



The social amplification of risk and climate disaster preparedness: lessons from the Kalapara region in rural Bangladesh

M M Golam Rabbani & Matthew Cotton

To cite this article: M M Golam Rabbani & Matthew Cotton (15 Apr 2025): The social amplification of risk and climate disaster preparedness: lessons from the Kalapara region in rural Bangladesh, *Environmental Hazards*, DOI: [10.1080/17477891.2025.2492320](https://doi.org/10.1080/17477891.2025.2492320)

To link to this article: <https://doi.org/10.1080/17477891.2025.2492320>



© 2025 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



Published online: 15 Apr 2025.



[Submit your article to this journal](#)



Article views: 316





[View related articles](#)



[View Crossmark data](#)

The social amplification of risk and climate disaster preparedness: lessons from the Kalapara region in rural Bangladesh

M M Golam Rabbani ^a and Matthew Cotton ^b

^aYork Trials Unit, Department of Health Sciences, University of York, York, UK; ^bDepartment of Humanities and Social Sciences, Teesside University, Middlesbrough, UK

ABSTRACT

Risk perceptions significantly influence how vulnerable communities respond to sudden and gradual onset environmental hazards. In this qualitative study, we adapt the Social Amplification of Risk Framework (SARF) based on thematic analysis of 60 interviews with residents of the Kalapara region in rural and coastal Bangladesh. We identify seven components of climate adaptation-relevant risk perceptions that potentially affect household responses to extreme weather events and slow-onset environmental stress: perceptual diversity, risk awareness, experiential knowledge of environmental stress, risk messaging, social norms and cultural values, trust in institutions, and demographic characteristics. By adapting SARF, we observe a broad spectrum of perceptual components and risk awareness, ranging from extreme caution to fatalistic attitudes. We also find evidence of a notable lack of public trust in institutions, weaknesses in top-down communication strategies for climate adaptation, and a heavy reliance on volunteer efforts for disaster preparedness and mitigation. Additionally, maladaptive behaviours may emerge due to ineffective risk communication and poor community engagement. These factors impede proactive responses to environmental stress, such as migration and planned evacuation.

Policy highlights

- The Social Amplification of Risk Framework (SARF) highlights the crucial role of social and cultural influences on risk perception and response strategies, promoting tailored communication that aligns with local norms and values.
- We propose that SARF-thinking can inform disaster preparedness planning, NGO and government actions by enhancing understanding of migratory and non-migratory decision-making, emergency evacuation management, and planned relocation.

ARTICLE HISTORY

Received 2 May 2024
Accepted 7 April 2025

KEYWORDS

Risk perception; social amplification of risk framework; disaster preparedness; emergency evacuation; planned relocation

CONTACT Matthew Cotton  m.cotton@tees.ac.uk  Professor of Environmental Justice and Public Policy, SSSH Department of Law, Policing and Investigation, Borough Road, Middlesbrough TS1 3BX, UK

© 2025 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group
This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

- SARF guides the integration of risk perceptions into disaster response and evacuation planning, facilitating more effective disaster risk reduction practices and successful adaptation against climate-induced vulnerabilities.
- This study helps develop targeted policies around planned relocation as communities perceive and manage risks differently in disaster-prone regions worldwide, highlighting the need for adaptive responses informed by local knowledge and cultural contexts.

1. Introduction

Investigating social vulnerability to climate-related stresses, shocks, and crises is a complex matter. Individual, household and community adaptive responses to climate risks do not precisely align with the impacts of a specific extreme weather event, and these impacts are not uniformly distributed across society. Sensitivity and adaptive capacity to climate change-induced hazard exposure varies depending on a range of overlapping social and physical factors. These factors include: geographic location, wealth, land assets, livelihood strategies, and social capital (Adger, 2003; Bixler et al., 2021). Understanding the socio-environmental context and processes of adaptive responses requires further exploration of the patterns and drivers of how vulnerable individuals perceive the probability and severity of impacts associated with climate-related hazards. Effective climate risk management must, therefore integrate perceptual factors to better contextualise climate adaptation decision-making (Heslin et al., 2018; Kniveton et al., 2013; Kulp & Strauss, 2019; Mallick et al., 2023). Understanding how people perceive environmental disaster risks and make decisions in response to extreme weather events and other climate impacts requires qualitative analysis to assist adaptation planners and policy authorities in identifying vulnerabilities and providing relevant information to support at-risk communities (Conway et al., 2019). In this in-depth qualitative case study, we examine the psychosocial dynamics of risk and vulnerability, climate change adaptive capacity and decision-making within vulnerable households in the Kalapara region of Southern and Coastal Bangladesh (described in section 3). We specifically apply and modify the *Social Amplification of Risk Framework* (hereafter SARF) as a conceptual model for climate adaptation response planning amongst vulnerable households.

2. Risk perception and responding to environmental disaster-related vulnerabilities

Risk is commonly defined as a function of the *likelihood* of a hazard multiplied by the *magnitude* of the hazard (Simpson et al., 2021). Whereas *vulnerability* is defined as a function of the *level of exposure* multiplied by the *sensitivity* to a potential hazard, and the *adaptive capacity* to respond. However, as risk theorists in the social sciences have long argued, it is essential to understand the broader context in which such risk calculations are applied in order for them to be effective. Risks have strong perceptual and experiential components – perceived risks are constructed based on the probability and magnitude of potential hazards, and these factors are influenced, in turn, by human values relating to the social, moral and affective components of decision-making, broader socio-

environmental conditions, and associated livelihood strategies (Ahmed et al., 2021). Perceptual, socio-cultural and socio-economic components of risk impact community vulnerabilities and shape adaptation responses. For example, when faced with the risk of living in a flood-prone area, people may typically respond by taking steps to minimise the potential harm, such as by changing farming practices, building (or lobbying for) new flood defences, or relocating to safer areas. The nature of this response is not straightforward, however, especially for those living in disaster-prone areas and with long ancestral and cultural ties to that place. Beliefs, values and social-cultural norms strongly influence how individuals perceive, and consequently respond to, climate risks and hazards (Cardona et al., 2012). Traditional disaster risk reduction cultural practices are often embedded within indigenous community experiences that stretch across trans-generational timeframes (Datta & Kairy, 2024). Psychosocial, cultural, and historical perceptions of hazard severity and risk influence individual responses to environmental hazards. These factors shape social framings of vulnerability, loss, and damage from disasters, which subsequently affect future community susceptibility (Azadi et al., 2019; Lechowska, 2018). Continuing the previous flooding example – individuals living in a flood-prone area for generations may perceive the severity of flooding differently from those living in less flood-prone areas. Individuals residing in flood-risk regions may take greater precautions due to their previous experience with flooding, though conversely, long exposure to frequent disasters may normalise the sense of risk and lead them to perceive themselves to be less vulnerable than they actually are (Agrawal, 2018; Domingues et al., 2021). In each scenario, broader socio-cultural, religious, and socio-psychological factors influence the adaptive response rather than just a response to calculating the likelihood and magnitude of climate-change-induced adverse events.

There is an ongoing epistemic debate regarding the appropriate research frameworks and mechanisms that can be applied to how anthropogenic climate change-related risks are perceived and their impacts measured (Libarkin et al., 2018; Slimak & Dietz, 2006; van der Sluijs, 2012; Weber, 2006). The components of risk perception vary by their nature and the type of influence they have on awareness, their affective and emotional response to climate risk, and their preparedness for future events (Lechowska, 2018). Risk perceptions have also been studied concerning several interpersonal and social subjectivity attributes, including differing social norms, value systems, and cultural conditions (Lee et al., 2015a; Renn & Rohrmann, 2000). Furthermore, there is a growing body of research into the influence risk perception has on individual responses, including migratory and non-migratory decision-making within or away from environmentally stressed regions (Hasnat et al., 2022; Koubi et al., 2016; Raimi et al., 2024). Contemporary research into climate risk perception highlights a range of variables that influence how individuals perceive and respond to risk-explanatory components, including the effect, probability, and consequences of the risk environment (Elshirbiny & Abrahamse, 2020). These are, in turn, shaped by an at-risk individual's socio-economic, environmental, physical, geographical, psychological, and demographic characteristics (Sattar & Cheung, 2019). These characteristics include the practical components of household economic and social circumstances, including issues such as income, working practices, social habits, governance arrangements, media messaging, social networks, and social learning – each having an impact upon the respective socio-cultural, political, ethical, aesthetic, emotional and affective components of risk (Auer, 2019; Pearson et al., 2021; Roeser, 2012; van der Linden, 2014).

