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An Analysis of Preparedness and The Impact of Floods in India

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Abstract

India is the most flood prone country in the world with instances of at least 15 major occurrences in the last decade. Apart from loss of lives and property, the country suffers huge economic, infrastructural as well as environmental damage on a yearly basis. In addition, several indirect and prolonged effects of floods affect the country as well. This is coupled with facilitating factors such as global warming and unplanned development in flood plains. Understanding the gravity of the situation, the government of India enacted the Disaster Management Act in 2005 subsequently forming the National Disaster Management Authority. This body has developed guidelines for flood mitigation at national, state as well as at regional levels. The country needs to develop effective flood mitigation system in order to reduce the periodic damage endured by the people and the state.

Key-words: *Flood mitigation; NDMA; Impact of floods; flood preparedness;*

Introduction

Human civilizations has been ravaged by natural disasters since time immemorial. They have been mentioned in fact and fiction alike and have shaped our history. The World Health Organization[1] has defined a natural disaster as "an act of nature of such magnitude as to create a catastrophic situation in which day-to-day patterns of life are suddenly disrupted and people are plunged into helplessness and suffering, and, as a result, need food, clothing, shelter, medical and nursing care and other necessities of life, and protection against unfavourable environmental factors and conditions." They account for the deaths of 90000 and affect about 160 million people every year[1]. According to Ritchie & Roser, like almost every other natural calamity, floods have seen an upsurge worldwide accounting for roughly 45% of all natural disasters during the decade of 2005-2014[2,3]. Floods are common around the world with India being the most flood prone country[4]. About one fifths of all global flood deaths occur in India[4]. Further, in the last decade from 1996 to 2005, the average annual flood damage in the country was 4745 crore rupees[5]. There have been at least 15 major flooding events in the last decade in the country and it is on a rising trend[6]. Floods cause great damage not only to lives, properties and infrastructure but also the healthcare system in a country. Moreover, there are risks of waterborne disease outbreaks after a flood, for instance the Cholera outbreak in the 1998 West Bengal floods[7]. Apart from the deleterious impact on health and healthcare, the country's economy, climate, agriculture and animal life takes a toll as well. Therefore, a multi-sectoral effort is required to mitigate and avert floods in India.

The country needs to scale-up efforts towards flood mitigation. This paper analyses the multi dimensional impact of floods on the country with instances from the past and emphasizes on the current flood mitigation and preparedness measures in the country. With a focus on the work of the National Disaster Management Authority (NDMA), it mentions a few global strategies envisaging the probable solutions to deal with the recurrent flood situation in the country.

The impact of floods in the Indian context

Floods have an immediate impact on lives, property, infrastructure and a long term impact like a dearth of safe

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drinking water, vector borne diseases, psychological ailments and an increased risk of epidemics. Likewise, the socioeconomic and environmental effects are profound as well. Damage to infrastructure, agriculture and transport sector directly and indirectly hampers the economy. Further, all these effects consequently affect the health of the affected population in the long run.

Impact on life and health

The health effects of floods are numerous. In a study done by FitzGerald, Clark, & Hou, the immediate impact of floods range from drowning, and injuries, to animal bites, allergies and worsening of existing injuries[8]. There has been a total of 105758 deaths in floods from 1953-2016 in India with highest number of deaths in Uttar Pradesh followed by Andhra Pradesh[9]. Some of the major floods to have affected the country include the Bihar flood of 1987 with 1399 deaths, Assam floods of 1998 affecting 47 lakh people, the Himalayan flash floods of 2012, the Uttarakhand flood of 2013 taking 1000 lives, and the floods in Kerala in 2019[6,10,11]. Apart from loss of lives and injuries, poisoning, impact on mental health, spread of infectious diseases, chemical & electrical contamination, carbon monoxide poisoning, disability and starvation are some of the long-term effects of floods[8]. Further, disruption of health services worsen the health system of the affected place. In addition, the lives and health of animals are adversely affected as well. The loss of infrastructure coupled with health ailments due to floods affect not only the health system but the socio-economy as well.

Socio-economic impact

In the last 65 years the country has suffered a loss of Rs 3,78,247.047 crore due to damage to property, livelihood, infrastructure and health pertaining to floods[9]. For instance, in 2015 India suffered a loss of Rs. 57,291.1 crore due to floods[9]. Further, sectors like agriculture, transport, tourism, livestock and animal husbandry endure irreplaceable damage in terms of economy as well. Damage to public property and houses due to floods in the period between 2013 and 2017 was worth Rs. 72.09 crore[9]. Furthermore, a total of 8,07,17,993 houses were destroyed on account of floods in the past 65 years[9]. What's alarming is that, the economic loss has increased over the years and has the highest figures in the last decade[9]. This increase can be partly attributed to the rapid urbanization and the relative incapability of flood management and drainage systems to cope up[9]. However, the impact of floods are not limited to health and socio-economy only.

