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River Flood Plain Zoning in Manipur, India: A Policy Experience

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Abstract

This research paper examines the history and practical application of flood plain zoning as a flood management strategy in India, with a focus on Manipur state. The study is based on interviews with people residing near the river where the government implemented the Manipur Flood Zoning Act in 2018. It was found that despite limited awareness about the Act, most respondents were in favor of its successful implementation in the future. Among others benefits, this study will contribute to the decision on whether the government should continue to enforce the Manipur Flood Plain Zoning Act. The study highlights the need for increased public education and awareness about flood plain zoning as a supplement to traditional flood management strategies in India. As the population and the frequency of extreme rainfall events increase, and climate change exacerbates the impacts of floods, alternative approaches such as flood plain zoning are crucial for reducing flood impacts and ensuring the safety of communities in flood-prone areas.

Key Words: Flood management; river flood plain zoning; peoples' perception; Manipur Flood Plain Zoning Act of 1978.

Introduction

Flood is the most common form of natural disaster, resulting in substantial loss of life, large-scale property damages, and disruption of community lifelines (Bipinchandra et

al., 2020). It occurs when usually dry land is submerged under water. Studies have shown that floods may have increased and will continue to increase in frequency and intensity in the future (Bloschl et al., 2015). Flood plains attract people due to favourable topography and economic opportunities. As these factors multiply, a fraction of the population and assets exposed to floods are expected to increase in future (Tellman et al., 2021). A range of flood intervention measures has been implemented to minimise flood-induced damages. Such steps aim to control flood through structural and non-structural flood management strategies (Wang et al., 2022). However, it is now realised that floods cannot be fully controlled even after a series of costly engineering projects. Consequently, non-structural measures of floodplain management, rather than the measures to mitigate flood damage, were adopted. The philosophy of this approach is to strive to keep the people away from flood water and appreciate flood plains as the domain of rivers (Wang et 2022).

After independence, India incurred large-scale flood-related human and economic losses even after intensive structural interventions. This suggested the limitations of the structural approach in preventing damages from floods. Authorities responded by exploring alternative strategies for minimising the scale of flood disasters to complement the existing structural measures. Floodplain zoning (FPZ), a non-structural flood risk reduction approach, was accepted by experts as the ideal complement to the previous efforts. FPZ aims to demarcate areas likely to be affected by floods of different magnitudes or frequencies and specify the types of permissible developments in these zones. It is a policy-oriented concept and widely recognised as an effective non-structural measure for flood management. FPZ reduces flood damages as zoning disseminates potential losses on a wider basis through strict regulation of unplanned development in flood plains. Bearing these in mind, the then Government of India drafted a model bill to enact relevant floodplain zoning legislation to all the States in 1975 (GoI, INCID, 1993). The model bill provided for the formation of a floodplain zoning authority by state governments, with a governing body under the chairmanship of the Chief Minister. Incidentally, the proposal has persuaded only a few states to legislate flood plains till date. They are Manipur, Rajasthan, Uttarakhand and the erstwhile state of Jammu and Kashmir (Ministry of Jal Shakti, 2022). As such,this study seeks to examine flood plain zoning policy implemented in Manipur from the perspective of people affected when the policy was recently operationalised. The specific objectives of the study is given below.

Objectives

1. To examine the perception of people who have been affected by the recent implementation of Manipur Flood Zoning Act 1978 about the constraints pertaining to proper operationalization of the Act.
2. To draw lessons from peoples' recent experienced with Act's implementation to facilitate future flood risk management through river flood plain zoning approach.

Study Area

Manipur is a hilly state in northeastern India, which borders Myanmar in the east. It lies at the eastern extension of the Himalayas. Physiographically, the state is divided into hills and valleys. The valley occupies the central part and constitutes only one-tenth of the total geographical area. The average elevation of the valley is about 790 m above sea level. Southwest monsoon climate prevails here with an average annual rainfall of 1632.4 mm, and the temperature ranges from 0° C to 36° C (GoI, report,2017-18). The state has sixteen administrative districts. This study is conducted within the jurisdiction of the Imphal East district. As per the 2011 census, the total population of Imphal East district is 452,661, with a population density of 638 persons per km^2 (GoI, Census Report, 2011). The Imphal is the major river that drains the valley of Manipur. It originates from the Senapati district in the hills of *Karong and runs north to south through the valley.* For this study, a part of the Imphal river from the Koirengei concrete bridge to the Lilong bridge is selected (Fig.1). The total length of this part of the river is 30 km. It extends from 24°53'3.70"N and 93°55'5.96"E to 24°43'13.28"N and 93°56'27.78"E.

