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Nandini riverfront development in Nasik city

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Abstract: Waterfront is a place where people can gather and where urban development is defined as a unique resource where land and water interface with each other. Since the beginning of the civilization, rivers have played an important role in shaping the nation's development. Due to the urbanization, in all over the world including riverfront areas are causing the deterioration of the environment by pollution and flood. Aim of the project is to change riverfront in the unique platform and to provide enjoyment facility in the city and to develop the small stretch of Nandini River at Kamatwada to improve the quality of river water and to develop its surrounding including slum area.

Keywords: Nasik, riverfront development, Nandini, slums redevelopment.

1. INTRODUCTION:

Nasik is well-known for its unique culture and is rapidly growing city; very good development is seen on the boundaries of the city. The city is situated on the banks of Godavari River. Nandini River originates from the foothills of Santusha hill near Mahirawani and Belgaon Dhaga and meets the Godavari at Takli Sangam. There is a bridge located on the river which is known as ITI Bridge.

As the banks of Nandini River are encroached by the slum areas because of it's the river as well as river bank is littered. It creates a very bad impression about the area near to the ITI Bridge, Kamatwada.

The Nasik city is known as the grape city and has become a center of attraction because of its beautiful surroundings and pleasant climate.

The main focus of the project is to improve the small stretch of Nandini riverfront and understand the slum rehabilitation. To improve the quality life of slum dwellers provide an affordable housing at a place near to the river.

2. STUDY AREA:

Nasik is an ancient holy city in Maharashtra, a state in western India with coordinates of 20.00" N, 73.78" E. Nasik is the 4th largest city of the Indian state of Maharashtra after Nagpur, Pune and Mumbai.

The city is a pilgrimage center and one of the four cities of India that hosts the 'Sinhastha Kumbha Mela' once every twelve years.

- Elevation: 584 m (1916 ft)
- Population: 14.87 lack
- Area: 11,603.43 sq.m

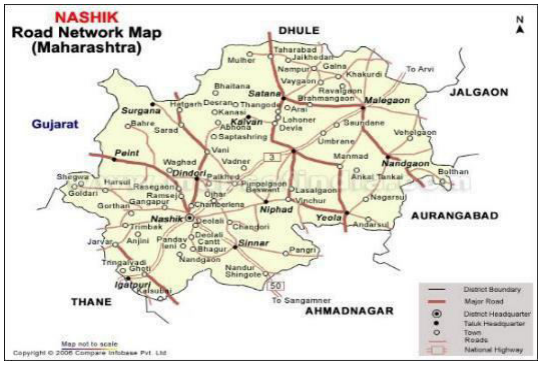

Figure1: Map of Nasik

figure2: stretch of Nandini River- 31,567 sq.m

Figure3. Stretch of Nandini riverfront-11,603 Sq.m

3. AIM:

The aim of the project is to develop the small stretch of Nandini Riverfront at kamatwada to improve the quality of riverfront and redevelop its surrounding including slum area.

4. OBJECTIVE:

The objective of the project is given below:

- To develop the small stretch of Nandini riverfront from Gautam Nagar this is 3941.33 sq.m and Bheem Nagar which is around 5246 sq.m.
- To secure the quality of water and the environment.
- To explore the existing slums and to understand rehabilitation of the slums.
- To develop the riverfront by providing public spaces for local people.

5. SCOPE OF STUDY:

The perspectives evolve in this study, development of riverfront and its surrounding will restore the city's relationship with its river, even redevelopment of slum area will give the completely new look to the riverfront as well.

6. LIMITATIONS:

Some limitations of the study are given below:

- Develop the small stretch of Nandini riverfront which is around 11,603.43 Sq.m from the Bheem Nagar 3941.33 sq.m to the Gautam Nagar of 5246 sq.m.
- Rehabilitation of slum area by providing affordable housing for them on public property.
- To secure the water and environment, the river water needs to be filtered, so that the cleanliness will create attraction for the citizens, by providing water filtration plant within the stretch of planning proposal for Nandini riverfront.