Myriad psycho-sociological models and conceptual frameworks have emerged over the past 30 years to seek to explain the relationship between risk perception and decision-making. These include dominant theories such as *Protection Motivation Theory* (Weyrich et al., 2020), the *Theory of Planned Behaviour* (Vinnell et al., 2021), Norm Activation Theory (Ataei et al., 2022), the *Cultural Theory of Risk* (Rühlemann & Jordan, 2021), and more recently the *Integrated Agent-Centred Framework* (Mitsushita et al., 2023), and *Trust Determination* models (Fellenor et al., 2020; Xue et al., 2021). A comprehensive review of the value of competing socio-psychological frameworks is beyond the scope of this paper, though collectively this body of work provides important tools to assess the relationships between individual experience and perceptions of risk and how those perceptions drive responses to climate-change-related vulnerabilities. For this analysis, we take from this body of literature the fact that individuals' perceptions of environmental risks and their influence on adaptation responses are shaped by a complex interplay of psychological, social, economic, and cultural factors. These factors determine how at-risk individuals identify hazards, assess their exposure likelihood, and respond to changes in their biophysical and social environments. In our analysis, we apply and then adapt one specific framework – the Social Amplification of Risk Framework (SARF) – as a lens through which to analyse our qualitative data gathered from affected communities in an environmentally-stressed region and then reflect upon the value of SARF to explain community-level adaptation responses, as described in section 4.

3. Social amplification of risk framework

The social amplification of risk framework (SARF) seeks to understand why certain risks are amplified or attenuated within social systems, contributing to a nuanced risk analysis that includes technical and socio-psychological dimensions and vulnerability responses (Kasperson et al., 2022; Pidgeon & Henwood, 2010; Siegrist & Árvai, 2020). SARF proposes that socio-psychological and socio-cultural factors either work to amplify or attenuate the perception of risks. Media, social networks, and interpersonal communication act as *amplification stations* to distort, exaggerate, or downplay risk messaging as it passes through these communicative channels. Psycho-sociological factors, including heuristics, cultural and religious values, trust in institutions, and group dynamics shape risk responses at the individual and societal scales (Kasperson et al., 1988). SARF is valuable in integrating the technical and socio-psychological dimensions of risk and uniquely capturing how social processes amplify or attenuate risk perceptions. This process of amplification and attenuation directly influences adaptive and maladaptive behaviours within communities at risk.

We adopt the conceptual lens of SARF to explore the dynamic communicative pathways of risk perception and adaptation management – it is an ideal model for examining the layered, context-specific responses observed in Kalapara's climate-vulnerable communities. SARF is particularly valuable in identifying, first, issues of *risk perception*, explaining why some risks are perceived as more serious than others; second, *risk amplification*, explaining why cultural values and personal experiences attenuate or amplify specific risk messages; third is *risk response* in terms of how risk information and experience affects behavioural responses, and lastly *risk communication*, how to improve dialogue

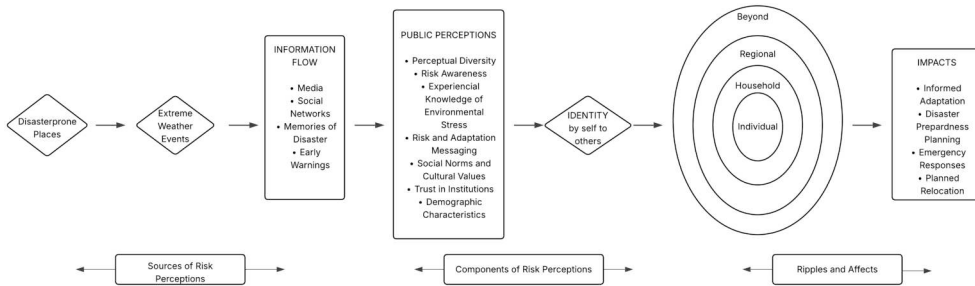


Figure 1. Vulnerabilities to environmental disasters and impacts of risk perceptions. Adapted by the authors from (Kasperson et al., 2022).

and information exchange (Busby & Duckett, 2012; Renn, 2011). As the SARF underscores the inherent complexity and socio-cultural contingency of risk communication and management in shaping outcomes for vulnerable groups, we argue that this framework provides a comprehensive conceptual model for explaining disaster adaptation and disaster preparedness responses for communities living in high-risk places affected by climate change.

We use qualitative data to modify the social amplification of risk framework (SARF) to household-level decision-making (explained in Figure 1) and in the discussion Section 7 below. We aim to show how social and individual drivers influence risk perceptions (amplify or attenuate perceptions of risk) and drive adaptation responses.

The relational chart in Figure 1. illustrates how the components of risk perceptions influence response to disaster vulnerabilities. The SARF framework focuses on how information flow and exchange mediate risk perception and action. Key components include exposure to information through print and televised media, social networks (including online), personal experiences and memories of prior disasters, and early warning signals from formal channels (government-backed systems) or lay expertise (community awareness and interpersonal communication). The role of information flow in risk perception is shaped, in turn, by emergent components from our qualitative analysis – categorised here into seven categories: *perceptual diversity*, *risk awareness*, *disaster experience*, *media coverage*, *social and cultural values*, *trust in institutions*, and *demographic characteristics*. We proffer these components as important contributory factors to understanding individuals' identification with their community, influencing regional, household, and individual responses to the hazard presented by climate-induced environmental stress. Responses to the level of perceived risk include adaptation decisions ranging from regional out-migration, emergency response to disasters, and fatalistic responses to future risk events. The flowchart in Figure 1 encapsulates the dynamic interplay between information flow, risk perceptions, identity, and consequent actions, highlighting the multifaceted nature of risk perception and response strategies. Using qualitative evidence from one of the most disaster-prone coastal areas of Bangladesh, we explore the links between risk perceptions and adaptive responses. We use this to refine the SARF's relevance to the study of vulnerability and disaster preparedness in rural environmental disaster research, thus adapting the framework for future climate and development planning research.

4. Case study context

Empirical fieldwork was conducted in the Kalapara region of Bangladesh. Bangladesh is situated in the Ganges Brahmaputra and Meghna (GBM) delta, which has mighty rivers and exposed and protected coasts of the Bay of Bengal. High population density, structural poverty, and disaster vulnerability have made this traditionally disaster-prone country one of the top at-risk countries for extreme weather events, sea level rise, heat stress and salinity intrusion. Bangladesh also experiences high internal and international migration levels due primarily to push and pull factors associated with a lack of rural livelihood opportunities – it is the sixth largest country of origin for international migrants, with an estimated 7.8 million Bangladeshi migrants living abroad as of 2019 (UNDESA, 2019). The domestic labour market cannot accommodate the estimated 2.2 million young adults joining each year (IOM Bangladesh, 2018). Thus, international migration to secure employment and send remittances home has become a key component of the Bangladeshi economy, equivalent to 5.4% of the national Gross Domestic Product (GDP) (IOM Bangladesh, 2020). Economic migration is exacerbated by forced climate-induced displacement (Kelman, 2018) and is expected to increase over the next 30 years (Kulp & Strauss, 2019), with an estimated 16–26 million Bangladeshis projected to suffer displacement due to climate factors in the period 2011–2050 (Kniveton et al., 2013). For those that cannot migrate, there is also evidence of a ‘trapped population’ that will stay in place despite the growing risks of river and coastal flooding, salinity intrusion and extreme precipitation events (Heslin et al., 2018). Even when migration is used as a climate change adaption strategy, recent evidence shows that displaced households are commonly prone to resettle in nearby villages where the overall risk profile remains the same to that which they have left (Mallick et al., 2023).

Kalapara, also known as Khepupara, is a rural and coastal upazila (a sub-unit of a district or a borough) in southern Bangladesh. Kalapara experiences the growing threat of multiple sudden onset environmental stresses such as cyclones, storm surges and coastal erosion (Sharmin & Islam, 2013); and gradual onset stresses, including salinity intrusion, sea-level rise, and increased ambient air and sea temperature (Ahamed et al., 2012; CEGIS and GoB CDMPII, 2013; Hasan & Akter, 2019). The villages of Kalapara are currently experiencing the negative impacts of extreme weather events on traditional livelihoods – predominantly fishing and farming, and more recently, tourism and bike-cabbing. These impacts are leading to chronic food insecurity and increased vulnerability of access to essential support services to meet basic human needs (Ibne Amir & Ahmed, 2013; Ruksana et al., 2021). Kalapara currently supports two types of fishing: (a) coastal fishing from the Bay of Bengal and (b) fish farming by adapting traditional farmlands. It also supports many subsistence rice, lentil, vegetable and fruit farmers. Fishing and farming sectors commonly employ informal day labourers. These livelihoods heavily depend upon safe prevailing environmental conditions – cyclones damage crops, fishers cannot go to sea, fish farms suffer pollution or structural damage, and farmlands become unproductive due to flooding or salinity. People’s homes are often damaged or destroyed by cyclones. Recent regional evaluation shows the growing number of climate-induced displaced people from Kalapara in the face of these risks, making it an appropriate study site to study how individuals at the household scale perceive and respond to the vulnerabilities of climate change-induced hazards (Bernzen et al., 2019; Shamsuddoha et al., 2012).

5. Methodology

Empirical research involved in-depth semi-structured interviews with 60 participants from four at-risk communities. Using snowball sampling, we recruited participants across low, medium, and high-income households. Respondents self-identified their livelihood category during the interview process, i.e. middle-class (grihostho), poor (gorib) and extremely poor (dustha) participants. Local diversity was considered throughout, including respondents from minority Rakhine communities. Specific efforts were made to include women, though cultural barriers concerning household roles and interaction with male interviewers limited their direct participation in recorded interviews. We aimed to include all household decision-makers interviewed together whenever possible to optimise diversity and data quality, as adaptive decisions, including migratory and non-migratory strategies, are usually joint concerns amongst all adult household members (Hossain et al., 2017).

