

**Significance of Riverine Island of Mahanadi River
at Cuttack, Odisha**

Submitted

*In partial fulfilment of the requirements for
the award of the degree of*

**MASTER OF ARCHITECTURE
(LANDSCAPE)**

By

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Declaration

I Rishab Ray, Scholar No.: 2017MLA004 hereby declare that the thesis entitled Significance of Riverine Island in Mahanadi River at Cuttack, Odisha, submitted by me in partial fulfilment for the award of Master of Architecture (Landscape), in School of Planning and Architecture, Bhopal, India, is a record of bona fide work carried out by me. The matter embodied in this thesis has not been submitted to any other University or Institute for the award of any degree or diploma.

19/05/ 2019

Rishab Ray

Certificate

This is to certify that the declaration of Rishab Ray is true to the best of my knowledge and that the student has worked under the guidance of the following panel.

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“It’s high time, let us give back to nature”
- Anonymous

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TABLE OF CONTENTS

| | |
|---|----|
| ACKNOWLEDGEMENT | 4 |
| LIST OF FIGURES..... | 7 |
| 1 Synopsis | 9 |
| 1.1 Aim..... | 9 |
| 1.2 Objective..... | 9 |
| 1.3 Scope..... | 9 |
| 1.4 Methodology | 9 |
| 2 Literature Review | 10 |
| 2.1 Background- What are Riverine Islands?..... | 10 |
| 2.2 Different Types of Islands: | 10 |
| 2.3 Riverine Island and its Ecology | 12 |
| 2.4 Types of Riverine Island in India | 12 |
| 3 Case Study: Aogu Wetland Forest Park | 14 |
| 4 Site..... | 22 |
| 4.1 Silver City / Cuttack City History | 22 |
| 4.2 Geography | 22 |
| 4.3 Geology & Soil | 23 |
| 4.4 Climate..... | 23 |
| 4.5 Hydrology..... | 24 |
| 4.6 Cultural | 24 |
| 5 Cultural & Natural Resources Assessment of Mahanadi | 26 |
| 5.1 Introduction: Mahanadi River | 26 |
| 5.2 Physiographic Property | 27 |
| 5.3 Physiographic Features | 27 |
| 5.4 Biodiversity | 28 |
| 5.5 Cultural significance of Mahanadi River | 28 |

| | | |
|-----|---|----|
| 6 | Site Analysis | 30 |
| 6.1 | Topography Analysis | 30 |
| 6.2 | Slope Analysis | 31 |
| 6.3 | Hydrology Analysis | 32 |
| 6.4 | Vegetation Mapping | 33 |
| 6.5 | Soil Susceptibility | 36 |
| 7 | Bibliography..... | 37 |
| 8 | Design Proposal and Recommendation..... | 38 |

LIST OF FIGURES

| | |
|---|----|
| Figure 1 Republic of Palau, Western Pacific Ocean..... | 10 |
| Figure 2 Whitsunday Islands | 10 |
| Figure 3 Aogashima | 11 |
| Figure 4 Palm Jumeirah | 11 |
| Figure 5 Whitesands Islands | 11 |
| Figure 6 Seychelles..... | 11 |
| Figure 7 Ko Nang Yuan..... | 12 |
| Figure 8 Conceptual section of river & city edge | 12 |
| Figure 9 Location map of Majuli River Island Figure 10 Aerial view of Majuli | 13 |
| Figure 11 Map of Sagar river island, Ganga Figure 12 Aerial view of Farmland, Sagar Island..... | 13 |
| Figure 13 Master plan of Aogu forest park | 14 |
| Figure 14 Issues Identification | 16 |
| Figure 15 Planning process of Aogu Park..... | 17 |
| Figure 16 Hydrological Design Approach..... | 18 |
| Figure 17 Planting Design Approach..... | 19 |
| Figure 18 Zoning approach of Aogu Park | 20 |
| Figure 19 Project phasing of Aogu Park..... | 21 |
| Figure 20 Location of Cuttack District | 22 |
| Figure 21 Base Plan of Riverine Island at Mahanadi | 23 |
| Figure 22 Women celebrating Kartik Purnima..... | 25 |
| Figure 23 Festival of Odisha, Kartik Purnima..... | 25 |
| Figure 24 Night View of Bali Yatra Festival | 25 |
| Figure 25 Watershed Basin of Mahanadi River..... | 26 |
| Figure 26 Catchment Area of Mahanadi River | 26 |
| Figure 27 Mahanadi Basin- Drainage & Sub Basin | 27 |