7. NEED OF STUDY:

Due to the urbanization and population growth, riverfront areas are getting degraded in terms of poor-quality limited access, formation of slums, etc. and are often found functioning as open sewers or dumping grounds. Nandini River needs to be developed with access to clean water. Because, Nandini River is the chief drainage line which creates very bad impression about the river. This project here focuses on the development of Nandini riverfront in Nasik by providing public spaces and by providing housing for slums can change a view of Nandini River.

8. PRINCIPLES FOR RIVERFRONT DEVELOPMENT:

There are some principles for riverfront development that we should keep in mind while planning a riverfront development.

- Showcase the history of river.
- Repair and enhance the environment.
- Feature the riverfront as the front door.
- Engage with the water.
- Connect to the river and limit obstacles.

9. RESEARCH METHODOLOGY:

"Aim of the project Nandini river is to develop the small stretch of Nandini river at Kamatwada to improve the quality of river water and to develop its surrounding including slum area and to explore the existing slums and to understand

slum rehabilitation of the slums." The river water must be properly analyzed and well treated, so that people can start their morning with the freshness while having activities at riverfront. This project is important to improve the quality of life and bring easy change in lifestyle of people of slum area.

- Reconnaissance survey
  a. Preliminary investigation
  b. Finalization of the study area
- Analysis and measurements of study area
- Collect drawings and river map from various sources

- **Reconnaissance survey-**

Reconnaissance survey is an extensive study of an entire area that might to be used for road, airfield or river. It is the preliminary survey. It is used at commencement of any project work through suggesting possible alternative paths and routes.

a. Preliminary investigation:

In this method, survey is should be done to collect adequate data to prepare plan/ map of area to be used for planning and design. In this step the alternative routes which are proposed after a rough survey in the second step are surveyed in details using some advanced instruments like chain, levels.

b. Finalization of the study area:

In this step, after all the investigation the area should be finalized as per the requirement or as per the need of project.

- **Analysis and measurements of study area:**

In this method, after selecting the site, first step in which we should analyze the site levels if there is contour site. The contour maps of site are required to be analyzed and measurements should be done by visiting the site.

- **Collect drawing and river map from various sources:**

In this method, we need to collect all the required drawings which is helpful to design. The drawings such as river maps, contour maps which is helpful if we want to design parks on the riverfront site, development plan is the most important document which is required to know that where we should limit our self to not touch the river site. The drawing should be accurate and should be collected from Municipal Corporation.

9.1 PRIMARY METHOD:

This method includes the primary data collected about the riverfront by doing live case studies. The data collected by case studies are as follows:

9.1.1 CASE STUDY - Osho Park, PUNE.

- **Location** – Osho international park, Koregoan park, Pune.
- **Area –** 12 acres
- **Project year –** 1974

The followers and disciples of Osho established a foundation in his name, in the year 1969. The headquarters of the foundation was set up on the ground floor of a building in Mumbai.

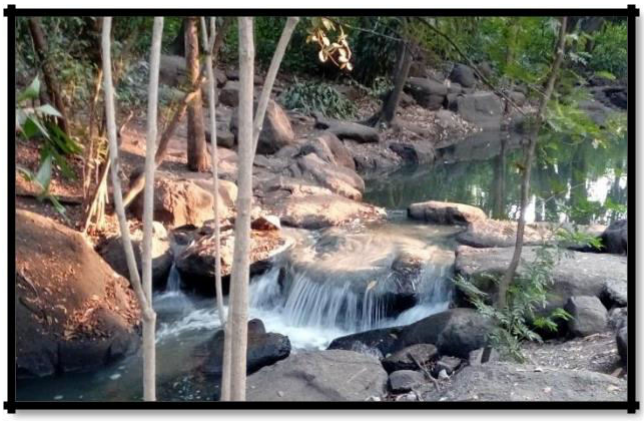

figure4: Osho Park

Later, due to space constraints and the bad weather of Mumbai, the headquarters were shifted to the Koregoan Park, Pune.

figure5: seating area

Figure6: Osho Park

The ashram is today known as Osho international meditation resort. Osho Dham today has about 2 lack members. Later on Nalla is known as Osho Park. They have created so many places for relaxation in the Osho garden.

Daily they used to purify the water using water filtration plant. There are 2 filtration plants they have provided. The main motive behind constructing the Osho Park is to develop the Nalla which is dirty and very unhygienic.

Even they have planted the various plants such as Chrysopogon Zizanioides commonly known as Votives plants in the Nalla so that the water can naturally purify itself.

