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Urban Flood Resilience: Risk and Business Continuity Management Systems Strategic Approach

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Abstract
Climate change and expanding urbanization present significant challenges for urban planning in attaining sustainable urbanization and development. Rapid and continual urbanization exacerbates flooding by increasing the number of impervious surfaces and altering flow paths. Flooding episodes and the risk they provide in metropolitan areas are a severe problem with global consequences.

Urban areas require a resilience-based risk management approach to build capacity, adapt, and minimize flood risks, which have negative consequences for infrastructure, health, and the environment, including roads, buildings, and homes, as well as disrupt transportation routes and commercial supplies.

I propose an alternative planning and managerial strategy for urban flood hazard management based on urban risk management frameworks, which combines risk management and continuity management systems to address urban system vulnerabilities through environmental changes. Using best practices throughout project design and implemen-tation can improve operational efficiency, including the community, and link risk assessment processes with disaster recovery efforts.

Keywords: Urban Development, Urban floods, Flood Risk, Clean Water, Sanitation, Flood Resilience, Urban Flood Risk Manage-ment, Continuity Management Systems

Introduction

Flooding is the most common occurring catastrophe in the world, with far-reaching and significant consequences for public health [1]. The impacts can be classed according to how they usually show after being exposed to a flood event. Flooding has increased in severity and frequency, putting densely populated urban areas in a changing environment at danger, increasing vulnerabilities and causing compound failures, resulting in network robustness, instability, and cat-astrophic collapse in road transportation networks [2- 4].

Climate change impacts worsen existing risks and increase vulnerabilities; thus, urban flood hazard management to environmental change affecting urban areas becomes a valuable asset for understanding such threats and assimilating the necessary knowledge and information to develop strategies and solutions to those problems [5, 6].

To lessen the risks posed by climate change impacts, there is an increasing demand for strategic planning and flood risk management that prioritizes a proactive approach to resilience over a reactive strategy and management that relies on previous tracking events to adapt. Currently, flood-reduction methods include dams, and channelization [7, 8].

However, these activities neglect the inherent uncertainties that come with human-nature interactions. Furthermore, climate change exacerbates the vulnerabilities of the urban system and its subsystems, making it an unreliable method for reducing flooding dangers or preventing flooding in the long run [9, 10].

Integrated disaster risk preparedness involves recognizing, identifying, and assessing flood risks through a systematic approach that includes risk assessment, prevention, mitigation, and preparation [11, 12]. Risk management strategies provide a semi-structured framework for action, allowing simple and complex structures to operate without con-straints. International standards are ideal for addressing risk as they require no reservations [13-15].

Academics, engineers, planners, decision-makers, and government officials are concerned with efficiently preventing and managing flooding and promoting sustainable regional development [16]. The risk management theoretical framework highlights the importance of using a systemic risk management approach to urban systems to discover var-iables that make them robust and resilient [17, 18].

Furthermore, business continuity management (BCM) offers a succinct plan for preparing the megacity to deal with disruptive situations that might otherwise prohibit it from meeting its goals to achieve resilience. This international standard can significantly reduce risk, particularly when a lack of awareness and a concrete strategy in a continuity management plan after the flood disaster or impact affects the megacity operations [19, 20].

The article thus provides unique frameworks for analyzing specific urban resilience concerns in urban areas across their several dimensions, including society, economics, environment, health, and infrastructure. The urban assessment and strategy demonstrate how numerous urban features can be defined using exposure and vulnerability to be combined into a unified, multidimensional model. To limit flood risk and damage, it is critical to use a comprehensive approach that minimizes exposure, reduces susceptibility, and increases flexibility. Flood risk reduction plans require a holistic approach that addresses unpreparedness concerns to transition from vulnerability to resilience.

Materials and Methods

In examining these complex issues, the study looked across real and hypothetical instances, discriminating between geographic, demographic, and socioeconomic factors. The literature used in this narrative review was sourced from Google Scholar, PubMed, Nature, and books produced by scholars on urban planning, risk management, and climate change impacts in urban areas. The literature search was carried out using terms such as “Sustainable urban drainage”, “Urban development”, “Urban floods”, “Flood hazards”, “Urban Risk Management”, Risk management strategies”, “Business Continuity” and “Flood Resilience”.

