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Flood Control Underground Tanks

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Abstract : M*umbai being the financial Capital of India that suffers the extreme flood event every year, which leads to huge loss of life property, plants & animals Hence it is very essential to Control flood in Mumbai City. The Reason behind the flood is low lying topography, Meteorological and hydrological conditions of the Mumbai City with this various measures have been Conducted for mitigation of flood and inundation damage but the drainage problem is still one of the major task Historically On July 26 2005 Mumbai experienced unprecedented flooding with record rainfall of 944 mm causing direct economic damages estimated at almost 5.50 Billion Rupees & 500 fatalities. It caused the worst havoc in decades The Current underground drainage system is capable of handling 50mm rainfall. And because of this drainage system mainly flood occur So It is necessary to study & propose solution to the problem so firstly we took small region of a particular area of Mumbai region which experienced the flood impact & work on a sustainable underground tanks.*

Keywords *- : Flood Control, storm water, sustainable development, drainage system. Underground tanks.*

I. INTRODUCTION

In Mumbai the drainage system was build during British rule. Drainage system in Mumbai today is capable of handling 25mm rain. After a flood the society and the economy of any country suffer in many ways such as loss of lives, vegetation, property and infrastructure, which leads to fewer people on the labour force, less agriculture available for local and for exporting, and less business. This will cause mass displacement of people many of them may be left jobless and homeless. In order to fill this gap government will have to spend at higher level. The country may look for international assistance to supply food and rebuild it's infrastructure. Some countries will support voluntarily while other will for their efforts, putting the assisted country in debit and an economic loss.
The most significant disaster in the world is flood. More than half of global flood damages occurs in asia. The main causes of extreme floods are due to natural factors such as high tides rainfall etc. , and human factors such as blocking of channels, improper land use and blocking of drainage channel deforestation etc. Flood results in losses of life and damages to properties. Managing risk from extreme event is a crucial component in flood management. Good planning and management can help in reducing the risk of flooding.
There are four rivers in Mumbai of which mithi river is crucial for Strom water drainage as it separates the main city from its outskirts. Over the years, land encroachment along the bank of rivers have disrupted it's bank. While untreated sewage, waste water , industrial waste and garbage have clogged the river. Shockingly , the Strom water Strom water roads get flooded heavy rain stooped everything in Mumbai, leading to death of many people and leaving thousands of commuter stranded across the city as transportation services failed to serve. In several parts of the city waist-high water was seen and it also entered in thousands of home. The city received maximum 316 mm rainfall, which was the heaviest since july 26, 2005, record of 955 mm rain. The rain in 2005 has caused the worst havoc in decades in the business capital of country.

Floods resulting from a number of basic causes of which the most frequent are climatological in nature. The report of RashtriyaBarhAyog (RBA, 1980) lists various situations related to floods as follows:-

1. Streams carrying flows in excess of the carrying capacity within their banks, thus overflowing adjoining land,
2. Heavy rainfall synchronizing with their river spill,
3. Heavy local rainfall,
4. Backing up of waters in tributaries at their outfalls into the main river with or without synchronization of peak Floods in them,
5. Typhoons and cyclones,
6. Ice jams or landslides blocking stream courses resulting in back water overflowing river banks,
7. Inadequate drainage to carry away surface water with the desired quickness.

II LITRATURE REVIEW

SR. NO.	Title	Author	Conclusion
1	Flood disaster preventi on	Japan Riverfront Research Center	The increasing number and intensity of natural disasters, likely related to climate change, is affecting countries all over the Japan. The growing threat from natural disasters has led to a call for action to improve the planning of resilience measures, So Japan developed underground tunnels.
2	Flood control system introduci ng storage tank in manalia city Hall area.	John Harlods S. Castro. Brain G. Euroltan.	The results of the simulation showed that the tank significantly reduced the flooding in the area during extreme storm event. And Feasible tank volume for that city is 50,000 cumec.

A)

B) III METHODOLOGY

Phase 1 :- Selection of site

Why We Choose Mumbai?

