Flood Resilient Planning Proposal for a Critical Area of Vadodara City

[1]Riya S Dalal, [2]Palak S Shah

[1]Student, [2]Ad-hoc Assistant Professor

[1]Master of Town and Country Planning,

[1]Sarvajanik College of Engineering and Technology

Abstract: Natural hazard, flood especially now a days stand as the most frequent one posing huge damages to urban area. Development of an assessment framework for evaluating the extent of resiliency of urban area can be an effective way of incorporating resilience-related issues into the urban planning process. This dissertation intends to assess the flood resilience in urban system and governance in terms of the flood management plan for Vadodara city, also called a part of lower Narmada Basin/Vishwamitri River, Gujarat, India. The main objective of this thesis is to identify the critical area in Vadodara city and make proper planning for that area to make flood resilience and giving design by using GIS (Geographic Information System). GIS –based flood-risk modeling and consequences of flooding are presented for the selected most critical area.

The main concern in this thesis is to present current scenario and condition of flood in Vadodara city and with reference to the information gathered, provide proper planning proposal for critical area of Vadodara city. This thesis also for present flood management/development and their effectiveness in decreasing flood damages and evaluation of flood resilience.

Index Terms **- Flood resilience, Urban Planning proposal, Flood risk, River overflow.**

I. INTRODUCTION

Water is basic piece of life and it is fundamental need of any individual in their life. Waterway is the principle wellspring of water and it has been have to develop dam and other structure on stream to gather needful water for populace of country. With the increasing speed of urban improvement in on going decades, some building ideas in regards to water control have been evolving.

Vadodara district with 149 Sq km area, is located central part of mainland Gujarat, lies between 21°49‟19” and 22°48‟37” north latitude and 72°51‟05”and 74°16‟55” east longitude. It falls in the Survey of India, degree sheets numbered 46B, 46F, 46J & 46G. The district is bounded in north & northeast by Anand, Panchmahals & Dahod districts, in east & in south east by Madhya Pradesh & Maharashtra State, in south east by Narmada district & in south & in west by Bharuch district. Vadodara city, the district headquarter is about 100 km south of Ahmedabad, is well connected to other parts of the State & Country by network of highways and railway network. Vadodara district is divided 12 taluaks. Details of the Talukas, their urban & rural areas and numbers of revenue villages & towns etc.

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Figure 1 Vadodara city Map

Vadodara received 442 mm of rainfall between 8 am and 8 on Wednesday, the highest in Gujarat this monsoon. Of this, 286 mm of rain fall in just four hours ending at 8 pm. **Rains in Vadodara , Gujarat rains:** Gujarat's Vadodara city has received a staggering 442 mm of rainfall in just 12 hours on Wednesday, leading to heavy water-logging in the entire city. The local administration swung into action as it is shifting people from low-lying areas. Locals say that water entered into houses last night after heavy rainfall. The Vishwamitri river is flowing above the danger mark. The river flows west through the city and joins the Dhadhar river and Khanpur river. The rains have forced the administration to shut the airport. Several trains were also canceled in view of the prevailing situation. Schools in the city will remain closed on Thursday.