Semi-structured interviews were conducted in Bangla and then translated into English. The lead author speaks both languages fluently. English transcriptions were coded in NVivo to organise codes and sub-codes and to visualise key themes. Interview data were then analysed through a multi-level coding framework in which top-level thematic coding established the broader context, followed by sub-coding to allow a more detailed examination of utterances (Baxter & Eyles, 1997; Braun & Clarke, 2006). The latter focused on the psychological, socio-cultural, and political-economic context of risk perception and climate adaption-relevant decision-making amongst interviewee responses. The goal was to develop an interpretive framework applicable to enhancing the SARF for climate adaptation-relevant hazards research. Emergent perspectives are presented as individual components of risk perception and adaptation decision-making related to the social amplification of risk under sudden and slow-onset environmental stress conditions. Thematic groups were then categorised and labelled. Each theme is discussed in turn in section 6.

6. Results

Data analysis revealed seven key thematic components influencing climate and disaster preparedness-related risk perceptions: *perceptual diversity*, *risk awareness*, *experiential knowledge of environmental stress*, *risk messaging*, *social norms and cultural values*, *trust in institutions*, and *demographics*. These components reveal a novel socio-psychological framework to understand perceived risks and how they shape responses to mitigate environmental stress, and to respond to extreme weather events. In the following section, we detail each component using illustrative representative quotes from participants to provide rich, descriptive detail. In Section 7, we then reconnect these risk components back to the SARF and discuss how this approach might be applied in further climate hazard-preparedness research.

6.1 Perceptual diversity

Perceptual diversity is one of the core findings related to how community members responded to disaster-induced vulnerability within an *information-poor* environment.

Members of at-risk households living under chronic environmental stress face extreme demands upon their cognitive processing of risk. This, in turn, influences the heuristics that they employ in decision-making (Kipling et al., 2019) and their relative capacity to plan for the future (Martin et al., 2019; Morgado et al., 2015). We found that the people in Kalapara have faced risks across multiple hazard ‘domains’, including cyclones, storm surges, salinity intrusion, and coastal erosion. Most respondents, however, reported paying little heed to chronic environmental stresses or sudden shocks in their everyday planning and decision-making. Moreover, these risk perceptions are ‘sticky’, in the sense of being resistant to change. There are two potential explanations for this. This first is the normalisation of climate-induced risks due to their commonality within the lived experience of their everyday lives – that risks have become commonplace and so are no longer perceived as unique external threats. The second concern relates to what Wullenkord and Reese (2021a) call *self-protective strategies*. If an individual’s psychological resources become overwhelmed in response to the threat of climate change-related hazards, they will often resort to a psychologically defensive strategy to shield themselves from associated discomfort and distressing emotions. Such self-protective strategies serve to ameliorate conflicts within one’s identity and to preserve positive self-esteem (Wullenkord & Reese, 2021b). In both cases, the actions of individuals in our study result in heightened vulnerability and the weakening of risk communication within local community social networks. Despite frequent and direct encounters with climate-related environmental stress and disasters, we find that reported risk perceptions generally did not match the severity of the hazard environment. Furthermore, these risk perceptions diverged from those proffered by technoscientific sources and authorities, such as those presented in regional climate hazard maps. This discrepancy between ‘lay public’ and ‘expert’ conceptions of risk highlights the ineffectiveness of such top-down methods in conveying risk to vulnerable communities.

One of the primary drivers of the apparent ‘stickiness’ of perceived risk is the paucity of information given to community members and the cognitive and socio-cultural components of information interpretation within and between households. As one male fisher who was born and grew up in Kavar Char and works on an employer’s boat explained:

There is no limit of disasters here, one or the other, every year. But we left our homes and went to the cyclone shelter. When the disaster is gone, we return home and start all over again.

This quote highlights a high level of awareness of disasters, their severity and frequency, as well as the seeming futility of response. ‘Start[ing] all over again’ is an inevitable consequence of taking self-protective action. Here, there is a strong awareness of the temporal nature of the disaster profile of the region, however, the rate and scale of environmental change exceeds individual household’s capacity to act in the face of the threat.

By contrast, a male subsistence farmer and fisher who lived his entire life in Kolatoli responded by saying:

No. There is nothing much. There are a few problems during the rainy season. There are no fish in the winter. We get fish during the rainy season.

These two statements show conceptual divergence in the framing of climate-related risk from: ‘no limit of disasters’ at one end, to ‘there is nothing much’ at the other. This

represents a cognitive and conceptual diversity in the connections drawn between environmental change, local hazard profiles, and personal experience and perception of climate risk. Some see patterns of harm evident in changing environmental conditions, and some see none. The ‘nothing much’ perception is reflective of a combination of risk normalisation – ‘there are a few problems ...’ – and self-protective action through which denial provides personal comfort in the face of potentially difficult emotions and feelings of powerlessness (Wullenkord & Reese, 2021b). Wachinger et al. argue that there are three further socio-psychological components to this form of risk normalisation and self-protective action (Wachinger et al., 2013). The first is the pragmatic position that respondents can prioritise the economic, aesthetic, and place-based advantages of living near river or coastal systems over the relatively high environmental risks that they generate. The second is that respondents can often frame the locus of responsibility for their actions and external uncertainties outside of themselves, e.g. towards local or national governmental institutions or sometimes to deities. Cultural theorists sometimes describe risk as a *fatalistic* position. However, it can be more thoroughly understood as a psychological process that externalises the locus of control – one that is rooted in a lack of personal capacity, agency, sense of control, and access to resources (in terms of personal financial and social capital). These limitations negatively impact individuals’ capacity to act in ways that ensure their well-being and livelihood security. For example, one higher-income subsistence farmer who fishes on someone else’s boat, perceives risks for his farm and house as disaster impacts but does not establish an association between the rise in environmental risks and their relatively sensitivity to such risks:

If Allah wants to keep someone alive, who can kill? He has created us. He is the one who will look after us. This is why we stay here confidently. The environment is good here. I have not thought of going anywhere. Rich people think of buying land in safer places. Not people like us.

This interviewee has lived in high-risk conditions, experienced crop damage, and witnessed fishers die during the cyclone. However, the fear of losing life and livelihood is framed as a responsibility beyond the individual. This utterance reflects the sense of powerlessness experienced in the face of environmental stresses and how this is juxtaposed against faith in divine will. The statement exemplifies hierarchical and fatalistic thinking (Jahan et al., 2015) described in the Cultural Theory of Risk, whereby some risks are recognised and amplified while others are suppressed depending on one’s cultural values, social networks and social capital (Johnson & Swedlow, 2021; Rühlemann & Jordan, 2021). Belief in God’s role in protection against environmental harm is a potential coping mechanism in the face of psychological stress under conditions of low physical and social capital – that one cognitively accepts a growing risk environment when one lacks the capacity to adapt to changing circumstances. This interviewee recognises on one level that other places are safer, yet they seem beyond reach. Currently, available resources in a *known* high-risk environment become psycho-socially constructed as preferable to *unknown* risks presented by alternative livelihoods in a different place.

6.2 Risk awareness

Information-poor decision environments can affect individuals’ ability to make fully autonomous choices. Risk awareness of extreme weather events considers the extent

to which individuals assess the probability (how likely a disaster is to strike) and imminency (when it will strike) of exposure to sudden and slow-onset environmental stresses. Risk awareness is a specific cognitive component of broader risk perception and vulnerability response within the SARF.

We found that most participants showed low awareness of the scientific terminology of climate change (in Bangla: Jolobayu Poribartan). However, most of them were experienced and concerned about disasters in the region. Drawing from the SARF framework, a low information input on sudden and gradual environmental stresses leads to low awareness, which diminishes or attenuates risk perception. Due to limited awareness of climate change as a global issue among vulnerable communities, as framed by technoscientific and policy authorities in the Global North, Kalapara participants were hesitant to discuss global climate risks or consider climate change a national threat to Bangladesh. This was accompanied by a general lack of awareness of state-led, science-based actions such as climate hazard mapping and the local adaptation plans in place to assist vulnerable populations. Participants were generally unaware of the personal roles and responsibilities outlined in government and NGO communications to reduce community sensitivity to disaster risks (Mahmud, 2020). Local examples of public bodies responsible for climate action include the Kalapara Environment and Public Safety Committee, supported by ActionAid Bangladesh and the representation of community interests at COP29 (Billah, 2024). Both of these organisations engage in local community engagement on climate change. It is notable, however, that despite the presence of such actors, there remains a strong reliance on community volunteer-led disaster relief and outreach efforts that enjoy little state intervention (Billah, 2024).

A male labourer who works both farming and fishing in Kolatoli describes himself as poor. He explains his (lack of) awareness of the risks of coastal erosion as:

If the embankment collapses, then we are finished. When the storm hits, everybody runs. If we die, we die sitting at home. Things get stolen. That is why I stayed at home during Bulbul. If Allah wishes to keep us alive, he won't kill us. If he wants to kill, it won't take any time.

