

# Critical Gaps and Implications of Risk Communication in International Agreements: 3 Select Case Studies From Urban Areas in the Tropics of South Asia

Shabana Khan (✉ [kshabana1@gmail.com](mailto:kshabana1@gmail.com))

Indian Research Academy <https://orcid.org/0000-0002-4863-6417>

Jyoti Mishra

University of Leeds


---

## Research Article

**Keywords:** Risk communication, Disaster response, Sustainability, Climate Change, Urban tropics, South Asia

**Posted Date:** June 1st, 2021

**DOI:** <https://doi.org/10.21203/rs.3.rs-532844/v1>

**License:**  This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

---

# Abstract

The cost of urban disasters has been consistently increasing, particularly in the cities of developing countries located across the tropics. Among various challenges of disaster risk management and climate change impacts, it is noted that most residents are poorly informed about their risk exposure and apposite response. The paper is based on the premise that one important cause for this gap is inadequate emphasis on risk communication at different levels of planning and agreements. Accordingly, it highlights some important gaps in the risk communication across international agreements including Sendai Framework for Disaster Risk Reduction (SFDRR), Sustainable Development Goals (SDGs), and United Nations Framework Convention on Climate Change (UNFCCC) and evaluates their impacts at the local level. It brings three select urban case studies located in the tropical areas of South Asia region that illustrate contradiction and chaos that results from inadequate stress on risk communication at the global level. The findings are based on secondary data and literature focusing on global agreements, risk communication, and disaster response. The paper argues that even though global strategies address urban risks, the fragmented nature of risk communication results in poor response and contributes to losses that occur in disasters. It suggests a need to address risk communication as a priority for dealing with risks at different scales. There is also a need to redefine risk communication that extends beyond warning generation and considers multiple factors influencing response including interlinked vulnerabilities, and variations emerging from varied geographical, socio-cultural, economic, and political processes.

## 1. Introduction

Officially, the world is largely urban with over 55 percent of its total population living in cities, which is expected to grow 68 percent in 2050 (United Nations 16 May 2018). Cities located in the tropical areas are some of the most populated cities in the world which share a wide range of development status and come from varied cultural backgrounds e.g. Bangkok, Bogota, Darwin, Dubai, Hong Kong, Jakarta, Kolkata, Kuala Lumpur, Lima, Mexico, Mumbai, Nairobi, Salvador, Singapore to name a few. Many of these cities will continue to grow in the near future implying swelling cumulative risks in the face of climate change, particularly those located in the developing countries (Norris 11 July 2014). Most of these cities are exposed to at least 1 or more natural hazards such as earthquakes, landslides, tropical cyclones, flooding, water scarcity, heat waves, bushfires, and so on (United Nations 2018). In the last ten years, nearly 83% of disasters are caused by extreme weather and climate-related hazards, wherein significant damage is experienced in the low and lower middle-income countries through heat waves and storms (IFRC 2020). Cities in tropical areas can be seen as hotspots of climate risks. The data from the top ten most populated cities in the tropics suggest that more than 138 million people are exposed to varied natural hazards by virtue of their location and excessive concentration of population (Swiss Re 2013; Norris 11 July 2014; Muhammad and Chan 2020).

The disaster management and planning across most cities are not only governed by the local administration and legislation but they also have obligations to follow guidelines suggested in the global agreements, such as SFDRR, SDGs, and UNFCCC. Among various challenges of disaster risk management and climate change, lay the poor and inadequate risk communication at different levels. The risk communication here not only refers to informing communities about their risk exposure through various means of early warning, but it has a wider connotation, which considers the local socio-cultural contexts, scale, uncertainty, causes of the disaster, past experiences, learning, and ongoing engagements that influence risk perception and response, and through that the entire process of risk management (Khan and Kelman 2010; Infanti et al. 2013; Khan et al. 2017). A gap is noted in the literature on the influences of risk communication in global agreements at the local level. This paper fulfills this gap by highlighting specific gaps in the risk communication across the three global agreements for their implications at the local level by using three select case studies from the urban tropics in South Asia.

## 2. Methodology

The paper is based on the secondary data and literature reporting recurrent damage and losses in disasters in general and cities located in tropics in particular along with varied publications on the global agreements of SFDRR, SDGs, and UNFCCC, risk communication, and disaster response. The paper is an outcome of ongoing research on risk communication, wherein it is particularly focusing on how the gaps in the risk communication at the global agreements influence local response and outcomes. A detailed assessment of risk communication across SFDRR, SDGs, and UNFCCC is submitted for publication separately as it is beyond the scope of one paper (Khan and Mishra n.d.). This paper evaluates three case studies, purposively selected to highlight varied nature of risk communication concerns and challenges faced at the local level that signify the need to rethink the use of risk communication in the global agreements.

The three case studies are selected from South Asia located in the tropical areas i.e. in between the Tropic of Cancer and the Tropic of Capricorn i.e. 23<sup>0</sup>.5'N & 23<sup>0</sup>.5'S of the equator, diversity in the nature of impacts, and greater familiarity of the authors based on their location as well as previous research work. It is noted that cities in South Asia are not only exposed to higher risks from climate change hazards but they also face high mortality rate (see figure 1). The coastal areas in South Asia, particularly those located in Bangladesh and India face tremendous risks to tropical cyclones and other coastal hazards including sea-level rise, erosion, and flooding (UNDRR 2009). Moreover, it

has been predicted that urban-dwelling will significantly increase in South Asia by 2050. In such cases, risk communication is not just an important need but critical for saving millions of lives exposed to varied hazards (Swiss Re 2013). The three selected case studies include the coastal megacity of Mumbai bearing incredible risks, a small island city of Malé facing isolation, and cross border cultural megalopolis region of Bay of Bengal facing tremendous pressure of rural-urban and climate change migrations. All of these cities are likely to experience significant and varied impacts of climate change such as sea-level rise, storm surge, tropical cyclones, flooding, landslides, water scarcity, and so on. These cities not just highlight distinct risks, and vulnerability but also demonstrate varied challenges of risk communication, gaps, and subsequent implications. Although the case studies are chosen from South Asia (Map 1), the impacts of these gaps are also studied and discussed for their wider implications.

### **3. Risk Communication And Global Agreements For Risks & Response**

The year 2015 is seen as ‘the year of big three’ when leaders from different countries agreed to address global risks from disasters (SFDRR), development (SDGs), and climate change (Paris Climate Agreement) perspectives (Pearson 2015). It was indeed a major step required to deal with existing and emerging risks in an increasingly globalizing world. The three agreements – SFDRR, SDGs, and UNFCCC go in-depth to assess various challenges and issues that the world faces relating to disasters, sustainability, and climate change respectively. However, despite having an all-encompassing nature, their influences on dealing with local risks and responses are varied due to assorted focus and different implementing agencies with varied resources and capacities that make it difficult to integrate practices at the local level (Hori and Shaw 2014). Besides, while all the three agreements underline the cooperation and implementation of the major international policies including each other, they share different languages and understanding of risk communication with a limited focus on risk communication (UNISDR 2015; United Nations 2015). While a gap is noted in terms of risk communication across the three global agreements (Khan and Mishra, n.d.), little is understood about how do they influence the risk response at the local level.

Risk communication is an important aspect of disaster risk response. It refers to the exchange of real-time information, advice, and opinions between experts and people facing threats to their health, economic, or social well-being (WHO 2021). The significance of risk communication lay in the fact that it not only enables people to make informed decisions but it also influences people’s perception, preparedness, and response to varied disaster risks (Shaw et al 2013; WHO, 2021). However, most studies note that implementation of disaster risk communication focuses primarily on one-way information flow for disseminating hazard forecasts, disaster warnings, alarms, or risk messages (Barnes et al 2007; Mackie 2013; Netten and van Someren 2011; Sharma and Patt 2011). However, in the changing risk scenario attributed to climate change, the purpose of risk communication is not just limited to simply conveying the information or persuasion of the passive public but is also to induce public engagement, hear local voices and values, and trigger actions that bring changes in social norms and behaviors (Moser 2010; Moser and Dilling 2011). A gap is thus noted between the theory and implementation of risk communication wherein risk communication practices are frequently limited to its traditional use as a tool to make people aware, warn and inform for risk responses in contrast to the expanding discourse of risk communication that invokes trust, heuristics, emotions, experiences and socio-cultural contexts that need to be evaluated and incorporated for addressing varied disaster risks (Sheppard et al 2012; Khan et al 2017). Part of the gap also exists due to a lack of acknowledgment of gaps in risk communication at the global level for their implications at the local level.

