

Reviving Vishwamitri River: an effort to a Sustainable Impact

Dr. Nirlesh Kothari

Professor and Dean
School of Business and Law
Navrachana University
Vadodara
nirleshk@nuv.ac.in

Ms. Anitha Thomas

Assistant Professor
School of Business and Law
Navrachana University
Vadodara
anithat@nuv.ac.in

Abstract

Rivers are the cradle of civilization and, as such, are indispensable features of urban history. Rivers are not merely unique spaces in a city, but also the most representative region which reflect the local character. Sixty-nine large cities in the India are located on river banks with rivers providing drinking water, convenient transportation channel, and abundant natural landscapes and causing moderate temperature. Thus river is this cities' most valuable natural resource". Since the urban population and the need for land have increased rapidly; a good many river spaces have been occupied, resulting in the deterioration of the river.

The Story of Vishwamitri River is one such story of a degrading or dying river. Indiscriminate "housing development" in not only low lying areas and pits but also in the river bed itself, filling up ravines and the river bed with waste and debris, allowing slums to develop near river and above all local authorities turning a blind eye to all the activities happening near the river are effectively killing the river. These activities have obstructed the natural flow of rainwater and the result is, even a downpour of 5 inches water floods the city of Vadodara. The section of Vishwamitri river passing through Vadodara is also a natural habitat many species of flora and fauna including crocodiles whose existence is threatened.

This study attempts to understand Vishwamitri River in its origin glory, resultant effects of Urbanization, the process of its degradation, general indifference among the community living on the river bank and work of various agencies involved in reviving the river.

Collaboration among agencies and people to bring about systemic changes needed for revival of the river seems a big challenge. The river seems to have lost almost all connection with the most people in the city; there are many die-hard supporters of the movement to revive Vishwamitri. The revival movement is in the right considering the heritage, the flora and the fauna. This study also aims to explore feasible ways to engaging various stakeholders and people in general leading to sustainable efforts for revival this glorious river.

Keywords: Environment Management, River Management, Reviving River, Sustainable efforts.

Vishwamitri River: An Introduction

The Vishwamitri River is a seasonal, west flowing river between the Mahi and Narmada rivers in Gujarat state. After flowing 80 km the river meets Dhadhar tributary on the right bank at Pingalwada village 500 m up stream of gauge and discharge site. After flowing another 55 km it falls into the Gulf of Khambat. The important tributaries of the Vishwamitri River are Surya, Jambua River and Bhukhi River. Surya River joins at Dena village before entering Vadodara and Jambua river joins at Jaas village near Khalipur after leaving Vadodara. Vishwamitri basin is part of Dhadhar basin which extends over an area of 3423 sq. kms in Eastern part of Gujarat. The total catchment area considered for the river extent within the project influence zone is 598 sq. kms.