Risk perception in the absence of global climate change-literacy leads respondents to socially construct alternative explanations of the vulnerabilities and appropriate adaptation responses to those espoused by technical and scientific experts (Merikle et al., 2001). Poor communication from relevant public authorities on the type, nature, and severity of risks, can lead vulnerable community members either to fail to respond to risk, or else engage in maladaptive responses – whereby action taken in response to environmental risks leads to more, not less, risk of harm. An example would be staying at home during a cyclone instead of retreating to a shelter. Improving overall community awareness of climate hazards is one component of empowering vulnerable people to gain control over the risks and take informed responses during emergencies.

One self-employed male tourist guide from Khajura, Kuakata describes his risk and response plan as follows:

Mentioning the Bulbul, we did not feel it because we knew that the water won't flood us, toppling the embankment. Even if it does, it won't be that disastrous. [Cyclone] Sidr was quite scary. People who were outside the embankment were killed. If we get warnings, we take precautions. People used to ignore it, but we are more aware and take the warnings seriously. The country has developed, and the people are more aware than before.

The quote highlights the importance of ongoing communication, dialogue, and trust-building from governmental, NGO, and scientific authorities to raise climate change awareness, enhance relationships between messengers and recipients, and improve community responses to shared vulnerabilities (Cook & Overpeck, 2019). From a SARF perspective, risk messaging must be sufficiently amplified through information provision techniques, community engagement with disaster preparedness, and intervention by scientific and policy authorities. In practice, however, messaging is often hampered by a lack of trust in the messenger and in the nature of the message being communicated. Effective early warning systems are shown here to influence personal perception and interpretation of risks, leading to (reportedly) successful evacuation and retreat procedures. However, the success of these warning systems requires concerted governmental and civil society actions to strengthen a generalised sense of trust in public authorities to improve 'bottom-up' community engagement with such 'top-down' risk messaging (Paek & Hove, 2024; Peters et al., 1997). Our findings point to opportunities for knowledge building and interventions on risk awareness and informed adaptation that can be applied in Kalapara and other areas to minimise vulnerabilities through improved information flow and social trust building both in advance of and at the stage of imminent disaster planning so that vulnerable communities do not wait for a system to fail before trusting the message to act.

6.3 Experiential knowledge of environmental stress

Individuals' direct and indirect experiences of environmental disasters amplify or attenuate risk perceptions. A self-described male, middle-class farmer and priest lives within two miles of the sea embankment and has a brick-built home on his land. The experience of having an entire home survive the cyclone and relatively affordable damage to his crops have given him the confidence to describe himself as living in a safe location:

It is harder for the people who live very close to the sea. The cyclone hits those whose houses are weak. People who had strong houses were safe from the cyclone. It hit our farmland but did not damage much.

Another participant from Kolatoli, living closer to the sea, puts his experience of living in an at-risk area as:

The cyclone Bulbul caused little damage to our home. That is it. But last year, my home was demolished. I did not get any help.

A self-declared poor fisherman and farmer with his wife from Khajura described emergency responses and perceived risks towards cyclone Bulbul as:

Yes, we went. When we learned about the cyclone warning, we left everything at home. When things happen like this, we have always lost our cows, goats, and hens.

We found that individuals will sometimes undergo personally risky behaviours in the short term (i.e. risks their life or well-being) to protect longer-term financial and food security in a post-disaster context. For example, some respondents mentioned how they would try to shelter livestock and protect property or crops by going out during storm conditions and risking their personal safety. This illustrates the importance of affordable asset protection for disaster preparedness – without adequate insurance or public assurance of livelihood

protection, the risk to life and health is exacerbated by a lack of financial resources and household decision-making that balances current health and well-being risks against future financial risks. This presents a fundamental environmental injustice that affects those too financially vulnerable to afford such asset protection through insurance or other means.

We find that repeated negative disaster experiences are directly linked to perceptions of future risk. Affected individuals could identify the loss and damage experienced (homes and crops damaged, livestock lost) and will often rationalise those impacts again by resorting to a degree of fatalism grounded in religious faith. However, studies suggest that people living in the highest-risk areas with higher disaster experiences rarely take measures voluntarily to reduce the impacts they experience personally (Kunreuther, 1996; Kunreuther et al., 2014). As evident in some of the responses in this study, there is a seeming lack of connection between experiential knowledge and practical action. This can result in dangerous outcomes for those affected. It is important, therefore, for communities to have a mechanism to share their experiences of disasters and to have a safe response to their vulnerabilities; otherwise, the socio-cultural components of risk attenuation lead to further harm for all exposed.

6.4 Risk and adaptation messaging

Most respondents from participating households had little formal school experience and very low print, televised, and social media access. The aforementioned information-poor environment leads to a low overall awareness of the anthropogenic drivers and impacts of contemporary environmental disasters (Biswas et al., 2021). Understanding the effects of environmental stress on health, well-being, and livelihoods through direct personal experience amplifies adaptation awareness and stimulates behavioural change and societal support (Lee et al., 2015b). We note that despite the frequency and severity of extreme weather events regionally, there is very little coverage of locally tailored information and impact-based warnings and responses through local media channels. Print, televised and social media portrayals of extreme weather events have a strong effect on risk perceptions (Parida et al., 2021). Such messages from external sources could be amplified or attenuated through further communicative practices and social ties within social circles and family and kinship networks. A trainee doctor describes how crucial locally tailored risk management communication is:

I have seen the outside world. I have read and seen in the media how people prepare to survive this type of disaster. But our village is different. No big trees are here [the nearest cyclone shelter is four miles away]. If floods hit, how would people survive? I tied up some cooking pots to stay afloat if floods hit [during cyclone Bulbul]. I packed up dry foods and registry documents and we prepared ourselves to survive the disaster. I helped other family members by tying up property with ropes.

The quote reflects direct and indirect experiences mediated through extant communication networks (including media reporting and local/national government messaging) and personal interactions with social networks. The meaning and interpretation of risk and adaptation messaging are socially constructed (Wachinger et al., 2013). The same participant describes the value of locally-tailored climate-change relevant information for future planning:

If the government would test the soil and give us some information about what type of crop will be good here, we would consider their recommendation. We don't know what type of fruits or crops grow in saline soil. So [information on] that would help.

The paucity of reliable and context-sensitive information from external sources acts as a barrier to adaptive capacity for vulnerable households and businesses. Risk and adaptation messaging from government and local media sources is either incomplete, unsuitable, or untrusted. For adaptation decision-making under conditions of rapid and slow onset climate-induced risks, government action to adapt the flow of useable information around farming practices, crop types, sustainable house-building materials, and siting practices would greatly enhance the adaptive capacity of respondent households. Therefore, risk perception is shaped by current information deficits and what Cotton and Stevens refer to as a 'responsibility gap' (Cotton & Stevens, 2019), in which local media, government authorities and external organisations (NGOs, international donors) either fail to meet the information needs of the target vulnerable populations, or else it is unclear to vulnerable communities which contact points can provide such relevant information. Again, we see that a lack of clear messaging around practical measures to ameliorate climate impacts within the SARF framework leads to the attenuation or minimisation of public understanding of risk and adaptation, which then leads to further harm.

6.5 Social norms and cultural values

Cultural values and beliefs significantly influence risk perceptions. As noted above, the perception of cyclones for Muslim respondents was often framed as an act of Allah, and as a means through which Allah tests their Iman (faith). Social networks, cultural norms, and beliefs directly affect how individuals and communities perceive risk. The opinion of friends, family and members of broader kinship networks and peers also shapes an individual's perception of the risk. Different ethnic and religious characteristics, therefore, shape risk perception outcomes in concert with the influence of social and cultural institutions. The psychosocial landscape of risk and adaptation decision-making stretches across communities, generations, and spatial characteristics, as captured in this quote:

Yes, we want to raise her (daughter) here because this is her ancestral land, too. The rest is the will of Allah. If the government can keep the embankment secure, everybody here will be able to live peacefully.

The statement captures the importance of reducing structural biophysical vulnerability to climate risks, the importance of trust in government institutions to ensure this security, and how this influences intergenerational and social equity in climate adaptation planning. The blending of supernatural authority and political authority gives insight into the participants' socio-cultural values underlying their risk perceptual response. When asked: what if the coastal erosion washes your home? One Rakhain participant responded:

Yes (with a laugh). When a storm hits, crops are damaged, then I think of leaving. When the disaster goes, then (laughs again). We don't go to the sea. If it comes, only God knows.