The following section discusses a few critical gaps in risk communication across the three global agendas for their substantial implications at the local level. The assessment of individual case study leads to a discussion on the wider implications of the specific gap, particularly in the face of rising risks from climate change. The overall discussion and conclusion are drawn in the later sections.

## **4. Critical Gaps & Implications**

### **4.1 Gap: Risk communication doesn’t emerge as priority due to its limited connotation**

Although the three agreements of SFDRR, SDGs, and UNFCCC cover varied intricacies of disasters, development and climate change; however, risk communication doesn’t emerge as a priority in any of these. The SFDRR outlines four priorities that include the understanding of risks, strengthening of risk governance, investments, and enhancing disaster preparedness and response in both pre-and post-disaster situations (UNISDR 2015). The document recurrently mentions communication that mainly refers to the communication systems or mechanism i.e. telecommunication, information technology, associated services, and policies. A limited perspective results in inhibited urgency for risk communication particularly in areas where there is no disaster or until a disaster occurs. Similarly, SDGs and UNFCCC though talk about various risks and responses; there is little emphasis on risk communication in policies. While early warnings are emphasized, they often come with a little time to respond and hence trigger fear and reactions among people instead of motivating them for a planned response. A limited connotation of risk communication, often centered on hazard characteristics and communication system, creates a

significant gap that can be frequently witnessed in disaster management practices in terms of the intention, outcomes or in the process of risk communication.

### **Case Study: Coastal Megacity - Mumbai, India.**

Mumbai, located at the latitude of 19<sup>0</sup>.0' N & 72<sup>0</sup>.48' E is one of the most densely populated cities of India with 20.7 million population in 2014 (Norris 11 July 2014). The city attracts a large population not only from various parts of India but also internationally. It is situated on the west coast of India, wherein it faces risks from rising sea level, storm surge, excessive rainfall, recurrent flooding, earthquake, and associated hazards (see map 1). Old buildings and poor urban planning keep the local vulnerability high during monsoon season attributed to blocked drainage, waterlogging, overflow, and building collapse. A study by the United States Trade and Development Agency finds that the city has lost nearly 140 billion INR in floods between 2005 and 2015, and more than 3000 lives have been wasted in rain-related incidents during this time (Moneycontrol News 11 Sep 2019). The city experienced a major disaster in July 2005 when it received its highest recorded 100 years rainfall of 944mm in 24 hours in which nearly one thousand people lost their lives (ibid). The event not only waterlogged a large section of the city but also halted means of communication including transport and telecommunications (Stecko and Barber 2007). The rapidly rising population and a high rent of properties have forced a significantly large population to live in urban slums, who become victims of recurrent flooding. Heavy rainfall also causes significant damage to old and dilapidated buildings that collapse from time to time. About 1472 incidents of building collapse in Mumbai city and suburbs have been recorded within 5 years from 2015 to 2019 wherein 106 people lost their lives and another 344 suffered injuries (PTI 04 March 2020). Limited housing options and inadequate rent control policies with little or no incentive for building improvement allow the increasingly old and dilapidated buildings to co-exist in the city that enhances its vulnerability to building collapse (Stecko and Barber 2007). Despite an average of 250-350 building collapses per year, the communication of building collapse in the District Disaster Management Plan of Mumbai City and Greater Mumbai mainly focuses on the role of various organisations involved before, during, and after a disaster with the acknowledgment of gaps such as rent control act, legal hurdles and paucity of funds, but gives a little plan to overcome the issues (Narvekar 2018, 31 July 2019; PTI 04 March 2020). While these plans make a passing reference of sustainable development and talk about risks from climate change, there is a lack of urgency and clarity around how and when these issues are going to be addressed. Even though vulnerability is identified, inadequate communication for public engagement and involvement for vulnerability reduction and participation become important contributors to risks. It is noted that major infrastructure developments in the region rarely pay attention to the disaster vulnerability (Moneycontrol News 11 Sep 2019). The communication of building bylaws and construction of illegal and risky infrastructure including old buildings remains in the legal purview with limited public interactions, awareness, and support. However, the cost of delayed and limited communication is frequently borne by the people who are either unaware of possible solutions, except when they receive legal order, or lack the capacity to make suggested changes. In many cases, the scope of rebuilding remains beyond the scope of inhabitants in the developing world wherein they are provided with a little assistance to support their relocation or rebuilding that may help to reduce the risk. The legal communication of risks occurs more as a threat than an opportunity to save the lives of people who fear where to go and how to deal with sudden evacuation. It is noted that nearly 16000 old buildings in Mumbai are in dilapidated conditions and not fully vacated by the residents in the fear of losing their housing despite notice (Malamulkar 1 September 2017). Besides, the speed of redevelopment and repair is very slow with a complex process, which keeps both vulnerability and risk high for impending disaster(s).

**Implications:** While cities are consistently growing, particularly in the tropical regions as noted in the case of India, inadequate risk communication may fail the efforts made to address existing risks (Bhagat 2011; Denis et al 2012). One important reason for the risk communication not being considered as a priority is its limited notion and understanding as applied in the local, city, and even global plans for disaster management. Most risk communications and solutions suggested in SFDRR, SDGs, and UNFCCC, though address the urban population with information, technology, warning process, and access, there is a little attention paid to the vulnerability factors, including the vulnerability arising through the systemic process. The focus of risk communication remains concentrated on hazards, which allows vulnerability to grow which is the main factor behind rising urban risks. While collaboration and cooperation are stressed (UNISDR 2015; United Nations, 2015), there is no emphasis for risk communication to be taken as a priority when new risks emerge while treating previous hazards, vulnerabilities, or disasters. As most developing countries lack resources to deal with significant risks, the accumulation of risks primarily due to vulnerability significantly enhances the possibility for disasters (UNDRR 2009; Cardona et al. 2012). While there are numerous articles on the significance and effectiveness of risk communication along with ways to make it right, little attention is paid to prioritizing risk communication (Tinker et al. 2000; Frewer 2004; EPA 2019; Abrams and Greenhawt 2020). Much of the risk communication comes from media as crisis information that gives a little choice for action that can revert the situation. Prioritizing risk communication with a focus on both hazard as well as the vulnerability can be an effective tool in disaster risk reduction. It would not only help the communities to know about the risk but also make them responsible to plan and prioritize their response for imminent hazards or disaster by addressing their vulnerabilities.

### **4.2 Gap: Inadequate Structures to Measure the Extreme Impacts of Risk Communication & Stakeholders Inclusiveness**

All the three agreements (SFDRR, SDGs and UNFCCC) view risk communication primarily as the responsibility of the national governments that lead to a top-down approach of dissemination of risk information with a little structure for engagement of varied stakeholders impacted by the risk communication (see UNISDR 2015; United Nations 2015; United Nations 1992). There is an implied emphasis on having communication systems for early warning, response, evacuation, and recovery; however, the agreements don't specify either the structures for engagements of varied stakeholders or measurement of subsequent outcomes of risk communications. In the absence of sufficient structures to measure and assess the change or results on the ground level, it is difficult to address various local challenges that are often not clearly articulated at the global scale (Mysiak et al. 2016 p.2190). This is also true for risks having global implications, particularly the extreme cases like COVID 19. While long-term risks are communicated, lack of structures to address the short-term implications of risk communication at the global level can have significant local impacts that are often not planned, as noted in the case of Malé during COVID 19 in 2020.