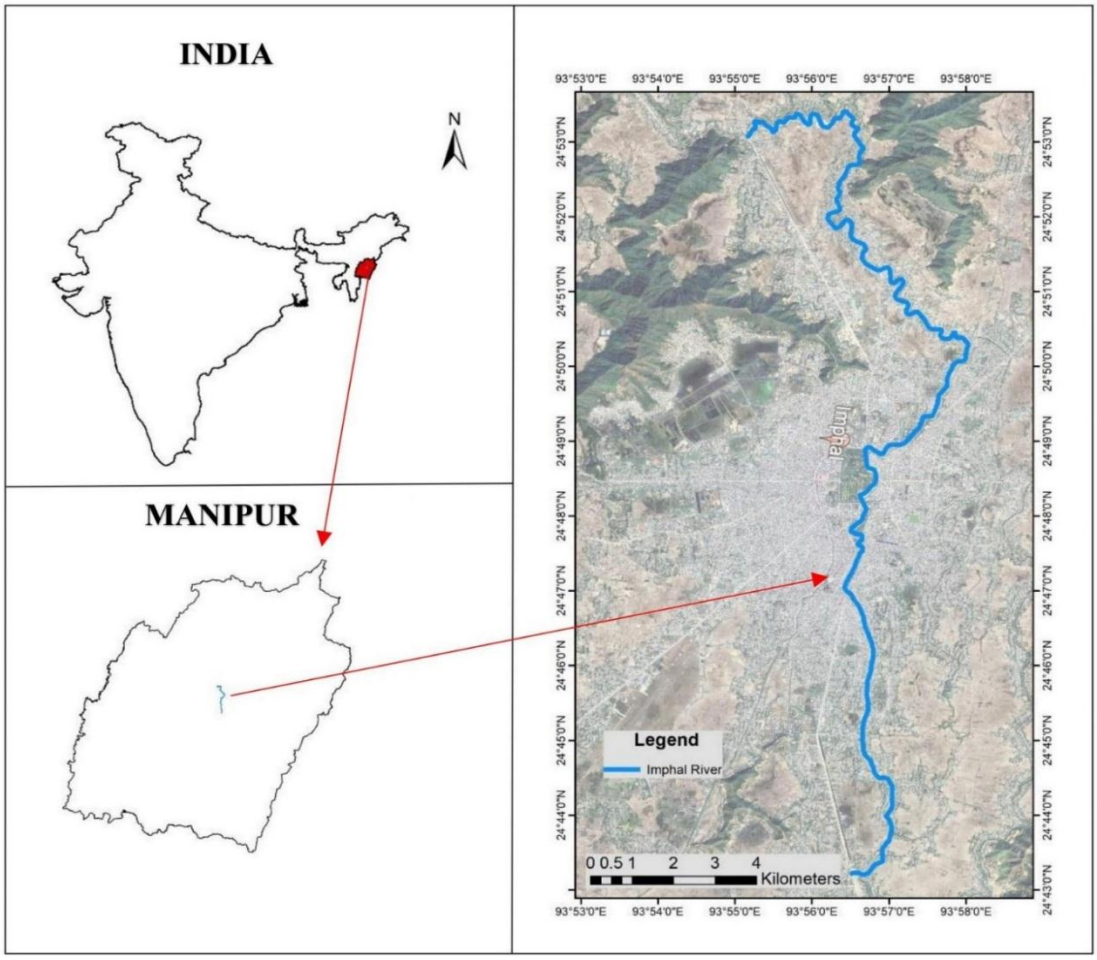

Figure 1: Location map of the study area.

Timeline of major floods in Manipur

The state has witnessed numerous floods of different intensities in the past. Figure 2 represents the occurrence of floods in Manipur over time during the pre-monsoon, monsoon, and post-monsoon seasons. The timeline is displayed along the x-axis, with events occurring chronologically from left to right. The intensity of each flood event is indicated by a vertical line, with the height of the line representing the relative magnitude of the flood compared to other events on the timeline.

