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Policy Frameworks for Sustainable Flood Management in the Urban Areas of Zamboanga City

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Abstract— *This study examines the policy frameworks designed to promote sustainable flood management in the urban areas of Zamboanga City, Philippines. Due to the city's susceptibility to regular and intense flooding caused by both natural and human factors, there is an immediate requirement for comprehensive and robust policy strategies to reduce these risks. The study examines current policies, their effectiveness, and the deficiencies that impede effective flood control management. The study offers a thorough analysis of the current policy landscape by employing a mixed-methods approach that combines qualitative and quantitative analyses. Conducting key informant interviews with government officials, urban planners, and community leaders, as well as surveys of affected residents, provides valuable insights into the complex challenges encountered by Zamboanga City. Additionally, the study examines secondary data obtained from scientific reports, government documents, and case studies of exemplary approaches used in other cities susceptible to flooding. The findings suggest that although there are multiple policies in existence and various land use regulations, their execution is frequently disjointed and lacks consistency. Furthermore, the study emphasizes the crucial significance of community involvement and cooperation among different parties, such as the local government unit (LGU), the non-governmental organizations (NGOs), and the private sector, in formulating and implementing flood management policies. A significant deficiency that has been identified is the city's restricted financial resources and technical capabilities, which hinder its capacity to implement more extensive and sophisticated flood management solutions. In order to tackle these difficulties, the study suggests a policy framework with multiple levels that focuses on incorporating green infrastructure, enhancing urban planning, and implementing advanced technologies like early warning systems and real-time data analytics. In addition, the creation of a centralized flood management office could improve coordination and streamline efforts among various administrative levels. The study emphasizes the necessity of implementing a comprehensive and flexible strategy for flood management in Zamboanga City. By synchronizing policies with scientific knowledge and practical circumstances, and by promoting robust institutional partnerships, sustainable flood management can be implemented as a viable and efficient approach to safeguard urban areas and bolster the resilience of the city's communities.*

Keywords— *Climate Change, Flood Management, Policy Framework, Sustainable, Zamboanga City.*

I. INTRODUCTION

Zamboanga City, a bustling urban center in the southern Philippines, has long grappled with the challenges of effective flood control management. Recurrent flooding events have plagued the city, causing significant disruption to the lives of its residents and the city's overall economic and social well-being. Due to the geographical location of the city and the effects of climate change, flood management has emerged as a key issue. The objective of this study is to examine the existing policies that are relevant to flood management in Zamboanga City and to determine any weaknesses or areas for improvement and provide practical suggestions for enhancing the flood management strategy. Flooding is one of the most significant concerns in the urban areas across the globe, and Zamboanga City which is situated on the southwestern part of Mindanao Island in the Philippines is not an exception. These floods in Zamboanga City occur frequently and are severe, hence leading to the destruction of property and interferences in social and economic activities of the residents. These events stress the need for reconsideration and improvement of current policies in order to develop a better and efficient system of flood control management. This study seeks to fulfill this gap by developing an extensive policy framework for Zamboanga City given its climatic, geophysical, and political environment. Thus, in Zamboanga City, urban flooding is a result of the climatic factors such as heavy rainfall and sea level rise and the anthropogenic factors like rapid urbanization, deforestation, and poor drainage system. The physical features of the city include coasts which are flat and close to sea level and rivers that are susceptible to floods making the city more vulnerable. Besides, Zamboanga City's socio-economic context, where a significant number of people live in informal settlements with inadequate access to flood resilience infrastructure, poses another challenge on flood management. Although there are some policies and plans that have been developed to tackle the characteristics of flood disasters, the implementation of these strategies is generally uncoordinated and ineffective. Some of the challenges include lack of coordination because the measures are fragmented, inadequate resources, and lack of participation of all the relevant stakeholders. Hence, an analysis of the existing policies and the creation of a comprehensive and coherent approach are crucial to increase the city's preparedness to floods.

