

# What Vadodara city can do to prepare for the future floods?

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**ABSTRACT:** Vadodara City and its 1.5 Million people suffer from recurrent flooding events, even a major one every few years. The Climate Change has further exacerbated the situation with changes in the weather pattern such as delayed monsoon as well as less frequent but high intensity rainfall. Floods cannot be stamped out, but can be managed. A mix of structured and non-structured approaches to flood mitigation need to be employed for being better prepared for floods. The paper discusses about such structured and non-structured flood mitigation measures in the context of Vadodara city basis the field survey in flood prone areas and interviews of Vadodara Municipal Seva Sadan (VMSS) authorities.

**Key Words:** Urban Flooding, Vadodara, Flood Management, Structural and Nonstructural Measures

## Introduction

The year-end monsoon season typically sets off alarm bells to watch for flooding in most of the cities in India, Vadodara too has experienced major floods. In Gujarat, Vadodara district which is surrounded by major rivers like Mahi on the north-west and Narmada on the south-east and minor rivers like Vishwamitri, Dhadhar and others is one of the key regions prone to floods.

In fact, as per Vadodara district's Disaster Response Plan 2016-17, flooding tops the list of all the disasters in terms of probability of occurrence and district's vulnerability to it. Since 1990, Vadodara has witnessed 4 major flooding events - July 2005, July 2006, September 2013 and June 2014[1]. In addition to these district-wise flooding events, severe water-logging affect the low lying areas of the city almost every year. This makes Vadodara city- a home to 1.5 million people, a strong candidate for the detailed study of flood-risks and its management.

## Dealing with climate change

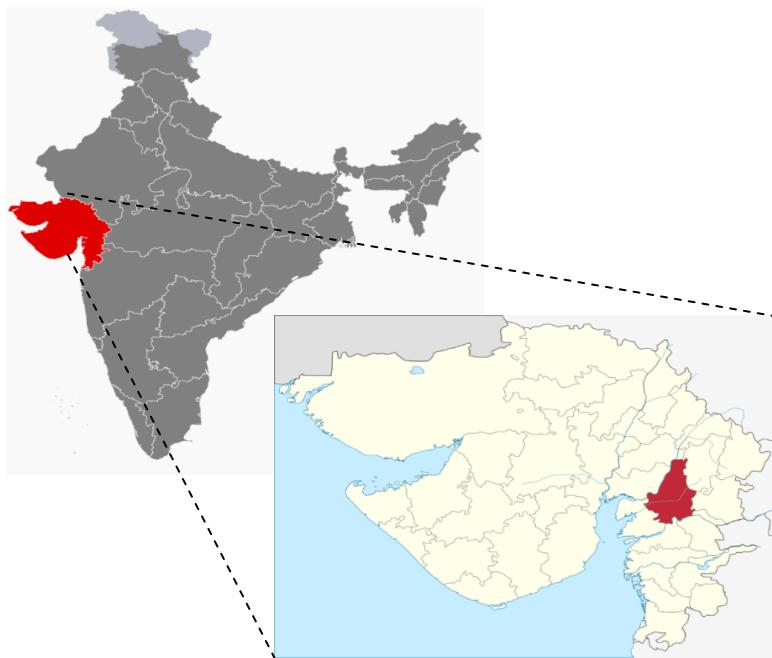


Figure 1: Location of Vadodara City - the focus region of this article

The reality is that climate change will bring with it unpredictable and unprecedented weather changes. In Vadodara, the onset of monsoon has been seen to be delayed by a month compared to few decades ago. So it is essential that the authorities and people of this city should plan on a coordinated and effective response on adaptation, mitigation and preparedness for alleviating the impact of the climate change. Climate change impacts the societies across the globe. For example, the year 2018 saw flooding events in United States, Japan, India, Jordan, Iraq, Kuwait, Qatar, Malaysia as well as Singapore to name a few [2]. Similar to other countries, historically, India too has been severely affected by the floods. For instance, the flood that occurred in September 2014 in J&K region was fourth on the list of the costliest floods in the world, with loss totaling to \$16 billion USD. The floods that happen in India are often accompanied by large fatalities. In fact, India has seen the highest number of deadly floods of all nations in the world since 1990. Of the 10 deadliest flood events in the world since 1990, most number of events (i.e 3 of 10)<sup>1</sup> occurred in India with total death toll from these 3 floods reaching to almost 10,000. The primary reason for such deadly floods is India's large population, high population density and significant percentage of land (12% of total land) prone to floods.