| | |
|---|----|
| Figure 28 Topography Map..... | 30 |
| Figure 29 Slope Map..... | 31 |
| Figure 30 Hydrology Map..... | 32 |
| Figure 31 Vegetation Analysis map..... | 33 |
| Figure 32 Conceptual Section with site images | 34 |
| Figure 33 Soil Erosion Analysis..... | 36 |

1 Synopsis

1.1 Aim

To develop an Ecological sensitive prototype plan for Riverine Island.

1.2 Objective

- a. To map the Mahanadi basin around Cuttack & its ecological and cultural heritage.
- b. To identify the reasons that lead to degradation of Mahanadi river edge and ecosystem.
- c. To understand Biodiversity of Mahanadi with relation to Cuttack.
- d. To study the parameter of assessment of healthy riparian edge in relation to delineated study area.
- e. To study the physiography of delineated site in micro and macro level.

1.3 Scope

- a. To give it a natural edge; this will restore biodiversity and support the stability of island ecology.
- b. To design a place to move around the riverine island as to establish it as a recreational space for the city people.

1.4 Methodology

- a. Collection of available data of the site - history, government tender document, water quality.
- b. Literature study: About Cuttack city & Mahanadi River, management and conservation of Riverine Island, case study, Cultural and Religious value of Cuttack city related to Mahanadi River.
- c. Site analysis: Topography, Slope, Vegetation, Hydrology, History, Land use, Water quality.
- d. Landscape Character analysis, activity mapping, and spatial analysis.
- e. Develop a conceptual plan for site opportunities.

2 Literature Review

2.1 Background- What are Riverine Islands?

An island is any piece of land that is totally surrounded with the aid of water. Very small islands such as emergent land elements on atolls are known as islets. A key or cay is some other identify for a small island or islet. An island in a river or lake can also be referred to as an eyot. There are two major sorts of islands: continental islands and oceanic islands. There are additionally artificial islands. A grouping of geographically and/or geologically associated islands is known as an archipelago. There is no preferred for the dimension which distinguishes islands from islets and continents. Any landmass surrounded by means of water should be regarded an island. Under this terminology all the land masses on the planet could be considered islands. Also, when defining islands as pieces of land that are completely surrounded via water, slim our bodies of water like rivers and canals are generally left out of consideration.



Figure 1 Republic of Palau, Western Pacific Ocean

2.2 Different Types of Islands:

- a. Continental Islands: it represents pieces of soil that have in some manner been connected with a mainland in moment but have spread from continents to structural islands encircled by water on all fronts.



Figure 2 Whitsunday Islands

- b. Oceanic Islands: These islets which are not sitting on the mainland shores and usually of volcanic origin are created as lava springs from natural aquatic

activities are created to achieve the bottom of the sea and appear above the sea stage. Oceanic islands are created in layers of volcanic foam.



Figure 3 Aogashima

- c. Artificial Islands: While most of the currently existing islands have been developed with medicinal procedures, certain islands were also man-made. These islands were established for a multitude of purposes such as the expansion of liveable soil, agriculture or the promotion of tourism.



Figure 4 Palm Jumeirah

- d. Barrier Islands: The narrow parallel islands that distinguish the continent from the sea are considered barrier islands. The islands of Barrier help to protect the bank against waves and hurricanes.



Figure 5 Whitesands Islands

- e. Coral Islands: that are built of coral are positioned in the warm waters of the tropical oceans of the world. Corals are tiny sea creatures that secrete a tough exoskeleton round them that is made of calcium carbonate. Examples of coral islands include the islands of the Bahamas. These kinds of islands are basically used for tourism.