Effect on the Environment

As much as natural events like storms, tsunamis and heavy rain exacerbate floods, the environmental aftermath is profound as well. Floods not only derange the ecology but also cause irreparable havoc to livestock and wildlife. For instance, the 1978 floods alone were responsible for the deaths of 2,39,174 cattle[9]. This not only affects sectors like agriculture and animal husbandry, but also has a long lasting economic impact on the people dependent on them. The flooding of forested areas result in innumerable loss of biodiversity, often ecologically valuable species that are difficult to get a count of. In addition, large quantities of water can affect farming habitats, often depriving farmlands of nutrients and accumulation of pollutants[12]. Apart from that, floods cause significant destruction of floodplains, vegetation and forest cover[12]. Thus, preparedness for floods is of substantial importance and requires a multi-sectoral approach to mitigate the deleterious impact of floods in India.

Analysis of preparedness against a disaster in India

The geographical location of India makes it climatically very sensitive, and the increasing usage of land area, climate change and the effect of global warming have made matters worse over the years[9]. A total of 40 million hectares of land (roughly 12% of the country's area by land) in the country is prone to floods[9]. Between 1953 and 2017, floods have occurred almost every year in India and has resulted in an economic loss of Rs. 3,78,247.047 crore and the destruction of 8,07,17,993 houses and property[9]. In addition, the magnitude of damage due to floods over the years have increased drastically as explained by the following figure.

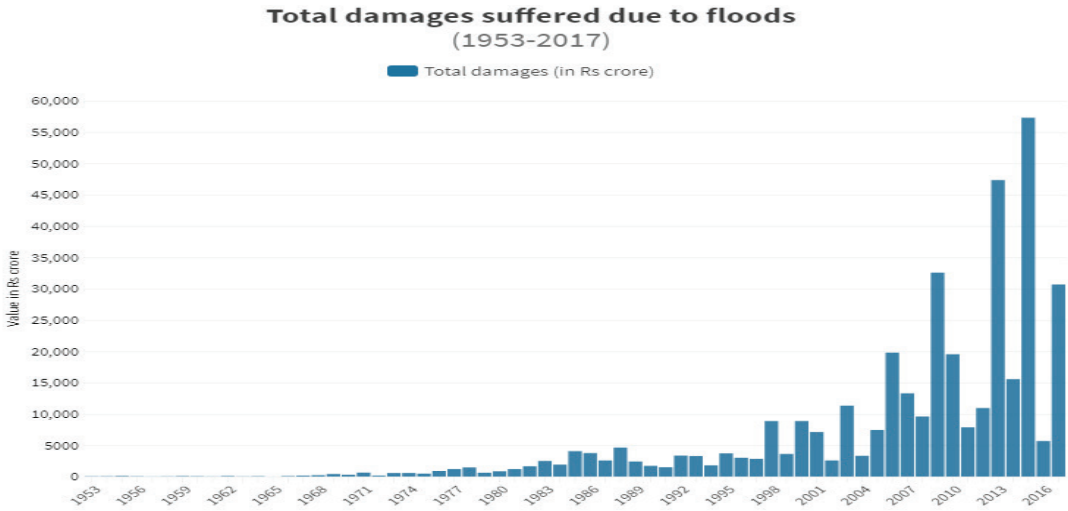

Figure 1. Total Damages suffered due to floods in India[9].

(Source: Available from https://www.indiatoday.in/india/story/loss-due-floods-india-people-killed-crop-houses-damaged-in-65-years-1591205-2019-08-27)

An increasing trend in total damage value caused by floods can be observed in the figure suggestive of firstly an increase in the frequency of the event, secondly, a relationship with population growth and lastly, the inefficiency of mitigation measures. Realising the gravity of the situation, the government of India enacted the Disaster Management Act which led to the onset of the NDMA in 2005[3].

The role of the NDMA in Flood Mitigation

Headed by the honourable Prime minister and State Disaster Management Authorities (SDMA), the NDMA aims to implement a holistic and integrated approach to disaster management in the country[3]. The authority agrees to the fact that increasing population, rapid urbanization, growing developmental and economic activities in the flood plains and global warming can be attributed to the unprecedented rise in the number of floods in the country[5]. Similarly, instances of flooding in urban area have also increased during the last decade largely due to improper urban planning and faulty drainage systems[5]. These statistics reveal that the system needs to upgrade the flood response system to mitigate the impact of periodic floods in the country. India not only lacks cutting edge technologies in flood forecasting and warning but also mitigation measures. In addition, these measures if at all active in some areas, don't cover all the river belts of the country. Furthermore, there is a dearth of awareness about floods and public participation. Despite the focus on planning activities, unplanned development of flood plains continue and pose a threat. Likewise, there is little documentation about the long term impact of floods and the way these were dealt with. Often this has resulted in poor infrastructural response, improper allocation of manpower and a dearth of strategic planning when required. As a result, the country has witnessed massive damage in the past not only in terms of lives and property, but also infrastructure and economy as stated in the previous sections[5]. Therefore, it is imperative to understand the need to address the deep rooted factors in flood mitigation and management.

