

# A Study on Flood Water Logging in Dadar East (Mumbai) Community Based Solution of Flood Water Logging.

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**Abstract**—Urban flooding is a recurring and critical issue in Mumbai, especially in low-lying and densely populated areas like Dadar East. This study investigates the extent, causes, and mitigation strategies for flood water logging in the region. A comprehensive methodology was adopted, including topographical and hydrological analyses, drainage capacity assessment, and field surveys. The analysis revealed that during peak monsoon (June to September), stormwater runoff in Dadar East exceeds drainage capacity by approximately 142,488 m<sup>3</sup>/hr, resulting in a net surplus of over 402 billion liters of untreated floodwater. To address this, a community-based solution is proposed involving the redirection of surplus floodwater to a temporary water treatment plant (WTP) established at Dr. N.A. Purandare Stadium. The modular plant, with a capacity of 1000 MLD, aims to treat and reuse a portion of floodwater to fulfill industrial demand in the Parel-Dadar region. This decentralized, scalable strategy not only mitigates flood risk but also promotes sustainable water resource utilization. The proposed solution demonstrates the feasibility and necessity of integrating engineered infrastructure with localized community planning to enhance urban flood resilience.

**Index Terms**—Flood water logging, Dadar East, Urban flooding, Community- based solutions, Flood mitigation.

## I INTRODUCTION:

Effective stormwater management is crucial for controlling surface runoff and preventing flooding in urban areas. Unlike rural areas where rainwater can percolate into the ground, urban areas with impermeable surfaces require specialized management strategies. Traditional stormwater management approaches focus on quickly conveying water away from urban areas, but modern approaches prioritize restoring the natural water cycle.

## Challenges of Stormwater Management:

Urbanization significantly alters the hydrologic cycle, leading to increased stormwater runoff. Impervious surfaces like roads and buildings restrict rainwater from percolating into the ground, resulting in rapid runoff into channels and pipes. Cities worldwide face challenges in managing stormwater, and the issue intensifies as populations grow.

## Stormwater Management Issues in Dadar East (Mumbai):

Dadar East is particularly vulnerable to stormwater-related issues, with flooding occurring frequently due to heavy rainfall and inadequate drainage infrastructure. Even minimal rainfall can cause significant waterlogging in some areas, resulting in infrastructure damage, economic losses, and disruptions to daily life.



Fig 1. Water logging at Dadar East

## Impacts of Flooding:

Flooding in Dadar East (Mumbai) can have severe consequences, including damage to infrastructure, loss of property, and risks to human life. The city's inadequate drainage infrastructure and poor management practices exacerbate the issue, highlighting the need for effective stormwater management strategies.

## II EASE OF USE

### Importance of Urban Flood Studies:

Urban flooding is a pressing issue in Mumbai, particularly in low-lying areas such as Dadar East. The rising frequency and severity of flooding events have significant socio-economic and environmental implications for local communities. Conducting an urban flood study can help identify the root causes, consequences, and potential solutions for flood water logging in Dadar East.

### Consequences of Flooding in Mumbai:

Flooding in Mumbai, especially in areas like Dadar East, can have devastating effects. The impacts are far-reaching, affecting not only the economy but also the lives of residents. For instance, the 2005 Maharashtra floods resulted in significant loss of life and property damage, highlighting the need for effective flood management strategies.

### Study Area: Dadar East

Dadar East is a densely populated region in central Mumbai, bounded by the Western Railway line, Eastern Express Highway, and Mithi River. Its geographical location and population density make it prone to flooding, emphasizing the need for targeted research and flood mitigation strategies.