The urban infrastructure, economy, and livelihoods of residents of Zamboanga City are all impacted by the recurrent issue of flooding. Sustainable flood management has emerged as a critical priority in light of the city's geographic location and the effects of climate change. The objective of this paper is to evaluate the existing policy frameworks that regulate flood management in Zamboanga City. The objective is to pinpoint any deficiencies or inefficiencies and suggest

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practical suggestions for the development of a flood management strategy that is both resilient and sustainable. Zamboanga City, situated on the southwestern tip of Mindanao Island in the Philippines, is no exception to the critical issue of flooding that affects urban centers worldwide. The severe and frequent flooding events in Zamboanga City have caused a significant amount of property damage, loss of life, and disruption of socio-economic activities. These occurrences underscore the necessity of reevaluating and improving current policies in order to establish a more sustainable and effective flood management system. This research study endeavors to address this need by investigating comprehensive policy frameworks that are specifically designed for Zamboanga City, taking into account its distinctive socio-political, geographic, and climatic context.

Climate factors, including torrential rains and rising sea levels, as well as anthropogenic factors, such as rapid urbanization, deforestation, and inadequate drainage systems, are the primary drivers of urban flooding in Zamboanga City. The city's vulnerability is further exacerbated by its geography, which is defined by low-lying coastal regions and rivers that are susceptible to overflow. Furthermore, the socio-economic structure of Zamboanga, which is characterized by a substantial proportion of the population residing in informal settlements with inadequate access to resilient infrastructure, exacerbates the challenges associated with flood management. The implementation of specific policies and plans that are intended to mitigate flood risks frequently lacks coherence and efficiency, despite their existence. The effectiveness of these measures is impeded by fragmented efforts, insufficient resources, and limited stakeholder collaboration. Consequently, it is imperative to develop a robust, integrated framework and conduct a critical examination of current policies in order to improve the city's resilience to flooding.

Urban areas face unique challenges in flood management due to their high population density, complex infrastructure, and altered hydrological systems. Tingsanchali (2012) highlights that urban flood disasters are particularly devastating due to the concentration of people, assets, and economic activities in cities. The author emphasizes the need for integrated approaches that combine structural and non-structural measures for effective flood management.

In the context of developing countries, Jha et al. (2012) argue that rapid urbanization often outpaces the development of adequate flood management infrastructure and policies. This mismatch leads to increased vulnerability, especially among low-income communities often situated in flood-prone areas. The authors stress the importance of proactive urban planning and land-use management to mitigate flood risks.

Effective flood management requires robust policy frameworks that address various aspects of flood risk reduction, preparedness, response, and recovery. Sayers et al. (2015) propose ten "golden rules" for strategic flood management, emphasizing the need for adaptive, integrated, and risk-informed approaches. These rules provide a useful framework for evaluating existing policies and developing new ones.

In the case of the Philippines, the enactment of the Philippine Taxation and Regulatory Act of 2010 (Republic Act No. 10121) marked a significant shift towards a more proactive and comprehensive approach to disaster management, including flood-related disasters (Congress of the Philippines, 2010). This law emphasizes the importance of local government units in disaster risk reduction and management, aligning with global trends in decentralized disaster governance.

Climate change adds another layer of complexity to urban flood management. Wilby and Keenan (2012) discuss the challenges of adapting to flood risks under climate change, highlighting the uncertainties involved and the need for flexible and robust strategies. They argue for a shift from traditional "predict and provide" approaches to more adaptive management strategies.

Gersonius et al. (2013) further explore this concept, proposing the incorporation of flexibility into water and flood risk infrastructure to deal with climate change uncertainty. This approach allows for adjustments and upgrades as new information becomes available, enhancing the long-term resilience of urban areas to flooding.

Effective flood management policies must also consider the role of community engagement and participatory approaches. Few (2003) argues that understanding local vulnerabilities and coping strategies is crucial for developing appropriate flood management interventions. The author emphasizes the importance of considering social and cultural factors in addition to technical solutions.