We find similarities in responses among respondents with different religious faiths. More than half of respondents mentioned disasters as an act of God, and adaptive action is in

God's hands, too. This response is relevant because fatalistic and hierarchical risk perceptions shape personal interactions with social and cultural institutions that ensure community safety – local authorities, educational institutions, and religious institutions. There is an outstanding question about the point at which direct personal experience of adverse environmental impacts leads to individuals repositioning their faith to allow stronger preventive or adaptive actions. The concern here is around the balance of responsibilities – if fatalistic supernatural responsibility is prioritised within the landscape or risk messaging, it creates ripple effects (as shown in [Figure 1.](#)) that lead to a lack of social action to pressure government authorities to act in the interests of social welfare. It creates what we might call *active avoidance* of political pressure on responsible authorities, which further widens the 'responsibility gap' between citizens and public authorities (Cotton & Stevens, 2019) – ultimately leading to maladaptive responses. Households' social norms and cultural values are embedded in religious and place-based identities, and this can lead to a form of maladaptation termed *place obduracy* (Rabbani et al., 2022) whereby the pace of social and cultural change needed to ensure public safety is outstripped by the pace of environmental change and the shifting landscape of climate risks. Action to shift public values and community dialogue from active avoidance and place obduracy towards direct social engagement with climate-responsible authorities is paramount to ensuring public welfare.

6.6 Trust in institutions

Trust in institutions such as government agencies, NGOs and charities also influence risk perceptions. However, a lack of sufficient response, corruption, mismanagement, insufficient representation, lack of transparency, ineffective communication and lack of accountability all contribute to a generalised loss of trust in the local and national institutions. Actions such as rent-seeking, cronyism, or embezzlement of humanitarian funds provided by donor organisations contribute to this phenomenon (Knox, 2009). If affected households do not receive humanitarian assistance from institutions responsible for protecting citizens from disasters, then households, in turn, lose trust. In certain cases, Bangladeshi public institutions fail to provide transparent and accessible information on the nature of climate hazards, and thus, there is a lack of clear guidance on how to prepare and protect lives and livelihoods from those hazards. Failure to provide information about public works and infrastructure development also undermines public trust in the institutional capacity to deal with climate threats. A male middle-income farmer and bike cab driver from Khajura describes his distrust in a government-led project to raise the coastal embankment:

Our roads and communications (Government Authority) are quite bad ... Have you had a look at the roads? They are all destroyed. Only Allah knows how long it is going to take to get it repaired.

There is growing and severe coastal erosion in Kalapara. A few participants mentioned Badamtoli, one of the communities in this study, where two and a half miles of road have fallen into the sea in recent years. The government commonly builds sea defences through wave-dissipating concrete block revetments, which help slow coastal erosion and protect farmlands and homes from storm surges (Hasan et al., 2022). If they are

successful in the long run, this technical fix will help to reduce erosion. However, for many respondents, the embankment-building authorities failed to build trust among the at-risk people through mismanagement, slow progress and poor communication practices.

Notably, some participants showed greater trust in governmental institutions. Questions were asked about their response if the newly built embankment collapsed. Multiple participants responded that the government would do something to protect them. If the sea defence works, it would protect the households from coastal erosion, at least for the time being, but it would not eliminate the risk for the longer term. As one male farmer and mechanic from Tolatuli said:

The government will look after it (the embankment). But we hope that it does not collapse.

The generalised sense of trust (or conversely mistrust) in the government shapes the perception of the risk of storm surge, flooding and saline intrusion to homes and farms. Moreover, it creates a sense of uncertainty and powerlessness amongst already vulnerable populations. If individuals see a failure in local and central government authorities' capacity to provide functioning infrastructure, such as roads and embankments, then they will be less willing to rely upon the same government authorities to protect them before or after an extreme weather event. Individuals might then show distrust in government-provided shelters or refuge accommodations. Thus, patterns of mistrust in both institutional authority and the quality of protective infrastructure may lead to maladaptive outcomes – whereby individuals shelter in their homes (for example), rather than retreating to a safer place.

6.7 Demographic characteristics

We found that age, gender, education, and other demographic factors affect risk perceptions in complex ways. Among our respondents, older adults were generally more risk-averse than younger adults, mirroring other studies (Botzen & van den Bergh, 2012). We found similar behaviour in how older individuals responded during emergencies and took refuge in the cyclone shelter with other family members. In concert with gender and age characteristics, formal education strongly shapes risk perceptions. Most of the participating household members in the sample did not have the equivalent of compulsory post-16 education. Therefore, they may struggle to interpret warnings addressed to them in scientific language, so their response to disasters may diverge from the instructions communicated by weather, climate and disaster experts. Multiple participants agreed that education helps people to interpret early warnings and responses during emergencies. As a farmer and shopkeeper in Tolatuli described:

The education rate has increased, and so has development. People take shelter before the storm. Farming has also increased. In the past, people did not get enough crops. Now, we produce many times from the same land.

As in many climate change risk communication contexts in the Global South, appropriate early warning systems, safety instructions, and community-compatible disaster management plans require early and ongoing engagement with vulnerable communities to save lives and livelihoods effectively – the social infrastructure of disaster preparedness is as critical as the complex physical infrastructure. Under challenging spatial and scientific

literacy conditions, hazard maps and complex written instructions or warning signals may be ineffective and thus dangerous to those who need them during an extreme weather event. Great emphasis on community-led, bottom-up interventions in disaster preparedness requires commitments from government, donor and NGO authorities to ensure that disaster risk is communicated clearly and is trusted by the users of such information. This would thus alleviate the responsibility gap between individuals and government authorities to ensure safety under conditions of environmental stress.

7. Discussion

The Social Amplification of Risk Framework (SARF) provides a valuable lens to understand and improve disaster preparedness for vulnerable communities such as those in this Kala-para case. Although this study did not quantify or compare perceived risks, it identified key components of risk perception. It demonstrated how SARF can inform the design of disaster preparedness measures that are both technically robust and socially relevant. By analysing how risks are communicated and perceived within communities – through media, social networks, and cultural norms – SARF can guide the development of more effective communication strategies that resonate with local values and experiences. This approach helps adaptation decision-makers to ensure that disaster preparedness measures are technically sound, socially accepted, and more likely to be adhered to, thereby enhancing community resilience against climate-induced disasters.

One of the key findings is that prevailing risk perceptions often lead our participants to disregard observable disasters, reducing their motivation to address vulnerabilities, such as to retreat or permanently relocate to a safer environment. Consequently, individuals may opt to remain in their current location if they perceive the risks associated with environmental disasters to be less dangerous than the financial and socio-cultural risks they might experience in a new place. When evaluating adaptive responses, especially in forced climate-change displacement, these risk perception components can be combined with other factors to identify when households should relocate for their own safety. The components of risk perception outlined in this study can also be utilised to prioritise drivers of disaster preparedness, interventions for adaptation practices, and local-level policy strategies. This approach enables researchers to identify, rank, and assess spatial relationships between risk perceptions and disaster preparedness more effectively.

Access to resources, technology, infrastructure, government support, and a strong sense of community reduce the likelihood of households making maladaptive decisions. However, household-level adaptation measures are often only temporary solutions in the face of escalating environmental stress. As the severity and likelihood of negative climate-change-related impacts increase, contemporary adaptive responses will become less effective over time. For example, when it comes to migratory decision-making, households might stay in place if they believe their location has the resources and capabilities to adapt to increasing disasters. However, repeated loss and damage can reduce resource access, limit technological and infrastructural improvements, and decrease government support, thus limiting their future capacity to adapt and increasing their vulnerability.

Individuals' perceptions of disaster severity are pivotal in shaping short-term retreat and relocation decisions during environmental hazards. Immediate evacuation responses

are influenced by several factors including: the perceived urgency of the threat, available resources, and trust in early warning systems. When households recognise a disaster as imminent and high-risk, they are likely to seek refuge, for example, in cyclone shelters, especially if they have sufficient time to act. However, this study also highlights that some households may hesitate to evacuate, despite prior disaster experiences and access to resources, due to fears of looting and property loss while away. Such trade-offs – between safeguarding personal safety versus protecting material assets – pose a critical challenge during high-stress scenarios. Addressing these barriers requires improving pre-disaster planning and ensuring robust post-disaster social security measures to minimise the competing risks households must navigate during crises.

In contrast to the immediate decision-making required for short-term evacuations, long-term migration emerges as a potential adaptive strategy to cope with chronic climate-induced stresses. Unlike evacuation, which is often reactive and event-specific, migration is a proactive, long-term response to gradual-onset environmental changes such as sea-level rise or soil salinity. By addressing both types of movement within the Social Amplification of Risk Framework (SARF), this study provides a comprehensive understanding of how risk perceptions shape short-term and long-term adaptive actions. SARF highlights how media, social networks, and cultural norms influence risk communication, shaping immediate responses to disaster warnings and broader decisions about relocation. Tailoring communication strategies to community-specific perceptions of risk and resilience through our adapted SARF model, shown in [Figure 1](#), could enhance evacuation compliance and longer-term adaptive planning. Improved early warning systems integrating localised, impact-based messaging can reduce confusion and ensure alignment between perceived risks and practical outcomes, fostering greater trust and cooperation during crises (Meléndez-Landaverde & Sempere-Torres, 2022).