Fig 2: Location map (Dadar East)

## III METHODOLOGY:

To assess the current situation of flood water logging in Dadar East, a comprehensive study was conducted. The study involved:

### Data Collection

1. Topographical Analysis: Topographical data was collected to understand the physical characteristics of the study area, including elevation, slope, and drainage patterns. This information helps identify areas susceptible to flooding and waterlogging.
2. Hydrological Analysis: Hydrological data was collected to analyze the rainfall and runoff patterns in the study area. This data helps understand the hydrological factors contributing to flood water logging.
3. Drainage Infrastructure Assessment: Data was collected on the existing drainage infrastructure, including the location, size, and condition of drains. This information helps identify drainage-related factors contributing to flood water logging.

### Study Approach

The study approach involved a combination of:

1. Literature Review: A review of existing literature on flood water logging in Dadar East.
  2. Field Observations: Field observations were conducted to gather primary data on the study area.
  3. Surveys and Interviews: Surveys and interviews were conducted to gather information from local residents and stakeholders.
- Proposing Solutions for Flooding and waterlogging

## IV CALCULATIONS:

### Proposed Solutions for Flooding and Waterlogging

To mitigate the impact of frequent flooding and water logging in the Dadar East region of Mumbai, a quantitative analysis was conducted. The following hydrological parameters were considered:

Stormwater catchment area [A]:  $2.34 \text{ km}^2 = 2,340,000 \text{ [m}^2\text{]}$

Average rainfall intensity [I]:  $124.86 \text{ [mm/hr]} = 2340000 \text{ [m}^2\text{]}$

Runoff coefficient for Dadar East [C]: 0.8

The Peak stormwater discharge (Q) was estimated using the Rational method

$$Q = C \cdot I \cdot A$$

$$Q = 0.8 * 124.86 * 2340000 / 1000 = 2,33,738 \text{ [m}^3\text{/hr]}$$

Thus, the estimated discharge generated due to rainfall and runoff is approximately  $2,33,738 \text{ [m}^3\text{/hr]}$

The Drainage infrastructure in Dadar East has a maximum handling capacity given by:

Drainage capacity [Daily] =  $2190 \times 10^3$  [m<sup>3</sup>/day]

Drainage capacity [Hourly] =  $2190 \times 10^3 / 24 = 91,250$  [m<sup>3</sup>/hr]

The deduction of drainage capacity from estimated discharge generated due to rainfall and runoff:

Surplus water =  $2,33,738 - 91,250 = 1,42,488$  [m<sup>3</sup>/hr]

Water Balance Analysis [monsoon period: June to September]

The analysis period covers 120 days [June to September]. The total stormwater discharge over this duration is:

Natural mitigation factors like infiltration and evaporation were also computed:

Infiltration rate = [10 mm/hr]

Evaporation rate = [3.3 mm/day]

Catchment area [A]:  $2.34 \text{ km}^2 = 2,340,000$  [m<sup>2</sup>]

Duration: 120 days [June to September]

Time per day: 24 hours

The total discharge and surplus volumes during the monsoon period were first calculated:

Total discharge volume:  $2,33,738 \times 24 \times 120 \times 1000 = 673,165,440,000$  [liters]

Surplus water :  $1,42,488 \times 24 \times 120 \times 1000 = 410,365,440,000$  [liters]

Using the respective rates, the infiltration volume and evaporation volume were computed as:

Infiltration volume:  $0.01 \times 2,340,000 \times 24 \times 120 \times 1000 = 6,739,200,000$  [liters]

Evaporation volume:  $0.0033 \times 2,340,000 \times 120 \times 1000 = 926,640,000$  [liters]

Accordingly, the net surplus stormwater volume, which must be managed through engineered solutions such as retention, treatment, or diversion, is given by:

Net Surplus volume:  $[410,365,440,000] - [6,739,200,000] - [926,640,000] = 402,699,600,000$  [liters]

This analysis highlights the importance of incorporating natural mitigation processes in urban flood planning to effectively reduce peak runoff and surplus accumulation.

A substantial volume of surplus water is generated in Dadar East as a result of rainfall and runoff during the monsoon season.