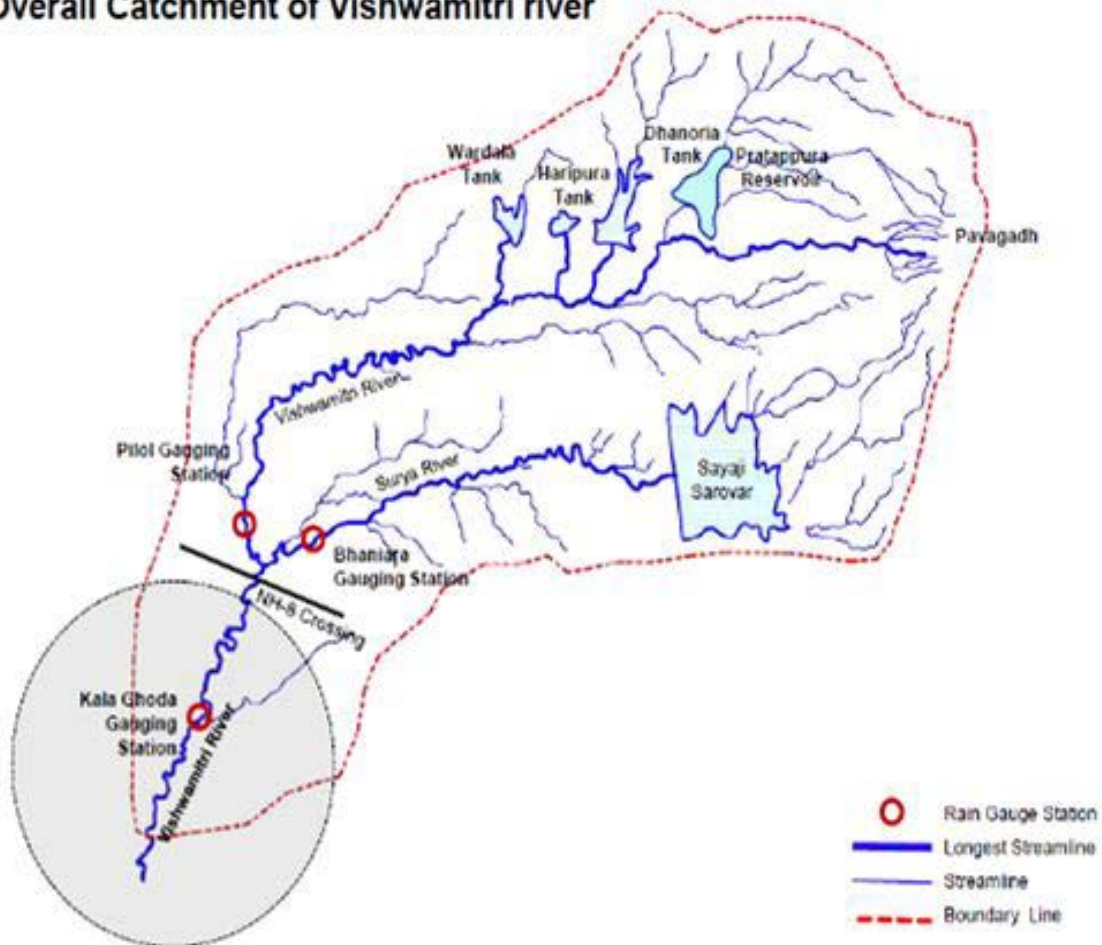


The Pavagadh hill from where Vishwamitri originates is made up of trappean rocks that rise abruptly 830 meters above sea level. The hill is around 5 km long and 5 km wide and consists of several scarps separated by extensive plateaus. It shows terraced appearance on account of

the differential weathering of the horizontally disposed constituent rocks. A number of subsurface anticlines and geomorphic highs control the drainage of the Vishwamitri River. These highs have caused anomalous bends in the channel of Vishwamitri River and such areas are poorly drained. For most of its course, the river flows in the Gujarat alluvial plain made up of loose sediments of gravel, sand, silt and clay. The channel of the Vishwamitri River is highly sinuous and deeply inside meandering channel, slope deviator and is controlled by subsurface heights, lineaments and faults in the area. It also shows a branching pattern.

Water from **Pratappura Sarovar, Haripura tank, Wardala tank, Dhanora tank, Asoj feeder** flows in vishwamitri. **Wardala tank, Haripura tank, Dhanora tank** in the north and **Sayaji Sarovar** are the main reservoirs within the **catchment area of the river vishwamitri**.

Overall Catchment of Vishwamitri River



.Uniqueness of Vishwamitri (in Vadodara):

- 1) 7 Kaanz (local name for Channel) including Bhuki Nala, 3 dried and 4 functional
- 2) 32 water bodies : 19 functional and 8 non functional
- 3) Habitat of Crocodiles

Present Status of Vishwamitri

The mounting population and advanced standards of living have resulted in an ever increasing demand for residential land both in villages and towns. Vadodara City is obligated to grow vertically rather than horizontally. Inability to address the increasing demand for infrastructure in the city had made more and more people being forced to stay near river banks. As a result of this, large numbers of human settlements have emerged on and near banks. Slum settlements have been overlooked as they became part of developmental strategies in Vadodara. Municipal authorities in charge of solid waste management pay little attention to urban drainage systems even though uncollected garbage is most often the cause of blockages which obstructs the natural course of the river. Due to urban and industrial activities are carried out in the vicinity have contaminated the groundwater. The artificial landfills of various wastes, subsurface injection of chemicals, hazardous wastes, are also affecting groundwater pollution. Along with this the inadaptability to deal with floods and lack of resources to deal with the same play a vital role in increasing vulnerability. These problems have affected that health of Vishwamitri River.