Mumbai as mentioned above it is financial capital of India and because of flood Mumbai deal with a heavy damage to Indian economy along with a huge loss life property and cattle, giving rise to diseases and emotional disturbances for remaining people. For Settlement of situation the government have to give huge amount of money to the flood prone region and the reasons for flooding effects and solution we already studied.

C) Site selection- The site choose for construction of Tank following point are taken into consideration

- Topographical feature
- Hydrological condition
- Metrological condition
- Flood intensity
- Long term water sealing condition.

D) Factors Affecting The Quantity Of Stormwater

The surface run-off resulting after precipitation contributes to the stormwater. The quantity of stormwater reaching to the sewers Or drains is very large as compared with sanitary sewage. The factors affecting the quantity of stormwater flow are as below:-

- Area of the catchment
- Slope and shape of the catchment area
- Porosity of the soil.
- Obstruction in the flow of water as trees, fields, gardens, etc.
- Initial state of catchment area with respect to wetness.
- Intensity and duration of rainfall.
- Atmospheric temperature and humidity.
- Number and size of ditches present in the area.

E) Flood forecasting-

It is used for estimating & predicting the magnitude, timing & duration of flood based on the known Characteristics of river basin in order to prevent damage to human life and environment.

From the records of past 5 years of various fluids areas in Mumbai such as Mumbai central, Kurla, Dadar, Hindmata, King Circle, Santacruz, Ov road, Tara road etc. From this identify the maximum load from area has Kurla East the reason for selecting Kurla East has the maximum flow from area on the basis of low lying area due to low lying area the water from higher elevation get enters into this region and maximum flow occurs for those areas suggested or underground tanks

Phase 2 :- Area Calculation

By using Departmental Topographical Map and GIS,GPS Software we have calculated required area $1.45 \times 10^6\ m^2$

Phase 3 :-Measurement of Rainfall

The rainfall intensity can be measured by using different kind of methods but in this it measured by using rain gauge and recording the amount of rain falling unit time. The rainfall intensity is usually expressed as per mm/hour or cm/hour. The rain gauge used can be both manual recording type or automatic recording rain gauge and the all rainfall data of city has measured by that particular cities water board and printed on official sites so we can take that rainfall data easily.

Phase 4 :- Discharge calculation

To calculation of the Discharge of flood the following methods are used:

i. Catchment runoff
ii. Empirical formulae
iii. Cross section & bed slope
iv. Rational method
v. Area of cross section & velocity
vi. Available records.

Mumbai drainage system Drain water around 41% to 62% of Total rainfall.

Evaporation & Seepage losses are around 2to3% & 7to8% respectively.

From that, we can find Require Volume of tank.

Phase 5:- Dimension of tank of tank

Underground water tank act like a reservoir .The water of high flood and the high rainfall can store in this tanks.

max. average rainfall : 944 mm/day.

loss = 52% (drain and others).

so rainfall = 454 mm.

total selected area : $1.45 \times 10^6\ m^2$.

Volume of water = 658300 m^3

No of tanks = 4

Depth of tank = 15 m

Diameter of tank = 120 m

Total volume of tank = 678584.013 m^3

Phase 6:- Discharge of stored water

After all this work we have to discharge the stored water or utilize this water for some purpose like domestic or commercial or construction etc. This system must be capable to sustain discharge, velocity, Speed of flowing water etc.

RESULT

We have provided 4 tanks to control flood for selected region. The tank has capacity to store 678584.013 m^3 of water.

II. CONCLUSION

On the whole, mumbai faces a lot damage from flood and the Mansoon weather of Mumbai for low laying coastal nature of City continues to put a flooding risk , so the flood control technique of underground water tank system is make low or less effective to flood water.

The flood control by Underground tank system can be use in flood arrival zone and the high intensity area with an efficient result.

During the drought period this project is 50-50 beneficial by this the environmental balance can maintain because this water can used for various kind of situation, like farming,fish production,hydropower, electricity generation etc .

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