Maskrey et al. (2016) demonstrates the value of participatory modeling for stakeholder involvement in flood risk management. Their study shows that engaging local communities in the development of flood risk management options can lead to more effective and locally acceptable solutions.

The concept of urban resilience has gained prominence in recent years as a framework for addressing various urban challenges, including flooding. Meerow et al. (2016) provide a comprehensive review of urban resilience definitions and propose a unified conceptualization that emphasizes the ability of urban systems to maintain or rapidly return to desired functions in the face of disturbances.

Liao (2012) proposes a theory of urban resilience to floods, arguing for a shift from resistance-based to resilience-based flood management strategies. This approach focuses on enhancing a city's ability to live with floods rather than trying to eliminate them entirely, which may be increasingly difficult in the face of climate change.

The overall goal of this study is to formulate policies that can be used in the management of flood disasters in the urban areas of Zamboanga City. This study seeks to identify and compare successful flood management approaches from other urban areas with similar challenges in order to draw lessons and assess the current flood management policies, plans and regulations in order to determine factors that are constructive, destructive, beneficial and unfavorable. Lessons can be learned from the case of Zamboanga City in terms of frequent flooding to other urban areas with similar problems. This is

important to the overall discussion of urban resilience and sustainable flood management since it focuses on the policy aspect. This study provides a strategic framework and concrete actions to enhance flood preparedness and response for the use of policy makers, planners and other stakeholders. Also, the study aims to address the difference between policy making and policy execution in order to ensure that good strategies produce expected outcomes on the field.

Thus, based on the analysis of the current literature, it can be concluded that urban flood management requires a complex approach that implies the use of structural and non-structural measures. The structural measures such as retention basins, flood walls, and levees are used in controlling the flow of water and minimizing repercussions. Land use planning, awareness raising, warning systems, and policy measures are non-structural measures ("UNDRR – United Nations Office for Disaster Risk Reduction," 2022). Hence, a good flood management strategy will involve the consideration of the local context and resources and the use of both the structural and non-structural measures. This study revealed that stakeholder contribution and community involvement in flood management are crucial as indicated by various studies. The involvement of the communities in planning and decision making enables them to own the interventions and their effectiveness is boosted. Also, the concept of green infrastructure, such as urban wetlands, green roofs, and permeable surfaces, is gradually being integrated as a sustainable approach to conventional engineering systems. Besides the abovementioned flood prevention, these nature-based solutions bring about other positive impacts on the quality of life in urban areas and the conservation of species and habitats. Leanings from the best practices for flood management are presented in the case of New Orleans (USA), Rotterdam (Netherlands) and Mumbai (India). These cities have put in place an all-encompassing strategy that encompasses social, legal and physical measures. The experiences gained from the above global cases can be useful in the identification of relevant strategies for Zamboanga City.

II. METHODOLOGY

In order to achieve the study's objective of developing a sustainable policy framework for flood management in Zamboanga City, a combination of qualitative and quantitative data collection and analysis methods were employed. The methodology seeks to determine the current state of flood management practices, as well as the challenges and opportunities for implementation, the perspectives of stakeholders, and the lessons that can be learned from other cities.

In the document analysis phase, the study identified the existing policies, plans, and regulations regarding flood management in Zamboanga City. The documents include the Local Climate Change Action Plan (LCCAP), the Comprehensive Land Use Plan (CLUP), the City Disaster Risk Reduction and Management Plan (CDRRMP), as well as other relevant ordinances and executive orders. The analysis of these documents aimed to uncover the strengths, weaknesses, opportunities, and threats (SWOT) of the current policy environment, in line with the research objectives set for this study. In this manner, the existing methods, standards, and organizational frameworks and structures were introduced and clearly defined.

