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**Comprehensive Advanced Specific Summarised Studies
-For Architecture Studies (CASS Studies)
(An Official Publication of Bureau For Health & Education Status Upliftment)**

**Strengthening Governance for Effective Urban Flood Management:
A Comparative Study**

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ABSTRACT:

Effective urban flood management needs strong governance. In developing countries, weak systems cause poor coordination and low flood awareness, especially in dry regions. European countries have good flood management with advanced systems and strong policies. Southeast Asian cities often lack the ability to manage floods well but are working to improve. India has a complex flood management system with many agencies, like the Central Water Commission and National Disaster Management Authority. Despite existing laws, coordination and effective flood management are challenging. This study reviews India's framework and suggests legal reforms to better manage urban flash floods. Globally, disaster risk and climate change are often handled separately, causing gaps in responsibilities and funding. There are many differences in how countries manage flood risks. Most laws focus on water resource management and general disaster risk, with few specifically on flood risk assessment. The study highlights the need for better integration of flood risk management and climate adaptation in national laws. Many laws are reactive, made after floods occur, rather than proactive. A holistic approach is essential. In India, flood management includes state and central government efforts with initiatives like the National Water Policy, AMRUT, and the Flood Management and Border Areas Programme. Despite these, effective coordination is still a challenge. The study emphasizes the importance of strong governance for managing urban floods, especially in developing countries, and calls for integrating flood risk management and climate adaptation into national laws to proactively tackle urban flooding.

Keywords: Urban flooding; Institutional framework; Flood management; Flood governance; Flash floods; Disaster management

Access this Article Online

Website: <https://heb-nic.in/cassarc>

Received on 29/05/2024

Accepted on 01/06/2024

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Quick Response Code:



1.0 Introduction:

Effective urban flood management heavily relies on robust governance structures. In many developing countries, weak institutional frameworks often lead to overlapping responsibilities, poor coordination, and insufficient flood awareness. This is particularly challenging in arid and semi-arid regions, where flood events are infrequent, and public and institutional awareness is low. Many European countries have well-established flood management frameworks that include advanced forecasting systems, robust infrastructure, and comprehensive policies integrating flood risk management into urban planning. In Southeast Asia, cities often lack the institutional capacity to effectively manage urban flooding. Efforts are being made to build local capacities and integrate flood adaptation solutions into spatial planning and urban design (Bloch et al., 2014). India presents a complex case with multiple agencies involved in flood management, such as the Central Water Commission (CWC) and the National Disaster Management Authority (NDMA). Despite existing policies and laws, challenges remain in terms of coordination among various governmental levels and effective implementation of flood risk reduction measures in urban areas. National flood legislation plays a crucial role in determining how flood risks are managed. The current study provides a literature review on the need of reformation in the existing legal framework for flash flood management mainly for the urban areas. The study provides an in depth scenario of Indian Institutional framework in this context

2.0 Literature Review: Legal Framework for Flash Floods management An International Scenario

Disaster risk management and climate change are often considered as separate issues in national laws, which can lead to gaps in institutional ownership, responsibilities, and allocated budgets (Mehryar & Surminski, 2021). Studies by Arnold (1988), Hartmann and Albrecht (2014), England (2019), Spray et al. (2009), Howarth (2002) examine the impact of national laws on flood risk management (FRM) in countries such as the US, Germany, Australia, Scotland, the Netherlands, and England and Wales. Additionally, there are legal analyses focusing on related sectors, such as national water laws (Hobbs, 1997; Howarth & McGillivray, 2002; Van Rijswijk et al., 2012) and environmental laws (Howarth, 2017; Stallworthy, 2006; Thornton, 2018). Flood risk governance exhibits significant variation across different countries

and regions. These variations are due to their different historical, cultural, political and social background, as well as the magnitude and actual impacts of flood risks encountered.

Traditionally most laws are focussed on water resource management and natural resource management (Lemon and Agrawal, 2006). There are very meagre laws specifically on Flood risk assessment . (Mehryar and Surminski, 2020). There is a critical need for improved integration of flood risk management (FRM) and climate adaptation strategies (IFRC, 2019). Also many laws arise as reactive measures following major flood events, rather than through proactive, re-emptive policymaking.

Thus there is an urgent need for pre-emptive and proactive governance measures to be incorporated into national legislation (Surminski et al., 2016). It is essential to adopt a holistic perspective on FRM and climate adaptation (Surminski & Szoenyi, 2019). Mehryar and Surminski (2020) conducted a study on the typology of laws in several countries (Table 1) and discovered that most laws are concentrated on water resource management (29%) or broader disaster risk management (25%). Other laws are centred on natural resource management (13%), climate change adaptation (9%), and land use and spatial planning (9%). Notably, only 4% of the laws are specifically dedicated to flood risk management strategies.