A visual representation of the historical trend of floods such as this give information about the frequency, timing, and relative severity of each event, and can be used to inform flood management and mitigation efforts in the region. As the figure suggests, the monsoon season witnesses the highest frequency of floods, as well as the highest severity. This is due to the heavy rainfall associated with the monsoon, which can overwhelm the state's drainage system and lead to widespread flooding. The post-monsoon season also experiences frequent and severe floods, largely due to the retreating monsoon and the influx of rains from Bay of Bengal origin tropical cyclones. These tropical storms can bring heavy rains and further exacerbate the existing flood situation in the state. On the other hand, pre-monsoon floods have been relatively rare and are mostly pluvial in nature. A pluvial flood is a type of flood that occurs as a result of excessive rainfall and insufficient drainage systems, rather than being caused by rising water levels from rivers, lakes or oceans. This may be due to the relatively drier conditions in the state during this season. Nevertheless, the figure highlights the importance of understanding the flood patterns in different seasons and the underlying causes to develop effective flood management strategies.

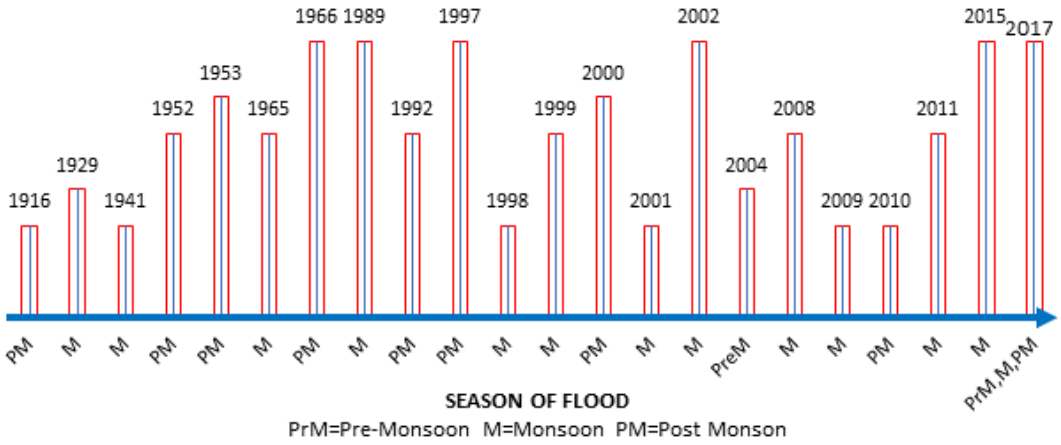

Figure 2: Timeline of Historical Flood Events in Manipur with Intensity Indicators: Pre-monsoon, Monsoon, and Post-monsoon Seasons. Height of the vertical lines roughly correspond to the severity of the flood. (Source: MASTEC Report).

Methodology

For this study, a segment of the Imphal River from Koirengei Bridge to Lilong Bridge was purposively selected. This section of the river was selected because the State Government of Manipur undertook a river dredging project in this area in 2018 to address the frequent flood events. The project included dismantling of unauthorised structures within 30 feet of the river, riverbed dredging, and embankment strengthening. To gather data, both qualitative and quantitative methods were applied. A sample size of 60 respondents was selected using systematic random sampling from both sides of the river. The data collection was done through structured interviews, and the collected data were analysed using statistical tools such as frequency, percentage, mean, etc. The strength of this methodology is that it provides a comprehensive understanding of the flood situation in the Imphal River by combining both qualitative and quantitative data. The use of structured interviews ensured that the data collected was systematic and consistent. The systematic random sampling technique ensured that the sample was representative of the population under study. The use of statistical tools allowed for a detailed analysis of the data and helped to identify patterns and relationships.

In addition, collecting people's opinions as a data source has its strengths. People's experiences and perspectives provide valuable insights into the impacts of floods on their lives and communities. The opinions of people who live close to the river are particularly important as they are directly affected by the floods. By gathering their opinions, the study provides a human dimension to the flood situation and helps to understand the social and economic impacts of floods on the community.

Results and Discussions

The findings from the survey of 60 respondents residing near the Imphal River from Koirengei bridge to Lilong bridge, presented in Figure 2 show that the average number of flood events people have experienced in the last ten years is 5.49, with a range of 0 to 10. Despite the frequent occurrence of floods, the mean number of floods that incurred financial loss to the respondents is only 0.12. This suggests that the floods have been largely manageable, but there is still a need for improvement. Despite this, 59.18% of the respondents believe that more severe flood events are likely to happen in the future. This highlights the need for effective flood management and control measures. The survey results show that 81.63% of the respondents want the construction of a continuous and quality-controlled retaining wall along the river banks, 40.82% want the river banks to be checked for the possibility of breaching, and 22.45% want the river bed to be dredged. The finding that 14.29% of the respondents want the Government to prohibit garbage dumping into the river with strict legal punishment is also significant. This indicates that the respondents are aware of the negative impact of waste dumping on the river and its banks.

