# **Revitalization of Urban Spine- Pan City Proposal** for Vadodara

# <sup>1</sup>Dhruvita.D. Zala <sup>2</sup>Dr. K. A. Chauhan <sup>3</sup>Dr. J.E.M. Macwan

<sup>1</sup>M. Tech Student <sup>2</sup>Associate Professor & Section Head (Urban Planning) <sup>3</sup>Professor & Head of Department <sup>1,2,3</sup>Department of Civil Engineering

<sup>1,2,3</sup>SVNIT. Surat. Gujarat. India

### Abstract

Vadodara has secured its name in the list of 100 Smart cities under the Smart City Mission of Ministry of Urban Development (MoUD), Government of India launched in June 2015. Sustainable and Smart city aims at long term high tech solutions. Cities have turned into concrete jungles due to advent of machines and over population. Vishwamitri river has acted as an urban spine to the city even though it's not a perennial as it divides it geographically into eastern and western region. While the river under design consideration i.e VMC area is 16.5 kms. The average width of the river is 500m while its depth is 8-10 mt. The 25km stretch of river passing through the city is the only river in the country having 206 crocodiles living in the urban context. A socio-economic survey was conducted for deriving the design proposal which included 25% of stake holders including ages, workers, slum dewellers, 50% of experts including VUDA and VMC officers. The rest 25% included the college and institute heads and faculty opinions. Even a movie is made showering the existing profile of the river. The state has cleared 66-acre plot for developing the crocodile park and a garden to boost the natural ecological balance and sustainable tourism. This paper envisages the Development to create a 'Cleaner, sustainable, diverse and integrated' river front for Vadodara to add flavor to the dead urban dense fabric. The river has become largely inaccessible from the city, and is no longer seen as an asset even though it has got potential to generate employment, education, recreation, business and provide inclusive growth. The first initiative will be to map the existing land use and propose the barrages to check the flow and accessibility of water for a sustainable development against seasonal flooding. Proposal for commercial development in the form of ratri bazaar, crafts centre, exhibition grounds, sports ground can add to the revenue for financial sustainability. The design proposal will provide new public spaces, heritage walk ways, botanical gardens, crocodile parks, exhibition grounds, promenades, footpaths and ghats along the riverbanks to add to the environmental and cultural sustainability. To promote walkability and cycle friendly environment larger blocks are broken into smaller ones. Paper focuses onto bringing a holistic urban innovation for the people of Vadodara. It will also talk about the volumetric guidelines, svp (special purpose vehicles), boosting of the recreational, commercial and green land use for a better sustainable futuristic urban planning. Keyword- Volumetric guidelines, Svps (special purpose vehicles), Promenades, Heritage walk way, Walkable Cities, Swach Bharat Abhiyan

# I. INTRODUCTION

The proposal for 'Resurging The Urban Spine of Vadodara City - Pan Project Proposal' aims to investigate the current role and situation of urban spine and to develop design strategies in context of landscape architecture and urban design. Designing tool involves thriving spaces that invite people to linger and, interact and connect. They support the popularity of activity centre's providing a space for a wide range of formal and informal activities that supports social and cultural life for users of the centre. As Vadodara is devoid of recreational spots and places, those which are there in the city itself are in unorganized and underdeveloped condition so due to this people find their recreational spots outside or moved to other zone which causes heavy traffic congestion and trip generation. As Vadodara is devoid of recreational spots and places, those which are there in the city itself are in unorganized and underdeveloped condition so due to this people find their recreational spots outside or moved to other zone which causes heavy traffic congestion and trip generation. Vadodara city has a potential to develop as a focal point for recreational activities with various garden, shopping areas. Whole riverfront stretch and many places of public attraction etc. This planning proposal for rejuvenation involves designing strategies to regenerate recreational spaces which are already existed in city. It starts with identifying pockets for development with respect to the people visited and by taking destination survey about pros and cons of recreational spots and suggestions regarding the facilities which needs to be modify. Proposal involves identified pockets individual drawing and the connected recreational transport circuit network so that all recreational spaces should be interconnected to each other To rejuvenate the urban spine so that people will be benefited by providing ambiguous environment and added advantage to the aesthetic beauty of the city.

# II. OBJECTIVE AND SCOPE OF STUDY

- To study the concept of resurging of urban spine in Indian context.
- To identify the potential space for resurging the urban spine of Vadodara city.
- To analyze demand and need of the residents for proposals.
- To rank the locations on basis of their existing condition.
- To provide a suitable planning proposal to resurge the urban spine of Vadodara city considering the future scope.

