Chapter 13
Flood Disaster Risk Governance in Changing Climate Contexts

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Introduction

Flooding is a common problem in many parts of the world. It has the potential to cause massive damages, particularly in flood-prone areas of poor and developing countries such as Bangladesh, Sri Lanka, India and Pakistan. In contrast, floods wreaked havoc in parts of the wealthiest and technologically advanced countries like USA, Germany and Belgium in 2021, exposing their existing flood control mechanisms, vulnerabilities of critical infrastructure, effectiveness of early warning systems and response to flooding in a way to safeguard public and private infrastructure as well as carry safer evacuations of people (Fekete & Sandholz, 2021). In 2020, flooding was observed as a common disaster (201 flood events out of 389 total disaster events), with Asia experiencing most of it (EM-DAT, 2020; CRED, 2021).

Cities are home to more than half of the world's population including the urban poor, which are exposed to flooding. In the future, the incidence of floods may increase in frequency and magnitude as a result of many factors like climate change (Carmin et al., 2013; McCarthy et al., 2001), unplanned development, rapid urbanization, socio-economic problems and bad governance. Climate change is impacting everyone and every region. Since the beginning of pre-industrial period, average global temperatures have increased by about 1 °C (Masson-Delmotte et al., 2021; Bajracharya et al., 2008; Mool et al., 2011). Kulkarni et al. (2013) and Sun et al. (2017) reported a significant increase in surface temperatures in the Himalayan region over the last 60 years. The annual mean surface air temperature in the

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Himalayan region increased at a rate of 0.1 °C per decade between 1901 and 2014 (Ren et al., 2017). During the early twentieth century, the Himalayan warming trend was 0.16 °C per decade, which eventually doubled to 0.32 °C per decade (Yan & Liu., 2014).

Since past 108 years, from 1901 to 2009, the mean annual temperature in India has increased by 0.56 °C (Attri & Tyagi, 2010), with an average temperature predicted to rise by 3.5–5.5 °C by the end of the twenty-first century (Lal, 2002). The region will be negatively affected if the warming trend persists.

Recently, the Intergovernmental Panel on Climate Change (IPCC) in its Special Report on Extreme Events and Disasters (SREX) predicted that there will be a further increase in the frequency of extreme weather events in twenty-first century, including the increase in intensity of floods. Climate change causes different changes in different regions, such as faster warming and flooding (Masson-Delmotte et al., 2021), which disproportionately affects socially vulnerable people living in the flood-prone areas. The impacts are, however, expected to be amplified in urban centres, which are commonly understood as areas that are warmer than the surroundings (Masson-Delmotte et al., 2021) and prone to flooding because the water flows to low-lying areas and into water bodies, causing increased runoff rather than seeping into the ground as a result of pavements and abundant impervious surfaces.

In recent times, many areas around the globe have been developing as urban at a faster rate, originating urban development as a problem with change in land use. It is believed that urbanization may increase the frequency and intensity of floods and expose communities to multiple flood hazards (Konrad, 2003). Nevertheless, flood exposure is a critical aspect to understand and manage flood risk. This has become more convincing after the introduction of two voluntary and non-binding agreements: the proactive approach 'Hyogo Framework for Action 2005–2015 (HFA)' and the people-centred approach 'Sendai Framework for Disaster Risk Reduction 2015–2030 (SFDRR)'. In this backdrop, the regional or city planners are tasked to prepare developmental strategies with maximum gains by incorporating disaster risk into policy and planning at the local level. In the past, flood risk management was primarily concerned with the distribution of relief and humanitarian aid to affected populations, which was later expanded to include prevention and mitigation measures through technological interventions such as the construction of dikes, protection walls, and dredging of water bodies. However, as knowledge has advanced and threats have increased, flooding is now being studied as a complex chain of climatic, hydrological, and social factors, with a clear emphasis on preparedness, adaptation, and resilience aspects of flood risk management. With one of the strategic priorities of the SFDRR 2015–2030 being 'strengthening disaster risk governance for disaster risk management' (UNISDR, 2015), the efforts to advance disaster risk governance theory to improve disaster risk reduction practices are gaining momentum globally (Shi et al., 2010)