Figure 6 Seychelles

- f. Tidal Islands: are continental islands that appear as islands during the high tide. Here the mainland is not totally cut-off from the island but the connecting land between the two is submerged beneath the water at some point of high tides.



Figure 7 Ko Nang Yuan

2.3 Riverine Island and its Ecology

Surrounded through water, which functions as a barrier to terrestrial animal and plant dispersion, islands supply a clear instance of ecological isolation the place biodiversity issues anticipate integral importance thru endemism. The size, distance, and period of isolation from massive landmasses regularly culminate in high degrees of adaptive specialization and for this reason high stage of endemism. Isolation, as a spinoff of biogeography insulation, is a key factor of evolutionary change, for it approves the genetic reservoir of a populace to emerge as distinct from that of other populations. Island isolation has commonly led to a high degree of flora and fauna specializations related with excessive endemism, and this is mainly true for small isolated oceanic islands.

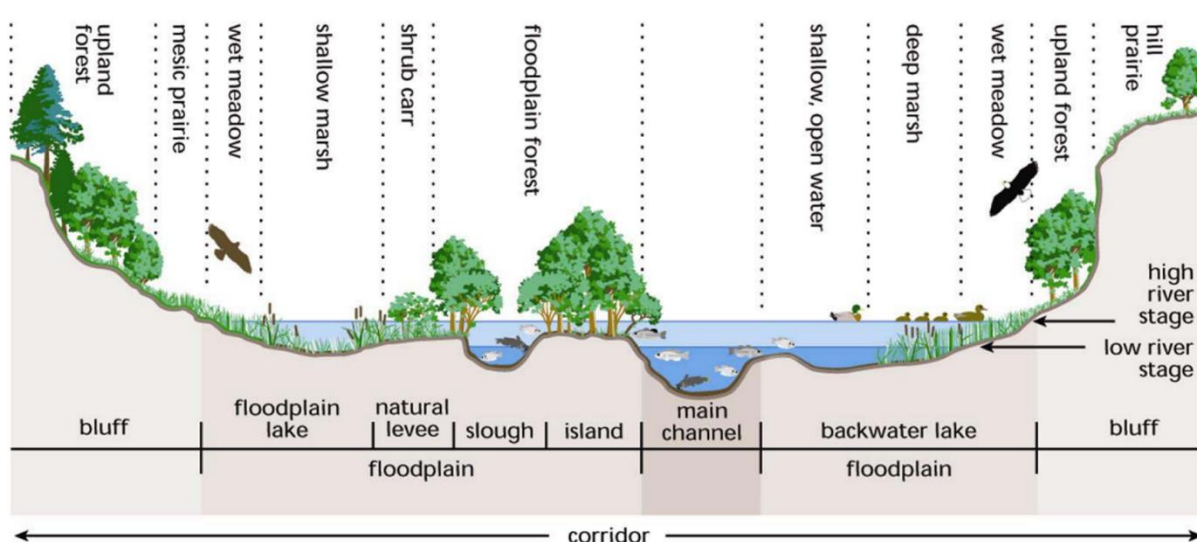


Figure 8 Conceptual section of river & city edge

2.4 Types of Riverine Island in India

- a. Riverine Island in Brahmaputra: Majuli is a UNESCO world heritage site in cultural landscape category site. And it is world's largest Riverine Island. Majuli River Island mainly consists of lowlands, swamps, riverine sand flats, tributaries,

channels and wetlands on which the local populace is completely dependent for their daily livelihood. A comprehensive study was undertaken on the fish biodiversity of the island to assess the medicinal value of certain fish species. A total of 15 different medicinal fish species were identified which were used to treat various diseases among the Mising, Nepalis, Deoris, Kacharis and Koch communities who reside here.



Figure 9 Location map of Majuli River Island



Figure 10 Aerial view of Majuli

b. Riverine Island in Ganga: River islands in Ganga are majorly of grass lands. The reason is of their island elevation. Those islands fall under flood plain areas. Therefore those islands are mainly used by the fisher men and cattle farmers. These islands are used seasonally and during flood the farmers settles in city. Edges of the islands are also used for small scale vegetable farming for their day today requirement. Silt deposition rate is also very high in ganga river.