## A. Scope of Study

- Physical boundary is limited VMC (Vadodara municipal corporation area).
- Limited to proposal of land use plan, rejuvenating & recreational spaces in the form of lake front, streetscape, garden, arts and craft zone, crocodile park, riverfront and places of public attraction.
- Financial aspects are out of scope.
- B. Need of Study
- Recreational spaces in Vadodara city are devoid in aesthetics and proper facilities, so people found their places of interest outside the zone or else to other commercial spaces.
- This crowd in search of recreational open public space for rest and relaxation, food etc results in more trips and heavy traffic congestion.
- Vishwamitri River has been an important part of Vadodara.
- Garbage is dumped in the river, sewage flows from the storm water outfalls, sewage flows through the tributaries, slums have encroached in to the river and cities have turned back onto the river.
- The lag in interconnectivity between the recreational spaces needs to be modify.
- Since the river is highly inaccessible, it has lost its cultural significance and therefore has been neglected and abused over the years.
- An unused land like the whole riverfront stretch needs to be revitalized in accordance with the existing places of public attraction for proper functioning of city.

# **III. STUDY AREA PROFILE**

# MAP SHOWING GUJARAT (VADODARA) IN INDIA



Fig. 1: (location map for Vadodara)

Vadodara is divided into two physically distinct eastern and western regions by the river Vishwamitri. The eastern bank of the river houses the old city, which includes the old fortified city of Vadodara. This part of Vadodara is characterized by packed bazaars, the clustered and barricade Pol system and numerous places of worship.



Source: Baroda, Gujarat & Bombay states surveyed 1876-77

Vadodara is located at 22.30°N 73.19°E in western India at an elevation of 39 metres (128 ft). It is the 18th largest city in India with an area of 235 square kilometres (91 sq mi) and a population of 4.1 million according to the 2010–11 census. The city sits on the banks of the Vishwamitri River, in central Gujarat. The Vishwamitri frequently dries up in the summer, leaving only a small stream of water. The city is located on the fertile plain between the Mahi and Narmada Rivers. According to the Bureau of Indian Standards, the town falls under seismic zone-III, in a scale of I to V (in order of increasing proneness to earthquakes).Vadodara features a tropical savanna climate under Köppen's Climate classification. There are three main seasons: Summer, Monsoon and Winter. Aside from the monsoon season, the climate is dry.



Fig. 3: (Project influence zone)



Fig. 4: (Evolution of Vadodara City)

# **IV. METHODOLOGY**

The methodology adopted for the study and the sequence of various steps undertaken is shown in the fig below. The first stage is selection of the study area with aim, objectives. In second stage literature review has been done. Third stage followed by collection of inventory and field data. Fourth stage consists of analysis and calculation for future requirements. In fifth stage proposals has been given in various locations to enhance the city development.



Fig. 5: Flow diagram of methodology: author

# V. DATA COLLECTION AND ANALYSIS

The Inventory data is collected from different sources like Vadodara Urban Development authority, Vadodara Municipal Corporation, internet, media and newspapers and the field data are collected from visitors, Experts and Stakeholders.

- A. Primary Data Collection
- Research papers and journals
- Internet and local news channels
- newspaper and magazine
- Government websites and documents
- Case studies and attending seminars, census.
- Data from organizations and agencies
- B. Secondary Data Collection
- Socio economic surveys and physical surveys, interviews and direct observations.
- Meetings with subject experts like architects, town planners
- Various departments of Vmc& Vuda, local residents and institutions, slums, environmentalist
- Made a documentary film and photography
- Meetings with Government officials

SWOT analysis is developed following an integrative procedural model that includes the visitors, stakeholders, and experts.



## Fig. 6: Data collection procedure: author

# C. Analysis

The analysis gives a complete understanding to identify behaviours of visitors, stakeholders and experts for existing situation of vishwamitri in vaodara city which is followed by comparative analysis, sentimental analysis, gap analysis and SWOT analysis.

#### D. Preference Analysis

Out of all the surveys conducted 30% of them were college going students youth, then 15% were business class people and 15% school going kids, 15% working class people while the rest includes retired, home makers and self-employed.



Fig. 7: Data analysis: author

These are the preference for amenities based on the age group.



Fig. 7: Data analysis: author

#### E. Comparative Analysis



Fig. 8: data analysis: author

Entertainment Elements	PREFERENCE 1 MIG	PREFERENCE 2 LOWER INCOME	PREFERENE 3 LIG	PREFERENCE 4 HMIG	PREFERENCE5 HIG
River Based Activities	39	30	11	6	10
Children Park	18	13	38	17	14
Crocodile Park	2	11	18	40	29
Heritage park	40	32	9	7	12
Art & Culture Gallery	1	0	24	30	45

Table 1: Showing The Preferences of Activities According to The Income Group

The comparison between different amenities is shown and it clearly shows residents are mostly wanting to develop with the heritage, crocodile park and water front.



Facilities to be upgraded: Maximum people felt that all the infrastructures are very important and a special consideration aand care should be taken care while the river front is developed.