Table1: Typology of laws in several countries

S.No	Typology of Law	Related Issues	Acts/Laws
1	Water resource management laws	Issues related to the water resource consumption, improving drainage systems and building watershed protection measures such as embankments and flood walls alongside the rivers	Water acts of Afghanistan (2009), Bangladesh (2013), China (1988), France (1992), Germany (2009), Honduras (2009), Indonesia (1974), Montenegro (2007), Poland (2001), and UK (2014).
2	Disaster Risk Management (DRM) laws	Issues related to the protection, mitigation and reduction of the multi-hazard risks	DRM acts of Bangladesh (2012), India (2005), Indonesia (2007), Myanmar (2013), and Pakistan (2010).

3	Flood risk management (FRM) laws	Laws are specifically about protection, prevention and control of flood risks	German ‘Act to Improve Preventive Flood Control’ (2005) and the US ‘Flood Disaster Protection Act of 1973’.
4	Natural resource management laws	Issues concerning conservation and preservation of the natural resources (non-water resources)	Albanian ‘Law on Protected Areas’ (2017), French ‘Law for Reclaiming Biodiversity, Nature and Landscapes’ (2016), and Nicaraguan ‘General Law on the Environment and Natural Resources’ (2014).
5	Land-use and spatial planning laws	Issues on management, planning, and governance of land-uses, development projects and property/land rights	‘Law about Spatial Planning’ in Indonesia (2007) and ‘The Building and Planning Act’ of Sweden (2010).
6	Climate change laws	Focus on strategies and actions for improving, adaptation and mitigation mechanisms	Climate Change Acts of Philippines (2009), Mexico (2012), New Zealand (2002), and Nicaragua (2009).

3.0 Criterion of distribution of roles and regulations in the laws related to Flood Risk Management

The involvement of different stakeholders across different countries varies from non-public actors (i.e. civil society, private sector and public-private partnerships) and local and regional governments (Mehryar and Surminski, 2020). The participation of different actors depends on the establishing or mandating the creation of a strategy, vision, policy, plan, regulation, assessment, criteria or guideline for flood risk management (FRM) in the national, regional and local levels. Table 2 highlights the involvement of different actors in different countries. Also flood risk management involves various organizations like departments, committees, boards, councils, institutes, and associations that handle different aspects of flood risk management (FRM), including operations and funding. Table 3 provides examples of structure of institutional framework for a few regions.

Table2: Involvement of different actors in different countries in fulfilling the vision, policy, plan, regulation, assessment, criteria or guideline for flood risk management

S.No	Involvement of non-public actors (i.e. civil society, private sector and public- private partnerships) and local and regional governments	Name of Countries
1	local government in addition to the regional/sub-national and national level government	UK, New Zealand, Pakistan and Philippines
2	engage communities (people, civil society and homeowners) in FRM activities.	Honduras, Philippines and USA
3	solely rely on defining the roles and responsibilities of the national government	Netherlands, Mexico and India

Table 3: Governing Bodies for Flood Risk Management in Selected Countries

S.No	Country	Institutional Framework Highlights	Source
1	UK	No single body; responsibilities shared among Defra, Environment Agency, Lead Local Flood Authorities, District/Borough Councils, Coast protection authorities, water/sewerage companies, Internal Drainage Boards, and Highways authorities.	Local Government Association https://www.local.gov.uk/topics/severe-weather/flooding/local-flood-risk-management/managing-flood-risk-roles-and
2	Germany	Complex framework with federal, state, and municipal governments having specific duties. Coordination through mechanisms like LAWA; federal government sets general standards.	Hartmann & Albrecht (2014); Bubeck et al. (2012, 2017)

3	Belgium	Highly fragmented framework with watercourse categories managed by different entities. Coordination via the Coordination Committee on Integrated Water Policy (CIW); regionalizing aspects of FRM responsibilities.	Mees et al. (2016)
4	Pakistan	Federal Flood Commission (FFC) is the principal body, with roles also played by Provincial Irrigation and Drainage Authorities, Pakistan Water and Power Development Authority, Emergency Relief Cell, military forces, and NGOs.	Khan (2009)
5	China	Unified management by the Ministry of Water Resources (MWR) with seven River Basin Commissions. Hierarchical structure from MWR to local Water Resources Bureaux at provincial, prefecture, county, and village levels.	WMO/GWP Associated Programme on Flood Management
6	Australia	Involves multiple stakeholders: State Emergency Service (SES), emergency response agencies, insurance industry, catchment management authorities, and local communities.	Thomalla & Robin (2013)