Officials from the city government, urban planners, community leaders, and representatives of NGOs participated in focus group discussions and semi-structured interviews. The purpose of these interviews was to gain insight into the challenges and limitations associated with the implementation, coordination, and capacity of institutions, as well as the financial and technical constraints. Additionally, the interviews aimed to identify the roles and responsibilities of the stakeholders involved, as well as to gather information on best practices and recommendations for the future. The study included a total of twenty (20) participants who were selected purposefully based on their roles and involvement in flood and urban planning management. The data obtained from these interviews were subjected to thematic analysis in order to comprehend the commonalities and disparities in the participants' answers, as well as the emerging issues.

The urban barangays in Zamboanga City were selected utilizing purposive sampling. These urban barangays include Baliwasan, Guiwan, Kasanyangan, Mampang, Putik, San Jose Gusu, San Roque, Sta. Maria, Talon-Talon, Tetuan, Tugbungan, and Tumaga.

Questionnaires were distributed to residents residing in flood-prone regions of Zamboanga City. The survey sought to document the firsthand encounters, perspectives, and requirements of residents regarding flood management. The survey comprised of a combination of closed and open-ended inquiries, encompassing various subjects such as individuals' personal encounters with flooding, their perception of the efficacy of existing policies, their level of awareness and preparedness, community participation and engagement, and recommendations for enhancement. A total of three hundred (300) residents were selected as a sample size in order to ensure representation from different socio-economic backgrounds and geographic locations. The survey data underwent statistical analysis to identify patterns and relationships.

The study examined effective flood management strategies from comparable urban areas to integrate optimal methods and creative solutions. The case study cities chosen were New Orleans, USA, which is known for its comprehensive strategy that combines levees, floodwalls, and community-based initiatives in response to Hurricane Katrina; Rotterdam, Netherlands, which is famous for its incorporation of green infrastructure, water plazas, and adaptive urban planning; and Mumbai, India, which is acknowledged for its endeavors to enhance drainage systems, early warning mechanisms, and slum upgrading programs. The examination of these case studies involved a comprehensive approach, which included conducting a literature review, analyzing policy documents, and conducting interviews with experts. The results were combined to determine important insights and possible adjustments for Zamboanga City.

The qualitative and quantitative data obtained from document analysis, interviews, surveys, and case studies were

combined into a comprehensive framework. This process entailed comparing policy documents with feedback from stakeholders in order to identify any gaps or inconsistencies. Additionally, survey data was utilized to either confirm or question the emerging themes from key informant interviews. Furthermore, local strategies were compared to international best practices in order to suggest practical and context-specific solutions. By integrating multiple data sources, a thorough and equitable analysis was conducted, encompassing the intricacies of flood management in Zamboanga City..

III. RESULT

The study provided a thorough analysis of the existing flood management policies in Zamboanga City, uncovering notable advantages, disadvantages, potential areas for improvement, and potential risks. These findings play a crucial role in developing a sustainable and efficient framework for managing floods. An exhaustive examination of current policies, plans, and regulations revealed a number of significant discoveries.

Table 1. SWOT Analysis

Strengths	Weaknesses	Opportunities	Threats
1.The Local Climate Change Action Plan (LCCAP) emphasizes climate resiliency in flood management.	1.Fragmented implementation due to lack of coordination between government agencies.	1.Potential to integrate innovative technologies such as early warning systems and real-time data analytics.	1.Limited financial resources and technical capacity.
2.The Comprehensive Land Use Plan (CLUP) incorporates zoning regulations aimed at reducing flood risks.	2.Insufficient incorporation of green infrastructure and nature-based solutions.	2.Opportunities for public-private partnerships to enhance resource mobilization and implementation efficiency.	2.Political changes and bureaucratic inertia hindering policy consistency and long-term planning.
3.The City Disaster Risk Reduction and Management Plan (CDRRMP) outlines strategic priorities for emergency response and disaster preparedness.	3.Outdated and inadequate drainage systems not being fully addressed in policies.	3.Growing awareness and advocacy for climate resilience and environmental sustainability.	3.Increasing frequency and intensity of flooding events due to climate change.

The table above shows an analysis of the strengths, weaknesses, opportunities, and threats regarding the existing flood management policies, plans, and regulations in Zamboanga City.