Only peer-reviewed English-language articles published between 2010 and 2024 were included in the literature search.

Limitations

The constraints associated with research on urban infrastructure systems in low- and middle-income countries (LMIC) in the context of flood events must be acknowledged. Furthermore, there is a notable deficiency in spatial data, as well as in the observation of discharge and other hydrological parameters, including surface water storage in rivers, lakes, reservoirs, and wetlands.

Urban Flood Risks

Flooding is referred to as water rushing onto previously dry land. Flooding is commonly associated with significant rainfall; however, it can occur in a variety of ways that are unrelated to current weather conditions. Water depth, flow velocity, matter fluxes, and temporal and spatial dynamics all contribute to the unique characteristics of each flood event [21].

Presently, 56% of the world's population (4.4 billion people) lives in cities. The current pattern is predicted to continue, with the urban population more than doubling by 2050, when approximately seven out of every ten people will reside in cities Climate change, urbanization, and aging infrastructure are all contributing to future flood danger, making ur-ban flooding one of the most pressing worldwide concerns of the twenty-first century. [22-24].

Managing urban flood risk is difficult due to the wide range of factors that contribute to the hazard, which include physical procedures, human actions, population density, and the multifaceted geomorphological nature of the ur-ban terrain [25-27]. Nonetheless, the most significant flood hazards are as follows:

- Health concerns, water pollution, and disease transmission via contaminated floodwater, standing water, and other sources.
- Social consequences due to damage to infrastructure, and loss of life
- Transport infrastructure, industrial, service, commercial, and land use
- Power grid and communication networks [28-30].

Rainstorms and floods have emerged as catastrophic weather events threatening urban social and economic growth, as well as the safety of people's lives and property [31, 32]. Many researchers have noted that as urban growth accelerates, the frequency of urban floods increases, as does their impact on cities [33, 34]. Figure 1 shows that the frequency of global flood disasters has increased during the past three decades.

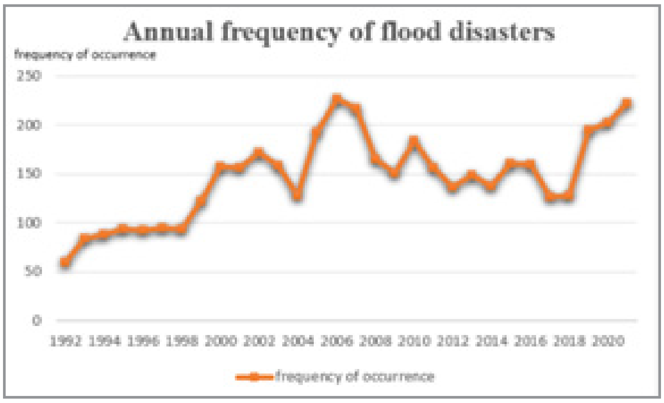

Figure 1: Annual frequency of flood disasters (Li, et. al., 2022) [34].

The gravity of these catastrophic flood events transfers to urban areas as the dynamics of urbanization lead to an insuf-ficiency of drainage facilities, despite new investments aimed primarily at the flood danger rather than the mitigation of vulnerabilities [35]. Several factors contribute to cities' increased vulnerability to flooding events. The quicker road to building infrastructures that suit the expanding needs of cities delays the requirements for undersizing and puts a strain on financial output. Urbaniza-tion also causes increased runoff due to surface waterproofing, which can clog natu-ral drainage channels [36-38].

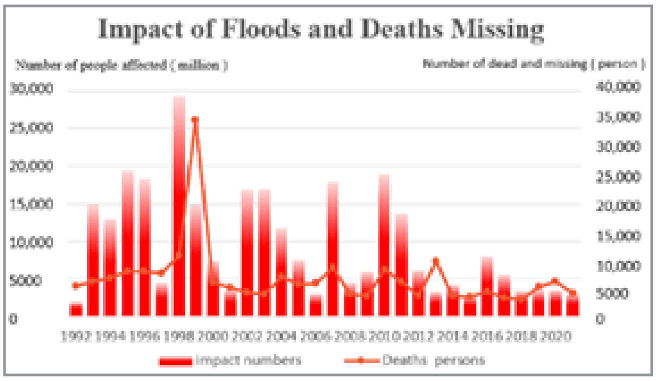

Figure 2: Number of dead, missing, and affected by floods, 1992–2021. (Li, et. al., 2022) [34].