The adapted SARF model is also useful in understanding the formation of fatalistic and hierarchical attitudes towards disasters. By examining how risk perceptions are shaped and spread through social interactions, media, and cultural beliefs, our adapted SARF explains why some communities may resign to fate or feel powerless against perceived inevitable threats. This framework identifies communication points that weaken risk messaging and reinforce fatalistic views. By modifying communication strategies and engaging influential community networks, these perceptions can be shifted towards more proactive disaster responses. As loss and damage from disasters accumulate, households at risk may shift towards a fatalistic attitude when they perceive outcomes as predetermined and beyond their control (Taylor, 2022). This fatalism arises when individuals feel overwhelmed by the hazardous environment and lack trust in institutions or authorities' ability to address countermeasures effectively. However, our study also highlights how fatalism is renegotiated based on personal experiences, indicating that it's not just an affective or emotional coping mechanism in response to loss. Participants don't see the risks as incomprehensible or senseless but rather view themselves as powerless, attributing disasters to divine will (commonly attributed to Allah amongst study participants). This belief leads to psychological distancing, resignation, and fatalism, hindering efforts to reduce vulnerability. Addressing fatalistic and hierarchical attitudes requires effective risk communication and active engagement in disaster risk reduction efforts, particularly focusing on religious beliefs that influence perceptions of control, working with local religious leaders to shape new narrative practices to protect vulnerable people.

8. Recommendations

This study demonstrates the utility of our adapted Social Amplification of Risk Framework (SARF) in unpacking how risk perceptions influence climate adaptation and disaster preparedness in vulnerable communities like Kalapara. SARF reveals that risk perception is not a linear process but is shaped by cultural norms, social networks, media, and institutional trust, which collectively amplify or attenuate risk perceptions. Key findings of this study highlight the interplay between short-term evacuation decisions and long-term migration responses, emphasising how perceived severity, urgency, and trust in information systems shape immediate actions during crises. For instance, households are more likely to evacuate when risks are perceived as severe and urgent, yet fears of looting or property loss can deter such decisions even when resources and early warning systems are available.

Additionally, SARF underscores the role of social dynamics in fostering or inhibiting adaptive behaviours. It explains why fatalistic attitudes – rooted in cultural and religious beliefs – emerge when individuals perceive themselves as powerless in the face of disasters. The study identifies key nodes of communication, such as local religious leaders and community networks, that can either reinforce or counteract these fatalistic perceptions.

Our adapted SARF provides actionable insights for improving risk communication and community engagement by tailoring disaster preparedness strategies to local cultural and social contexts. Decision-makers can leverage this framework to design interventions that foster trust, align perceived and actual risks, and address barriers to both short-term evacuation compliance and long-term adaptive planning, such as managed retreats. SARF offers a roadmap for developing nuanced, context-sensitive disaster risk reduction strategies that resonate with local values and experiences.

Further research is needed to understand specific risk perceptions and sensitivity and the challenges these groups face in accessing resources and making informed adaptation decisions, including managed retreats. Risk perceptions also evolve with related knowledge and experiences over time. Understanding the decision-making process individuals use to weigh different drivers of risk perception and make short-term and long-term choices is crucial for developing effective risk reduction policies, managing evacuations in emergencies, and designing and implementing relocation strategies.

9. Conclusions

Bangladesh has unique vulnerabilities to environmental disasters, where reliance on climate-sensitive sectors in fishing, farming, and coastal tourism is high, and resources for coping with and adapting to new landscapes of environmental hazards are limited. In Kalapara on the southern coast, the impacts of cyclones, sea level rise, unpredictable monsoons, seasonal variations, and salinity intrusion manifest through both gradual and sudden disasters and ecological catastrophes. Some of these effects may take years or even generations to become evident. Signs of a humanitarian crisis induced by increasing environmental stresses are already emerging across the country, specifically in this region, prompting managed retreat responses for coastal communities. In this context, individuals' perceptions of such changing environmental stress risks shape their attitudes, behaviours, and household decision-making processes. When understanding how risk perceptions are amplified or attenuated within vulnerable communities, the components identified in

this study – perceptual diversity in information-poor environments, risk awareness, experiential knowledge, media messaging, social norms, cultural values, trust in institutions, and demographics influence households' perception of risk severity, vulnerability, and their perceived ability to adapt – are raised as significant issues for public authorities to address. The biggest challenge we find is that rural communities perceive climate disasters as uncontrollable, which can lead to self-protective action of climate risk denialism or fatalism in the face of a lack of social control over risk factors and, consequently, higher vulnerability. Socio-economic, cultural, and contextual factors vary geographically and are vital for designing targeted interventions to prevent unmanaged displacement and facilitate successful adaptation, including planned evacuation and relocation. It, therefore, behoves risk managers and environmental adaptation practitioners to better understand the connection between information flow, community dialogue, social values, and fatalistic responses that diminish and attenuate risk perception if disaster preparedness is to be effective amongst vulnerable, rural and coastal communities across climate-sensitive regions of the world.

Disclosure statement

No potential conflict of interest was reported by the author(s).

ORCID

M M Golam Rabbani  <http://orcid.org/0000000174756853>

Matthew Cotton  <http://orcid.org/0000000288774822>

References

- Adger, W. N. (2003). Social capital, collective action, and adaptation to climate change. *Economic Geography*, 79(4), 387–404. <https://doi.org/10.1111/j.1944-8287.2003.tb00220.x>
- Agrawal, N. (2018). Disaster perceptions. In *Natural disasters and risk management in Canada. Advances in natural and technological hazards research*. 49 (pp. 193–217). Springer. https://doi.org/10.1007/978-94-024-1283-3_5.
- Ahamed, S., Rahman, M. M., & Faisal, M. A. (2012). Reducing cyclone impacts in the coastal areas of Bangladesh: A case study of kalapara upazila. *Journal of Bangladesh Institute of Planners*, 5(December), 185–197. <http://en.wikipedia.org/wiki/Cyclone>.
- Ahmed, Z., Guha, G. S., Shew, A. M., & Alam, G. M. M. (2021). Climate change risk perceptions and agricultural adaptation strategies in vulnerable riverine char islands of Bangladesh. *Land Use Policy*, 103, 105295. <https://doi.org/10.1016/j.landusepol.2021.105295>
- Ataei, P., Karimi, H., Moradhaseli, S., & Babaei, M. H. (2022). Analysis of farmers' environmental sustainability behavior: The use of norm activation theory (a sample from Iran). *Arabian Journal of Geosciences*, 15(9), 859. <https://doi.org/10.1007/s12517-022-10042-4>
- Auer, R. (2019). Environmental aesthetics in the Age of climate change. *Sustainability*, 11(18), 5001. <https://doi.org/10.3390/su11185001>
- Azadi, Y., Yazdanpanah, M., & Mahmoudi, H. (2019). Understanding smallholder farmers' adaptation behaviors through climate change beliefs, risk perception, trust, and psychological distance: Evidence from wheat growers in Iran. *Journal of Environmental Management*, 250(September), 109456. <https://doi.org/10.1016/j.jenvman.2019.109456>
- Baxter, J., & Eyles, J. (1997). Evaluating qualitative research in social geography: Establishing 'rigour' in interview analysis. *Transactions of the Institute of British Geographers*, 22(4), 505–525. <https://doi.org/10.1111/j.0020-2754.1997.00505.x>