Main problems are:

- 1) Level of water – dries up after monsoon
- 2) Quality of water is bad an worsening
- 3) Surrounded by slums areas
- 4) Excessive flooding during heavy rains

Sewage Management in Vadodara

Development and industrialization exert pressure on the riverine system degrading the serenity of the rivers. A study on Vishwamitri River has looked into the spatial difference in pollution levels in the stretch of river. Significant difference was observed between the water and soil quality of the river before it enters the Vadodara city and after it leaves the city limits. The observed difference is directly correlated with the quantum of sewage entering the

river from the city at different points and solid waste dumping practiced on its banks. The total domestic sewage generation from Vadodara city is about 215 MLD out of which the treatment is being given to only 180 MLD of the sewage. The treated and untreated wastewater is let out into the river. Vadodara Municipal Corporation has established the sewage treatment capacity of about 215 MLD out of which 180 MLD is being used as a sewage collection facility. Contribution of industrial sources is estimated at about 20-25 MLD, out of which two industrial areas are treating their wastewater through CETPs (capacity 7.75 MLD). The other industries are treating their wastewater through their own treatment plants. However, there is large number of small scale industries located in residential areas generating significant amount of wastewater and not having any treatment plant. The wastewater from such industries is let out into the VMC sewerage system.

Sewage is diverted through the natural drains, as the network does not exist or is inadequate. To avoid sewage overflowing in the streets and lanes, the lines are connected to these nallahs as a temporary measure. Hence, as a priority measure, the network needs to be separated and diverted to STP. **The pollution resulting in Vishwamitri** is largely due to the untreated sewage, which enters at various points across the 21-km odd meandering stretch of the river in the city. Also, the river being seasonal, the water flowing in the river for most part of the year is nothing but sewage let out. The water in the downstream is used for irrigation purpose by the adjoining farms. Lack of storm water drains also results in the overflowing of sewers and frequent cleaning and maintenance. The overflowing sewage, many a times, finds its way to the river / nallah / water bodies. Consequently, rain water is also let out in the sewers. Hence, one of the prime objectives of the department is to separate sewage from storm water. The sewerage system has not reached the newly developed areas of the city. The sewage from this area needs to be collected and conveyed to the treatment plant location and treated before it is discharged in the river.

Land use

The change in land use pattern over last couple of decades due to urbanization has emerged as a major cause of urban flooding in Vadodara. Increasing unplanned construction in the low elevation areas and river banks, depletion of water bodies, encroachment of river banks by slums and the conversion of land for agriculture to a large extent are the major land use changes responsible for frequent flooding in the city. The study makes an understanding that area of the existing water bodies is also decreasing due to dumping of wastes and

construction along the banks. The presence of slums has increased by a great extent throughout the city, especially along the banks of Vishwamitri River reducing the width of the river. Unplanned construction around low lying zones, obstructing the flow of water into the sinks is causing water logging in most of the areas in Vadodara.

Lack of Ecological Awareness

Due to urbanization and land use has reconstructed natural river channel to an artificial one, while doing this only the issue of safety has been taken into account, while the impact of engineering and construction on the ecosystem, flora and fauna, and microbes is not considered. Although large-scale drainage is advantageous to flood control and management, the city's capability of restoration, self-purification and self-recovery has been reduced, followed by the disappearance of natural wetlands and water pollution. These developments has broken the initial nature character of the riverfront and made the river diversity into singleness, which changed the original forms of the eco-system.

Ignorance of the Historical Context

At present, many landscape design projects in Vadodara, blindly following the beautification movement, and simply pursue modernization. This approach lacks individuality and character, preferring homogeneity over the innate quality that makes Vadodara distinct. It tends to ignore local characteristics. The city's riverfront projects are hastily designed square green spaces along riverfronts without thorough planning guidance, strong concept and clear design themes while ignoring the potential conflict between modernism and local culture. Riverfronts typically have rich historical resources and heritages; however many current riverfront projects have ignored traditional culture and local characteristics in the application. Meanwhile, the urban riverfront design and planning cannot be well combined with traditional culture. Some buildings are repaired, rather than removed from the original material carriers, which damages a large number of old buildings. Moreover, existing buildings or sites are not taken into consideration by local builders who design large scale project, which seriously destroys the original riverfront features and profiles, and artificially separates the city's spatial form.

