii) knowledge and experience from living in the same environment and exposure to disaster helped in flood preparedness, (iii) women's labour force participation helped in the minimisation of crop loss and outside work supported family income and (iv) women's traditional knowledge on disease management worked as a safeguard in health and disability management.

Women use bonding, bridging and linking social capital as a vital adaptive capacity resource against floods. Different activities were performed, such as accessing food, sharing water sources for drinking, cooking, cleaning, and sometimes sharing latrines. Several cases were found where landless, women-headed, and women-managed families had to rely on their neighbours and relatives for land and livelihood support because men were either absent due to death or migration.

The insights from this study provide important evidence of how women's contribution to flood adaptation is acknowledged by the male participants in FGDs. It's generalizability may be seen as being constricted by the fact its insights come from 20 FGDs in just one District, but the wider significance extolled here relates to the imperative to recognise the diversity and importance of women's roles in flood resilience and adaptation. Despite a lot of current work on disaster management in Bangladesh, very little attention is given to the role of patriarchal social norms and culture in the ways that adaptive capacity and resilience is understood and acted upon. These issues are important and require a gender lens on disaster management, in accordance with the Sendai Framework, where women are understood as not merely victims but as agents with important contributions to make.

### Credit author statement

Md Javed Azad: Conceptualization, reviewing, method development, analysis, writing (original draft preparation). Bill Pritchard: Supervision, method development, editing.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Data availability

Data will be made available on request.

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