### **Case Study: Island City – Malé, Maldives**

Located on a low-lying archipelago at the latitude of 4<sup>0</sup>.17'N & 73<sup>0</sup>.50'E, the capital of Maldives – Malé is one of the highly vulnerable cities in the world to the impact of climate change. It is susceptible to sea-level rise, water scarcity, tropical storms, storm surge, flooding, and tsunami, many of which pose a direct threat to its survival. It is one of the most densely populated island city in the world with 129,281 population which is nearly 38 percent of the country's population living in an area of two square kilometers (May and Riyaza 13 July 2017). Low fiscal strength further adds to its vulnerability to cope with the impact and recover from the impact of any natural disaster (Schafer 20 January 2019). Both Malé and the country rely heavily on tourism which contributes to 23 percent of its total GDP (UNDRR 2019). COVID 19 had a devastating impact on the only major source of its economy i.e. tourism. Maldives declared the State of Public Health Emergency from 12 March 2020, that included travel restrictions between resorts, safaris, and inhabited islands, banning all excursion activities within the country, suspension of tourist check in to guest houses and city hotels in Greater Malé Region, which was followed by restrictions across the entire country and on all non-essential travel between islands (MMPRC 2020). However, on 15 July 2020 restrictions on resorts, hotels, and liveboards in uninhabited islands were uplifted, and from 1 August 2020, all hotels and guest houses in inhabited islands opened for all (ibid). The severe impact on the economy, made the city and the nation to pull out all the rules and implement one of the most open border policies in the world (Rasheed 7 October 2020). It occurred mainly due to the unsustainability of lockdown attributed to the small size of the nation and economy that rely heavily on tourism, which was not the case in major countries of the region including India, Pakistan, or Bangladesh, which kept several restrictions on travel to control the spread. Contrary to other places, visitors in the city of Malé did not need to have negative COVID tests but had to follow quarantine rules, however, despite such rules, the drop in the tourists has been significant i.e. nearly 87% due to travel restrictions in other countries (ibid). Travel advisories to drop non-essential travel in Europe and America also added to the drop in the overall number of tourists to Malé. Apart from the fear of COVID 19, the fact that insurance companies would not cover the recovery expense also added to this drop in tourists flow. On the one hand, where it is deemed as an essential step to reduce COVID 19 spread in larger countries, on the other hand, for a small city and islands like Malé, the impact of such communication is found wrecking by making more people vulnerable to disaster with little or no income, which led to a very different response from the government. Such situation could be avoided by ensuring engagement of varied stakeholders in global risk communication.

**Implications:** Despite an acknowledgment of the diversity of population composition at different scales, there is inadequate structure to accommodate the extreme impacts of risk communication at the global or local level. COVID 19 presented an exemplary situation when a common risk communication of the pandemic by the WHO led countries to take a variety of approaches. While Hungary opted for complete control and rule by decree, Malé opted for open borders policy, and other countries chose partial or full lockdowns for variable times (Baume and Bayer 2020; Dunford et al. 7 April 2020; Rasheed 7 October 2020). Although the inclusiveness of the vulnerable groups has been emphasized in planning in most global agreements in general, they often remain only on the receiving end in terms of risk communication. Studies note that disasters bear the potential to not just wipe out human lives but may also disrupt the economy of a city or even an entire nation (Swiss Re 2013). Inadequate structures to assess and measure the outcome of the risk communication at the local level keep the local plans disconnected without much accountability at the local or global scale. Therefore, it is essential to not just inform but also account for such losses attributed to poor risk communication so that they can be planned to avoid the worst-case scenario. Jerneck (2013) notes that in the face of varied risks, particularly as in the case of climate change, it is essential that the narratives have a direction (toward sustainability), distribution (global inclusiveness), and diversity (multiple approaches, methods, and solutions). Global inclusivity is not only essential to involve effective participation in dealing with threats like COVID19 but also to avoid secondary hazards such as poverty or extreme control.

### **4.3 Gap: Missing Cultural Links and Differentiation in Risk Communication**

The three global agreements also talk of risk communication from a technical point of view, where the information given to the society is informed by science and data available on a particular hazard or its likely impacts. A little emphasis is placed on its local socio-cultural relevance and association that significantly affect the disaster response and produce variations over space and time (Cannon 2015; Khan

2012). The review of the 2030 agenda for SDGs emphasizes the inclusion of culture as an integral component of the future (Yildirin et al. 2019). However, it has yet to be linked with the risk communication aspects. Within a society, people may understand various terms differently, which is not limited to the technical terms such as risks, vulnerability, or resilience but also the severity of risk as perceived and framed by the local people which is often deep-seated in a society (Cardona et al 2012; Sandell et al 2013). With an excessive emphasis on top-town risk communication in the form of the early warning system, technological support, and cooperation, the social framing of risk and the outcome of risk communications are frequently overlooked. This results in deviation from the prescribed top-down response either because of inapplicability or due to negative impacts of the suggested response. An essential need for locally and socio-culturally informed risk communication is noted recurrently during the exposure to COVID 19 in different parts of the world. The cultural megalopolis of Bengal presents one good example from the urban tropics.

### **Case Study: Cross-Border Cultural Megalopolis Region of Bengal**

The Bay of Bengal region, mainly spread across India and Bangladesh, is known for its rich cultural identity. Cities located in the low-laying tropical areas of this region are exposed to multiple climate and health hazards including tropical cyclones, flooding, sea-level rise, storm surge, erosion, salinization, and tsunami. Many of these hazards are likely to be intensified by climate change, and in the presence of tremendous challenges of urban development, resource scarcity, and cross-border migration, they bear the potential to cause disasters if not managed well (Population Reference Bureau, 1 October 2001; Debova 2014). Kolkata urban agglomeration with over 14.1 million populations is located at  $22^{\circ}.57'N$  and  $88^{\circ}.36'E$  in the Ganges-Brahmaputra river delta in India. The urban belt extends to the adjoining cities of Khulna ( $22^{\circ}.85'N$  &  $83^{\circ}.54'E$ ), Dhaka ( $23^{\circ}.8'N$  &  $90^{\circ}.41'E$ ), and Chittagong ( $22^{\circ}.35'N$  &  $91^{\circ}.78'E$ ) in Bangladesh. Dhaka is though located outside tropical zone, it can be seen as a growth center triggering development in the region. With millions of people in each city, this region is emerging as one of the most high-risk areas in the world in the face of climate change (Danda 2020). In contrast to Malé, the Bengal megalopolis region shares a rich traditional and cultural heritage with the neighboring cities that spread across two nations, and hence it would be limiting to see a city in isolation. The impact of ignoring the cultural ties was noted in the separation of Bangladesh from India in 1947 and then from Pakistan in 1971 (Debova 2014). The cross-border migration between India and Bangladesh has remained an ongoing activity ever since the creation of the country attributed to shared history, ethnicity, religious, linguistic, and cultural ties (Joseph and Narendran 2013). Policies underpinning these socio-cultural factors not only disrupt the development process but also lead to unrest as noted in the case of CAA act in 2019 that led to conflict, unrest and destruction not just in Kolkata but also in other parts of India (Debova 2014; Canton 4 March 2020).