Work of various agencies involved in reviving the river.

Vadodara Design Academy (VDA)

In 1998, after a month-long study, budding architects of city-based Vadodara Design Academy (VDA) created an information bank on the river. Despite passing through the heart of the city, Vishwamitri is waiting to make a connect with the city, opine the students. The finding of the study reveals:

- River is an important urban element but the relation of Vishwamitri and Vadodara is declining due to degrading conditions and no access that people have to the river. All the construction that has happened on the banks of Vishwamitri river so far are facing back side. People are no longer dependent on Vishwamitri and hence there is a dire need to make the edges of the river active and involve people.
- The crocodile-infested river, which according to latest census is home to 260 reptiles, has strong ecology. The diversity of flora varies from 'gando baval', 'pipal', bottle palms, 'asopalav', African tulip trees, mango trees, bamboo, gulmohar, goras ambli, mahuda and amba among others. Similarly, the riverbank is also rich in shrubs and herbs like ink berries, tulusi, coffee senna, thai eggplants, eelgrass, little ironweeds, brahma grass, marigolds, Indian whitehead to name a few.
- Continual urbanization has resulted into encroachment of river edges causing severe abasement and degradation of river edge and water. Dumping of organic and industrial waste has led to increased chloride levels in surface and groundwater. Also, deposition of solid waste on the river edges has resulted into siltation of river beds diminishing the floor carrying capacity of the river, the study states.
- Vishwamitri has become a back yard rather than a front yard for the city. This river and its bed are the lungs of the city and it is very important that attitude of people regarding the river changes. Apart from recreational models, Vishwamitri can also give us economic models like urban farming.

VDA has shared the study which included survey of Vishwamitri's landscape, ecology, topography, hydrology, pollution levels among others with professional bodies like Vadodara chapters of the Indian Institute of Architects, Indian Institute of Interior Designers, NGOs like Vaho Vishwamitri Abhiyaan apart from consultant hired for riverfront development project.

Vaho Vishwamitri Abhiyaan jointly proposed by National Bioshield Society and the Community Science Centre, Vadodara is a voluntary; grass-root citizens' movement that envisions and advocates a Holistic and Inclusive approach to comprehensively revive Vishwamitri River and its watershed in Vadodara and Panchmahal Districts of Gujarat State, India. It strives to ensure multiple, short and long term benefits to the entire watershed and its different stakeholders now and in future. The vision is to bring a comprehensive revival of the River while respecting its past, responding to its present and designing harmonious future.

Proposed by a group of experts and NGOs, the project seeks to make around 135 kilometers stretch of the river clean and ecologically sustainable by building check-dams and small reservoirs, putting effluent treatment systems to contain river pollution, besides planting 8.5 million trees. The Abhiyan aims to develop a "Bioshield" starting from Pavagarh hill to Bay of Khambhat throughout the length of river Vishwamitri. This bioshield will create everlasting flow of clean water in the river that has wild plants and animal habitat on its banks supporting vegetation and propagating organic farming practices for environmental conservation. This is advocated by a program planned by Community Science Centre of Vadodara and National Bioshield Society together supported by various experts and people.

"The 'Vaho Vishwamitri Abhiyaan' is a call to revive the river by implementing sensitive eco-engineering, landscape planning and architectural designing to achieve the outcome," said former vice-chancellor of Gujarat Agriculture University Padmashri awardee M H Mehta, who heads both NBS and CSC, Vadodara. The plan includes setting up seven lakes along the river so that city gets water enough for a population of 18 lakh and double than what it gets from Ajwa by 2025. "This project is of prime importance for Vadodara. By changing the quality of water, you can also change quality of life of the people," said professor Erico Drioli, an international expert of water treatment.

Goals envisaged by Vaho Vishwamitri project:

- 1) develop participatory, interdisciplinary, research based and sound design solution and development strategies that ensure ecologically and economically healthy and experimentally rich river watershed and Vadodara city
- 2) Generate greater awareness among different stakeholders about the present issues and opportunities possible vibrant future for River Vishwamitri, its associated water-bodies and the human settlements

3) Help ensure successful implementation of the above vision and goals in a timely and effective manner

Vaho Vishwamitri Abhiyaan aims to...