9.1.2 CASE STUDY: Sabarmati riverfront, Ahmadabad

The Sabarmati river flows from the north to south divided Ahmadabad into two equal parts. As the city grew, the Sabarmati River was posing health and environmental hazard due to increase in urban pressure.

The river became inaccessible to the public. The slums on the riverbank were disastrously flood prone.

- Architect- Arch. Bimal Patel led HCP design, planning and management.
- Developer- Sabarmati riverfront Development Corporation limited.
- Size of project- 204 Hac.
- Cost of project- 1152 Cr.

9.1.2.1 PRE-SCENARIO OF SABARMATI RIVER:

Due to increase in urban growth, sewage use to leak from sewage pipeline, the city having sufficient coverage of the sewage system, this may be due to:

- Carrying capacity of existing system.
- Sewage connections in the storm water drains.
- Intermixing of sewage system and storm water; particularly at crossings of storm water drains.

The Sabarmati riverfront development project is a city level intervention. The project is to transform the Sabarmati into major asset, which will improve the efficiency of its infrastructure.

9.1.2.2 THE CHALLENGES: REHABILITATION AND RESETTLEMENT OF SLUMS:

- More than 10000 hutments on both banks of the river occupying major critical project area.
- Unorganized Guzaari bazaar of more than 1200 vendors on the eastern side of bank.
- Nearly about 160 dhobis using both the side of river for washing activities.

The project proposed in 1960s. The Construction of Sabarmati riverfront began in 2005. Since 2012, the waterfront is gradually opened to public and facilities are constructed and some facilities are actively under construction. The major objective of project is environment improvement and sustainable development.

9.1.2.3 REHABILITATION OF SLUMS:

- More than 10000 families residing in the riverbed.
- Relocated and rehabilitated on well-developed residential colonies.
- Improved the social and economic well-being of them.
- Total cost for rehabilitation of slums: 455 Cr.

9.1.2.4 REHABILITATION OF GUZARI BAZAAR:

The project has strengthened the existing Guzaari bazaar (unorganized Sunday bazaar) on nearby well developed riverfront market.

- Capacity: 1641 vendors
- Parking: Two-wheeler- 1942
  Car- 428
- Area: 63000 Sq.m
- Tree plantation: 800 nos.

9.1.2.5 REHABILITATION OF DHOBIS:

- Area: 9380 Sqm
- Capacity: 168 dhobis at a time
- Total seven blocks have been constructed with the facility to use terrace to get the clothes dry.
- Even can use washing machines and dryers.

Figure7: Riverfront Flower Park

9.1.2.6 CYCLE SHARING AT SARDAR BRIDGE:

- More than 100 people are taking rides in the morning and evening.
- Cycle sharing will be start soon in Subhash bridge.

Figure8: Provision Cycle track

9.2 SECONDARY METHOD:

The method used in this research included review of research papers on riverfront such as Sabarmati riverfront, Yamuna riverfront, Gomati riverfront, Godavari riverfront, Mula-Mutha riverfront.

In this method the references can be taken by the research papers as well. The references which have been taken by each research paper is mentioned in summary form given below:

RESEARCH PAPER 1:

"Waterfront Development: A case study of Sabarmati Riverfront"- Dipali Babubhai Paneria, Vishwa D. Mehta, Bhaskar Vijaykumar Bhatt.

In this research paper, project has been conceptualized as an urban project to improve the habitat, structure and conditions of the river and its adjoining area. It includes the formation of public spaces, parks and socio-cultural facilities for the city. Project aims to provide Ahmadabad with a meaningful riverfront environment along the banks of Sabarmati River and to redefine an identity of Ahmadabad around the river.

The project has provided more than 10 kilometers of continuous pedestrian pathways at each bank. They made the direct access to from public Ghats to the water. 85% of the riverfront land has been proposed for the public infrastructure, recreational spaces, plazas, parks, sports facilities, and gardens.

Introduction of cultural institutions like museums, exhibition spaces, monuments, performance venues, has significantly enhanced the availability of civic amenities.

The project also focuses on to upgrade iconic informal markets, and to create vibrant new spaces for residents and tourists.