While both India and Bangladesh went for a complete lockdown in the late March, several differences were noted in the risk communication across the two nations. At the one hand, India adopted a tougher approach of 1-day curfew leading to nationwide lockdown for 21 days, on the other hand, Bangladesh adopted a relatively soft approach with ten days of public holidays with relatively a greater emphasis on community engagement and awareness (Chauhan 25 March 2020; Mamun 23 March 2020). Although the language, measures, and strictness of risk communication varied significantly across the two nations with varied socio-cultural interpretations of the risk by the central governments, many similarities were noted in the local response to COVID 19 across borders in the Bay of Bengal region. The concept of social distancing couldn't be applied to thousands of densely populated slums with millions of residents in Kolkata, Dhaka, and Chittagram (Mahmud 20 Mar 2020; Ray 15 Apr 2020). The situation became further critical with the arrival of migrant population in the densely populated risk areas, who not only became the carriers of the disease but also enhanced the local vulnerability with reduced income and heightened exposure to cyclone *Amphan* (PTI 27 March 2020; DhakaTribune 20 April 2020). In Kolkata, nearly 84 people lost their lives, another 3 million had to evacuate and suffer significant damage during the cyclone *Amphan*, wherein migrants suffered more who had lost both home and source of earning (Ellis-Petersen and Rahman 21 May 2020). Similarly, in Bangladesh 2.5 million people had to be evacuated, nearly 10 million people were affected and 500,000 lost their homes (ibid). Apart from the disaster response, commonalities were also observed in the celebration of various cultural festivities during COVID 19 in the Bengal region of India and Bangladesh (Banerjee and Samaddar n.d; Paul 29 November 2020). While risk communication at the national level totally ignored the local cultural diversity, a greater sensitivity could be used to generate support and effective response to common risk communication. While local governments play an important role in bridging this gap, however, reduced emphasis on the role of culture in risk communication at the global scale brings a little support for its modification at the local level.

**Implications:** The generic guidelines of WHO are followed by different nations based on their institutional framework, capacities, and resources with a little contextualization of the local socio-cultural variations and hazards exposures. Subsequently, several aberrations were noted in the global response to COVID19 due to the local socio-cultural conditions. For examples, WHO and most governments promoted frequent hand washes to control the spread of Coronavirus, however, it was difficult for the places suffering water scarcity and slums with limited water supply as noted in Nairobi, India, and many other parts of the world (Natarajan 18 March 2020). People also faced double jeopardy due to the occurrence of two or more hazards in many other tropical areas including Philippines due to Tropical Cyclone Vongfong and in Fiji due to Cyclone Harold in the COVID situation that made both evacuation complex and created a challenge of livelihood for the one

displaced (IRFC 2020). It is noted that countries with loose or rule breaking culture (e.g. Mexico 150,000 deaths) were affected significantly more by COVID 19 than those which followed rules (e.g. Japan's 5000 deaths) even with a nearly identical population (Gelfand 1 February 2021) [67]. Many of the disaster responses are interconnected with cultural practices, and risk communication without accounting for local cultural beliefs and practices not only makes people feel alienated but also a culprit of not following laws. Various religious gatherings occurred across different nations and became the source of infection spread e.g. Church gathering in South Korea and Kuching, Sarawak, and Tabligh gathering in Malaysia, Brunei, India, and Indonesia (BBC News 2 March 2020; Supramaniam and Ghazali 11 April 2020; Aubrey 9 April 2020) . Such incidents not only create fear and erode trust but may also result in stress and discrimination within societies having diverse cultural orientations as noted in India and many other countries (Sayeed 29 March 2020; Paul November 2020). In contrast, cultural integration is also the cause of local resilience that has governed socio-economic ties and migrations across nations. In this case, a deeper understanding of cultural connotation of risk and response can support the risk communication to achieve better results.

## 5. Discussion

The frequent occurrence of disaster in urban tropics is not just significant but also consistently rising with population growth and climate change as many such cities are located in developing countries where they lack adequate resources and funding to manage increasing risks (OECD 2015). In such cases, a better preparedness of the local population becomes an important way to avoid disasters. This requires the population to be well informed about various risks, their vulnerability and their response. However, most of the risk communication is centered on the hazard occurrence and emergency response rather than addressing the root of disaster that lay in social, economic and political vulnerability (Wisner et al. 2012; Southard 2017). The social and cultural construction of risk has been repeatedly highlighted in literature but hardly addressed through risk communication for its overall resolution (Johnson and Covello 1987; Beck 1992; Austen 2009). Although risk communication has gained significance and evolved in studies focusing on the disaster and climate change risks, its applications in the global agreements primarily centered on hazards with emphasis on warning generation and coordination for response. As delineated in Case Study 1, with limited risk communication, vulnerability continues to prevail and causes recurrent disasters. While SFDRR, SDGs, and UNFCCC talk about various risks and responses, risk communication is primarily understood as a top-down approach of risk information dissemination focusing on early warning and technological interventions. In contrast, disasters may not necessarily follow the sequence of hazards characteristics but they do recurrently and disproportionately affect the most vulnerable population (Hallegatte et al. 2020). It is also noted that in many cases where risk communications address specific vulnerabilities e.g. COVID-19, fail to pay attention to interlinked vulnerabilities arising from systemic processes where short term solutions of lockdown, social distancing, and excessive fear of disease bear the risk to be counterproductive in long-term (Alcántara-Ayala 2020). There is, therefore, a need of having a broader perspective of risk communication that acknowledges not just various types and factors of vulnerability but also interlinked vulnerabilities and apposite response to overcome them.

A limited focus is also the reason for not having risk communication as a priority in most development and planning processes. The culture of risk communication as a priority has a potential to reduce the disaster cost with shared accountability leading to effective risk governance (Ahren and Rudolph 2006; Amaratunga et al. 2019). The need for more proactive risk communication is consistently increasing with changing risk scenarios in the face of climate change. It is noted that many emerging issues are not addressed or identified as key areas in three global agreements wherein urban areas are particularly identified to be vulnerable. A pro-active risk communication may not only make people risk-informed but would also create a context of shared responsibility for bringing change when they are aware and be involved.

COVID19 brought forth an opportunity to view the varied impact of common risk communication in different context of the selected case studies (see figure 2). IFRC (2020) notes that multiple crises overwhelmed both local as well as global capacities to deal and provide assistance in time that resulted in constrained international solidarity with dwindling economic situations. It is essential that the guidelines for global risk communication consider the local implications particularly in the areas of extreme impacts. As many countries may require support to deal with such a complex situation, therefore, it is vital that the global agreements take account of risk communications and implications at various levels by creating structures for engagement and measurement of outcomes.

The integration is not just essential at the global but also at the local scale. Extant literature recurrently notes that the effectiveness of disaster preparedness and response to warning system depends not just on the ethnic and socio-economic population composition but also on the shared culture of response and adaptation to warnings (Perry 1987; Aguirre 1988; Vaughan 1995; Khan 2012a, SAMHSA 2017). Many of these differences also have spatial expressions, however, little attention is paid to changing spatial patterns of disaster risk for risk communication (Khan et al 2012).

The population growth in cities has been seen largely as a demographic phenomenon and similar measures are suggested across countries despite diverse socio-cultural differences (Khan 2012b). The role of culture is rather protruding in disaster response as it influences risk interpretation and choices that people make during a disaster (Schipper 2014). However, often it is ignored at the global and local level of

planning of DRR and risk communication leading to a significant gap in response. The cultural differences need attention from the perspective of both risk communication and response. The acknowledgment of varied impacts of disasters and risk communication has become an essential need in the age of information. In the current era of social media and fake news, a misinterpretation often travels faster than accurate information or data (Lewandowsky et al 2019). In such case addressing risk communication in a coherent manner is essential for all the global agreements addressing risk as the cost of incoherence is unavoidable (Murray et al 2017; Sandholz 2019).

## 6. Conclusion

Fragmented risk communication in the face of rising risk from climate change in cities located in the tropical areas of developing countries bears the seed for poor response and high loss in disasters. In most cases, dissemination of last minute warning to people about risks is found less beneficial as risk means different things to different people and hence fails to generate optimum response from all sections of the society. The three cases studies depicted varied context of urban tropics that highlight varied needs and gaps in the ongoing risk communication. It is noted that there is an increasing need to not just priorities risk communication across the three global agreements but also to redefine risk communication which extends beyond warning generation and considers multiple factors influencing response including interlinked vulnerabilities emerging from varied socio-cultural, economic, political processes. It is noted that the purpose of risk communication is not just limited to make people aware, warn, and inform about their risk exposure and response but also to enhance their engagement in appropriate risk response including risk reduction activities, particularly from the most vulnerable section. As global agreements tend to influence disaster response at the local level, it is essential that they not only include a comprehensive risk communication planning but also provide guidelines for the same to be adopted at national or local level. As risk is the common unifying factor across the three leading global agendas of SFDRR, SDGs and UNFCCC, appropriate risk communication has the potential to lead the way forward for the conjoint outcome of a sustainable world. However, further research would be required to re-orient global risk communication to address community-specific risk exposure and have adequate structures for the effective participation of urban communities.