The fact that the flood frequency and intensities are increasing, has led a large number of developed economies to look at best way to mitigate floods than achieve complete control on it since latter is practically impossible and economically unviable. The obvious implication is then to figure out how the flood risks can be best managed to minimize the damage to both human lives and assets.<sup>2</sup>

### **Plural approaches to flood mitigation**

There are several approaches to flood mitigation. These approaches run the gamut of short to long-term measures that includes both unstructured and structured approaches [3]. Structured measures involve long term infrastructure development to combat the chronic flooding, whereas non-structured measures involve low capital investment short term initiatives.

### **FLOOD MITIGATION IN VADODARA**

- Structured Measures:***

Without drainage, people in the slum areas and few society areas have connected their drains to the storm water drains. These drains, thus, not only have to handle higher drainage volume during rains but also pollute the river causing severe diseases. The sewerage network or on-site septic Tank / community-scale Sewage Treatment Plant must be installed to prevent run-off drainage capacity reduction. The water released during floods from Ajwa Dam Reservoir should be diverted as it creates havoc in the city and the river Vishwamitri doesn't have the capacity to contain the amount of water released from Ajwa [4]. Government authorities should ensure to have careful monitoring of maintenance of storm water drainage system and desilting activities. The areas in which the storm water drains have not been installed must be provided with one at the earliest possible instance and the old drains of lesser capacity should be replaced with the new increased diameter storm water drains. With time the road level has become too higher than the residential area, for which the society level too should be leveled up and then road levels should be maintained in accordance with the Residential level. VMC should also help construct paved roads for slums, societies and villages as during flood it gets very difficult for people to manage things without roads. The authorities should inspect and identify the roads, bridges, culverts, etc. in the vulnerable and flood risk areas and repairs should be carried out wherever necessary. Low-lying areas should be used for parks and other low-impact human activities.

- Unstructured Measures:***

Ensure Garbage Van goes in every area to collect garbage as there's no cleaning done or garbage picked from some areas and so people dump their garbage into any nearby Nallah, open spaces or water bodies which blocks and chokes the flow of water, also clogs the drains.

Ensure Closed type community dustbins be put in all the wards of the city for the cleanliness and to prevent mosquitoes and diseases through floods. Monitoring of activities like disposal of municipal solid waste and debris is must. People should be motivated and given awareness to have their own insurance cover to enable them to recover at least major part of their losses and aid resilience. Launching of awareness generation campaigns on proper disposal of solid waste, desilting of drains and water bodies and prevention of encroachment on to flood plain, taking into account its serious impact and extremely low level of public awareness. To educate the people of vulnerable areas, the techniques for protecting themselves from flood waters through live demonstrations and use of provided flood saving equipment are essential measures.

Ensure Afforestation programmes is conducted in the Vishwamitri<sup>[5]</sup> to reduce the frequency and severity of flood waters. Authorities should ensure that no building activity should be allowed in the bed of water bodies like river, lake, pond or nallah/ storm water drain, etc, Ensure more sufficient number of Tarappas, tubes and other lifesaving equipment should be kept in the flood prone area for emergencies during floods. People should ensure to prepare a flood check list which should include a list of telephone numbers for family, friends, and community leaders and prepare a safety kit which must include a bottled water, first-aid kit, torch, sheets and blankets, waterproof clothes, battery-operated radio, medication, personal valuables, and identity proofs / personal documents<sup>3</sup>.

### **Conclusion**

While a lot of general flood mitigation measures that can be applied to any region apply to Vadodara city as well, the measures specific to Vadodara's context have been recommended in this article. These measures include both structured and non-structured recommendations. Structured measures such as properly planned sewage network, on-site STPs, diversion of Ajwa dam discharge, monitoring of Storm Water drain flow and desilting,paver block roads in flood prone areas, repair of curls of water channels, use of low-lying areas for low-impact human activities such as parks are recommended to be prepared for the floods in long term. Non-structured measures such as Door-2-Door garbage collection, closed type community dustbins, strict monitoring of MSW and debris disposal, publicizing and encouraging subscription to flood insurance, awareness programs for flood preparedness with item check-list in events of flood emergency, afforestation along Vishwamitri banks, availability of life savings equipment in flood prone areas, are recommended to be prepared for the floods in short term.

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<sup>1</sup>Source: Centre for Research on the Epidemiology of Disasters - emdat.be/disaster\_profiles/index.html

<sup>2</sup>[www.academia.edu/Documents/in/Flood\\_Mangement](http://www.academia.edu/Documents/in/Flood_Mangement)

<sup>3</sup> Source: [https://training.fema.gov/emiweb/is/is909/preparedness\\_handoutsmaster.pdf](https://training.fema.gov/emiweb/is/is909/preparedness_handoutsmaster.pdf)