Disaster Risk Governance: Concept and Meaning

Disaster risk governance has been a centre of attention since the HFA 2005–2015, which advocates for good governance and disaster risk reduction and terms them as mutually supportive, but its origins can be traced back to 3200 BC, with evidence from Iraq indicating that members of the Asipu social group were advised on how to manage disasters (Coppola, 2015). The approach to dealing with disasters in place for centuries was hazard specific and relief centric; for example, actions were taken to reduce the negative impacts of floods and then separately for fires or other hazards by providing relief. Recognizing that this approach was time consuming and required significant resources; however, accomplishments were made on a variety of fronts, including disaster awareness, capacity building and the involvement of international agencies to take responsibility, set up committees and develop policies and legal frameworks under the umbrella of the United Nations to guide all relevant stakeholders in administrative and development spheres on disaster risk reduction. In the nineteenth century, for example, planning committees were set up by the British and Indian governments to manage drought impacts facing the region (Coppola, 2015). The response phase of disaster management was prioritized, and disasters were mostly viewed as natural calamities rather than human induced.

After a long period of ignoring it, disaster risk governance, or simply risk governance, shapes under the umbrella of governance. According to the United Nations Development Programme (UNDP), governance is 'the exercise of authority (politically, economically and administratively) for managing country affairs at the various levels. Encompassing and transcending government, as well as enabling all individuals and groups to express themselves, exercise their legal rights, meet obligations and reduce disparities through the mechanisms, processes and institutional frameworks contained within this'. Good and supportive governance is essential for building disaster-conscious and-resilient societies by establishing adequate and appropriate (top-and ground-level) governance arrangements, strengthening institutional mechanisms and developing policy and legal frameworks, enhancing international cooperation, coordinating and overseeing disaster risk reduction at the global, national and regional levels. Because it is the vulnerabilities of populations and other elements at risk that turn a natural hazard into a disaster (Wani et al., 2022). The Sendai Framework for Disaster Risk Reduction 2015–2030 includes risk governance as the second of four priorities, as 'strengthening of disaster risk governance to manage risk'.

A Paradigm Shift in Disaster Risk Reduction Policy at the Global Level

Change in Approach: From Reactive to Proactive

In recent times, disaster management has been a subject attracting attention from everyone including common people to policymakers and researchers around the globe. The shift, which was inevitable, progressed from a culture of reaction to a culture of prevention. More precisely, from a reactive, relief-centric approach to a more holistic and proactive (action and result oriented) preparedness, prevention and mitigation approach. Rightly so, given that the global community, especially the poor and developing countries, have been adversely impacted and suffering substantially in terms of human losses and economic costs, proving a setback to development. The distribution of relief and humanitarian aid to disaster-affected communities through the involvement of local and global humanitarian organizations is a well-known, age-old dimension of disaster management that is predominantly observed in developing countries and is thought to have existed since the dawn of global cooperation (Kamidohzono et al., 2015).

Declaration of 1990s as the International Decade for Disaster Risk Reduction

The General Assembly of the United Nations in its 44th session declared the 1990s as the International Decade for Natural Disaster Risk Reduction, which effectively started on January 1, 1990 (IDNDR, 1994). The main objective of declaring 1990s as a decade for natural disaster risk reduction was to reduce human loss, damages to assets, social and economic disruption as a result of natural disasters such as drought, earthquake, and other adversities of natural origin, particularly in the poor and developing countries and regions of the world through international cooperation (UNISDR, 2012a). The need for such a decade was felt with the goal of reducing disaster losses by gathering various stakeholders, experts, professionals, policy and decision makers from various backgrounds, cultures and nationalities under one umbrella organization, namely the United Nations, with moral authority and a strong commitment to addressing disaster-related issues confronting the global community (Lechat, 1990).

In addition, the developing countries were witnessing more devastation and were somehow neglected at the international forums when it came to managing disasters as a global concern. The world community, particularly comprised of developed nations, later recognized that reducing disaster risk has positive impacts on all people, with a special focus on developing countries, because the poor countries housing millions of vulnerable people (in any case) were not in a position to respond to or withstand disasters on its own.