## Declarations

**Funding:** This research is self funded.

**Conflicts of interest/Competing interests:** There is no known conflict of interest.

**Availability of data:** The paper is based on secondary literature and data published and open for use.

**Code availability:** N.A.

**Ethics approval:** N.A.

## References

- Abrams EM and Greenhawtm M (2020) Risk Communication During COVID-19. *J Allergy Clin Immunol Pract* 8(6):1791-1794. doi: 10.1016/j.jaip.2020.04.012.
- Aguirre BE (1988) The lack of warnings before the Saragosa tornado. *International Journal of Mass Emergencies and Disasters* 6(1): 65–74 <http://www.ijmed.org/articles/133/download/> Accessed 26 December 2020
- Ahrens J, and Rudolph P (2006) The Importance of Governance in Risk Reduction and Disaster Management. *Journal of Contingencies and Crisis Management* 14: 207-209 DOI: 10.1111/j.1468-5973.2006.00497.x
- Alcántara-Ayala I (2020) Editorial: Root causes and policy dilemmas of the COVID-19 pandemic global disaster. *International Journal of Disaster Risk Reduction* <https://doi.org/10.1016/j.ijdr.2020.101892> Accessed 23 April 2020
- Amaratunga D, Haigh R, and Hettige S Eds. (2019) *Accountability in the Context of Disaster Risk Governance*, UNDRR <https://reliefweb.int/sites/reliefweb.int/files/resources/Accountability%20in%20the%20context%20of%20disaster%20risk%20governance.pdf> Accessed 30 April 2020
- Aubrey S (9 April 2020) Covid-19: Sarawak's latest death linked to Kuching church gathering cluster, says Health DG. *Borneo Post Online*. <https://www.theborneopost.com/2020/04/09/covid-19-sarawaks-latest-death-linked-to-kuching-church-gathering-cluster-says-health-dg/> Accessed 19 April 2020



- Austen L (2009) The social construction of risk by young people. *Health, Risk & Society* 11(5): 451-470 DOI: 10.1080/13698570903183871
- Barnes LR, Grunfest EC, Hayden MH, Schultz DM, and Benight C (2007) False Alarms and Close Calls: A Conceptual Model of Warning Accuracy. *Weather and Forecasting*. 22(5): 1140–1147. doi:10.1175/WAF1031.1
- Banerjee S and Samaddar B (n.d.) Cultural similarities between Bengal and Bangladesh during the COVID 19 crisis. Manuscript no. RJHSS-1206 /23-09-2020 submitted to *Research Journal of Humanities and Social Sciences*.
- Baum MDL and Bayer L (31 March 2020) Rule by decree in Hungary reopens wounds on European center right. *Politico*. <https://www.politico.com/news/2020/03/31/rule-by-decree-in-hungary-reopens-wounds-on-european-center-right-158366> Accessed 9 April 2020
- BBC News (2 March 2020) Coronavirus: South Korea sect leader to face probe over deaths. <https://www.bbc.com/news/world-asia-51695649> Accessed April 19, 2020
- Beck U (1992) *Risk society*. Sage, London
- Bhagat RB (2011) Emerging Pattern of Urbanization in India. *Economic and Political Weekly* 46(34): 10-12
- Cannon T (2015) Disasters, climate change and the significance of 'culture'. In *Cultures and Disasters: Understanding Cultural Framings in Disaster Risk Reduction*. Edited by Fred Krüger, Greg Bankoff, Terry Cannon, Benedikt Orłowski, E. Lisa F. Schipper. Routledge
- Canton N (4 March 2020) In House of Commons, India faces fire for CAA, Delhi riots. <https://timesofindia.indiatimes.com/india/india-under-fire-in-uk/articleshow/74465081.cms> Accessed 14 March 2020
- Cardona OD, et. al (2012) Determinants of risk: exposure and vulnerability. In: *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*. In *A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (IPCC)*. Edited by Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley. Cambridge University Press, Cambridge, UK. Pp. 65-108 [https://www.ipcc.ch/site/assets/uploads/2018/03/SREX-Chap2\\_FINAL-1.pdf](https://www.ipcc.ch/site/assets/uploads/2018/03/SREX-Chap2_FINAL-1.pdf) Accessed 25 January 2021
- Chauhan C (25 March 2020) Covid 19: Disaster Act invoked for the 1st time in India. *Hindustan Times*. <https://www.hindustantimes.com/india-news/covid-19-disaster-act-invoked-for-the-1st-time-in-india/story-EN3YGrEuxhnl6EzqrlreWM.html> Accessed 21 March 2021
- Dabova E (2014). India-Bangladesh border fence and crossborder migration. *Aldea Mundo*. 19 (38): 19-34 <https://www.redalyc.org/pdf/543/54343693003.pdf> Accessed 14 December 2020
- Danda AA (2020) Climate Change & Sea Level Rise in the BIMSTEC Region: Towards a Suitable Response. *ORF Issue Brief*. <https://www.orfonline.org/research/climate-change-and-sea-level-rise-in-the-bimstec-region-towards-a-suitable-response/> Accessed 14 December 2020
- Dhaka Tribune (24 March 2020) Mad rush to villages despite govt call for no movement. <https://www.dhakatribune.com/bangladesh/2020/03/24/coronavirus-mad-rush-to-villages-despite-govt-call-for-no-movement> Accessed 20 April 2020
- Denis E, Mukhopadhyay P, and Zérah MH (2012) Subaltern Urbanisation in India. *Economic and Political Weekly* XLVII (30): 52-62
- Dunford D, et al (7 April 2020) Coronavirus: The world in lockdown in maps and charts. *BBC News*. <https://www.bbc.com/news/world-52103747> Accessed April 22, 2020
- Ellis-Petersen H and Rahman SA (21 May 2020) Kolkata surveys damage after bearing brunt of Cyclone Amphan. *The Guardian*. <https://www.theguardian.com/world/2020/may/21/kolkata-surveys-damage-after-bearing-brunt-of-cyclone-amphan> Accessed 26 December 2020
- EPA (2019) *Getting Risk Communication Right*. USA: Environmental Protection Agency. <https://semspub.epa.gov/work/HQ/199586.pdf> Accessed 24 January 2021
- Frewer L (2004) The Public and Effective Risk Communication. *Toxicology letters*. 149: 391-7. Doi: 10.1016/j.toxlet.2003.12.049.
- Gelfand M (1 February 2021) Why countries with 'loose', rule-breaking cultures have been hit harder by COVID. *The Guardian* <https://www.theguardian.com/world/commentisfree/2021/feb/01/loose-rule-breaking-culture-covid-deaths-societies-pandemic> Accessed 22

March 2021

Hori T and Shaw R (2014) Local disaster risk management in a changing climate: Perspective from Central America. Emerald, United Kingdom

IFRC (2020) World Disasters Report 2020. [https://media.ifrc.org/ifrc/wp-content/uploads/2020/11/20201116\\_WorldDisasters\\_Full.pdf](https://media.ifrc.org/ifrc/wp-content/uploads/2020/11/20201116_WorldDisasters_Full.pdf). Accessed 19 December 2020

Infanti J, Sixsmith J, et al (2013) Literature review on effective risk communication for the prevention and control of communicable diseases in Europe. ECDC, Stockholm

Jerneck A (2013) Searching for a Mobilizing Narrative on Climate Change. *The Journal of Environment & Development* 23 (1): 15-40