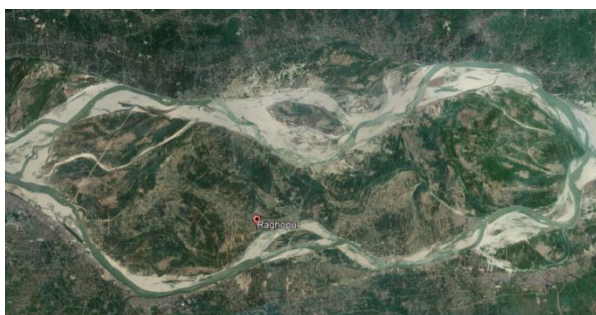


Figure 11 Map of Sagar river island, Ganga Island



Figure 12 Aerial view of Farmland, Sagar

3 Case Study: Aogu Wetland Forest Park

- a. Project Statement: Aogu is located on the path of Asian migratory animals for 1600 hectares. Because of property subsidies and the end of farming in the region, the site has been recovered from the ocean and south reinstated by a coastal wetland. The job focuses on establishing a series of resettlement technologies on the ground, which are reclaimed for human growth, and highlights the place as the way natural structures are seeded, as well as environmental instruction and ecotourism.



Figure 13 Master plan of Aogu forest park

- b. Project Narrative: A variety of different uses and development were regarded in the last centuries, flat and expansive coastal zones. Competition and conflict between human enhancement and nature preservation along the coastline are taking place all over the globe. The Aogu Wetland and Forest Park project is located in the southwestern area of Taiwan and has improved somewhat before it finally returned to the natural lake. The site was a frequent flood mud shed on the shore of the Bei-Gang River previously than 1964. The site began the construction of a C-shaped seapric and, as a result of the agricultural and gantry industries, recovered 1,000 hectares of land from sea in 1964. Historically, a sugar plantation, pig farm, and a poultry farm were desalinated and structured.

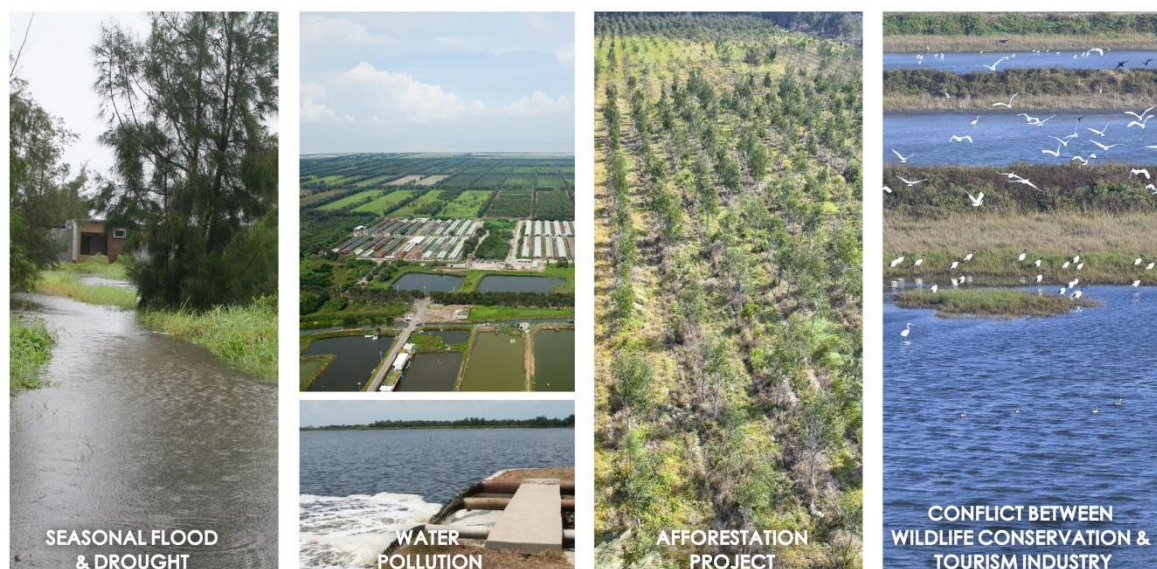
After the land has been subsidized and the floods have occurred with the help of the sea, the soil is saline and the sugar production at the premises has ceased. The location was selected in 2001 as a forest region. In the last 40 years, the countryside and environment has changed dramatically and the property now includes a combination of natural wetlands and artificial forests. This evolving climate is the result of the Aogu Wetland and Forest Park.