Flood Risk Management

Risk management is the process of identifying potential alter-natives, managing them, and taking necessary action to avoid undesirable consequences. It emphasizes the measurable nature of events and consequences, including probabil-ity, quality, and quantity [39]. These descriptions are also applicable to climate change hazards and extreme weather events. A comprehensive risk management framework addresses issues with planning, strategy, operations, finance, and governance. It considers the specific needs of running departments and operations, as well as the potential impact of concurrent threats and occurrences [40-42].

A risk management and continuity management system ap-proach to flood threats consists of two parts:

1. The first phase is the proactive stage that involves risk as-sessments, hazard prevention and mitigation, structural and non-structural preparedness, disaster management policies and programs, risk monitoring, protection and rescue plans, citizen education and training, warning and information systems, and hazard analysis and evalua-tion [43, 44].
2. The second phase (reactive) involves taking actions to help flood victims and minimize damage. The operations carried out at that point are known as immediate disaster response measures. It encompasses all strategic, opera-tional, tacti-cal, and technical actions to protect and rescue individuals and property from immediate or long-term threats. The aforementioned methods are aimed at ensuring the contin-uation of operations to preserve lives, identifying who is in control, developing a shelter-in-place strategy, identifying an alternate location, taking ac-tions to prevent property damage, and increasing the recovery rate in the shortest fea-sible period [45, 46].

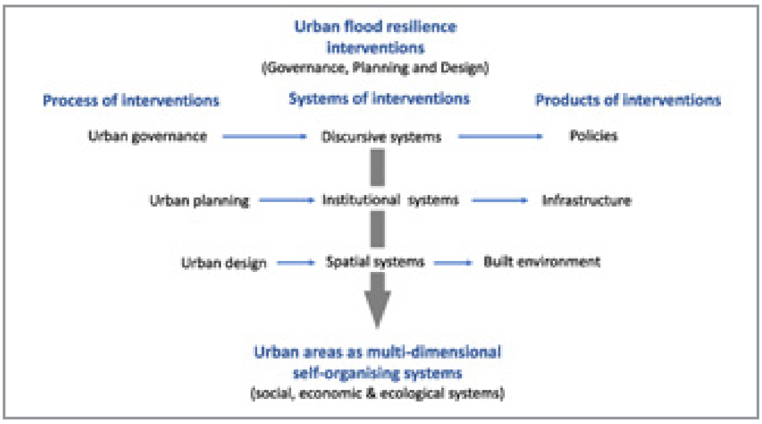

Figure 3: Urban flood resilience interventions (Mai, et al., 2020) [48]

Figure 1 depicts nested levels of urban systems, entry points for urban resilience interventions, and the results of those actions. The junction of the nested layers and the many self-organizing systems (social, economic, and ecological) of urban regions defines the multidimensional arena in which urban flood resilience interventions are executed [47, 48].

A risk-based strategy seeks to reduce flood risk by identifying various hazards such as risks, vulnerabilities, and expo-sures [49]. Risk is the likelihood of an unsafe situation or event occurring in a specific location. Vulnerability is the po-tential harm caused by the event, while exposure is the presence of the goal in the area where the hazardous event oc-curs [50, 51].