In a nutshell, IDNDR's main goals were as follows (IDNDR, 1994; Lechat, 1990):

- To effectively mitigate the effects of natural disasters by building the capacity of each country, with a focus on developing countries, by providing them with special assistance in assessing disaster damage potential, developing early warning systems and disaster-resilient infrastructure.
- To develop appropriate guidelines and future strategies for applying scientific knowledge and technical expertise while considering the various cultures and economic structures of the countries.
- To plug crucial knowledge gaps and alleviate human suffering by promoting scientific and engineering enterprises.
- To facilitate the dissemination of technological information.
- To develop certain measures on critical aspects of disaster management such as assessment, early warning, prevention and mitigation through programmes like transfer of technology, education and training, and project demonstration, which are disaster and area specific and to evaluate the effectiveness of such programmes

International Strategy for Disaster Reduction and Hyogo Framework for Action 2005–2015

In a significant development, a global framework, namely the International Strategy for Disaster Reduction (ISDR), was adopted in 1999 in Geneva, Switzerland, with the vision 'to enable all communities/nations to become resilient to all types of hazards and reduce associated risks' (UNISDR, 2012b). This was within the United Nations system and successor to the 1990s International Disaster Reduction Decade (Fig. 13.1). ISDR's implementation was facilitated by the United Nations Office for Disaster Reduction (UNISDR). Following that, the breakthroughs in disaster management continued, with the world community taking disasters losses seriously while attempting to manage them effectively through the adoption of the Hyogo Framework for Action (HFA) 2005–2015: Building the Resilience of Nations and Communities to Disasters (UNISDR, 2005).

This feat of managing disasters through the constant and systematic efforts was accomplished at the United Nations General Assembly (UN/GA) second World Conference on Disaster Risk Reduction (DRR) from 18 to 22 January 2005 in Kobe-Hyogo, Japan, after very carefully reviewing the Yokohama Strategy for a Safer World and its Plan of Action, which was adopted during the first World Conference on Natural Disasters from 23 to 27 May 1994 in Yokohama Japan.

The HFA was a 10-year plan that first identified the ways of and detailed the measures for building resilience of communities required across different sectors (global and local) to reduce disaster losses, vulnerabilities, risks from hazards by bringing together different stakeholders (national and international, government and

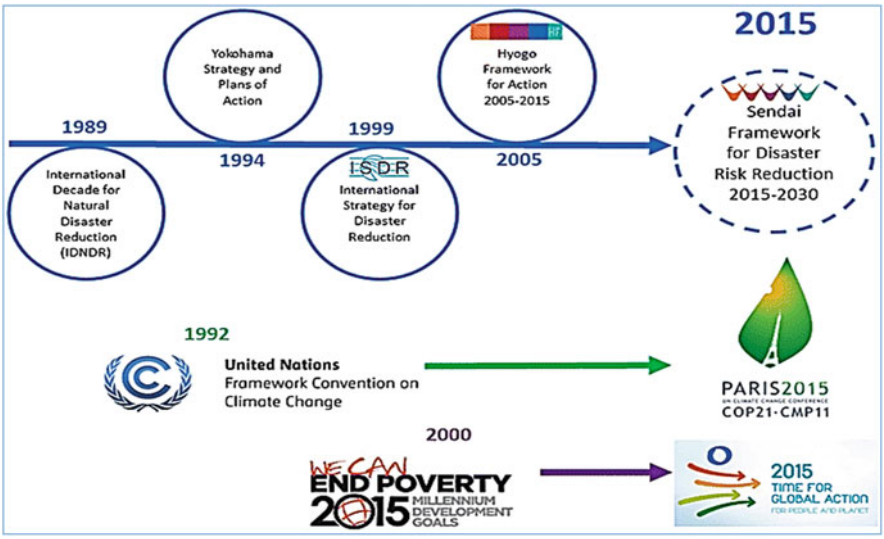

Fig. 13.1 Global commitments towards disaster risk reduction from 1989 to 2015. [Adapted from Andrew Maskrey's Presentation (UNISDR, 2015)]

non-government, experts, etc.) under one umbrella through international cooperation and coordination (UNISDR, 2005).