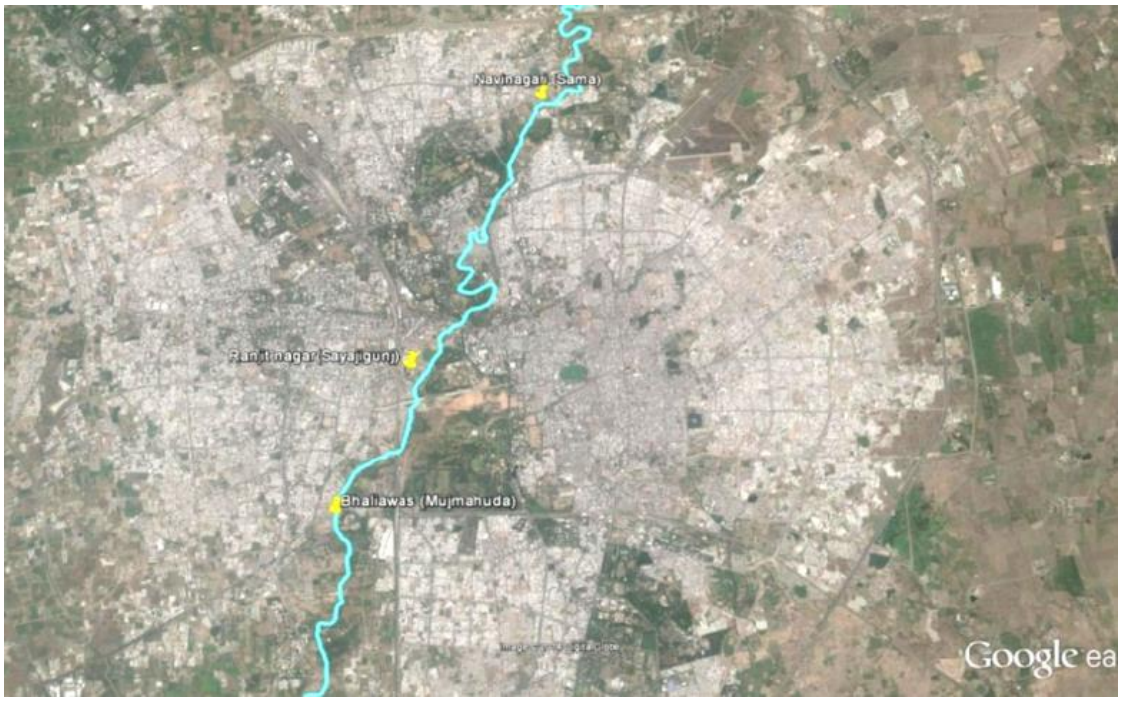

Figure 2: Map of Vadodara and river Vishwamitri, Gujarat, India

The dam is about 3.5 miles (~5.5KMs) long and 15 feet wide with 62 gates built on tge Surya rivulet and the Vaghali Nala at a distance of about 12.5 miles(~20KMs) from Baroda. Completed in 1890, when full the reservoir of the dam is supposed to have catchment area of something close to 195 square kilometers. The excess water in event of floods is dispatched to the Vishwamitri River of Baroda.

Although the population of Vadodara at that time was 100,000 it was the ruler's vision to build the reservoir 3 times larger. This reservoir has the ability to attend to the water requirements of about 300,000 people residing in the eastern parts of the city.

Figure 3 Ajwa dam on Vishwamitri River

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Flood Resilience

Resilience is the ability of individuals, communities, organizations and states to adapt and recover from hazards, shocks or stresses without compromising long-term prospects for development. Resilience is the capacity of individuals, communities, businesses, and systems within a city to survive, adapt, and grow, no matter what kinds of chronic stresses and acute shocks they experience.

II. STUDY AREA

Vadodara city profile

Modern Baroda (now known as Vadodara) is a great and fitting memorial to its late ruler, Maharaja Sayajirao Gaekwad III (1875-1939 AD). It was the dream of this able administrator to make Vadodara an educational, industrial and commercial centre and he ensured that his dream would come true. As per provisional reports of Census India, population of Vadodara in 2011 is 1,670,806; of which male and female are 869,647 and 801,159 respectively. Although Vadodara city has population of 1,670,806; its urban / metropolitan population is 1,822,221 of which 949,998 are males and 872,223 are females.

Climate

Vadodara district area, in general, being located south of *Tropic of Cancer* and in transition zone of heavy rainfall areas of South Gujarat and arid areas of North Gujarat plains, have sub-tropical climate with moderate humidity. The various season of the year are (a) monsoon - middle of June to October, (b) winter - November to February, and (c) summer – March to June. From March onward the temperature starts rising till it reaches maximum, as high as 41° C in some parts of the district. January is the coldest month of the year. There is a Indian Meteorological Department (IMD) station located at Baroda (Vadodara), where observation of climatic data is recorded since 1900.

Locations

There are almost five critical areas in Vadodara city:

Vadodara city Area name	Zone	Total Area (Approx)
Shubhanpura	West	2.15 km^2
Karelibagh	North	1.14 km^2
manjhalpura	West	7.8 km^2
Fatehgunj	North-central	3.32 km^2

Year 2005 Flood at Baroda City

Rainfall in this region occurs in mid-June to mid- September annual average rainfall is about 931.9 mm. Due to cyclonic circulation of upper air from 25 June to 3 July 2005, the otherwise moderate rain regions of Central and South Gujarat received unprecedented rainfall of 110 cm in 9 days. The floodwaters washed away villages, damaged/destroyed houses causing loss of life and extensive damage to property. The heavy rains has left many of the major dams full while the medium and small dams are overflowing, the worst being the case of Pratap Pura lake in Vadodara district where nearly 100-feet long breach developed in check dam-cum-reservoir as it overflowed and water gushed out towards the villages downstream. Much of the overflowing water was been drained into the Vishwamitri river flowing through the Baroda city. The situation has eased for the villages as the water level has established after the rains have stopped, but the water released from reservoir made river flowing near danger mark.

Figure 4 Vishwamitri River flowing near danger mark at heart of Baroda.