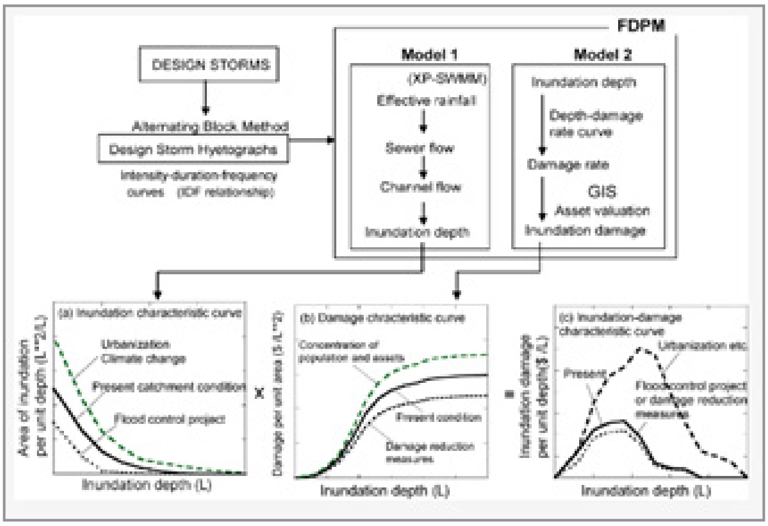

Figure 4: Flood damage prediction model (upper) and three curves for flood damage characteristics (lower): (a) Inun-dation characteristic curve; (b) Damage characteristic curve; and (c) Inundation-damage characteristic curve (Puia, & Potts, 2021) [51].

To identify the vulnerabilities of urban systems, cities must develop strategies with clear objectives. These strategies are based on regulations and compliance that direct away from and reduce the risks that increase vulnerabilities. The pre-vention and alleviation of those threats become part of the urban agenda, which emphasizes measures of outcomes and community sustainability [52-54]. As the population of urban settlers grows fast around the world, the social compo-nent of this plan becomes critical to equitable growth because infrastructure is of significance to society and community resilience [55, 56].

Risk Management Framework for Flood Hazards in Urban Areas

To identify the objectives of a risk management assessment, the study's location and scope, as well as the operational procedures in the region under threat, must be determined. A risk assessment aims to identify and study hazards to explain the activities necessary to achieve the following objectives:

- The possible impact on (that is, damage to)
- A specific value (e.g., the house) from
- A frightening process (flood) [57].

Risk criteria also represent a major concern for the framework. To calculate an acceptable risk level, examine both the likelihood and consequence scales, as well as their combination in present circumstances [58]. City leaders and stake-holders should prioritize tackling bearable and intolerable hazards based on local conditions. Governments increas-ingly utilize risk modeling to assess exposure to natural catastrophes and crises [59, 60]. Assessing and analyzing vari-ous sorts of risks from bad consequences is critical to understanding and mitigating their effects, as well as recovering rapidly after the event has occurred on the balance of probabilities. There are three main risk modeling approach in-puts:

- **Hazards:** Climatic events affecting a region might create uncertainty about hazard occurrences and exposure in the affected area. An understanding of previous flooding occurrences in a local or global context provides a real sense of the severity and frequency with which those events are expected to occur.
- **Exposure:** Mapping the land affected by a flood event is crucial for determining exposure. Accounts for human occupation and physical assets must be completed. To differentiate exposure; identify specific components such as physical shape, economic value, human profession, and location.
- **Vulnerability:** The level of hazard closely correlates with the vulnerability of exposed elements. Flood hazards can be classified and studied based on the intensity and frequency of their impacts. Hazard parameters can be determined by examining and comprehending event logs and risk modeling probabilities. The nature, scale, frequency, and intensity of the hazard can all be used to estimate its severity. Hazard models, with clearly communicated assumptions, can provide a comprehensive understanding of environmental dynamics and evolution, including issues like urbanization and climate change [61-63].

The Different Phases of Risk

Risk management can identify distinct stages of risk and provide assessment tools to discover interdependencies among the many departments in the urban system. The risk identification framework is recursive and may be examined fre-quently [64]. The IPCC has supported four generations of risk management systems. These phases facilitate the processes of analyzing and evaluating the vulnerability of disaster-causing factors and disaster-bearing bodies that may pose poten-tial threats or injuries to life, property, livelihoods, and the environment on which humans rely, as well as determining the nature, scope, and loss of flood risks [65, 66].

- The first and second generations explore climate change concerns and analyze associated risks and implications.
- The third generation explores the nature of adaptation.
- The fourth generation focuses on evaluating and managing risks [66].