RESEARCH PAPER 2:

"Water Quality profile of Yamuna river, India"- Mahindra pal Sharma, Indian Institute of technology Roorkee, May 2009.

This research paper focuses on how to conserve, protect and restore the biodiversity of Yamuna River by providing public recreation spaces that the city needs in framework of zonal development of zone O. To reestablish the river's eco system so that people start using river for commuting on recreation purpose; to protect the people and city activities from the floods.

Making the concrete like Ahmadabad would not feasible here as Yamuna River is extremely vulnerable to floods. This kind of riverfront basically changes the social space of the river

altering it into an urban commercial space rather than natural and ecological landscape.

The need to conserve the 52-km stretch of the Yamuna in Delhi and Uttar Pradesh as 'conservation zone' and restoring the river's ecological functions is also stressed. This is possible only by keeping a strict check on environment flow that passes through this stretch especially in the lean season.

RESEARCH PAPER 3:

"Riverfront development of Gomati River in Sultanpur city"- Shradhanand Tiwari, department of civil engineering, Vandana Pandey mayo institute of medical science and nursing college.

In this research paper, aim of the project is to change riverfront in the unique platform and to provide enjoyment facility in the city, people and tourism with instructing and entertainment places of development. This plan includes the development of the city and good sources of income for tourism.

The urban society will change into the hi-tech city. This is better for the ecological system and will reduce stress of people living in the city.

The Gomati River attached with drains, Ghats, park, riverbank (Sitakund), etc. This is a fact and cannot be denied that it better changes that make the city a better tourism place. Sultanpur is connected to a surrounding eight cities. There are five primary drains in the city, two are on one side of the river and other are on the other sides, and they are known as Hatiya Nalla, Ganda Nalla, etc. This drainage works on the discharge of water which is thrown into the river.

Aim of the project is to change riverfront as a unique platform and to provide enjoyment facility in the city.

The river water must, therefore, be properly analyzed and well treated before supplying to the public for their daily purpose.

The quality of water obtained from the river is generally not reliable, as it contains a large amount of silt and a lot of suspended matter, the disposal of untreated waste and sewage into the river is further liable to contaminate their waste.

Gomati River is nature's valuable gift to Sultanpur city.

The planning proposal offers a peaceful nature to the city based throughout riverfront to the center of the Sultanpur. Turn the river into a major help for the improvement of city-based and quality of life through a planning proposal makes Sultanpur full of life.

RESEARCH PAPER 4:

"Godavari riverfront development in Nasik city"- Prof. Y.D. Deore, Harshvardhan Odhekar, Rajendra Sansare, Ketan Patil, Ajit Kadam, department of civil engineering.

In this research paper, aim of the project is to make clean and healthy environment by providing parks, jogging tracks, open spaces, where people can gather. Godavari River needs to be developed with amenities, gardens and parking spaces, community facility so that essentially the area is useful in handling congestion throughout the year as well as create places for relaxation for citizens of Nasik.

Nasik municipal corporation had (NMC) had tried to improve the small stretch of riverfront by constructing small Ghats, jogging tracks and retaining walls at some stretch of the left bank of river about 3 Km long under the Goda park project.

SECTION 1:

AHILYABAI HOLKAR (VICTORIABRIDGE) TO RAMSETU BRIDGE:

This stretch consists of very important places like Gandhi Talav, Ramkund, Yashwant Rao Maharaj patangan, old vegetable market**,** dhobi Ghat, Naroshankar temple.

GANDHI TALAV: It is small artificial lake which is full of water around the year. It is not well-maintained, all the litter and organic material like flower waste are dumped into the lake.

RAMKUND: It is the holy lake where people carry out the spiritual activities and have the holy bath. And then drop all the waste in the Ramkund.

YASHWANT RAO MAHARAJ PATANGAN: it is an open space in front of Yashwant Rao Maharaj Samadhi. It consists of unorganized parking, small stalls of seasonal sale.

OLD VEGETABLE MARKET: from the time of Nasik was known, this place was a vegetable market. But it was migrated during the Kumbha Mela 2015 to relieve the congestion.

SECTION 2:

RAMSETU BRIDGE TO GADGE MAHARAJ BRIDGE:

In this stretch weekly market is set on Wednesday. As it is a huge market setup more open space is required in this area. But this area consists of many food stalls, daily vegetable

vendors sitting randomly which acquire very large area and create unnecessary crowd which affects the traffic conditions of that area.