- Bernzen, A., Jenkins, J. C., & Braun, B. (2019). Climate change-induced migration in coastal Bangladesh? A critical assessment of migration drivers in rural households under economic and environmental stress. *Geosciences (Switzerland)*, 9(1), <https://doi.org/10.3390/geosciences9010051>
- Billah, M. (2024). Kalapara's Dulali Begum takes her climate fight to COP29.
- Biswas, B., Roy, S. K., Ullah, M. N., & Mukharjee, S. K. (2021). Public perceptions about the impact of climate change on human health: A study of Bangladesh. *Aquademia*, 5(2), ep21012. <https://doi.org/10.21601/aquademia/11445>
- Bixler, R. P., Paul, S., Jones, J., Preisser, M., & Passalacqua, P. (2021). Unpacking adaptive capacity to flooding in urban environments: Social capital, social vulnerability, and risk perception. *Frontiers in Water*, 3), <https://doi.org/10.3389/frwa.2021.728730>
- Botzen, W. J. W., & van den Bergh, J. C. J. M. (2012). Risk attitudes to low-probability climate change risks: WTP for flood insurance. *Journal of Economic Behavior & Organization*, 82(1), 151–166. <https://doi.org/10.1016/j.jebo.2012.01.005>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp0630a>
- Busby, J., & Duckett, D. (2012). Social risk amplification as an attribution: The case of zoonotic disease outbreaks. *Journal of Risk Research*, 15(9), 1049–1074. <https://doi.org/10.1080/13669877.2012.670130>
- Cardona, O. D., Birkmann, J., & Fordham, M. (2012). *Determinants of risk: exposure and vulnerability*. <https://www.researchgate.net/publication/244062037>.
- CEGIS and GoB CDMPII. (2013). Vulnerability to climate induced drought: SCENARIO & IMPACTS. https://www.bd.undp.org/content/bangladesh/en/home/library/crisis_prevention_and_recovery/vulnerability-to-climate-induced-drought-scenario—impacts.html.
- Conway, D., Nicholls, R. J., Brown, S., Tebboth, M. G. L., Adger, W. N., Ahmad, B., Biemans, H., Crick, F., Lutz, A. F., De Campos, R. S., Said, M., Singh, C., Zaroug, M. A. H., Ludi, E., New, M., & Wester, P. (2019). The need for bottom-up assessments of climate risks and adaptation in climate-sensitive regions. *Nature Climate Change*, 9(7), 503–511. [Online]. <https://doi.org/10.1038/s41558-019-0502-0>
- Cook, B. R., & Overpeck, J. T. (2019). Relationship-building between climate scientists and publics as an alternative to information transfer. *WIREs Climate Change*, 10(2), <https://doi.org/10.1002/wcc.570>
- Cotton, M., & Stevens, E. (2019). Mapping discourses of climate change adaptation in the United Kingdom. *Weather, Climate, and Society*, 11(1), 17–32. <https://doi.org/10.1175/WCAS-D-18-0024.1>
- Datta, R., & Kairy, B. (2024). Decolonising climate change adaptations from indigenous perspectives: Learning reflections from Munda indigenous communities, coastal areas in Bangladesh. *Sustainability*, 16(2), 769. <https://doi.org/10.3390/su16020769>
- Domingues, R. B., Jesus, S. N. d., & Ferreira, Ó. (2021). Place attachment, risk perception, and preparedness in a population exposed to coastal hazards: A case study in Faro Beach, southern Portugal. *International Journal of Disaster Risk Reduction*, 60, 102288. <https://doi.org/10.1016/j.ijdr.2021.102288>
- Elshirbiny, H., & Abrahamse, W. (2020). Public risk perception of climate change in Egypt: A mixed methods study of predictors and implications. *Journal of Environmental Studies and Sciences*, 10(3), 242–254. <https://doi.org/10.1007/s13412-020-00617-6>
- Fellenor, J., Barnett, J., Potter, C., Urquhart, J., Mumford, J. D., & Quine, C. P. (2020). 'Real without being concrete': The ontology of public concern and its significance for the social amplification of risk framework (SARF). *Journal of Risk Research*, 23(1), 20–34. <https://doi.org/10.1080/13669877.2018.1501598>
- Hasan, M. K., & Akter, R. (2019). Climate change impacts on local people livelihood and its adaptation through agroforestry in coastal district Patuakhali of Bangladesh. *Agriculture and Forestry Journal*, 3(1), 6–14.
- Hasan, M. K., Rahman, M. A., & Womera, S. A. (2022). Experimental study on the stability of concrete block revetment for high waves propagating over submerged geotube breakwater. *International Journal Of Coastal, Offshore And Environmental Engineering(Ijcoe)*, 7(1), 15–22. <https://doi.org/10.22034/ijcoe.2022.151075>
- Hasnat, M. A., Chowdhury, M. A., & Abdullah-Al-Mamun, M. M. (2022). Perception of people on climate-induced migration issues in coastal areas of Bangladesh. *Migration and Development*, 11(1), 142–162. <https://doi.org/10.1080/21632324.2020.1742504>

- Heslin, A., Deckard, N. D., Oakes, R., & Montero-Colbert, A. (2018). In R. Mechler, L. M. Bouwer, T. Schinko, S. Surminski, & J. Linnerooth-Bayer (Eds.), *Displacement and resettlement: Understanding the role of climate change in contemporary migration*. Springer Open. https://doi.org/10.1007/978-3-319-72026-5_13.
- Hossain, B. M. R., Hassan, S. M. K., Islam, S., & Nabi, F. D. (2017). Empowering the vulnerable women in disaster prone areas: A case study of southern and northern region of Bangladesh. *IOSR Journal Of Humanities And Social Science*, 22(9), 14–21. <https://doi.org/10.9790/0837-2209151421>
- Ibne Amir, K., & Ahmed, T. (2013). Climate change and Its impact on food security in Bangladesh: A case study on Kalapara, Patuakhali, Bangladesh. *Journal of Earth Science & Climatic Change*, 4(5), <https://doi.org/10.4172/2157-7617.1000155>
- IOM Bangladesh. (2018). *Saving lives, protecting migrants*. (May), Dhaka. Retrieved 21 March 2024, from <https://bangladesh.iom.int/resources/saving-lives-protecting-migrants-annual-report-2018-bangladesh>.
- IOM Bangladesh. (2020). Bangladesh: Survey on drivers of migration and migrants' profile. Retrieved 7 March 2024, from <https://reliefweb.int/report/bangladesh/bangladesh-survey-drivers-migration-and-migrants-profile>.
- Jahan, F., Mamun-ur-Rashid, & Wahab, S. A. (2015). The role of fatalism in resilience to food price volatility in Bangladesh. *IDS Bulletin*, 46(6), 60–67. <https://doi.org/10.1111/1759-5436.12187>
- Johnson, B. B., & Swedlow, B. (2021). Cultural theory's contributions to risk analysis: A thematic review with directions and resources for further research. *Risk Analysis*, 41(3), 429–455. <https://doi.org/10.1111/risa.13299>
- Kasperson, R. E., Renn, O., Slovic, P., Brown, H. S., Emel, J., Goble, R., Kasperson, J. X., & Ratick, S. (1988). The social amplification of risk: A conceptual framework. *Risk Analysis*, 8(2), 177–187. <https://doi.org/10.1111/j.1539-6924.1988.tb01168.x>
- Kasperson, R. E., Webler, T., Ram, B., & Sutton, J. (2022). The social amplification of risk framework: New perspectives. *Risk Analysis*, 42(7), 1367–1380. <https://doi.org/10.1111/risa.13926>
- Kelman, I. (2018). Islandness within climate change narratives of small island developing states (SIDS). *Island Studies Journal*, 13(1), 149–166. <https://doi.org/10.24043/isj.52>
- Kipling, R. P., Taft, H. E., Chadwick, D. R., Styles, D., & Moorby, J. (2019). Challenges to implementing greenhouse gas mitigation measures in livestock agriculture: A conceptual framework for policy-makers. *Environmental Science and Policy*, 92(November 2018), 107–115. <https://doi.org/10.1016/j.envsci.2018.11.013>
- Kniveton, D., Rowhani, P., & Martin, M. (2013). Future migration in the context of climate change, Climate change related Migration in Bangladesh. (3).
- Knox, C. (2009). Building trust amidst corruption in Bangladesh. *The Round Table*, 98(403), 449–459. <https://doi.org/10.1080/00358530903017972>
- Koubi, V., Stoll, S., & Spilker, G. (2016). Perceptions of environmental change and migration decisions. *Climatic Change*, 138(3–4), 439–451. <https://doi.org/10.1007/s10584-016-1767-1>
- Kulp, S. A., & Strauss, B. H. (2019). New elevation data triple estimates of global vulnerability to sea-level rise and coastal flooding. *Nature Communications*, 10(1), <https://doi.org/10.1038/s41467-019-12808-z>
- Kunreuther, H. (1996). Mitigating disaster losses through insurance. *Journal of Risk and Uncertainty*, 12(2), 103–111.
- Kunreuther, H., Slovic, P., & Olson, K. (2014). Fast and Slow Thinking in the Face of Catastrophic Risk. Working Paper # 2014-06. <https://doi.org/10.2139/ssrn.2488653>.
- Lechowska, E. (2018). What determines flood risk perception? A review of factors of flood risk perception and relations between its basic elements. *Natural Hazards*, 94(3), 1341–1366. <https://doi.org/10.1007/s11069-018-3480-z>
- Lee, T. M., Markowitz, E. M., Howe, P. D., Ko, C. Y., & Leiserowitz, A. A. (2015a). Predictors of public climate change awareness and risk perception around the world. *Nature Climate Change*, 5(11), 1014–1020. <https://doi.org/10.1038/nclimate2728>
- Lee, T. M., Markowitz, E. M., Howe, P. D., Ko, C. Y., & Leiserowitz, A. A. (2015b). Predictors of public climate change awareness and risk perception around the world. *Nature Climate Change*, 5(11), 1014–1020. <https://doi.org/10.1038/nclimate2728>