The way foreword

The NDMA has prepared the executive summary guidelines to minimize damage due to floods[5]. The primary objectives of the guidelines are to improve forecasting and real time monitoring, strengthening emergency response capabilities and multi-sectoral involvement[5]. To effect the plan, the NDMA plans to set up a National Flood Management Institute (NFMI) at a strategic location in the country[5]. Further, a Flood Forecasting and Decision Support System (DSS) are planned to be set up as well[5]. In addition, the activities proposed to minimize flood risk and losses are to be implemented in 3 phases at the central as well as state levels[5]. Apart from that, the NDMA plans to regulate the unplanned developmental activities in the flood plains to say nothing of the strategic construction of dams,

reservoirs and other storages[5]. Additionally, a National Disaster response Force (NDRF) has been made by the government of India for prompt response to disasters[5]. The NDMA has acknowledged the fact that multi-sectoral collaboration is essential in this aspect and has partnered with the Meteorological department, the Central Water Commission, Remote sensing department, weather forecasting department at both the state and national levels[5]. Further, initiatives like the Calamities relief fund, Flood insurance, drainage improvement, catchment area afforestation, anti-erosion works, the National Flood Mitigation project and Medical preparedness strategies are also underway to strengthen the cause[5]. In spite of the above mentioned strategies, certain issues remain unaddressed. For instance, the ecological protection of the flood prone areas, insufficient funding allocations, frequent river erosions, infrastructural lack, biodiversity loss and lack of concrete relief & redemption strategies are some of them.

Although the NDMA has developed strategies to combat damage caused by floods in India, some grey areas still remain which need to be addressed. For instance, the people living close to the flood plains can be educated and trained about planned vegetation and retention ponds that help to retain water during flooding[13]. In addition, they can be edified with easy control measures such as usage of sandbags and inflatable tubes[13]. Certain blockade methods like construction of dikes, dams, diversion canals, bunds and weirs are few options that can be employed at strategic positions to mitigate the devastation caused by the water flow[13]. Some compelling evidences can be seen in the Dutch flood mitigation system, for instance the "Delta program"[14]. The program has resulted in the planning of canals within cities to minimise the risk of urban flooding[14]. Correspondingly, the Netherlands has developed national policies to tackle the issue of flooding and as a part of the Delta program, has developed multi-sectoral collaborative strategies for that matter[14]. Be that as it may, some of these strategies can be implemented in the Indian setting to help the cause. Likewise, some of the UN strategies such as the 'Sendai Framework' for disaster risk reduction can be implemented in the country as well.

The framework was adopted at the 3rd UN conference in Sendai, Japan in 2015[15]. Supported by the United Nations Disaster Risk Reduction (UNDRR), the framework aims to build on strategies to reduce disaster risk and subsequent loss due to the disaster. The framework emphasizes on 7 targets based on the ultimate goal of preventing new and reducing existing disaster risk through multi-dimensional approaches[15]. Additionally, it has 4 priority areas of action which are; understanding the disaster risk, strengthening disaster risk governance to manage disaster risk, investing in disaster risk reduction for resilience and enhancing disaster preparedness for effective response[15]. Further, it is based around several guiding principles that ensure a holistic and multi-sectoral support in the cause[15]. Thus the framework can be employed to device strategies to mitigate the risk of floods in the Indian context.

The government needs to tackle the perennial problem of frequent floods more effectively to reduce damages caused by the same. As explained in the Sendai framework, a multi-sectoral approach incorporating economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures need to be developed[15]. Moreover, an effective funding mechanism needs to be developed and planned for the cause both at the central as well as the state levels. Likewise, infrastructure development in terms of preparatory measures both at the state as well as national levels can be planned. Similarly, at the level of policymaking, actors and stakeholders need to be aware of the ground realities and incorporate members of the population prone to floods. In other words, progress needs to be made at every level of the country's functioning to mitigate the frequent losses that happen due to floods.

Conclusion

Floods have been ravaging India since long and the loss of lives, property and economy has been enormous. Correspondingly, there has been an increase in both the frequency and magnitude of floods in the last decade. The infrastructural, economic as well as ecological loss is also on a rising trend as well. Additionally, the lurking factors facilitating this upsurge like global warming, urbanisation and unplanned development of flood plains have increased over the years. Natural as well as human factors as stated before can be attributable to the increasing instances of floods. The substantial losses endured in the past also suggest that the country's flood mitigation measures need to be evaluated and sharpened up. Further, the lack of effective management and control strategies in the country has resulted in frequent degradation of economy and environment alike. India not only has a dearth of appropriate technologies but also strategies at the policymaking level to design efficient

intervention measures to tackle the problem. For these reasons and many more, the NDMA has designed the 'Executive summary guidelines', emphasizing on forecasting, real time monitoring, emergency response and multi-sectoral collaboration. In addition, it also plans to tackle the causative elements responsible for floods for instance, river erosion and unplanned development in the flood plains. However, many grey areas remain unaddressed which need to be effectively dealt with. The country can take ideas from the international platform for instance the Netherlands, which has developed effective flood mitigation measures. To put it in another way, the government can take ideas from others and try and incorporate some global strategies such as he Sendai framework for disaster risk reduction, in the local context. A multi-sectoral approach is required to deal with the issue of floods in the country. The NDMA guidelines although promising, face many challenges along the way.

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