SECTION 3:

GADGE MAHARAJ BRIDGE TO AMAR DHAM BRIDGE:

This is the area where most of the development is required. Various amenities can be provided here. Riverbanks are wide here but no use it is captured by the slum. Firstly, the slums have to be shifted some other place. A low budget housing scheme should be carried out in NMC owned area.

AMENITIES PROVIDED:

- Parking areas
- Organized market area
- Jogging track / walkways
- Gardens, parks
- Amphitheatre
- Ambient lighting and laser fountains
- Oxidation pond for treating the wastewater
- Making the surrounding clean and hygienic

After the surveillance of the current Godavari riverfront, it is observed that there is necessity of beautification of the river and river banks. Some open space is required for the people to breathe fresh and feel peace. Some lighting work is required because even though all that glitters is not gold, but all that glitters is attractive.

Slums are to be shifted to the place allotted by the NMC which will maintain the cleanliness and pleasant feeling once the feeling of homeliness is developed no one will spread the litter because no one litters in their own house.

RESEARCH PAPER 5:

"Riverside restoration-city planner's viewpoint: case of Mutha riverfront, Pune, India"- S. Barve & S. Sen., department of architecture and regional planning, IIT Kharagpur, India.

In this research paper, Aim of the project is to improve the quality of river water and its surrounding environment thereby utilizing the riverside land for recreational space.

There are total five monitoring stations which are located along the river and Nalla set up by the Pune municipal corporation. It is found that pH value of river water is well within permissible limits of 6.5 to 8.5 for more part of the year. Hence it may be inferred that the river water is suitable for use of domestic uses.

After the study of the existing situation of riverfront area in Pune three major issues were identified that needed further investigation in

details, based on which the proposals were drawn up later.

ENVIRONMENTAL ISSUES:

To Controlling the flow into channels finding ways to regulate disposal of untreated sewage and effluent in the river. There are different approaches which can be used for the allocation of different functions to vacant lands along the river.

One of such an approach is to establish an appropriate land use criterion for the construction of land suitability matrix. Land suitability analysis is the process of determining the fitness of a given tract of land for defined use. This method is used to assess the capability of land for future land uses, as well as the opportunities for the future land development.

For cleaning and purification of river water six additional sewage treatment plants and two pumping stations have been proposed for treatment of the entire generated sewage and removal of residues from effluent treatment plants at the meeting point of major three nallas. The strategy for river bed improvement has been chalked out for “stream channelization “of the river and major Nallas, silt removal from time to time. Slum relocation was also advocated to nearby location to maintain their workplace in close proximity to their residences.

10. DATA AND SURVEY:

NANDINI RIVERFRONT:

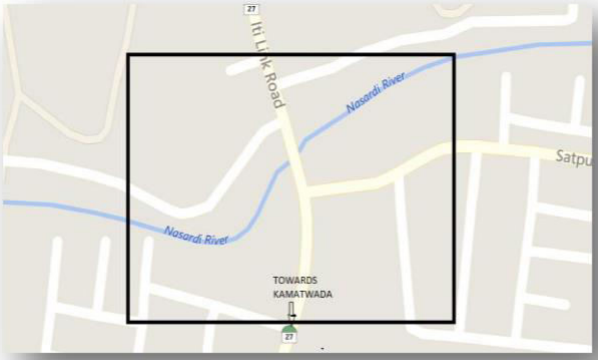

Figure9: Stretch of Nandini rive

Figure10: Satellite view of Nandini River

Figure11: Development plan

10.1 PRESENT SCENARIO:

During the Ganesh Utsav, the people use to do the Visarjan of Ganapati in the Nandini River, which make the river's water more polluted. The people as well as municipal corporation is equally responsible for these issues. The Mandal's of Ganapati is focusing on the issues such as water pollution, disadvantages of plastic.

Later on, Municipal Corporation has decided to set some rules on these issues, where the donation of Ganapati idol is the best solution on it. But this solution is not sufficient, creating the spaces for this activity, we can give a new look to the space as well. The main aim of the project is to provide the space for the activity which is held on the site.