4.0 Institutional Framework for Flash Flood Management: National Scenario

In India, flood management operates under a two-tier system: State Level Mechanism and Central Government Mechanism (Tarun Ghawana, 2015). The State Level Mechanism includes the Water Resources Departments, State Technical Advisory Committee, and Flood Control Board, with Irrigation and Public Works Departments managing flood-related issues in some states. The Central Government supports state efforts through various organizations and expert committees. Established in 1945, the Central Water Commission (CWC) focuses on flood control, water conservation, and resource utilization nationwide. The Brahmaputra Board, created under the Brahmaputra Board Act of 1980, oversees flood management in the Brahmaputra and Barak Basins. The Ganga Flood Control Commission (GFCC), founded in 1972, develops comprehensive flood control plans for the Ganga Basin. The Farakka Barrage Project Authority handles anti-erosion and riverbank protection near the Farakka Barrage.

Additionally, the National Disaster Management Authority (NDMA), established in 2005 under the Prime Minister's chairmanship, aims to prevent and mitigate disaster effects, including floods, and ensures a coordinated disaster response (Table 4).

Table 4: Functions of National Disaster Management Authority (NDMA), India

S.No	Function
1	Lay down policies on disaster management.
2	Approve National Plan.
3	Approve plans by Ministries or departments in line with the National Plan.
4	Provide guidelines for State Authorities to create State Plans.
5	Provide guidelines for integrating disaster prevention/mitigation into development plans.
6	Coordinate enforcement and implementation of disaster management policy and plans.
7	Recommend funding for disaster mitigation.
8	Support other countries affected by major disasters as determined by the central government.
9	Take measures for disaster prevention, mitigation, preparedness, and capacity building.
10	Set policies and guidelines for the National Institute of Disaster Management.

5.0 Government's Initiatives and Policies on Floods

After the unprecedented floods of 1954, the Government of India launched several initiatives and formed committees to study and address the problem of floods:

- Policy Statement (1954): The Union Minister for Planning, Irrigation, and Power presented statements to Parliament outlining objectives to manage and contain floods.

- High Level Committee on Floods (1957) & Policy Statement (1958): This committee made several recommendations, emphasizing that absolute flood immunity is unattainable and suggesting floodplain zoning, flood forecasting, and integration with other water plans.
- National Flood Commission (Rashtriya Barh Ayog) (1980): The commission provided 207 recommendations covering data collection, legislation, flood damage reporting, and a comprehensive approach to flood management.
- Expert Committee on National Flood Commission Recommendations (2003): Chaired by Shri R Rangachari, this committee reviewed implementation and highlighted the need for realistic flood damage assessment and better management of flood plains.
- National Water Policy (1987/2002/2012): This policy emphasized flood management through flood cushions in water projects, non-structural measures like flood forecasting, and strict regulation of activities in floodplain zones.

5.1 Other Major Initiatives

- Atal Mission for Rejuvenation and Urban Transformation (AMRUT): Launched in June 2015, AMRUT aims to transform urban infrastructure, providing essential services like water supply and sewerage, which also aid in flood control.
- Flood Management and Border Areas Programme (FMBAP): Approved by the Union Cabinet in 2021, this centrally sponsored scheme has a total outlay of Rs. 4,100 crore for 2021-26, with Rs. 2940 crore allocated for critical flood control works, including anti-erosion and drainage development.
- Committees and Policies: The government has established several committees, such as Rashtriya Barh Ayog and Task Force 2004, and framed National Water Policies in 2002 and 2012 to manage and optimize water resources.

6.0 Conclusion

The study highlights the importance of strong governance in urban flood management, particularly in developing countries where weak institutional frameworks lead to overlapping responsibilities, poor coordination, and low flood awareness. In contrast, many European countries have robust flood management systems integrating advanced forecasting, infrastructure, and comprehensive policies. Southeast Asian cities struggle with institutional capacity but are working to integrate flood adaptation into urban planning. India, with agencies like the Central Water Commission and the National Disaster Management Authority, faces

challenges in coordinating flood risk reduction despite existing policies. The study reviews international legal frameworks, emphasizing the need for integrating flood risk management and climate adaptation into national legislation to address these challenges proactively.

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