The HFA had set the following five priorities for action:

(1) Make Disaster Risk Reduction (DRR) a priority at all levels (global and local) with robust institutional arrangements/networks in place to support its implementation.
(2) Know the disaster risk by identifying, assessing, and monitoring procedures, and enhance early warning system.
(3) Use knowledge, education and innovation to better understand disasters and develop a culture of safety and resilience.
(4) Reduce the underlying disaster risk factors.
(5) Improve disaster preparedness at all levels to ensure an effective disaster response.

The United Nations Framework Conventionon Climate Change (UNFCCC), established on principles to promote climate change cooperation and regulate greenhouse gases, adopted the Kyoto Protocol in 1997. The Kyoto Protocol with its first commitment period from 2000 to 2012, ran parallel to the Eight Millennium Development Goals (MDGs), which were intended to be achieved by 2015. These initiatives operated concurrently with the Hyogo Framework of Action. These words of action (policies, frameworks) worked out by various people from varied backgrounds represented the global community's concerted efforts to address issues of global concern and emerging challenges as a result of the complex interactions of natural phenomena with social and economic conditions, compounded by

anthropogenic interference. The synergies between these policies and frameworks were not clearly defined, whether it was reducing global hunger or poverty, gender equality or women's empowerment, environmental sustainability, or climate change and management of disasters.

From Disaster Management to Disaster Risk Management

The pre-2015 efforts at the global level (Fig. 13.1) were majorly concentrated on some important phases of disaster management and particularly focused on preparedness, response and recovery. However, a shift was observed since the inception of HFA 2005–2015, which to a great extent focused on reducing losses from disasters by managing disaster risk. Although it started with just providing relief to the affected communities in the eventuality of a disaster—disaster management—the global works prioritized disaster risk management.

The expected outcome of prioritizing disaster risk management was to substantially reduce damages and losses from disasters by reducing existing risks or preventing new risks through the application of DRR policies and strategies (corrective, prospective, compensatory and community-based approaches) at all levels. This approach of managing risk gained momentum in the following years, i.e. post-2015 era, and was mainly guided by the Sendai Framework for Disaster Risk Reduction 2015–2030 (SFDRR). A successor instrument to HFA, the SFDRR was adopted at the third World Conference on Disaster Risk Reduction on 18 March 2015 in Sendai, Japan, after threadbare international-level consultations of multi-stakeholders and concerted inter-governmental negotiations (UNISDR, 2015).

Innovation is a key in disaster research and this is believed to be a defining factor in the introduction of SFDRR after reviewing HFA, as well as to ensure the continuity of work and progress made during the HFA period. Promoting engagement at all levels (community, institutional and societal) and across the sectors is among the guiding principles of SFDRR for the prevention and reduction of disaster risk. Both natural and human-made hazards and its associated risks as well as health resilience finds a mention in SFDRR envisaging and broadening its scope while clearly recognizing the global and regional platforms for disaster risk reduction. The action priorities give a strong emphasis on understanding risk and investing in disaster risk reduction as well as building preparedness, however, 'strengthening of disaster risk governance to manage disaster risk' as a priority was a major highlight, something never seen before.

Sendai Framework for DRR has the following four priorities of action (UNISDR, 2015):

(1) Understanding disaster risk
(2) Strengthening disaster risk governance to manage disaster risk
(3) Investing in DRR to improve resilience

(4) Building preparedness for better response and building back better for safer and resilient infrastructure

With the advances in disaster risk management theory and knowledge, as well as innovation in science and technology, it is believed that money spent on aspects/activities in the pre-disaster phase, such as preparedness and mitigation, will save huge bucks during the post-disaster phase, such as response and relief, as well as mobilizing resources and encouraging multi-stakeholder participation and community involvement will prepare ways for effective and efficient disaster risk management.

Understanding Disaster Risk Governance in Kashmir Context

At the global level, there have been consistent and calibrated efforts to mitigate the negative effects of disasters. The policies and legal frameworks that provide strategies and actions were broad in nature and needed to be tailored to the conditions of specific locations while keeping in mind the hazards and risks that were context specific. In developing countries, institutional mechanisms were non-existent, and human resources were inadequately equipped to develop and implement risk-informed policies and plans. The multi-hazard-prone Kashmir region with a history of flood disasters found itself in a similar situation. Following the 2005 Kashmir earthquake, there were dramatic changes in the approach towards disaster management, with more concerted efforts made on policy, planning, education and research fronts to recognize risks from impending disasters as well as lessen their impacts by focusing on all phases of disaster management and particularly pre-disaster phase for a safe and disaster-resilient Kashmir.