In addition, slum communities also usually dispose their solid waste and wastewater directly into the river which causes the pollution. It creates a very bad impression about the area. The Nandini River meets to the Godavari River at Samata Nagar, at place where treatment plant works on the discharge of water in all residential area and domestic sewage, wastewater and rainwater which drains into the Nandini River.

10.2 COLLECTION OF DATA:

During survey, to collect the data from NMC (Nasik municipal corporation), some questionnaire have been ask to the corporation why the Nandini river needs to be clean as soon as possible.

Dr. Hemlata Patil ma'am who guided for the topic riverfront development, the information which is given by them is very useful.

Q. What is the purpose behind starting this project?

Q. What kind of development we are going to do?

Q. For whom we are going to design? (Specific age group if any)

Q. Festivals like Ganpati Visarjan have celebrated on the riverbank. Are we going too developed according to that?

Q. How will we going to make that space better?

Q. What are we going to do with the slums?

Q. Are we going to provide housing for slums?

Q. How will we going to utilize that space?

Q.Is there any problems people are facing who are in surrounding?

10.3 PLANNING PROPOSAL OF NANDINI RIVER:

Nandini River needs to be developed with the access to the river, amenities, parking spaces, community facility so that it will create spaces of relaxation for citizens of Nasik. In planning proposal for Nandini riverfront, the solution for the riverfront is to provide some facilities like pedestrian walkways, landscape gardens.

Earlier the Nasik municipal corporation (NMC) had proposed a plan and approved to construct a protection wall on the bank of river at a cost of 7.76 Cr in 2013. Even local citizens of the Nasik are taking the initiative to clean the water.

On July 1st, the times of India group along with Nasik Municipal Corporation and forest department planted over 27,500 trees at Santusha hill, Belgaon Dhaga and Untwadi.

This research paper is mainly focusing on the slum's redevelopment and waterfront areas. While considering the issues related to Nandini River, the solution is mentioned in planning proposal of Nandini River.

For purification of river water, two pumping stations have been proposed for treatment of water. To improve the quality of life, creating the open spaces for citizens of Nasik, which bring easy change in lifestyle of people of slums as well? Slum clearance and the new housing for the economically weak people have been proposed where the place is provided nearby the location to maintain their workplace.

In planning proposal for Nandini riverfront, the solution for the activity which is held on site during Ganesh Utsav, the open space is provided which is shown in figure.8.

10.4 Data collected from the site visit:

SR.NO	LAND	AREA SQ.M	PERIMETER (METRES)
1.	Total area	31,567 Sq.m	739 m
2.	Open land	11,603 Sq.m	-
3.	Gautam Nagar	3941.33 Sq.m	-
4.	Bheem Nagar	5245 Sq.m	-

This information is required in designing point of view, as a how much area we required and how much area is available. This data is basically helps to design properly.