Johnson BB & Covello VT (1987) *Social and cultural construction of risk: Essays on risk selection and perception*. Springer, Dordrecht

Joseph J and Narendran V (2013) *Neither Here nor There: An Overview of South-South Migration from both sides of the Bangladesh-India Migration Corridor*. International Institute of Social Studies. The Hague: Erasmus University Rotterdam.  
[https://www.iss.nl/sites/corporate/files/Rajan-Joseph-Narendran\\_South\\_Asia\\_S-S\\_migration\\_lit\\_review\\_bibly\\_June2013.pdf](https://www.iss.nl/sites/corporate/files/Rajan-Joseph-Narendran_South_Asia_S-S_migration_lit_review_bibly_June2013.pdf) Accessed 26 December 2020

Hallegatte S, et al (2020) From Poverty to Disaster and Back: A Review of Literature. *EconDisCliCha* 4: 223-247  
<https://doi.org/10.1007/s41885-020-00060-5> Accessed 26 March 2020

Khan S (2012a) *Living in a Hazardscape: A Study of Hazards and Response in the Wellington Region, New Zealand*. Lap-Lambert: Verlag

Khan S (2012b) Disasters: Contributions of Hazardscape and Gaps in the Global Response Practices. *Natural hazards and Earth System Science* 12: 3775-3787

Khan S, Crozier M, Kennedy D (2012) Influences of Place Characteristics on Hazard Perception and Individual Response in the Hazardscape of the Wellington Region. *Natural Hazards* 62 (2): 501-529

Khan S and Kelman I (2010) Progressive Climate Change and Disasters: Communicating Uncertainty. *Natural Hazards* 61(2): 873-877

Khan S, Mishra JL, Lin KE, Doyle EEH (2017) Rethinking communication in risk interpretation and action. *Natural Hazards* 88(3): 1709-1726

Khan S and Mishra J (n.d.) Risk Communication Across the Global Agreements of SFDRR, SDGs and UNFCCC (Under Review)

Lewandowsky S, Ecker UKH, and Cook J (2017) Beyond misinformation: Understanding and coping with post-truth era. *Journal of Applied Research in Memory and Cognition* 6(4): 353-369.

Mackie B (2013) Warning Fatigue - Myth or Misunderstanding: insights from the Australian Bushfires. *Canadian Risk & Hazards Network*. 5(1): 51–55

Mahamulkar S (1 September 2017) 16,000 old buildings in Mumbai dilapidated but not fully vacated. *The Times of India*.  
<https://timesofindia.indiatimes.com/city/mumbai/16000-old-buildings-dilapidated-but-not-fully-vacated/articleshow/60315284.cms>  
Accessed 25 December 2020

Mahmud F (20 March 2020) Coronavirus: In dense Bangladesh, social distancing a tough task. *Aljazeera*.  
<https://www.aljazeera.com/news/2020/3/20/coronavirus-in-dense-bangladesh-social-distancing-a-tough-task> Accessed 21 March 2021

Mamun S (23 March 2020) Coronavirus: Bangladesh declares public holiday from March 26 to April 4. *Dhaka Tribune*.  
<https://www.dhakatribune.com/bangladesh/2020/03/23/govt-offices-to-remain-closed-till-april-4> Accessed 21 March 2021

May JF and Riyaza F (13 July 2017) Maldives' Population Dynamics. *PRB*. <https://www.prb.org/maldives-population-dynamics/> Accessed 26 December 2020

Mitra P and Yenkhom S (5 Jun 2020) Kolkata: Covid 19 spike after migration, cyclone Amphan. *Times of India*.  
<https://timesofindia.indiatimes.com/city/kolkata/covid-spike-after-migration-amphan/articleshow/76204475.cms> Accessed 20 April 2021

MMPRC (2020) COVID -19 Updates – 24<sup>th</sup> December 2020. <https://visitmaldives.com/en/covid19-updates> Accessed 26 December 2020

Moneycontrol News (11 September 2019) Mumbai lost Rs. 14,000 cr to floods between 2005 and 2015: Study. <https://www.moneycontrol.com/news/trends/mumbai-lost-rs-14000-cr-to-floods-between-2005-and-2015-study-4425241.html> Accessed 28 December 2020

Moser S (2010) Communicating climate change: History, challenges, process and future directions. *Wiley Interdisciplinary Reviews: Climate Change* 1(1): 31–53

Moser S, and Dilling L (2011) *Communicating Climate Change: Closing the Science-Action Gap*. Oxford University Press, Oxford <https://doi.org/10.1093/oxfordhb/9780199566600.003.0011>

Muhammad M, and Chan J C L (2020) Tropical Cyclone Impacts on Cities: A Case of Hong Kong. *Frontiers in Built Environment* 6. <https://www.frontiersin.org/article/10.3389/fbuil.2020.575534>. Accessed 14 December 2020.

Murray V, Maini R, Clarke L, and Eltinay N (2017) Coherence between the Sendai Framework, the SDGs, the Climate Agreement, New Urban Agenda and World Humanitarian Summit, and the role of science in their implementation. *Integrated Research on Disaster Risk*, International Council for Science. <https://www.preventionweb.net/publications/view/53049> Accessed 21 March 2020

Mysiak J, et al (2016) Brief communication: Sendai framework for disaster risk reduction – success or warning sign for Paris? *Nat. Hazards Earth Syst Sci* 16: 2189–2193 <https://www.nat-hazards-earth-syst-sci.net/16/2189/2016/nhess-16-2189-2016.pdf> Accessed 12 December 2020

Narvekar M (2018) Greater Mumbai District Disaster Management Plan. Municipal Corporation of Greater Mumbai. [http://dm.mcgm.gov.in/sites/default/files/documents/Disaster\\_Management\\_Plan\\_2018.pdf](http://dm.mcgm.gov.in/sites/default/files/documents/Disaster_Management_Plan_2018.pdf) Accessed 25 December 2020

Narvekar M (31 July 2019) District Disaster Management Plan. District Disaster Management Authority – Mumbai City District. <http://dm.mcgm.gov.in/draft-dmplan> Accessed 25 December 2020

Natarajan S (18 March 2020) Coronavirus: Why washing hands is difficult in some countries. *BBC News* <https://www.bbc.com/news/world-51929598> Accessed 22 March 2021

Netten N, & van Someren M (2011) Improving Communication in Crisis Management by Evaluating the Relevance of Messages. *Journal of Contingencies and Crisis Management* 19(2):75-85. doi: 10.1111/j.1468-5973.2011.00636.x

Norris F (11 July 2014) For Biggest Cities of 2030, Look Toward the Tropics. *New York Times*. <https://www.nytimes.com/2014/07/12/business/for-biggest-cities-of-2030-look-toward-the-tropics.html> Accessed 14 December 2020

OECD (2015) *Disaster Risk Financing: A global survey of practices and challenges*, OECD Publishing, Paris <http://dx.doi.org/10.1787/9789264234246-en> Accessed 25 March 2021

Paul S (19 November 2020) Religious responses to the pandemic among Bengali Hindus in West Bengal: A Survey. *National University of Singapore*. <https://ari.nus.edu.sg/20331-64/> Accessed 21 March 2021

Pearson L (2015) 3 Ways SDGs could fill the shortcomings of SFDRR. *Global Network of Civil Society Organisations for Disaster Reduction*. <https://gndr.org/news/blogs/item/1492-3-ways-the-sdgs-could-fill-the-shortcomings-of-the-sfdr.html> Accessed 20 March 2020

Perry RW (1987) Disaster preparedness and response among minority citizens. In *Sociology of disasters: Contribution of Sociology to disaster research*. Edited by R. R. Dynes, B. D. Marchi, and C. Pelanda. Pp. 135-151. Franco Angeli, Milano, Italy

Population Reference Bureau (1 October 2001) *Climate Change Impacts and Emerging Population Trends: A Recipe for Disaster?* <https://www.prb.org/climatechangeimpactsandemergingpopulationtrendsarecipefordisaster/> Accessed 26 December 2020