In 2005, after the enactment of Disaster Management Act in India, many national and local-level authorities and committees were formed to ensure effective disaster management. The UT of Jammu and Kashmir (an erstwhile state of India) envisaged a plan document, the first of its kind, a separate, 'Disaster Management Policy in 2011', which was later revised in 2017, after learning lessons from the 2014 Kashmir flood. The policy document advocated for a proactive, integrated and holistic, multi-hazard approach to disaster risk reduction by providing guiding principles on all phases of disaster management, establishing disaster management authorities at different levels, and encouraging multi-stakeholder role and participation in disaster risk reduction efforts for a safe & resilient future.

The 2014 floods in Kashmir were historic, causing widespread devastation and highlighting various existing vulnerabilities and loopholes in disaster planning and development aspects. The community's role was exceptional during the disaster response & recovery phase, motivating local planners/authorities to provide guidance on community-based disaster management through the State Disaster Management Plan in 2017. Which also focused on the establishment of a

comprehensive multi-hazard early warning system and a state-level emergency operation centre in the region. Following the twin disasters of 2005 and 2014, as well as the region's warming climate as understood from various research works considering the local climatic regime (Romshoo et al., 2020; Ahmed et al., 2021; Ahsan et al., 2021; Ahmad et al., 2021), the field of disaster management has received some serious attention on various fronts, including risk governance (Table 13.1).

Conclusion

The poor and vulnerable populations across the world, especially in developing countries, are at the greatest risk from disasters. Climate variability and change, combined with multiple environmental, social and economic vulnerabilities of elements at risk, are increasing overall disaster risks for all communities worldwide. The scientific community now widely accepts the fact that disasters or severe impacts of hazards are not 'acts of god' but rather natural hazards that turn into disasters as a result of human actions or decisions. In the disaster management context, individuals, societies and institutions have been taking initiatives since time immemorial to deal with the effects of disasters after facing losses in terms of death and destruction.

The ongoing disaster risk reduction process has evolved tremendously from the traditional approach of managing single hazards by focusing on humanitarian relief to a more action-oriented and effective all-hazard approach with a focus on preparedness, prevention and mitigation. The ultimate goal is to reduce disaster risks for all individuals, particularly the poor and vulnerable populations in developing countries, in order to ensure a safe and resilient future. At the international level, this has been accomplished by recognizing disaster risk governance as a key factor in disaster risk reduction, strengthening it through initiatives that provide platforms for multi-stakeholder involvement (public and private authorities, media, civil society and non-governmental organizations), and coordinating and guiding on how to reduce disaster risks at the community, regional and national levels.

Good governance is essential for fostering a resilient culture and a disaster-conscious society. Which is poorly understood in countries and regions that lack strong political will, technical expertise, sufficient human resources, institutional mechanisms and processes. Kashmir Valley, a multi-hazard-prone region, is one such example. Following the twin disasters of the 2005 earthquake and the 2014 flood, the region has been on a path of developing and implementing plans and policies to ensure effective disaster risk management. The implementation of these risk-informed programmes, plans and policies has been slow due to inherent challenges and issues, including a lack of political will. With the increased frequency and intensity of disasters, there is a growing interest in strengthening disaster risk governance in order to make disaster risk management a top priority at all levels and across all sectors by building capacities of societies and institutions.