Interviews with key informants provided detailed and subtle insights into the difficulties and possible remedies for flood management in Zamboanga City. The implementation faced challenges including the absence of a centralized authority to coordinate flood management across various sectors, inadequate technical knowledge and training among local government personnel, delays in policy enforcement due to bureaucratic obstacles and political intervention, and financial limitations that restricted the extent and magnitude of flood mitigation initiatives. The stakeholders identified various potential solutions. Government officials emphasized the necessity of improving institutional capacity and inter-agency coordination. Urban planners stressed the importance of integrating green infrastructure into urban development plans. Community leaders supported more community participation in planning and decision-making. Non-governmental organizations (NGOs) emphasized the need for ongoing public education and awareness campaigns.

Surveys conducted among residents in flood-prone areas yielded valuable data regarding public perceptions and experiences. Of the three hundred (300) residents surveyed, two hundred twenty-five (225), or seventy-five percent (75%), reported having encountered at least one severe flooding incident in the past five years. The majority of residents identified inadequate drainage systems and rapid urbanization as the primary factors leading to flooding. Among the three hundred (300) residents surveyed, thirty percent (30%), or ninety (90) individuals, expressed satisfaction with the effectiveness of current flood management policies. Conversely, sixty percent (60%), or one hundred eighty (180) residents, believed that there was insufficient infrastructure to handle floodwaters. Among the three hundred (300) residents surveyed, one hundred sixty-five (165) individuals, equivalent to fifty-five percent (55%), were knowledgeable about flood risk reduction measures. However, only one hundred twenty (120) individuals, which represents forty percent (40%) of the total, had taken proactive measures to prepare for the possibility of flooding. Among the three hundred (300) residents surveyed, two hundred ten (210) or seventy percent (70%) indicated their willingness to engage in community-led flood management initiatives. A significant number of residents emphasized the necessity of holding regular community meetings and effectively sharing information.

Examining the most effective methods used in New Orleans, Rotterdam, and Mumbai yielded practical and implementable observations. The following table shows the exemplary methods employed by the three (3) primary global cities to effectively address their issues with flooding.

Table 2. Case Study of Three Cities

New Orleans, USA	Rotterdam, Netherlands	Mumbai, India
The city's investment in levees and floodwalls, combined with community-based initiatives, has significantly improved flood resilience.	Integration of green infrastructure, such as water plazas and permeable pavements, has effectively reduced flood risks while enhancing urban aesthetics.	Upgrading drainage systems and implementing early warning mechanisms have mitigated the impacts of urban flooding.
Emphasis on community engagement and disaster preparedness has enhanced public awareness and response capabilities.	Collaborative governance models involving public, private, and community stakeholders have facilitated innovative flood management solutions.	Efforts to improve living conditions in informal settlements have reduced the vulnerability of marginalized communities.

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By combining qualitative and quantitative data, the study identified several main themes and important factors that need to be taken into account when creating a flood management framework that is environmentally and economically sustainable. These findings are as follows:

1. Creating a centralized office to organize flood management endeavors and guarantee policy consistency across various sectors.
2. Strengthening cooperation and improving initiatives to build the capacity of different agencies.
3. Allocating resources towards modernized and efficient drainage systems while integrating environmentally-friendly infrastructure solutions.
4. Utilizing cutting-edge technologies like early warning systems and real-time data analytics to improve flood forecasting and emergency response.
5. Promoting and encouraging active participation of the community in planning and decision-making processes.
6. Implementing ongoing public education and awareness campaigns to enhance preparedness and resilience.
7. Investigating a range of funding options, such as public-private partnerships and international grants, in order to secure the required resources.
8. Offering technical training and capacity-building programs to enhance the skills and capabilities of local government personnel and community leaders.

The findings of the study emphasize the intricate nature of flood management in Zamboanga City, emphasizing notable deficiencies in policies and difficulties in implementation. Nevertheless, they also present possibilities for inventive thinking, cooperation, and involvement with the community. Zamboanga City can improve its ability to withstand floods, safeguard its inhabitants, and encourage sustainable urban growth by implementing a comprehensive and integrated policy framework.