The natural systems scheme is displayed in Aogu Wetland and the Forest Park. The location was reclaimed and returned to a suddenly emerging coastal wetland as a shelter for migratory animals and other fauna. This job focuses on the creation of a collection of preservation and rehabilitation policies at locations reserved for human growth, and highlights the site as a scheme of seeding for natural systems, as appropriate for environmental schooling.

c. Project Issues:

- i. Seasonal Flooding and Drought: The place is still surrounded by the subsidizing of soil via a C-shaped seawall. The precipitation can rise to 300-500 mm per month during the hurricane season and cause the main flood problem. The sparkling water's shortfall difficulties wetland and forested habitat sustainability during the dry season. Water Pollution: In the Aogu Wetland and Forest Park, is a pig farm with 30,000 pigs. The wastewater from the pig farm is treated with the aid of a secondary remedy plant, however the outflow from the plant and other untreated wastewater from surrounding fish farms and villages create most important issues to the wetland and Woodland Park.
- ii. Afforestation Plan: The afforestation scheme cultivated single crop from 2001 to 2009 in a plot every 100 by 400 meters of soil. The low-diversity artificial forest and the natural habitat face an indispensable challenge of natural succession in the changing climate.
- iii. The Wildlife Conservation Conflict with the Tourism industry: the wetland of Aogu and Forest Park has become well known in the last few years because of the amount of migratory animals. The major clashes and economic effects that arise from unregulated touristic activities on wetlands and forest ecosystems.
- iv. The design of the Aogu Wetland and Forest Park is intended to use the least influential methods to deal with economic problems and to restore natural habitats for a variety of wild and water oxygen species. The main purpose of this task is to bring this place back to its economic and education principles, maintain it and recreate it.
- v. Afforestation Mission: In accordance with the economic intent, each one hundred plants of the afforestation project were cultivated with the support of 400 meters of soil between 2001 and 2009. The low-range, artificial forest and medicinal environment.
- vi. Wildlife Conservation conflicts with tourism industries: in recent years, the Aogu Wetland and Forest Park have become renowned for the amount of migratory animals. Unregulated tourism activity creates serious disputes and economic effects for forest and wetland ecosystems.

The Aogu wetland and forest park graphics objectives for the most minimal use of methods to help bring natural environments for various types of waterfowl and fauna to the bottom of economic problems. The predominant idea is to return to, maintain and recreate the environment and educational principles of this place.