The findings imply that the people have a strong desire for the government to take proactive measures to prevent and regulate floods. They have recognized the importance of the government's role in controlling and managing floods and are willing to support the government's efforts in this regard. The results provide valuable

insights into the public perception and expectations towards government intervention in flood control and management, which can inform policy-making and implementation.

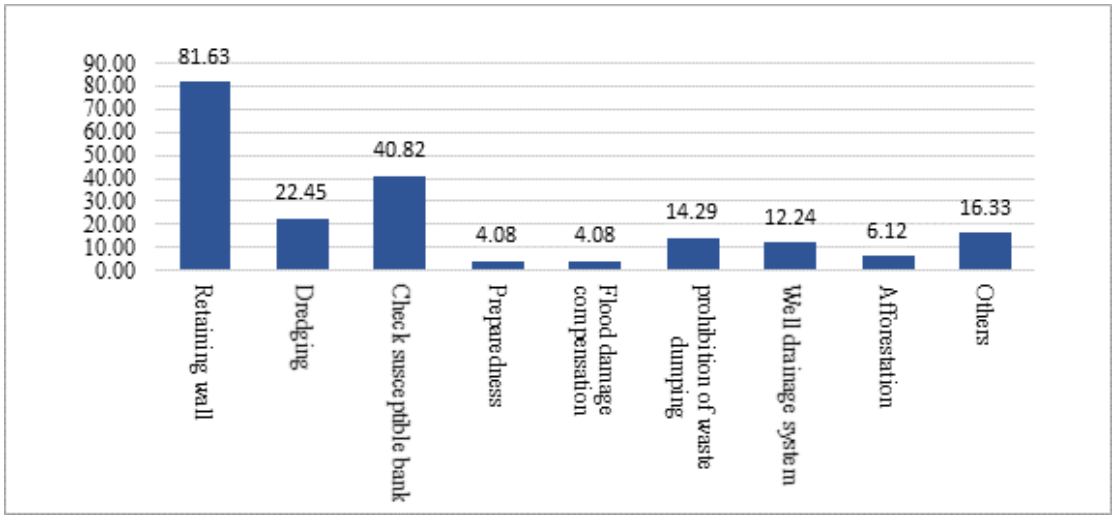

Figure 2: Opinion of people on government interventions **(%). (**Source**:** Field Survey**)**

The results of the study highlight the need for increased public engagement and awareness-raising activities in the implementation of flood control and management policies in the area. The finding that only 4% of the respondents were aware of the Manipur Flood Plain Zoning Act of 1978 suggests a lack of understanding and knowledge about the policy among the people residing close to the river. This raises concerns about the effectiveness of the government's outreach and communication efforts to educate the public about the measures taken to mitigate flood risk in the area. The need for involving local communities and stakeholders in the development of flood control and management policies cannot be overemphasized. The involvement of the local people can provide valuable insights into the needs and perspectives of the communities most vulnerable to the impacts of floods. Additionally, their participation can enhance the perception of the success of the policies and increase their understanding of the objectives and benefits of the measures taken by the government.

The findings from Fig. 3 (a) highlight a critical issue with the 2018 eviction drive, which is the selective nature of the eviction. According to the survey results, most of the evicted properties were kitchen gardens (57%), which are of minor importance and are not permanent. The respondents also opined that the eviction was not done strictly (59%) and that many structures were untouched, and new ones were constructed in restricted areas. Additionally, some structures removed during the eviction were even reconstructed in the same spot.

It is possible that the selective nature of the eviction was due to the necessity of the people and the structures such as community halls, crematoriums, water supply pumps, clubs, etc., which are considered essential in modern times.

The respondents gave various reasons for this selective eviction. The bar graph in Fig. 3(b) represents reasons given by the respondents for selective eviction. These findings suggest that the respondents have a nuanced understanding of the reasons behind the selective eviction of structures during the 2018 eviction drive. A majority of them (56.1%) believe that the eviction was selective because certain structures were considered to be essential or unavoidable, and their removal would have created undue hardship for the local community. This highlights the importance of considering the needs and perspectives of the people who are most vulnerable to the impacts of the project, and balancing these needs with the goals of the project.

On the other hand, the belief that the selective eviction was due to the flexibility of the project (21.95%) suggests that the implementation of the eviction drive was not consistent or uniform across all areas, and that the authorities may have made exceptions in certain cases. This raises questions about the transparency and accountability of the implementation process, and highlights the importance of ensuring that the policies and procedures are applied consistently and fairly across all areas. The perception that political connections (15.6%) and political will (4.8%) played a role in the selective eviction suggests that there may be a risk of political influence at the local in the implementation of the project, and that measures need to be taken to ensure that the policies are implemented objectively and without bias.