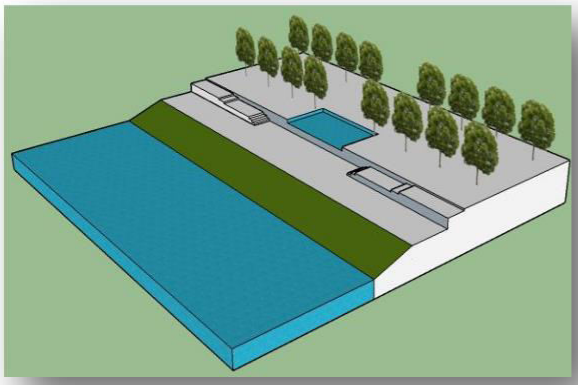

Figure12 : Provision of open spaces

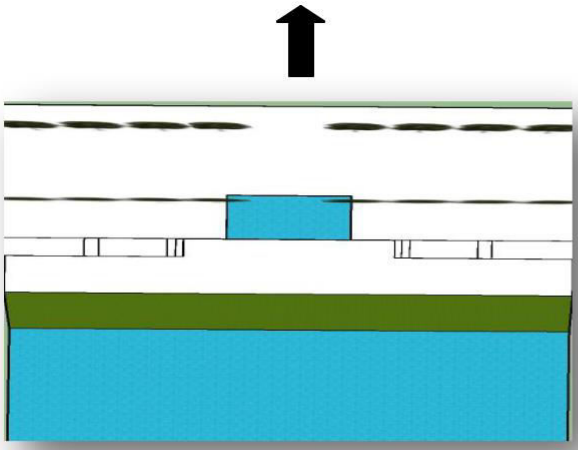

Figure13 : Provision of open spaces

Figure14 : Development of riverbank

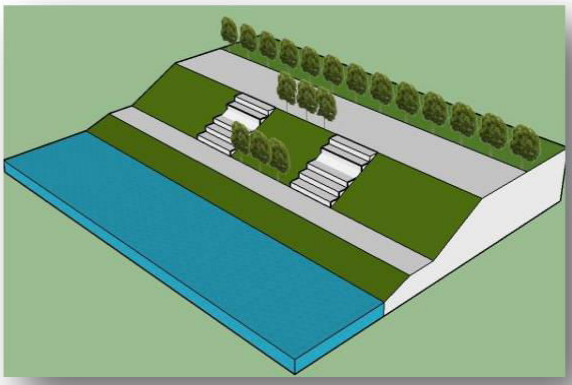

Figure15: Provision of walkways

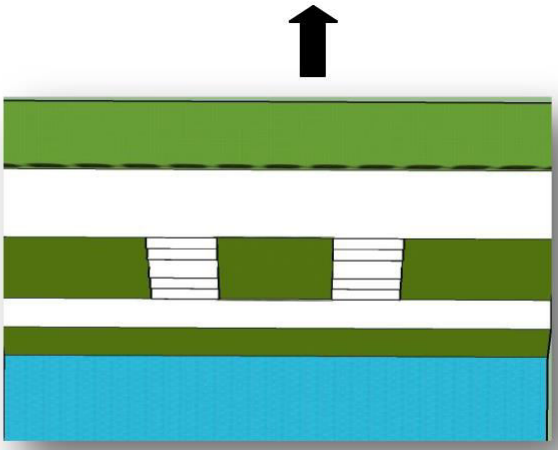

Figure16: Provision of walkways

Figure17 : Development of riverbank

10.5 SEWAGE SYSTEM:

Intercept the sewer running into the river and divert it to the water treatment plant. Earlier the sewage from some drainage point directly falls into the river that makes the water dirty, mosquito ridden and unhealthy environment. The project aim is to provide a pumping station, so that all sewage goes into the pumping station for transformation it to river quality.

Figure18: Development of Sewage system

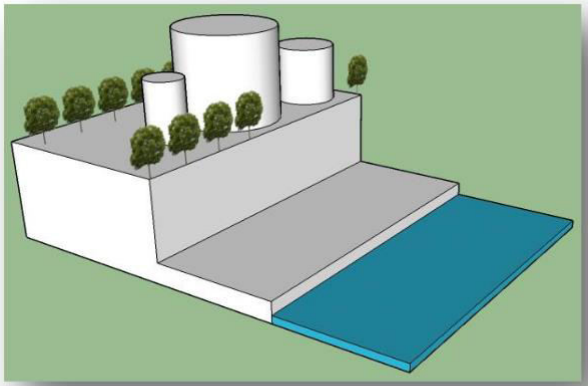

Figure19: Water Filtration Plant

As per the research if we provide the water filtration plant, it should be located at a place according to the consideration of flow of water. Hence the filtration is provided at Gautam Nagar.

10.6 REHABILITATION OF SLUM DWELLERS:

There were around 35 slums on the one side of the river bank that is stretch of Gautam Nagar which cover nearly 30% of the critical project area. More than 40 families are allotted with houses for resettlement. Each house is 25 Sq.m carpet area. Commonly the relocation of a slum is provided on the outskirts of the city. But in this case, the project aim is to provide the affordable housing near to the prime location of the city.

11. CONCLUSION:

For a rapidly growing city like Nasik, the principal challenge is to secure the quality of water and its surrounding environment by utilizing the riverside land for recreational and other functions. After the surveillance of the current stretch of Nandini riverfront, it is observed that there is the need of development at the river banks. Slums are to be shifted to the place allotted by the NMC which will maintain the cleanliness and pleasant feeling and once the

feeling of homeliness is developed no one will spread the litter because no one litters in their own houses. The main objective of the project is to provide adequate public access to the river.

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