A fifth generation might also be suggested, which would highlight the benefits of adaptation and create frameworks for assessing such benefits for improvement [67]. To identify risk management techniques for assessing flood threats, cli-mate change consequences, and adaptation solutions, consider the following steps:

1. A scoping effort to determine the context of the assessment. This describes the overall plan to be followed and es-tablishes relationships between stakeholders and experts.
2. The risk identification process defines scenario development requirements and prioritizes actions.
3. Risk analysis is the process of analyzing the repercussions and their likelihood. This is a well-developed discipline, with numerous ways for conducting impact assessments.
4. Risk evaluation prioritizes adaptation and mitigation techniques.
5. Risk management involves implementing appropriate adaptation and mitigation measures.
6. Monitoring and review involve assessing measures and making decisions to reinforce, reconsider, or restart the risk assessment process [67, 68].

Interdependence cannot always be expected; thus, emergency managers and business continuity planners must use tools to discover them. Risk management affects organizational structure and culture in the event of a disaster to make cities more resilient.

Flood Risk Resilience

Flood risk interventions will differ depending on the present condition of the urban system, its resistance to impacts, how stakeholders define resilience for the specific project at hand, and which parts of resilience must be enhanced to reduce urban climate vulnerability. The World Bank (2023) issued a list of key features for urban system resilience. The complexity associated with climate change projections, as climate conditions become more varied and dynamic, is a barrier to urban system adaptation. This high level of unpredictability necessitates developing new techniques that consider the dynamics of flood hazards. As a result, typical risk management approaches are insufficient to address flood-related consequences. Table 1 displays these features for urban system resilience, which can be tailored to the specific conditions of the metropolitan region to help build adaptation plans that will boost resilience [69, 70].

Table 1: Key capacities to build urban climate resilience in infrastructure (Ospina, et al., 2022; World Bank, 2023) [70, 71].

Robustness refers to a city's ability to survive climate extremes and fluctuation while maintaining its operations, processes, and infrastructure.
Redundancy refers to having extra resources available in case of an emergency, such as numerous water pipes serving a single site.
Learning involves acquiring knowledge and abilities to innovate, adapt, and improve performance, while also exploiting current knowledge to build resilience.

Flexibility pertains to a system's ability to adapt to uncertainties and problems. Consider adjusting infrastructure development plans following a disruptive extreme event.
Inclusion means providing women and underprivileged groups with skills and resources during times of crisis in order to promote equality.
The process of self-organization describes the ability to operate autonomously and reorganize functions and processes in response to events or stressors, diagnose issues, assess objectives, and deploy assets.

Low- and middle-income countries (LMICs) account for 89% of the global flood-prone population. Sub-Saharan Africa is home to 44% of the 170 million people who are at danger of severe flooding and live in extreme poverty. Over 780 mil-lion people live on less than $5.50 a day and are at risk of flooding [72, 73]. However, some LMICs have launched groundbreaking programs to address the effects of climate change and alleviate the damaging effects of floods. Lusaka, Zambia, has implemented various solid waste management projects as part of the Cities Race to Resilience initiative [74]. This capital city faces frequent flooding, particularly during the wet season. Furthermore, Lusaka is undergoing tremendous population growth, with an expanding peri-urban population living in informal settlements. The city's 70% population resides in uncontrolled regions, making waste management a significant challenge in managing flood-related risks [75]. The accumulation of urban waste from informal settlements often results in blocked drains, which worsens flood risk. This in turn can result in standing water, which increases the risk of water-borne disease out-breaks, such as cholera, presenting a high-level public health risk [76-80].

In the private sector, companies rely on one another in the same way that the public sector does. There are no business continuity plans in a vacuum. Private organizations' risk management and business continuity plans rely on public en-tities, whereas public agencies' emergency management measures rely on private organizations [81, 82]. For example, Lusaka has developed numerous solid waste management methods as part of the Cities Race to Resilience initiative. These programs' resilience in the face of more frequent heavy urban precipitation events is supported by initiatives like monthly city clean-ups, in which the mayor's office collaborates directly with ward councilors and communities to clear out drainage systems and reduce flooding risk. These interdependencies must be aligned and coordinated with a conti-nuity management system that enables the various departments and agents to collaborate and complement one another [70, 83].