Sayajigunj Goggle Map Photo

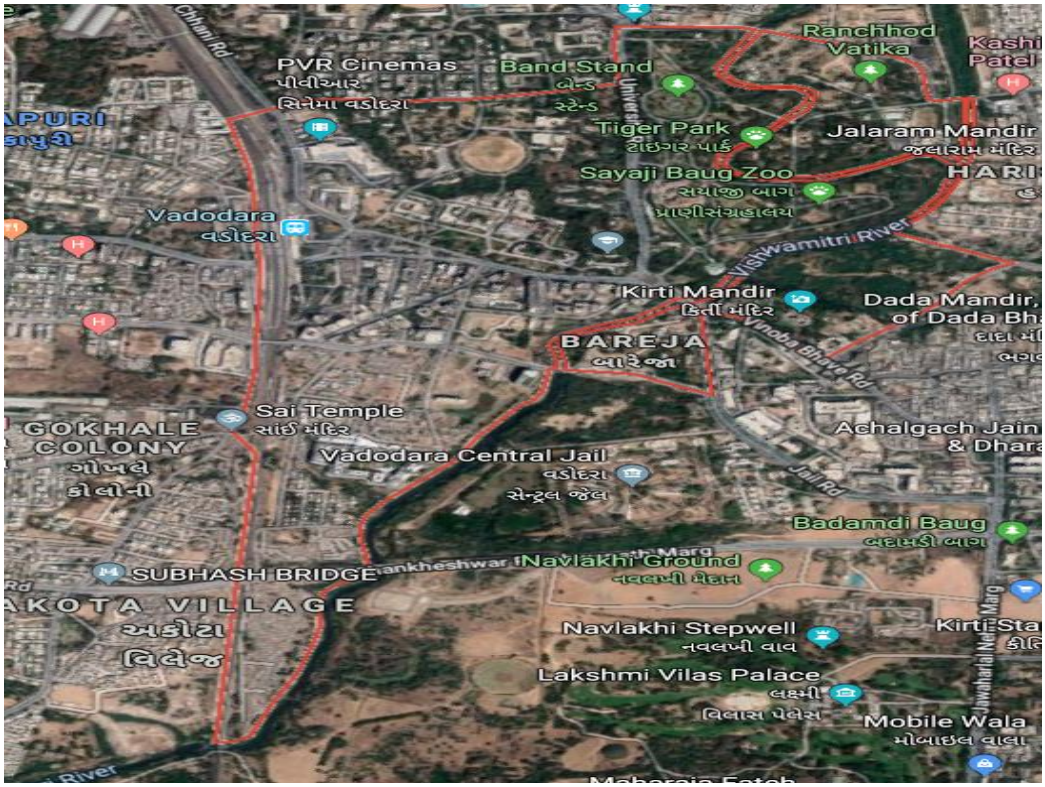

Figure 4 Sayajigunj area of Vadodara city

III. RECOMMENDATIONS

Below listed some flood prevention measures that can reduce the flooding effects as well as improves the resilience of the city.

a. Construction of artificial Reservoir
b. Land use control
c. Construction of Embankments/ protection wall
d. Channel Improvement
e. Drainage Improvement
f. Diversion of Flood Waters
g. Watershed Management
h. Increasing the carrying capacity of river
i. Channel Dredging

IV. CONCLUSION

From the above study it may be concluded that in areas experiencing flash flood at Baroda city new localities were built encroaching drainage channel. The flash flood may damage most of the structures built on illegal landfills. Taking this fact in to consideration the urban planner has to monitor the areas for checking the growth and expansion of the city, proper planning and management is required to mitigate the flood risk vulnerability in these areas. Satellite data gives an objective view allowing a synoptic viewing to predict changes in the region, use of time-series satellite data shows a continuous change, which is useful to resource management. In addition, combination of traditional methods with modern technologies like high resolution satellite data with frequent dates of acquisition can help for long term planning of land

and water resources, they may also prove excellent for detailed prediction at local scale for disaster management to prevent could-be- avoided damages.

V. REFERENCES

1. A global network for operational flood risk reduction, Lorenzo Alfieria, Saggy Cohenb, John Galantowiczc

2. Flood hazard vulnerability assessment in Kashmir Valley, India using geospatial approach, Tauseef Ahmad, Prof. Arvind Chandra Pandey, Dr. Amit Kumar

3. Urban flood mitigation planning for Guwahati: A case of Bharalu basin, Tanaya Sarmah , Sutapa Das

4. Hec-Ras Flow Analysis In The River Tapi , Darshan J. Mehta, Dr. S. M. Yadav & Mrs. Sahita Waikhom

5. GIS data base design, development and flood analysis: A case study of Olpad Taluka of Surat, Praful M. Udani1 and Dhruvesh K. Mathur2

6. Use of GIS-environment under the analysis of the managerial solutions for flood events protection measures, Aleksandr Nikonorov,Vladimir Badenko, Vitaly Terleev

7. Impacts of land use–land cover change and urbanization on flooding: A case study of Oshiwara River Basin in Mumbai, India, P.E. Zope, T.I. Eldho, V. Jothiprakash

8. Flood resilient communities: a Framework and case studies, James Hughes & Brian Sharman – AECOM

9. Calculating Discharge Carrying Capacity of River Tapi, Patel Chandresh G. Dr. P. J. Gundaliya

10. Urban Flood Vulnerability and Risk Mapping Using Integrated Multi-Parametric AHP and GIS: Methodological Overview and Case Study Assessment, Yashon O. Ouma, Ryutaro Tateishi.