IV. Discussion

The study on policy frameworks for sustainable flood management in the urban areas of Zamboanga City provides insights into the complex challenges, opportunities, and potential solutions related to flood resilience in the city.

A. Policy Gaps and Implementation Challenges

The study revealed significant deficiencies in policy and difficulties in implementing flood management measures in Zamboanga City. The main obstacles that arose were fragmented policies, inadequate coordination among government agencies, limited resources, and bureaucratic hurdles. These challenges highlight the crucial necessity for a more comprehensive and synchronized approach to flood management. To address these gaps and improve policy coherence, it would be beneficial to create a centralized entity that is responsible for overseeing flood mitigation efforts, promoting collaboration between different agencies, and streamlining decision-making processes.

B. Community Engagement and Stakeholder Collaboration

An important finding from the study is the crucial significance of community engagement and stakeholder collaboration in improving flood resilience. The community members demonstrated a readiness to engage in flood management initiatives, emphasizing the significance of including residents in the process of planning, decision-making, and response efforts. By actively involving local communities, establishing collaborations with non-governmental organizations, and promoting communication among various stakeholders, it is possible to develop flood management strategies that are both inclusive and effective. Building local resilience and promoting sustainable practices requires empowering communities through education, awareness programs, and capacity-building initiatives.

C. Green Infrastructure and Nature-Based Solutions

Green infrastructure refers to a network of natural and natural areas such as parks, wetlands and forests that provide environmental, social and economic benefits. Nature-based solutions are approaches that use natural processes and ecosystems to address various challenges, such as climate change, water management, and urban development. The incorporation of green infrastructure and nature-based solutions has emerged as a promising strategy for improving flood resilience in urban areas. Global case studies have demonstrated the efficacy of green roofs, permeable pavements, wetlands, and water plazas in reducing flood risks. These measures also offer additional advantages, such as enhanced biodiversity and improved urban aesthetics. Zamboanga City has the opportunity to utilize nature-based solutions alongside traditional engineering methods to improve its ability to adapt to the effects of climate change. Integrating green infrastructure into urban planning policies and providing incentives for its implementation can foster the development of urban landscapes that are more resilient and sustainable.

D. Innovation and Technology Adoption

Advanced technologies, such as early warning systems, real-time data analytics, and remote sensing tools, present substantial prospects for enhancing flood prediction, monitoring, and response capabilities. Utilizing data-driven methodologies and harnessing technological advancements can improve the city's readiness and coordination during severe weather occurrences. Allocating resources towards infrastructure upgrades, implementing flood mapping technologies, and developing digital platforms for risk communication can enhance the city's ability to withstand and recover from adverse events, as well as facilitate prompt decision-making. Enhancing the technical capabilities of local government institutions and establishing collaborations with research institutions and technology companies can facilitate the efficient implementation of these technologies.

E. Financial Resources and Capacity Building

It is essential to tackle the financial limitations related to flood management in order to implement sustainable and resilient solutions. Utilizing a variety of funding sources,

investigating public-private collaborations, and obtaining international grants can facilitate the acquisition of resources necessary to sustain flood mitigation initiatives. Moreover, it is crucial to offer technical instruction and capacity-building initiatives to local government personnel, community leaders, and residents in order to improve the city's readiness and ability to respond. Enhancing the ability of institutions and securing stable financial resources are crucial elements of an effective flood management plan.

The results and discussions from this study emphasize the immediate requirement for a comprehensive, integrated, and community-led strategy to handle floods in Zamboanga City. To enhance its resilience to flooding and promote sustainable urban development, the city can address policy gaps, encourage collaboration among stakeholders, incorporate green infrastructure, embrace innovation and technology, and mobilize financial resources.