- Stabilize the banks of watershed
- Reduce gully and sheet erosion of soil along the banks
- Retain more rain and storm water flow
- Improve flow of water in the river, its tributaries and ponds
- Mitigate floods
- Raise ground water levels
- Improve base flow of underground streams
- Improve wildlife habitat conditions
- Improve water quality
- Bio-shield for ecosystem

Technical experts in GOG, GOI and even World Bank have appreciated and accepted the holistic plan as technically feasible and highly beneficial. Although the project has received support from many expert groups and NGOs, it is yet to start for lack of funding agencies. "The voluntary grassroots movement to revive Vishwamitri river and a number of villages around the river is a big task and I am sure the mission will succeed through eco-friendly sustainable system," said Dr. Abdul Kalam on his visit to Vadodara.

Navnath Mahadev Trust

Their perspective is for rebound determination of purity, cleanliness and holiness of Vishwamitri river: Via immediate impact of stopping the drainage lines and waste that came out from sewage pumping lines that were added to Vishwamitri river by VMSS(Vadodara Mahanagar Seva Sadan) and move it to any other direction.

The Benefits this trust envisions include:

- Nuisance of mosquitoes will be no more.
- Stink which is coming out from Vishwamitri river will be stopped and it will prevent air pollution and water pollution.

- The flood risk will be reduced via making the river channel broad and removing the waste of drainage immediately.
- After purifying the alluvial clay of Ajwa lake, Pratap lake, Bhukhi river and the rain water lines, that will be moved towards the Vishwamitri river. Accordingly build a Check Dams in every 1 km, in result which the water will be stored for the whole year.
- All weather fruits will be received via planting the Ayurvedic plants in every 500 meters.
- Via placing iron grids systematically, the Crocodile Park about 2 km will be developed near Vadodara or in the open area of Vadodara. In result of that the risk of crocodile will be removed from the city area and citizens can enjoy the river shore.
- Navnath Mahadev temples and the river bank will be developed as a picnic spot during 31 km of the Vishwamitri river stream.
- Duress by the organizations or people on all the Vishwamitri river over as will be open and it should be developed as picnic spot via planting.

VMSS efforts:

In 2011, former Vadodara MP Balkrishna Shukla, kick started the rejuvenation project, that would decide the location of check dams on the river, landscaping and even excavation of earth in the river to resection it. The river has been meandering through the city; some steps have been taken to straighten the river channel near some of the meanders. However, though this helped in reducing erosion, it increased the capacity of Vishwamitri only marginally. Bhukhi inundated some parts of the city on the west side. VMC diverted part of the flow to river Mahi through river Mini. This diversion has marginally improved the situation.

Vishwamitri Riverfront Development

The Vishwamitri Riverfront Development Project is another perspective to develop the River. It aims to rejuvenate the Vishwamitri River which has a unique ecosystem and natural environment linked to it. It will create an active and public riverfront with improved physical and social infrastructure that will transform the heart of the city while still preserving the natural environment of the river. The project is proposed by Vadodara Municipal Seva Sadan

(VMSS) and outlines the proposals for different improvements and interventions that are required for implementation of the project. The plan includes i) diversion of Bhukhi River, ii) Resectioning and diversion of Vishwamitri River, and iii) River front development. It also envisages using Narmada WBC for enhancing water flow in Vishwamitri.

The project aims to improve flood mitigation through the development of the river edge and embankments. The project proposed an innovative solution to water management in the river whereby rainwater can be retained in the river through barrages, and water can be replenished using water with tertiary treatment from local STP. A dedicated crocodile habitat is also proposed which will be confined and integrated with existing city zoo and park. In addition to the public, riverfront which will include promenades, there are many new parks and gardens that have been proposed. The master plan will also integrate other developments planned for the project will comprise of different revenue models which will include sale of reclaimed land, saleable additional FSI among others.

It is claimed that the study and analysis of river-site conditions was comprehensive and covered all important environmental and physical parameters such as river hydrology and hydraulics, geo-technical investigation, topographical survey, land use, built form, land ownership, infrastructure, informal settlements, etc.

The riverfront development project is expected to include the Bhavnath Mahadev Trust perspective as well as the river rejuvenation project taken up by VMSS in 2011.