However, due to constraints in storage capacity, treatment infrastructure, and distribution systems, it is impractical to utilize the entire surplus water quantity effectively. To address this challenge, the present study proposes a solution that considers only a percentage of the total surplus water. This targeted approach aims to satisfy the industrial water demand of the Parel and Dadar East areas over the four-month monsoon period from June to September. By optimizing the use of available surplus water within realistic operational limits, this methodology seeks to contribute to sustainable water resource management and industrial water supply resilience in the region.

To moderate the repeating surge water logging in Dadar East, a brief floodwater redirection and treatment procedure has been proposed. The strategy includes the establishment of a transitory water treatment plant (WTP) on Dr. N.A. Purandare Stadium, utilizing secluded treatment advances reasonable for quick arrangement and short-term use. The excess water produced due to overwhelming precipitation and runoff is channeled through a brief high-capacity pipeline arrangement associated to existing adjacent pumping stations. This framework encourages the exchange of abundance water to the WTP location at Purandare Stadium, empowering on-site treatment and halfway reuse of water for mechanical or development purposes amid the rainstorm period (June to September).

This community-focused course of action ensures diminish in urban flooding, optimizes arrive utilize, and progresses decentralized, scalable reuse through a and cost-effective brief system setup. We are proposing arrangement to build Brief water treatment plant on Purandare stadium in Dadar ranges roughly 27000 square meters.

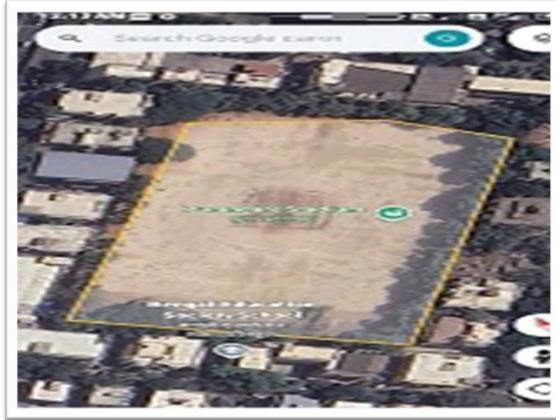


Fig. 3: Dr. N. A. Purandare Stadium in Dadar East

Projected Temporary Water Treatment Plant

Treatment Plant Capacity : 1000 [MLD]

Daily flow rate: 1,000,000 [m<sup>3</sup>/day]

Total flow rate (June to September): 122,000,000,000 [liters]

Industrial Water Demand

Total industrial demand (June to September): 110,010,000,000 [liters]

Treatment Cost (Approximate):

Low estimate: ₹. 0.50 per 1000 liters

High estimate: ₹. 2.00 per 1000 liters

So, let's use ₹1.00 to ₹1.50 per 1,000 liters as a typical temporary treatment cost.

Monthly water to be treated:

$110,010,000,000 \div 4 = 27,502,500,000$  liters/month

The total cost of treating 110.01 billion liters of water in a temporary water treatment plant is approximately ₹110.01 crore to ₹165.01 crore, depending on the treatment technology and setup cost.

## V FUTURE SCOPE:

This study supports the BMC and similar agencies in:

1. Promoting stormwater reuse to reduce potable water stress
2. Reducing urban flood risk via decentralized interventions
3. Exploring multi-purpose stormwater applications, including power generation and underground storage

RESULT: An estimated 27% of the surplus floodwater in Dadar East can be effectively diverted and treated through a temporary treatment system. This approach not only mitigates flood-related issues but also reduces the dependency on reservoir live storage and meets the industrial water demand of the region for the monsoon period (June to September).

## VI CONCLUSION:

The study on flood water logging in Dadar East, Mumbai, highlights inadequate drainage, rapid urbanization, and extreme rainfall as key causes of flooding. By transferring extra flood water which is generated from (rainfall + runoff) of Dadar East towards water treatment plant we can reduce the 27% impact of flooding and water logging in Dadar East and also, we can provide 110-billion-liter quantum of water to Fulfill the industrial Demand of Dadar East and Parel.

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