Table 13.1 Insights into historical flood events in Kashmir Valley, India

Year of occurrence	Description of the flood event/extent of damage	Evidence
1838	A major flooding known as the "Great Flood" forced the residents to use boats owned by them to rescue themselves and move to safety.	Bates (1873) and Digby (1890)
1841	A major flooding in the region caused i. Loss of lives ii. Sweeping of security personnels iii. Damage to important city bridges	Bates (1873) and Lawrence (1895)
1865	Flood in the month of August resulted in damage to the crops	Ince (1888) and Digby (1890)
1869	Heavy rains caused damage to standing crops	Bewell (1875) and Digby (1890)
1871	Complete inundation of the entire state giving resemblance to a large lake and caused damage to crops	Khoihami (1885), Ram (1895) and Rai (2004)
1885	Compound event: Earthquake-induced landslides triggered flooding in the low-lying areas surrounding the Jhelum River.	Jones (1885) and Neve (1885)
1893	Continuous rains over two days, Lawrence described as a "Great Calamity" in his book, followed by famine. 2225 houses damaged, 225,426 acres of crop land submerged, 329 cattle killed	Climo (1893), Ganga Ram (1928) and Mehran (2015)
1903	Entire Srinagar city was inundated and resembled a big lake. 7000 houses damaged, including 773 on Dal Lake. Besides that, a total of 83 villages were affected; among them, 26 have lost their whole Kharif crops.	Saleh et al., (2017) provides more sources.
1950	A major flood that resulted in loss of 100 human lives as well as damage to 5000 houses.	Ballesteros-Cánovas et al., (2020)
1957	Severe flooding across Kashmir Valley caused damages to crops and public property. It led to famine as a compounding effect. 600 villages were reportedly inundated with economic losses approximating 4 crore and 2 lakh Indian rupees.	Kelman et al., (2018) and Ballesteros-Cánovas et al., (2020)
1959	Incessant rains over four days triggered floods in the Jhelum floodplain and its low-lying areas.	Jammu and Kashmir state archives, Council Records, Ref 15842
1992	A major flood across Jammu and Kashmir and parts of Pakistan affected thousands of people and caused multiple casualties.	Kelman et al., (2018) and Bhat et al., (2019)
2014	Unprecedented rainfall in the first week of September as a result of an interaction between western disturbances and monsoonal currents caused flooding in the Jhelum floodplain. It caught people unawares and caused large-scale devastation and affected millions of people in India and Pakistan administered Kashmir. The causalities were low due to the heroic efforts of young people who braved floodwaters to remove trapped people to safety before the external help came. Many houses in low-lying areas collapsed due to the persistence of water for more than two weeks. Standing crops were also destroyed.	Venugopal and Yasir (2017)

Understanding that disaster risk management is both an individual and collective responsibility, the role of government and other relevant stakeholders is to guide everyone to make disaster reduction efforts, with a particular emphasis on community-centred disaster risk management activities in all phases of a disaster. The progress in disaster risk reduction policy and planning (especially post-2005) under the auspices of the United Nations is a new beginning, but this must be developed, adapted and implemented in letter and spirit to location-specific requirements at national and regional levels. Yet a lot is to be done to achieve a safe and resilient future for everyone.

References

Ahmad, S. T., Ahmed, R., Wani, G. F., Sharma, P., & Ahmed, P. (2021). Glacier changes in Sind basin (1990–2018) of North-western Himalayas using earth observation data. *Modeling Earth Systems and Environment*, 1–13.

Ahmed, R., Ahmad, S. T., Wani, G. F., Ahmed, P., Mir, A. A., & Singh, A. (2021). Analysis of landuse and landcover changes in Kashmir valley, India—A review. *Geo Journal, 1-13*, 4391. https://doi.org/10.1007/s10708-021-10465-8

Ahsan, S., Bhat, M. S., Alam, A., Ahmed, N., Farooq, H., & Ahmad, B. (2021). Assessment of trends in climatic extremes from observational data in the Kashmir basin. *NW Himalaya. Environmental Monitoring and Assessment, 193*(10), 1–18.

Attri, S. D., & Tyagi, A. (2010). *Climate profile of India*. Environment Monitoring and Research Center: India Meteorology Department.

Bajracharya, S. R., Mool, P. K., & Shrestha, B. R. (2008). *Global climate change and melting of Himalayan glaciers* (pp. 28–46). Melting glaciers and rising sea levels: Impacts and implications.

Ballesteros-Cánovas, J. A., Koul, T., Bashir, A., Del Pozo, J. M. B., Allen, S., Guillet, S., ... & Stoffel, M. (2020). Recent flood hazards in Kashmir put into context with millennium-long historical and tree-ring records. *Science of The Total Environment, 722*, 137875.