Evaluating and advancing a flood hazard initiative in urban settings must consider the compounded effects of concur-rent hazards and extreme weather conditions. Incidents such as flooding and heatwaves can lead to simultaneous dis-ruptions or failures in services, creating complex threats that may affect various urban systems and their subsystems, thereby indirectly influencing the effectiveness of flood management programs. According to a World Bank report in sub-Saharan Africa urban areas (2023), even if a medical facility is not directly threatened by flooding, a storm could lead to increased demand for emergency services, damage to overhead electrical infrastructure, heightened need for climate-controlled spaces due to elevated heat and humidity, and a proliferation of breeding sites for vector-borne dis-eases. These considerations are crucial, as they can adversely affect the urban system's capacity to mitigate flood risks and respond to their consequences [70].

Developing Continuity Plans for Urban Flood Management

Organizational structure and community participation are critical considerations in urban resilience planning. Local governments can use these interconnections to interact with their communities, solve problems, and develop partner-ships. The city's preparation to implement a disaster and business continuity strategy to mitigate flood risks demon-strates its organizational resilience [84]. Researchers, policymakers, and urban water management practitioners must contend with integrating a flood-resilient continuity system into urban planning and management as climate change impacts become more severe [85, 86].

Decentralized adaptive management techniques involve municipal leaders and policymakers at all levels, from neigh-borhood to national, and are more effective than centralized top-down interventions, in addressing these difficulties [87]. A methodology known as business continuity planning entails creating and validating a plan to maintain opera-tions during and after disasters or disruptions. This strategy focuses on managing operational factors to ensure an entity can function efficiently after a disaster [88].

Figure 5 illustrates a risk matrix designed for an urban flood adaptation strategy aimed at enhancing climate resilience and mitigating impacts across various scenarios. For instance, integrating a multi-functional green space within urban planning can significantly bolster the resilience of residents by offering cooling effects on hot days and promoting the absorption of heavy rainfall, which in turn diminishes the likelihood of urban flooding [70, 89].

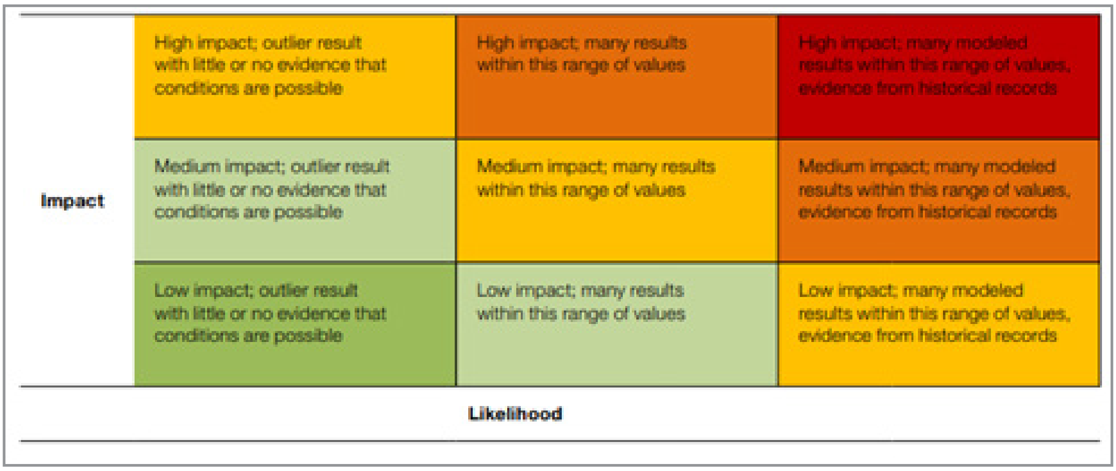

Figure 5: Urban Flood Risk Matrix.

The risk matrix serves as a tool for visualizing and quantifying the effects of flooding in the context of a risk manage-ment evaluation, commonly referred to as a "Flood Impact Analysis." Its primary objective is to assess the possible magnitude of flooding and its repercussions on infrastructure, structures, and communities, thereby facilitating more informed decision-making regarding mitigation strategies.

Resilience is defined as the ability to recover from physical, mental, and socioeconomic challenges. Restoring the built environment promptly after flooding reduces distress and disturbance caused by flooding [89]. Flood risk management and urban continuity management involve preparing an organization/nation to deal with disruptive situations that would otherwise hinder it from accomplishing its goals [90, 91]. The universal standard Business Continuity Manage-ment System (BCM) ISO 22301 defines the criteria for planning, establishing, implementing, operating, monitoring, reviewing, maintaining, and continuously improving a documented management system to protect against, reduce the likelihood of, prepare for, respond to, and recover from disruptive incidents [92].