PTI (4 March 2020) 106 deaths in building collapse cases in five years in Mumbai. *The Economic Times*. E-paper. <https://economictimes.indiatimes.com/news/politics-and-nation/106-deaths-in-building-collapse-cases-in-five-years-in-mumbai/articleshow/74479912.cms?from=mdr> Accessed 19 December 2020

Rasheed Z (7 October 2020) Maldives pulls out all the stops as COVID 19 devastates tourism. *Aljazeera*. <https://www.aljazeera.com/news/2020/10/7/the-maldives-opened-its-borders-to> Accessed 26 December 2020

Ray S (15 April 2020) Social Distancing Takes A Walk In Kolkata's 3,000 Slums With 18 Lakh People. *The Times of India*. <https://timesofindia.indiatimes.com/city/kolkata/social-distancing-takes-a-walk-in-kolkatas-3k-slums-with-18l->

people/articleshow/75149104.cms Accessed 21 March 2021

Schafer H (20 January 2019) Bracing for climate change is a matter of survival for the Maldives. World Bank Blogs. <https://blogs.worldbank.org/endpovertyinsouthasia/bracing-climate-change-matter-survival-maldives> Accessed 26 December 2020

Schipper L (2014) The case for recognising the role of culture in reducing disaster risk. CDKN's blog series: Rethinking a new global agreement for disaster risk reduction. [https://cdkn.org/2014/08/opinion-the-case-for-recognising-the-role-of-culture-in-reducing-disaster-risk/?loclang=en\\_gb](https://cdkn.org/2014/08/opinion-the-case-for-recognising-the-role-of-culture-in-reducing-disaster-risk/?loclang=en_gb) Accessed 27 December 2020

Sharma U, & Patt A (2011) Disaster warning response: the effects of different types of personal experience. *Natural Hazards* 60(2): 409–423. doi:10.1007/s11069-011-0023-2

Shaw R, Takeuchi Y, Matsuura S, and Saito K (2013) Risk Communication. World Bank, Washington, DC. <https://openknowledge.worldbank.org/handle/10986/16147> Accessed 28 March 2021

Sheppard Ben, Melissa Janoske, and Brooke Liu (2012) Understanding Risk Communication Theory: A Guide for Emergency Managers and Communicators. Report to Human Factors/Behavioral Sciences Division, Science and Technology Directorate, U.S. Department of Homeland Security. College Park, MD: START

Sandell T, Sebar B, Harris N (2013) Framing risk: Communication messages in the Australian and Swedish print media surrounding the 2009 H1N1 pandemic. *Scandinavian Journal of Public Health* 41: 860–865

SAMHSA (2017) Greater impact: How disasters affect people of low-socio-economic status. Disaster technical assistance centre supplemental research bulletin. July [https://www.samhsa.gov/sites/default/files/programs\\_campaigns/dtac/srb-low-ses.pdf](https://www.samhsa.gov/sites/default/files/programs_campaigns/dtac/srb-low-ses.pdf) Accessed 15 December 2020

Sandholz S (2019) COHERE: Costs of incoherence, and benefits of coherence: Sendai Framework for Disaster Risk Reduction, Paris Climate Agreement and Sustainable Development Goals and New Urban Agend. Research Project. UNU-EHS, Tokyo <https://unu.edu/projects/cohere-costs-of-incoherence-and-benefits-of-coherence-sendai-framework-for-disaster-risk-reduction-paris-climate-agreement-sustainable-development-goals-and-new-urban-agenda.html#outline> Accessed 21 March 2020

Sayeed VA (29 March 2020) Kannada newspaper accuses Muslims of spreading coronavirus. Frontline <https://frontline.thehindu.com/dispatches/article31199645.ece> Accessed 2 April 2020

Southard N (2017) The Socio-Political and Economic Causes of Natural Disasters. CMC Senior Theses. 1720. [http://scholarship.claremont.edu/cmc\\_theses/1720](http://scholarship.claremont.edu/cmc_theses/1720) Accessed 20 December 2020

Stecko S, and Barber N (2007) Exposing Vulnerabilities: Monsoon Floods in Mumbai, India. Case study prepared for Revisiting Urban Planning: Global Report on Human Settlements 2007. <https://staging.unhabitat.org/downloads/docs/GRHS.2007.CaseStudy.Mumbai.pdf> Accessed 28 December 2020

Supramaniam R and Ghazali F (11 April 2020) [WATCH] 40% of all Covid-19 cases traced to tabligh gathering. The Malaysian Insight. <https://www.themalaysianinsight.com/v/236622> Accessed 19 April 2020

Swiss Re (2013) Mind the risk: A global ranking of cities under threat from natural disasters. [https://cdn.downtoearth.org.in/themes/DTE/images/Swiss\\_Re\\_Mind\\_the\\_risk.pdf](https://cdn.downtoearth.org.in/themes/DTE/images/Swiss_Re_Mind_the_risk.pdf). Accessed 19 December 2020

Tinker TL, Collins CM, King HS, and Hoover MD (2000) Assessing risk communication effectiveness: perspectives of agency practitioners. *J Hazard Mater* 73(2): 117-27. doi: 10.1016/s0304-3894(99)00131-4. PMID: 10708888. UNDRR (2009) Global Assessment Report on Disaster Risk Reduction (2009). United Nations. <https://www.preventionweb.net/english/hyogo/gar/report/index.php?id=9413> Accessed 14 December 2020

UNDRR (2009) Global Assessment Report on Disaster Risk Reduction (2009). United Nations. <https://www.preventionweb.net/english/hyogo/gar/report/index.php?id=9413> Accessed 14 December 2020

UNDRR (2019) Disaster Risk Reduction in Republic of Maldives: Status Report 2019. Bangkok, Thailand, United Nations Office for Disaster Risk Reduction (UNDRR), Regional Office for Asia and the Pacific. [https://reliefweb.int/sites/reliefweb.int/files/resources/68230\\_4maldivesdrmstatusreport.pdf](https://reliefweb.int/sites/reliefweb.int/files/resources/68230_4maldivesdrmstatusreport.pdf) Accessed 26 December 2020

United Nations (1992) United Nations Framework Convention on Climate Change. <https://unfccc.int/resource/docs/convkp/conveng.pdf>  
Accessed 23 March 2020

United Nations (2015) Sustainable Development Goals. **2015**. <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>  
Accessed 28 December 2020

United Nations (16 May 2018) 68% of the world population projected to live in urban areas by 2050, says UN.  
<https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html>. Accessed 14 December 2020

United Nations (2018) The World Cities in 2018. Data Booklet.  
[https://www.un.org/en/events/citiesday/assets/pdf/the\\_worlds\\_cities\\_in\\_2018\\_data\\_booklet.pdf](https://www.un.org/en/events/citiesday/assets/pdf/the_worlds_cities_in_2018_data_booklet.pdf). Accessed 14 December 2020

UNISDR (2015) Sendai Framework for Disaster Risk Reduction 2015 – 2030. Geneva, Switzerland. UNISDR/GE/2015 - ICLUX EN5000 1st edition. [https://www.preventionweb.net/files/43291\\_sendaiframeworkfordrren.pdf](https://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf) Accessed 28 December 2020