#### F. Gap Analysis

The gap analysis is done on the basis of standard norms considering current scenario for up-gradation of recreational land use for future development in Vadodara City.

Year	Percentage of Recreational	Minimum Requirement of Percentage	Gap(N-M)		
2011	12.54	15	2.54		

Table 2: Gap analysis: author

Where,

P = Recreational facilities gap.

M = Existing Recreational

N =Required Recreational facilities

Based on Urban and Regional development plans Formulation and Implementation URDPFI Norms India 2015 for a port city the recreation area can be minimum 15 to 20 percent of the total land use of the city

#### G. Attraction Feature



Fig. 10: data analysis: author

The chart shows that maximum attraction for the residents and the out siders lies in the heritage (35%) and culture (25%) of the city. Thus by the survey strong need for strengthening the heritage should be proposed.



Fig. 11: data analysis: author

Maximum people i.e (35%) people surveyed are having two and four wheelers which contribute largely to the traffic problem and only 5% are such who have no vehicles which include outsiders, students and slum people.

#### H. Swot Analysis

#### 1) Strength

- Vishwamitri River has great historic and cultural significance in the context of the city.
- It is an ecological corridor, a living river.
- The river runs through the heart of the city and has several public institutions on its banks.
- The character along the river is varied and distinct.
- The river has a meandering course which has given rise to several ox bow lakes which are an important environmental asset.

#### 2) Weakness

- Over the years the river has become inaccessible, neglected and abused.
- Garbage is dumped in the river.
- Sewage flows into the river from storm water outfalls and natural drains.
- Areas surrounding the river face flood risks every year.
- Slums have encroached on the river bank which do not

#### 3) Opportunities

- The historic and cultural aspects of the river can be revitalized and given new meaning.

- The natural ecology and river system can be preserved and revived to transform an important natural feature into an asset for the city.
- Existing cultural district can be strengthened and new one can be created along the riverfront.
- Existing commercial district can be redeveloped and transformed as the new central business district of the city.
- Northern and southern stretches of the river are relatively undeveloped and can provide many opportunities for growth and development.

## 4) Threats

- Flood management and mitigation is required so that areas surrounding the riverfront may be developed and habitable.
- Pollution in the river needs to be curbed and diverted so that the natural ecological system is restored.
- Crocodiles in the river need to be moved to a dedicated habitat for public safety.
- In the central portion the city has already developed upto the edge of the river and the vision for the riverfront will need to take this into consideration

# VI. PLANNING PROPOSAL

## A. Proposal 1

Develop Barrages to retain water in the river.





Fig. 13: proposal for developing a barriage





C. Proposal 3- Designing of The SAMA Lake Front



Fig. 15: SAMA talav location - google earth



Fig. 16: conceptual diagram for developing sama talav



Fig. 16.1: Uniform embankments

With the growing threat to pollution and encroachments, conserving the lake as an urban asset of the city is important

#### 1) Recommendations

A comprehensive strategy for development of the lake should be formulated that addresses the needs of the local area and the wider context. This is necessary to ensure that the project is successful in the long run.

#### 2) Improve accessibility

Create new accesses to the lakefront in order to integrate the master plan with its overall context.

#### 3) Entry Points

Create new and distinct entry points to the lakefront

#### 4) Uniform Embankment

Developing a uniform embankment provides more land area for the development around the lake for the public use.

#### 5) Activity Zone

After the development of uniform embankment and availability of land, various supporting facilities for the public can be distributed across all sides of the lake.

#### 6) Flood

Catchment area needs to be studied and an overflow linkage to Vishwamitri River needs to be designed accordingly to ensure that rain water during monsoons does not pose a threat to the surrounding areas. Other parameters to be considered for detail design- Quality of water, lighting, materials etc.

#### D. Proposal 4 Crocodile Park Proposal

A unique characteristic of Vishwamitri River is that it is an urban river with a thriving population of crocodiles in the city limits. Mugger, the crocodile species are very crucial to protect from human activities and vice versa.

A protected habitat for the crocodiles shall enable a mutually secure solution.



Fig. 17: conceptual diagram for developing crocodile park





Fig. 9.135 Satelite Image



Fig. 9.138 Land Use, Development Plan-The location as an designated for Representional Purpose (RP)



Fig.9.137 Proposed Crocodile Park as a part of Viohwamibri Riverfront Development Project





## 1) Benefits

This project will provide protection for crocodiles against predators, extreme climate, disease while providing appropriate and sufficient food and water to sustain health and vitality.

It will also provide protection for Humans as crocodiles will be kept in a confined habitat.

It will promote public understanding of the value of crocodiles in the wild.



Fig. 18: conceptual diagram for developing crocodile park

#### 2) Considerations for a Crocodile Habitat

All crocodiles must have access to clean water at all times.