V. CONCLUSION

The study on policy frameworks for sustainable flood management in the urban areas of Zamboanga City offers valuable perspectives on the difficulties, possibilities, and remedies related to flood resilience in the city. The study provides practical suggestions to improve flood management strategies and encourage sustainable urban development by analyzing current policies, stakeholder viewpoints, global benchmarks, and community input.

The study revealed that fragmented policies, lack of coordination, and insufficient resources are major obstacles to effective flood management. It acknowledged the significance of community involvement, collaboration among stakeholders, and public awareness in developing local resilience. The study also emphasized the potential of green infrastructure and nature-based solutions in improving flood resilience and urban livability. It advocated for the integration of innovative technologies, such as early warning systems and data analytics, to enhance flood response. Furthermore, it stressed the importance of diversifying funding sources, building technical capacity, and fostering public-private partnerships for sustainable flood management.

The current policy frameworks for flood management in Zamboanga City are primarily focused on disaster response and relief efforts. The City Disaster Risk Reduction and Management Office (CDRRMO) is responsible for coordinating disaster response and relief efforts in the city. However, there is a lack of emphasis on proactive measures for flood prevention and mitigation. The existing policies also do not adequately address the root causes of flooding in the city, such as poor urban planning, inadequate drainage systems, and deforestation.

In order to achieve sustainable flood management in Zamboanga City, it is essential to implement a comprehensive policy framework that addresses the root causes of flooding and focuses on prevention and mitigation measures. The following recommendations are proposed:

1. Establish a specialized agency or task force to facilitate flood management endeavors, foster cooperation among different agencies, and guarantee consistency in policies;
2. Involve residents, community organizations, and NGOs in flood planning, decision-making, and response activities to cultivate a feeling of ownership and enhance local resilience;
3. Integrate nature-based solutions into urban planning policies, provide incentives for the adoption of green infrastructure, and encourage sustainable land use practices to reduce the impact of flooding;
4. Allocate resources towards the acquisition of cutting-edge technologies for flood prediction, monitoring, and early warning systems, while also strengthening the technical capabilities of local government institutions to improve preparedness;
5. Investigate various funding options, such as public-private partnerships and international grants, to ensure the availability of the required resources for the successful implementation of sustainable flood mitigation projects;
6. Prioritize sustainable urban planning practices that take into account flood risk assessments and incorporate green infrastructure solutions, such as permeable pavements and green roofs, to reduce surface runoff and improve drainage;
7. Invest in upgrading and expanding the city's drainage systems to ensure efficient water flow and reduce the risk of flooding. This includes regular maintenance of existing drainage infrastructure and the construction of new drainage channels where necessary;
8. Establish regulations for development in flood-prone areas and enforce building codes that require structures to be flood-resistant. This will help reduce the impact of floods on buildings and infrastructure in the city; and,
9. Engage with local communities to raise awareness about flood risks and encourage residents to take proactive measures to protect themselves and their properties. This includes conducting flood drills, providing training on emergency preparedness, and establishing community-based early warning systems.

Given the persistent issue of urban flooding in Zamboanga City, it is crucial to continuously monitor, evaluate, and adjust flood management strategies. Future endeavors should prioritize the ongoing evaluation and revision of flood management policies to align with changing climate risks and urban development priorities. This can be achieved by investing in training programs, workshops, and initiatives that promote knowledge sharing and enhance technical expertise among stakeholders. Additionally, it is crucial to establish strong monitoring and evaluation systems to track the effectiveness of flood management interventions and make necessary adjustments to strategies. Furthermore, fostering collaboration with other cities prone to flooding, sharing best practices, and participating in international networks can help leverage global expertise in sustainable flood management.

Zamboanga City can effectively tackle its flood management challenges, safeguard its residents, and construct a more sustainable and resilient urban environment by implementing the suggestions presented in this study and promoting a culture of resilience. In order to effectively manage urban flooding and ensure the city thrives despite

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environmental challenges, it is crucial for policymakers to be committed, stakeholders to actively participate, and the community to make collective efforts.

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