Analysis and Strategies to Revive the Vishwamitri River:

This research is more of status report and a case study compiling and reviewing various activities and movements taken up for revival of Vishwamitri River. The paper also brings out experts' different views, takes a critical view of VMSS's riverfront plan and its likely impact on revival of the river and its ecosystem.

Vaho Vishwamitri seems to be a comprehensive plan aimed at reviving the river and extends to cover entire stretch of river, however, it seems to lack political and large scale people support and also necessary resources.

Efforts by VMSS seem to be confused and beset with normal political bureaucratic hassles. There isn't enough information about Rs.300 crore plan for cleaning Vishwamitri taken up in 2006 by then city mayor Mr. Balakrishna Joshi. It is now supposed to have been merged with Riverfront development plan after spending some undisclosed amount. Riverfront development by VMSS is a project with political as well as bureaucratic support and adequate resources allocated by the government – however, it is confined to Vadodara City alone with focus on beautification of 10 km stretch of river rather than entire river revival. It is also going to use Narmada water like Sabarmati riverfront project in Ahmedabad – an idea that is not easy to accept. This project is a project of real estate development with interest of builders' lobby and is likely to play havoc with the fragile river ecosystem within the city thriving on meandering river. This project is obviously a half-baked project and a clear example of how a builders' lobby with the help of politicians and bureaucrats can vitiate ecosystem in the name of development to meet their own selfish agenda.

It is not clear why VMSS has chosen to go ahead with riverfront development project and not Vaho Vishwamitri project which is far more comprehensive..

Most of the initiatives fall short of resources and/or people's support. We suggest crowd-sourcing, crowd-funding and crowd-pulling with an idea to involve people in all activities including generating resources for Vaho Vishwamitri project. This would include corporates as well as people living along the banks of Vishwamitri both in urban as well as rural area.

Holistic efforts can make the difference. Water Conservation Plan, stakeholders' commitment, visionary Municipal plans

Urban redevelopment strategies along a river would be sustainable with three measures: ecological river system restoration, historical context protection, and the humanistic extension of urban open space. To restore natural ecological functions, a design layout must be functionally optimized, respect natural forms, foster river biological communities and encourage natural purification capability. To protect historical sites, a design must maintain the city's cultural heritage, create a spirit of identity and a sense of belonging, and improve the city's aesthetics. To extend public recreation spaces, a design must create diversified and recognized spaces, generate and improve functions, develop more places near the water, for

human use, promote more people-friendly spaces and promote harmonious and healthy developments for both society and the environment.

The above arguments are well justified by following two cases of river revival:

1) **Kumudvathi River Rejuvenation Program**

Concerned with the emergent crisis of water scarcity affecting Bengaluru city and 200 villages in the Kumudvati River belt, The Art of Living launched the 'Kumudvathi River Rejuvenation Program' on February 3rd 2013, under the banner of its initiative 'Volunteer for a Better India' (VBI). VBI is a platform for citizens to address crucial social issues relating to the protection of the environment.

2) **Jal Jagruti Abhiyan**

Several villages in Maharashtra are today springing to life again, thanks to the Jal Jagruti Abhiyan, a multi-pronged initiative of The Art of Living that is addressing water issues in a concerted and effective manner in Sangli, Latur, Osmanabad and Jalgaon. Through the Jal Jagruti Abhiyaan, 33 villages in 4 districts of drought affected areas has regained their prosperity and benefitted more than 80,000 people. The Abhiyan is actively engaged in de-silting rivers and increasing their holding capacity, cleaning the beds of debris and waste, and strengthening river banks to hold up during floods at a number of points in various districts. The rivers Terna and Gharni, bandharas at Takli and Jewali, as well as the Esai Devi and Babhalgaon tanks are among the water bodies that have been cleaned up, benefitting several villages in Sangli, Jalgaon, Osmanabad and Latur districts. In Jalgaon alone, canals in 6 villages in 6 talukas have been recharged.

Sources of Information and References

- Vadodara Design Academy
- Vadodara Community Science Center.
- Prashant Rupera, TNN, 9Apr2015 with Prof. Shishir Raval, HoD, Dept of Architecture, MSU
- Vadodara, 2013 - Ongoing (Ref. HCP Design, Planning and Development Pvt Ltd.)
- Journal of Environmental Research, Vol.10, No.01, Jul-Sep 2015.