Recovery planning focuses on giving resources to individuals in need while also increasing city resilience through re-silient building initiatives. Financial resources can come from several sources, such as contributions, disaster risk fi-nancing, insurance, community-based development projects, and social protection programs like cash-for-work trans-fers [93, 94]. These are significant steps that include numerous tasks that could be included in the design of the flood risk strategy's management system. First, the perceived usefulness is taken into consideration. We need to think about the perception of the framework's support from stakeholders who are significant to the intended users, as well as the awareness of the risk, which leads to a more optimistic outlook on the benefits of BCM [95, 96].

When planning and implementing a continuity management system plan, consider the following critical components:
• Policy • People with defined responsibilities • Management processes relating to: • policy • planning • implementa-tion and operation • performance assessment • management review • improvement. • Documentation providing au-ditable evidence • Any business continuity management processes relevant to the organization [97].

All vital sectors of the city must be recognized and kept operating or quickly recovered. Critical operations include life safety, environmental controls, communication networks, and supply chain management [98]. Information technology is a support function that is typically time critical [99]. Understanding the impact of disruptions over time requires identifying important functions and operations that have been affected by flooding [100, 101].

Furthermore, recognizing potential repercussions and evaluating when they begin to disrupt urban operations [102]. A flood impact analysis lays the groundwork for effective business continuity management. Assembling information aids in identifying vulnerable assets and processes, defining recovery timelines, determining resource needs, and develop-ing strategies [103, 104]. When implementing a continuity management program, it is critical to determine the severity of a threat based on criteria such as location, infrastructure, and political and economic conditions [105, 106]. To study flood threat data, start with a broad overview and then narrow down to specific details. Flood hazards, for example, can be recognized in the community's general area, disrupting power supply (e.g., power loss), and in building structures (e.g., faulty drainage and sewage systems) [107, 108].

Marolla (2018) provided guidelines for restarting normal operations after a catastrophic event. Seven basic activities outline how a city can maintain or restore critical operations. Quickly resuming normal activities after a flood is critical for recovery [109]. The following describes the essential method of operations for restoring the city's functionality:

- Create an emergency preparation team that includes federal, local, and organizational workers from all levels and departments. Prioritize those with critical expertise for quick recovery.
- Identify who is in control during a disaster risk occurrence and inform all employees.
- Identifying who is in command during a catastrophe risk

event is critical, and all employees must be aware of whom that person or position is. Create a succession plan for management in case a job or leader is unavailable due to floods.

- Investigate the city's operations and national status. Identify critical internal and external functions for departments, municipalities, telecommunication networks, and infrastructure to ensure recovery and continuity.
- Identifying a new location or jurisdiction for critical infrastructure operations is crucial.
- Collaborate with similar departments or the Public Building Commission to share facilities as needed.
- Determine how leaders and staff will be informed about the emergency plan and communication methods during a flood event. List the communication instruments in order of preference, emphasizing the most effective method of com-munication above the least effective based on the type and intensity of impact.
- The emergency contact list outlines how to contact staff in the event of a disaster, such as a power outage or flood-ing. It includes technical means for responding to restore operations and protect residents' well-being.
- Annually document and update your continuity management system plans [109, 110].

To quantify the benefits of a strategy, it's necessary to analyze all events that the alternative protects against and estimate how it minimizes the predicted loss for each impact [111, 112]. The risk management method reduces possible losses compared to the baseline. The impact of a crisis is determined by its scope and endurance. The net benefit of a strategy is calculated by subtracting the annual cost of the alternative from its benefit. Use sensitivity analysis to assess the impact of changes in cost, loss, and probability estimations on strategy selection [113, 114].

Establish a policy framework and implement processes that tailor laws and regulations. Low- and middle-income countries (LMICs), characterized by densely populated regions within limited geographic confines, offer a distinctive context for formulating flood risk management policies [115].

The prevalence of concrete infrastructure inhibits natural water runoff and percolation, and adequate drainage systems capable of managing severe rainfall are often lacking. A thorough master plan aimed at preventing and mitigating flood-related losses should adhere to specific guidelines for evaluating investments in climate resilience against flood-ing.