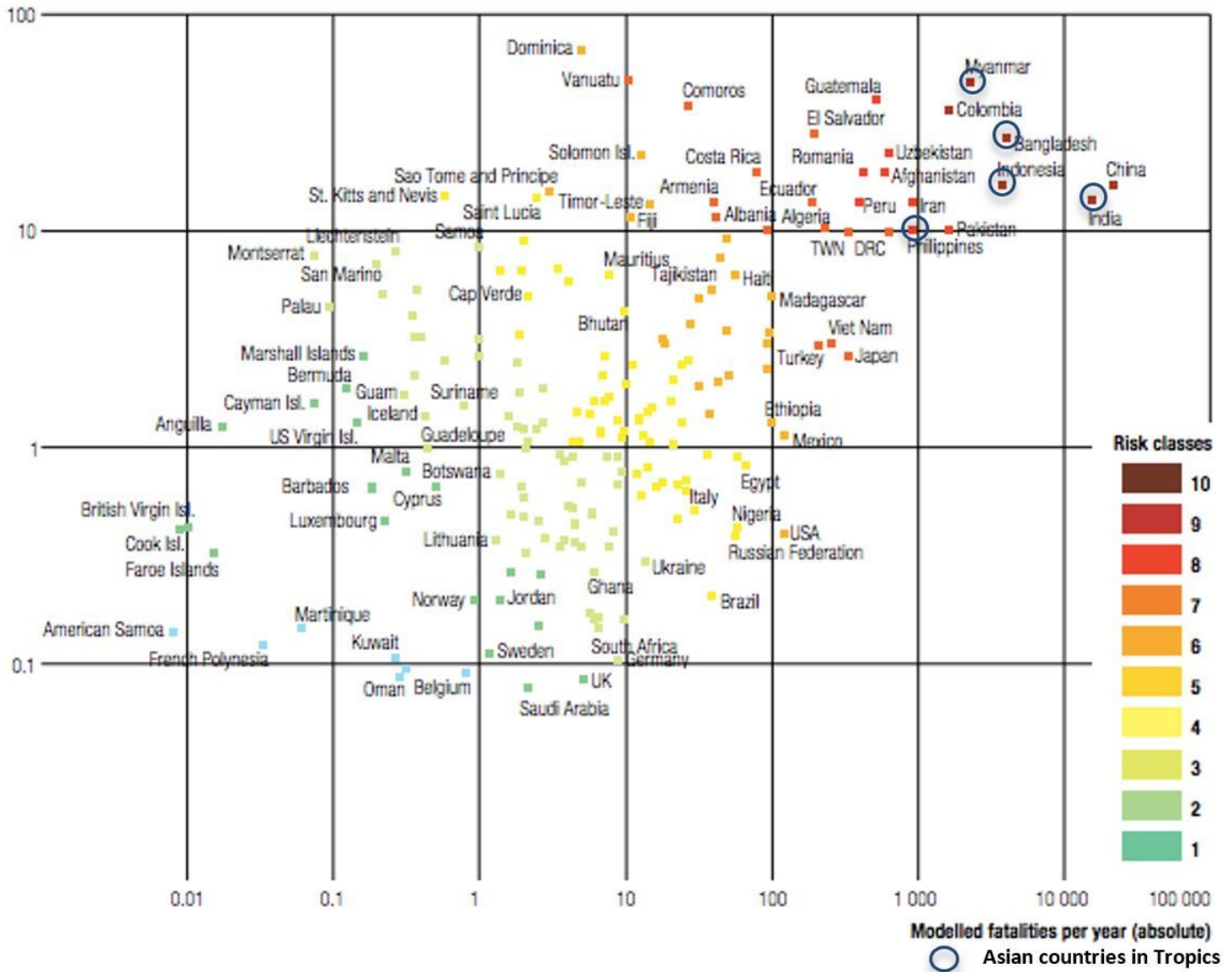
Vaughan E (1995) The significance of socio-economic and ethnic diversity for the risk communication process. *Risk analysis* 15(2): 169-80

Wisner B, Gaillard JC, & Kelman I (2012) *The Routledge Handbook of Hazards and Disaster Risk Reduction*. Routledge, New York

WHO (2021) Risk Communication. <https://www.who.int/risk-communication/background/en/> Accessed 25 February 2021

Yildirin E et al (2019) Culture in the implementation of the 2030 agenda: A report by the culture 2030 goal campaign. Barcelona  
<https://www.ifla.org/files/assets/hq/topics/libraries-development/documents/culture2030goal.pdf> Accessed 21 March 2021

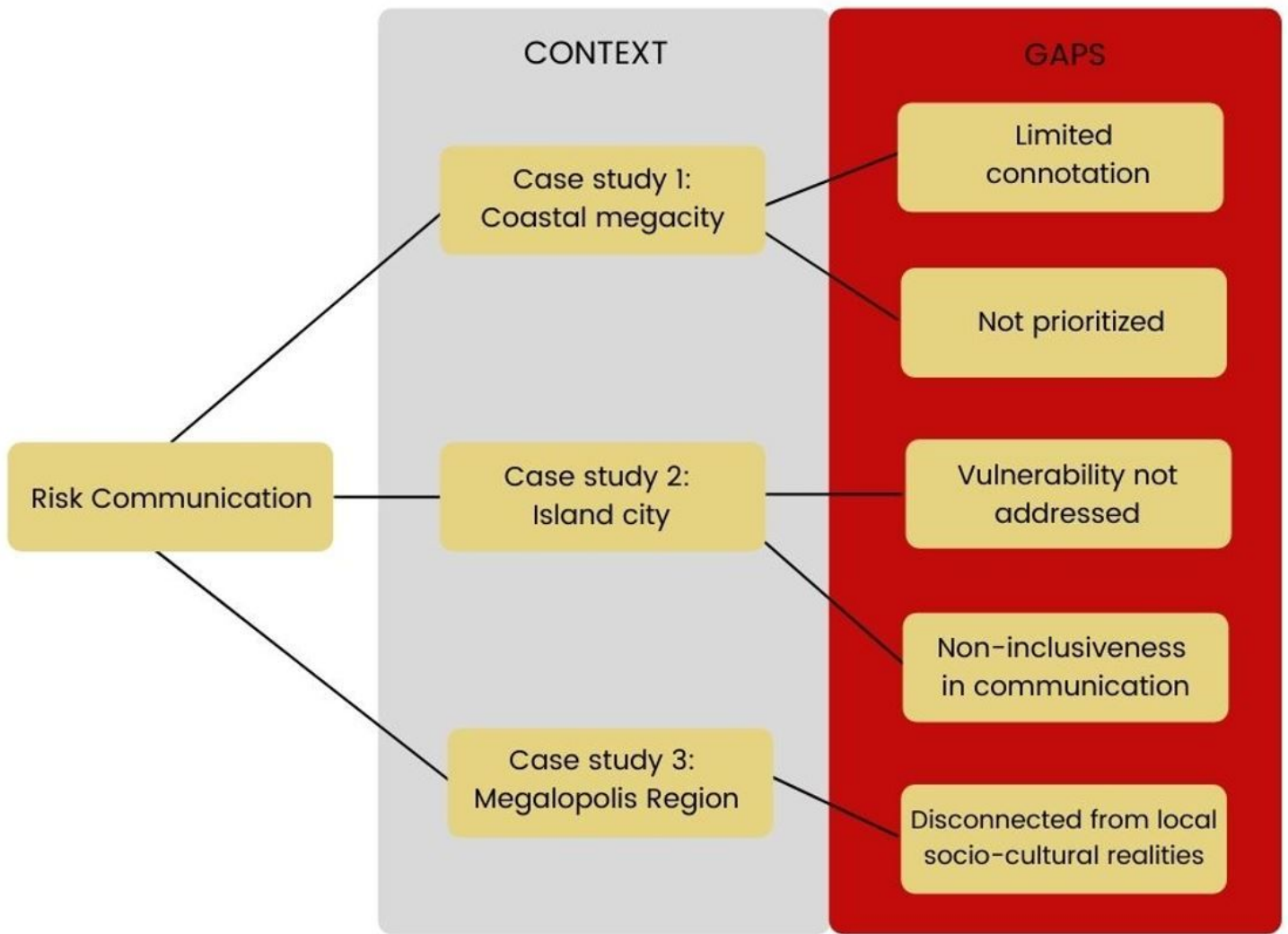
## Figures



Based on UNDRR 2009 p. 50

Figure 1

Country-wise multi-hazard risk and modeled fatalities per million per year. Based on UNDRR 2009 p. 50



**Figure 2**

Gaps in risk communication emerging from varied urban contexts of selected case studies. Source: The authors

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [map.jpg](#)