Figure 3: (a) Type of structures and properties removed in the 2018 eviction drive **(b)** Perceived reasons why many properties were left out from the eviction drive (figures in %). (Source: Field Survey)

The survey results indicate that 51.02% of the respondents fully intend to support the implementation of the Manipur Flood Plain Zoning Act of 1978. However, 48.98% of the respondents do not support the implementation of the Act. The primary reason cited by these individuals is their attachment to their birthplace and their reluctance to relocate to other areas. Additionally, they also expressed a lack of trust in the

government's ability to effectively implement the policy. These results suggest that a significant proportion of the population has concerns about the potential impact of the policy on their communities and the effectiveness of its implementation.

Furthermore, according to the survey data presented in Fig 4(a), a significant portion of the respondents, 56%, indicated that they do not support the implementation of the Manipur Flood Plain Zoning Act 1978 because they are against the forced relocation of settlers that may be involved as a result of the Act's implementation. On the other hand, 21% of the respondents expressed trust issues with government officials, while the remaining respondents were roughly equally divided between concerns that the situation may become worse, the exercise would be costly, and there would be no suitable place for relocation.

The results of the survey indicate that a significant proportion of respondents (56%) believe that the failure of the Manipur Flood Plain Zoning Act to materialize is due to the carelessness of the government. 20% of respondents believe that the lack of funds is the reason for the failure of the Act, and 18% believe it is due to political implications.

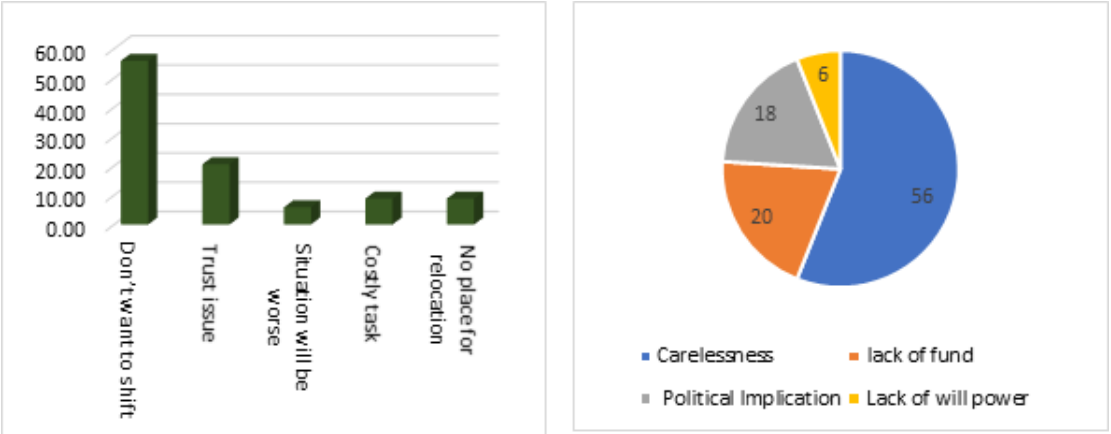

Figure 4: (a) Reasons why people do not want the Act in % **(b)** People's Opinions on the Failure of the Act in %. (Source: Field Survey)

Conclusion

The findings of the study emphasize the significance of flood plain zoning in managing flood risk. While floods cannot be completely prevented, their impacts can be reduced through appropriate measures. The study area has a history of experiencing different flood events, and the residents will continue to face them in the future. Despite the existence of the Manipur Flood Plain Zoning Act 1978, only half of the population residing in the area is aware of it and wants its full implementation. The study highlights that some residents were against the implementation of the Act due to the belief that it would result in forced relocation of homes and eviction of settlers. There were also trust issues with government officials and concerns about the situation becoming worse, the exercise being costly, and a lack of relocation options.

The study also suggests that the Act's failure to materialize is partly due to the carelessness of the government, a lack of funds, and political implications. In conclusion, it is important to acknowledge that managing floods is a shared responsibility between the government and the people. The study calls for the need to conduct awareness and education campaigns to educate the residents about the importance of their cooperation in reducing the impacts of floods. This finding has implications for flood plain zoning in the broader context of India, and highlights the need for effective communication and collaboration between the government and the people to ensure successful implementation of flood plain zoning policies and measures.

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