Bates, C. E. (1873). *A gazetteer of Kashmir*. Light & Life Publishers.

Bellew, H. W. (1875). *Kashmir and Kashghar: A Narrative of the Journey of the Embassy to Kashghar in 1873–74*. Trübner & Company.

Bhat, M. S., Ahmad, B., Alam, A., Farooq, H., & Ahmad, S. (2019). Flood hazard assessment of the Kashmir Valley using historical hydrology. *Journal of Flood Risk Management, 12*, e12521.

Carmin, J., Dodman, D., & Chu, E. (2013). Urban climate adaptation and leadership: From conceptual understanding to practical action.

Climo, W. H. (1893). The floods in Kashmir and Srinagar a new focus of endemic cholera. *British Medical Journal, 2*(1702), 396.

Coppola, D. P. (2015). Hazards. *Introduction to international disaster management*, 40.

CRED (Centre for Research for Epidemiology for Disaster) (2021). *Disaster Year in Review 2020: Global Trends and Perspectives*. https://cred.be/sites/default/files/CredCrunch62.pdf. Accessed 15 Sept 2021.

Digby, W. (1890). *Condemned unheard: The Government of India and HH the Maharaja of Kashmir: a Letter to the Rt*. Hon. Sir Ughtred Kay-Shuttleworth. Indian Political Agency.

EM-DAT. (2020). *Disaster profiles*. https://www.emdat.be/emdat_db/. Accessed 10 Sept 2021.

Fekete, A., & Sandholz, S. (2021). Here comes the flood, but not failure? Lessons to learn after the heavy rain and pluvial floods in Germany 2021. *Water, 13*(21), 3016.

IDNDR (International Decade for Natural Disaster Reduction). (1994). Yokohama strategy and plan of action for a safer world. Guidelines for natural disaster prevention, preparedness and mitigation. http://www.unisdr.org/we/inform/publications/8241. Accessed 20 Oct 2021.

Ince, J. (1888). *Ince's Kashmir handbook: A guide for visitors, re-written and much enlarged by Joshua Duke*. Thacker, Spink and Co.

Jammu and Kashmir state archives, Council Records, Ref 15842

Jones, E. J. (1885). Notes on the Kashmir Earthquake of 30th May 1885. *Records of the Geological Survey of India, 18*(3), 153–156.

Kamidohzono, S. G., Gomez, O. A., & Mine, Y. (2015). *Embracing human security: New directions of Japan's ODA for the 21st century*. JICA Research Institute Technical Report no. 94. http://jicari.jica.go.jp/publication/assets/JICA-RI_WP_No.94.pdf. Accessed 10 Oct 2021

Kelman, I., Field, J., Suri, K., & Bhat, G. M. (2018). Disaster diplomacy in Jammu and Kashmir. *International Journal of Disaster Risk Reduction, 31*, 1132–1140.

Khoihami, P.G.H. (1885). *Tarikh-i-Hassan*. Persian manuscript. Vols. I–II, folios 511 and 263. Srinagar, India: Research & Publication Division, Srinagar Library, University of Kashmir.

Konrad, C. P. (2003). *Effects of urban development on floods*.

Kulkarni, A., Patwardhan, S., Kumar, K. K., Ashok, K., & Krishnan, R. (2013). Projected climate change in the Hindu Kush–Himalayan region by using the high-resolution regional climate model PRECIS. Mountain Research and Development, 33(2), 142–151.

Lal, M. (2002). *Possible impacts of global climate change on water availability in India. Report to Global Environment and Energy in the 21st Century* (pp. 5–25). Indian Institute of Technology.

Lawrence, W. R. (1895). *The valley of Kashmir*. H. Frowde.

Lechat, M. F. (1990). *The international decade for natural disaster reduction: background and objectives*. Blackwell.

Masson-Delmotte, V., Zhai, P., Pirani, A., Connors, S. L., Péan, C., Berger, S., ... & Zhou, B. (2021). Climate change 2021: the physical science basis. *Contribution of working group I to the sixth assessment report of the intergovernmental panel on climate change, 2*.