Crocodiles require a pool of water that is large and deep enough to enable the crocodile to completely submerge. It is recommended that between 60-75% of the bottom of the tank or enclosure is water.

There must be sufficient dry ground to enable the animal to exit the water completely to bask itself and turn around comfortably. The land substrate should consist of a large flat rock, stones or pebbles. As a general guideline, the land area should be approximately 25-40% of the total area of the tank or enclosure.

The crocodile must have exposure to sun and shade within the pool as well as on dry ground so that the animal may regulate its temperature. Shade is very important because crocodiles may burn and /or overheat. In particular, young crocodiles must have shelter.

Water temperatures must be maintained at between 26°C and 29°C. Crocodiles prefer air temperatures that range between 29°C and 33°C.

E. Proposal 5 - Integrated Public Transport



# **Public transport**



Fig. 19: conceptual diagram for developing public transport

A river link public transport route has also been recommended for providing dedicated public transport along the riverfront. This will encourage visitors and ensure access for all. This public transport route will cater to all the future development along the riverfront and should be integrated with planned BRTS routes and other existing public transport routes. Pedestrian and cycling network. The public promenades along the riverfront will form a dedicated pedestrian & cycling network which can be

integrated with a wider city plan for pedestrian and cyclists. 29 km of promenades will be developed which will form part of the pedestrian and cycling network. 3 nos of pedestrian bridges are proposed.

F. Proposal 6- River Front Edges



*G.* Monitoring Water Quality with Smart Technology- Smart Water Sensors to Monitor Water Quality in Rivers and Lakes The following excerpts are from the technical brochure of Libelium, particularly called 'smart water'.

- 1) Libelium
- To simplify remote water quality monitoring, Libelium launched a Smart Water wireless sensor platform.
- To measure the most relevant water quality parameters (more than 15) for water control, it is equipped with multiple sensors along with an accurate turbidity sensor.
- Waspmote Smart Water is the first water quality-sensing platform to feature autonomous nodes that connect to the Cloud for real-time water control.
- It is suitable for potable water monitoring, chemical leakage detection in rivers, remote measurement of swimming pools and spas, hydroponics, fish tank monitoring and levels of seawater pollution.
  - 2) Features
- 1) Waspmote plug & sense



2) Solar panel



3) Programming the Nodes



4) MESHLIUM



- 5) OTAP
- Over the Air Programming is also possible once the node has been installed. With this technique you can reprogram wirelessly
  one or more Waspmote sensor nodes at the same time by using a laptop and the Waspmote Gateway.



## 6) Typical OTAP Process



- 7) Example of installation of a complete mote Program in minutes
- The Sensor data gathered by the Waspmote Plug & Sense! nodes is sent to the Cloud by Meshlium, the Gateway router specially designed to connect Waspmote sensor networks to the Internet via Ethernet, Wi-Fi and 3G interfaces.

# VII. A 'SMART APPROACH' FOR WATER SYSTEM MANAGEMENT

One of the major road block in the way of revitalizing the urban water bodies is the Lack of Data/Information: India has a number of lakes, but data about their existence is extremely hazy as there is no orderly or scientific census of lakes. In many cases, we do not even have correct data on the number of waterbodies that exist in a particular area. For example, in 2001, on the order of High Court a joint survey committee assessed the number of natural waterbodies in Delhi and came up with a list of 508 waterbodies, which differed from a count of 794 submitted by TAPAS (a Delhi based NGO). The court asked for another survey and Delhi Development Authority (DDA) came up with a new count of 580 waterbodies in Delhi in 2004. To make the situation worse, there is also mismanagement of data by the concerned departments. For example, in many cases lakes have been given different names by various departments, hence it becomes difficult to locate and identify the lake itself at the first place. This situation underlines the fact that the urban water bodies will continue to be under stress, encroached and manipulated to be used for alternative uses.



Once identified the next challenge is about monitoring of the water quality, and consequently ensuring the upkeep and maintenance at the desired level by the urban local body. A methodology is suggested on the next page.

With the emergence of ICT (Information and communication technology) tools and methods, it is now possible to monitor and manage our precious resource at much closer level. The agenda could be multifold and the opportunity for the application of ICT at different level can be explored further. Few possibilities are-

1) Geographical integration and networking of these water bodies as per the catchment potential and drainage hierarchy. (Can we make use of existing storm water infrastructure?)

- 2) Continuous and real time monitoring of the water levels as well as the pollution levels for closer watch, control and management.
- 3) Integration of bio-diversity module for each lake ecosystem by way of ICT sensors and monitors.
- 4) Better flood moderation and control due to increase of water channelization and increased percolation by way of ground water recharging.
- 5) Improved household, business and societal awareness (to bring the public participation),
- 6) Develop and demonstrate widely applicable concepts for energy recovery from water use, enhancing the water-energy nexus.

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