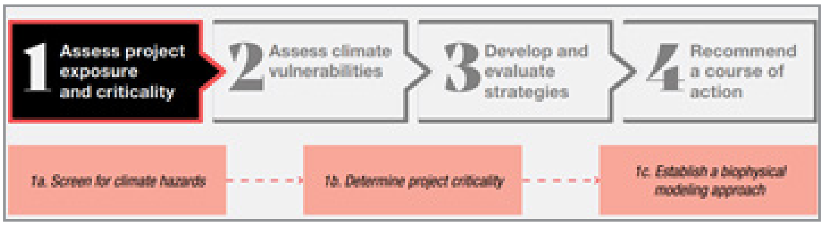

Figure 6: Urban Flood Risk Assessment Framework (Marolla, et al., 2023) [116].

Following the screening and evaluation of the flood project, which involves determining the required analytical com-plexity, the subsequent phase entails evaluating the project's susceptibility to flood-related hazards. In this context, vulnerability refers to the likelihood of project elements experiencing physical damage because of climate change. This vulnerability assessment is particularly crucial in informal areas of low- and middle-income countries (LMICs), espe-cially in slum environments, where the characteristics of informal settlements exacerbate and amplify risk factors [116].

The final phase of flood management involves the identification and implementation of effective and appropriate strategies, which encompass both direct measures—such as flood abatement, flood control, and flood alleviation—and indirect measures that can be either structural or non-structural. The subsequent evaluation aims to establish a compre-hensive strategy for effectively addressing the impacts of flooding, which includes the following components: As-sessing the immediate to medium-term physical, economic, environmental, and social consequences arising from spe-cific weather events.

- Analyzing vulnerability by investigating trends in impact indicators.
- Evaluating responses in terms of associated costs, distributional impacts, and overall efficiency.
- Identifying opportunities and methods for integrating climate risk considerations into local and regional policy-mak-ing [116, 117].

Flood management initiatives can typically be divided into categories such as recovery measures, flood alleviation, flood control, and flood relief. These initiatives may involve both structural and non-structural methods, contributing to the mitigation of floodplain activities [118].

Conclusion

Floods are not unpredictable, but they are commonly underestimated. To ensure effective and pragmatic management, it is crucial to prioritize flood forecasting and warning systems, as well as disaster management and evacuation prepa-rations in the event of a flood. Urbanization, modern human settlements, production, transportation, and insufficient urban planning and management have resulted in catastrophic occurrences linked to societal and technological devel-opments.

Flood risks are identified by examining the components of exposure, sensitivity, and adaptive ability, which have se-vere consequences for human life, health, economic loss, and environmental damage. The concept of risk has evolved from an expected value of the probability of a hazardous event and its consequences to an ontological or sociological term that accounts for the various socio-cultural components of disaster risks. This study offers an interdisciplinary definition of risk as the possibilities and consequences of negative repercussions for human life, health, property, or the environment. As a result, the goal of risk methods is not to uncover solutions but rather to provide guidelines that can help you locate such solutions while also building capacity and resilience.

This study aims to stimulate additional comparative research in low- and middle-income countries (LMICs) to facilitate mutual learning and the exchange of knowledge in the pursuit of urban flood resilience. This can be achieved either through the implementation of risk management programs or by conducting comprehensive cross-boundary case stud-ies and literature reviews. Furthermore, achieving a balance in the geographical focus of research initiatives, along with fostering interdisciplinary and transdisciplinary collaboration, is essential for generating knowledge that can lead to more effective strategies for enhancing flood resilience.

Highlights

- Climate change and increased urbanization pose problems for sustainable urban planning and development.
- Inadequate urban infrastructure makes cities more vulnerable to flooding.
- A multidimensional and comprehensive risk management methodology is proposed for mapping urban flood re-silience.
- This management technique adds quantitative and qualitative value to flood resilience assessments.
- Risk management and continuity systems include long-term resilience, loss recovery, and functional restoration.
- Integrating frameworks for incorporating flood resistance into the urban planning process.

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Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author.

Conflicts of Interest

The authors declare no conflicts of interest.

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