- Libarkin, J. C., Gold, A. U., Harris, S. E., McNeal, K. S., & Bowles, R. P. (2018). A new, valid measure of climate change understanding: Associations with risk perception. *Climatic Change*, 150(3–4), 403–416. <https://doi.org/10.1007/s10584-018-2279-y>
- Mahmud, S. (2020). Laypeople's perceptions and communication of climate change in the coastal region of Bangladesh. In M. Brüggemann, & S. Rödder (Eds.), *Global warming in local discourses: How communities around the world make sense of climate change* (pp. 209–244). Open Book Publishers. <https://doi.org/10.11647/OBP.0212.06>.
- Mallick, B., Priovashini, C., & Schanze, J. (2023). "I can migrate, but why should I?"—voluntary non-migration despite creeping environmental risks. *Humanities and Social Sciences Communications*, 10(1), <https://doi.org/10.1057/s41599-023-01516-1>
- Martin, K., McLeod, E., Périard, J., Rattray, B., Keegan, R., & Pyne, D. B. (2019). The impact of environmental stress on cognitive performance: A systematic review. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 61 (8), 1205–1246. <https://doi.org/10.1177/0018720819839817>
- Meléndez-Landaverde, E. R., & Sempere-Torres, D. (2022). Design and evaluation of a community and impact-based site-specific early warning system. *Journal of Flood Risk Management*, <https://doi.org/10.1111/jfr3.12860>
- Merikle, P. M., Smilek, D., & Eastwood, J. D. (2001). Perception without awareness: Perspectives from cognitive psychology. *Cognition*, 79(1–2), 115–134. [https://doi.org/10.1016/S0010-0277\(00\)00126-8](https://doi.org/10.1016/S0010-0277(00)00126-8)
- Mitsushita, K., Murakoshi, S., & Koyama, M. (2023). How are various natural disasters cognitively represented?: A psychometric study of natural disaster risk perception applying three-mode principal component analysis. *Natural Hazards*, 116(1), 977–1000. <https://doi.org/10.1007/s11069-022-05708-x>
- Morgado, P., Sousa, N., & Cerqueira, J. J. (2015). The impact of stress in decision making in the context of uncertainty. *Journal of Neuroscience Research*, 93(6), 839–847. <https://doi.org/10.1002/jnr.23521>
- Paek, H.-J., & Hove, T. (2024). Message framing and trust as moderated mediating mechanisms for effective government response to uncertain risk messages. *Journal of Risk Research*, 27(1), 124–137. <https://doi.org/10.1080/13669877.2024.2311410>
- Parida, D., Moses, S., & Rahaman, K. R. (2021). Analysing media framing of cyclone amphan: Implications for risk communication and disaster preparedness. *International Journal of Disaster Risk Reduction*, 59, 102272. <https://doi.org/10.1016/j.ijdrr.2021.102272>
- Pearson, A. R., Tsai, C. G., & Clayton, S. (2021). Ethics, morality, and the psychology of climate justice. *Current Opinion in Psychology*, 42, 36–42. <https://doi.org/10.1016/j.copsyc.2021.03.001>
- Peters, R. G., Cavello, V. T., & McCallum, D. B. (1997). The determinants of trust and credibility in environmental risk communication: An empirical study. *Risk Analysis*, 17(1), 43–54. <https://doi.org/10.1111/j.1539-6924.1997.tb00842.x>
- Pidgeon, N., & Henwood, K. (2010). The social amplification of risk framework (SARF): Theory, critiques, and policy implications. In P. Bennett, K. Calman, S. Curtis, & D. Fischbacher-Smith (Eds.), *Risk communication and public health* (pp. 53–68). Oxford: Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780199562848.003.04>.
- Rabbani, M. M. G., Cotton, M., & Friend, R. (2022). Climate change and non-migration — exploring the role of place relations in rural and coastal Bangladesh. *Population and Environment*, 44(1–2), 99–122. <https://doi.org/10.1007/s11111-022-00402-3>
- Raimi, K. T., Sarge, M. A., Geiger, N., Gillis, A., & Lee Cunningham, J. (2024). Effects of communicating the rise of climate migration on public perceptions of climate change and migration. *Journal of Environmental Psychology*, 93, 102210. <https://doi.org/10.1016/j.jenvp.2023.102210>
- Renn, O. (2011). The social amplification/attenuation of risk framework: Application to climate change. *WIREs Climate Change*, 2(2), 154–169. <https://doi.org/10.1002/wcc.99>
- Renn, O., & Rohrman, B. (2000). Cross-Cultural risk perception, A survey of empirical studies. In B. Rohrman, & O. Renn (Eds.), *Risk perception research* (pp. 32). Springer US. https://doi.org/10.1007/978-1-4757-4891-8_1.
- Roeser, S. (2012). Risk communication, public engagement, and climate change: A role for emotions. *Risk Analysis*, 32(6), 1033–1040. <https://doi.org/10.1111/j.1539-6924.2012.01812.x>

- Rühlemann, A., & Jordan, J. C. (2021). Risk perception and culture: Implications for vulnerability and adaptation to climate change. *Disasters*, 45(2), 424–452. <https://doi.org/10.1111/disa.12429>
- Ruksana, S., Shahana, A., & Tahmina, Y. (2021). A geospatial analysis to assess risks of extreme events in low lying Delta environment: a case study of the Patuakhali district in Bangladesh. Retrieved 21 October 2022. <https://doi.org/10.2139/ssrn.3972017>.
- Sattar, M. A., & Cheung, K. K. W. (2019). Tropical cyclone risk perception and risk reduction analysis for coastal Bangladesh: Household and expert perspectives. *International Journal of Disaster Risk Reduction*, 41(July), 101283. <https://doi.org/10.1016/j.ijdrr.2019.101283>
- Shamsuddoha, M., Khan, S. H., Raihan, S., & Hossain, T. (2012). *Displacement and migration from climate hot-spots in Bangladesh: causes and consequences*.
- Sharmin, Z., & Islam, M. S. (2013). Consequences of climate change and gender vulnerability: Bangladesh Perspective. 16 (January).
- Siegrist, M., & Árvai, J. (2020). Risk perception: Reflections on 40 years of research. *Risk Analysis*, 40(S1), 2191–2206. <https://doi.org/10.1111/risa.13599>
- Simpson, N. P., Mach, K. J., Constable, A., Hess, J., Hogarth, R., Howden, M., Lawrence, J., Lempert, R. J., Muccione, V., Mackey, B., New, M. G., O'Neill, B., Otto, F., Pörtner, H., Reisinger, A., Roberts, D., Schmidt, D. N., Seneviratne, S., Strongin, S. ... Trisos, C. H. (2021). A framework for complex climate change risk assessment. *One Earth*, 4(4), 489–501. [Online]. <https://doi.org/10.1016/j.oneear.2021.03.005>
- Slimak, M. W., & Dietz, T. (2006). Personal values, beliefs, and ecological risk perception. *Risk Analysis*, 26(6), 1689–1705. <https://doi.org/10.1111/j.1539-6924.2006.00832.x>
- Taylor, D. (2022). Climate anxiety, fatalism and the capacity to act. In C. Watkin & O. Davis (Eds.), *New interdisciplinary perspectives on and beyond autonomy* (pp. 150–164). Routledge. [Online]. <https://doi.org/10.4324/9781003331780-13>.
- UNDESA. (2019). International migrant stock 2019. Retrieved 14 March, 2024. https://www.un.org/en/development/desa/population/migration/publications/migrationreport/docs/MigrationStock2019_TenKeyFindings.pdf.
- van der Linden, S. (2014). On the relationship between personal experience, affect and risk perception: The case of climate change. *European Journal of Social Psychology*, 44(5), 430–440. <https://doi.org/10.1002/ejsp.2008>
- van der Sluijs, J. P. (2012). Uncertainty and dissent in climate risk assessment: A post-normal perspective. *Nature and Culture*, 7(2), 174–195. <https://doi.org/10.3167/nc.2012.070204>
- Vinnell, L. J., Milfont, T. L., & McClure, J. (2021). Why do people prepare for natural hazards? Developing and testing a theory of planned behaviour approach. *Current Research in Ecological and Social Psychology*, 2, 100011. <https://doi.org/10.1016/j.cresp.2021.100011>
- Wachinger, G., Renn, O., Begg, C., & Kuhlicke, C. (2013). The risk perception paradox-implications for governance and communication of natural hazards. *Risk Analysis*, 33(6), 1049–1065. <https://doi.org/10.1111/j.1539-6924.2012.01942.x>
- Weber, E. U. (2006). Experience-Based and description-based perceptions of long-term risk: Why global warming does not scare us (Yet). *Climatic Change*, 77(1–2), 103–120. <https://doi.org/10.1007/s10584-006-9060-3>
- Weyrich, P., Mondino, E., Borga, M., Di Baldassarre, G., Patt, A., & Scolobig, A. (2020). A flood-risk-oriented, dynamic protection motivation framework to explain risk reduction behaviours. *Natural Hazards and Earth System Sciences*, 20(1), 287–298. <https://doi.org/10.5194/nhess-20-287-2020>
- Wullenkord, M. C., & Reese, G. (2021a). Avoidance, rationalisation, and denial: Defensive self-protection in the face of climate change negatively predicts pro-environmental behavior. *Journal of Environmental Psychology*, 77, 101683. <https://doi.org/10.1016/j.jenvp.2021.101683>
- Wullenkord, M. C., & Reese, G. (2021b). Avoidance, rationalisation, and denial: Defensive self-protection in the face of climate change negatively predicts pro-environmental behavior. *Journal of Environmental Psychology*, 77, 101683. <https://doi.org/10.1016/j.jenvp.2021.101683>
- Xue, K., Guo, S., Liu, Y., Liu, S., & Xu, D. (2021). Social networks, trust, and disaster-risk perceptions of rural residents in a multi-disaster environment: Evidence from Sichuan, China. *International Journal of Environmental Research and Public Health*, 18(4), 2106. <https://doi.org/10.3390/ijerph18042106>