McCarthy, J. J., Canziani, O. F., Leary, N. A., Dokken, D. J., & White, K. S. (Eds.). (2001). *Climate change 2001: impacts, adaptation, and vulnerability: contribution of Working Group II to the third assessment report of the Intergovernmental Panel on Climate Change (Vol. 2)*. Cambridge University Press.

Mehran, D. (2015). Food shortages in Kashmir: Response of society. *Journal of Central Asian Studies, 22*.

Mool, P. K., Maskey, P. R., Koirala, A., Joshi, S. P., Wu, L., Shrestha, A. B., et al. (2011). Glacial Lakes and Glacial Lake Outburst Floods in Nepal. *Icimod*, 1–109.

Neve, A. (1885). The late earthquake in Kashmir. *Lancet, 126*(3236), Article 455.

Rai, M. (2004). *Hindu rulers, Muslim subjects: Islam, rights, and the history of Kashmir*. Princeton University Press.

Ram, P. B. (1895). Report on the administration of the Jammu and Kashmir State for 1892–93. .

Ram, G. (1928). *Floods in Jammu and Kashmir. Jammu and Kashmir government flood management report*. Published by the State Government.

Ren, Y. Y., Ren, G. Y., Sun, X. B., Shrestha, A. B., You, Q. L., Zhan, Y. J., et al. (2017). Observed changes in surface air temperature and precipitation in the Hindu Kush Himalayan region over the last 100-plus years. *Advances in Climate Change Research, 8*(3), 148–156.

Romshoo, S. A., Bashir, J., & Rashid, I. (2020). Twenty-first century-end climate scenario of Jammu and Kashmir Himalaya, India, using ensemble climate models. *Climatic Change, 162*(3), 1473–1491.

Saleh, S. F., Rather, F. F., & Jabbar, M. J. (2017). Floods and mitigation techniques with reference to Kashmir. *International Journal of Engineering and Computer Science, 7*(4), 6359–6363.

Shi, P., Li, N., Ye, Q., Dong, W., Han, G., & Fang, W. (2010). Research on integrated disaster risk governance in the context of global environmental change. *International Journal of Disaster Risk Science, 1*(1), 17–23.

Sun, X. B., Ren, G. Y., Shrestha, A. B., Ren, Y. Y., You, Q. L., Zhan, Y. J., et al. (2017). Changes in extreme temperature events over the Hindu Kush Himalaya during 1961–2015. *Advances in Climate Change Research, 8*(3), 157–165.

UNISDR (United Nations International Strategy for Disaster Reduction). (2005). *Hyogo framework for action 2005–2015: Building the resilience of nations and communities to disasters*. www.unisdr.org/files/1037hyogoframeworkforactionenglish.pdf. Accessed on 14 Sept 2021.

UNISDR (United Nations International Strategy for Disaster Reduction). (2012a). *Milestones in the history of disaster risk reduction—yearly archives*. http://www.unisdr.org/who-we-are/history. Accessed on Sept 2021.

UNISDR (United Nations International Strategy for Disaster Reduction). (2012b). *Milestones in the history of disaster risk reduction—yearly archives*. http://www.unisdr.org/who-we-are/history. Accessed 03 Jan 2022.

UNISDR (United Nations International Strategy for Disaster Reduction). (2015). *Sendai framework for disaster risk reduction 2015–2030*. http://www.wcdrr.org/uploads/Sendai_Framework_for_Disaster_Risk_Reduction_2015-2030.pdf. Accessed on 10 Jan 2022.

Venugopal, R., & Yasir, S. (2017). The politics of natural disasters in protracted conflict: the 2014 flood in Kashmir. *Oxford Development Studies, 45*(4), 424–442.

Wani, G. F., Ahmed, R., Ahmad, S. T., Singh, A., Walia, A., Ahmed, P., ... & Mir, R. A. (2022). Local perspectives and motivations of people living in flood-prone areas of Srinagar city, India. *International Journal of Disaster Risk Reduction, 82*, 103354.

Yan, L., & Liu, X. (2014). Has climatic warming over the Tibetan Plateau paused or continued in recent years. *Earth Ocean and Atmospheric Science, 1*(1), 13–28.