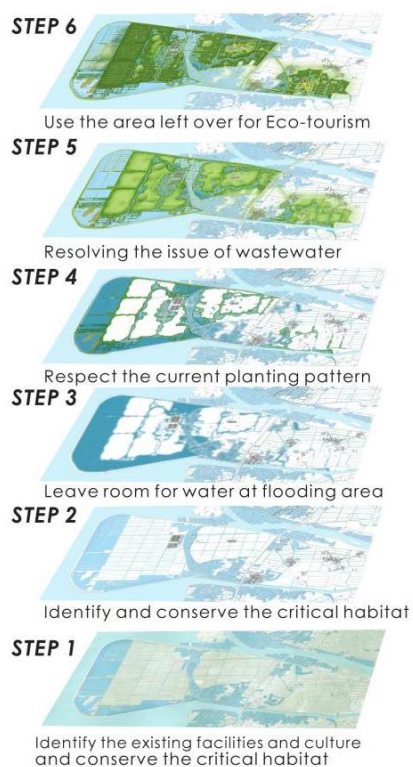
- 1) **Seasonal Flood and Drought:** The site is still enclosed by a C-shaped seawall with the challenge of land subsiding. The rainfall during typhoon season can reach 300-500 mm per month, and create the major flood issue. During the drought season, the shortage of fresh water challenges the survival of wetland and forest habitat.
- 2) **Water Pollution:** In the Aogu Wetland and Forest Park, is a pig farm with 30,000 pigs. The wastewater from the pig farm is treated by a secondary treatment plant, but the outflow from the plant and other untreated wastewater from surrounding fish farms and villages create major problems to the wetland and forest park.
- 3) **Afforestation Project:** Based on the economic purpose, the afforestation project planted single species in each 100 by 400 meter land plot from 2001 to 2009. The artificial woodland with low diversity and natural habitat faces the critical issue of natural succession in the changing environment.
- 4) **Conflict between Wildlife Conservation and the Tourism Industry:** The Aogu Wetland and Forest Park is becoming famous because of the number of migrating birds in the past few years. Unregulated tourism activities create major conflicts and environmental impacts to the wetland and forest habitats.

Figure 14 Issues Identification

d. Analysis & Planning Process: The Wetland and Forest Park at Aogu faces complex hydrological and natural systems. A sequence of physical examinations, suitability analyzes and planning strategy that describes the following is the result of this diagram:

- i. Classify current facilities and culture;
- ii. Locate and preserve critical habitats;
- iii. allow water space in the flood region;
- iv. comply with crops and natural patterns;
- v. solve waste water problems; and
- vi. Uses the remaining areas for eco-tourism purposes.

Planning Process



The project faces complicated hydrological and natural environmental systems. The master plan is the result of a sequence of physical surveys, suitability analyses, and planning processes.

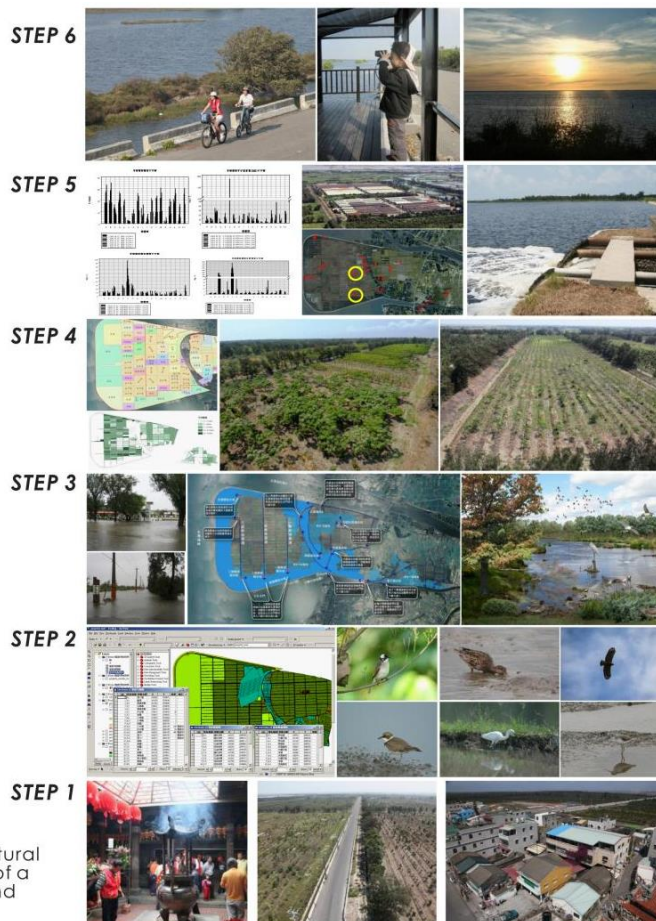


Figure 15 Planning process of Aogu Park

- e. Hydrological approach: The location is rare for freshwater. Consequently, it is the leading principle of hydrological policies that preserve all sparkling water on the ground, excluding a storm precipitation range that exceeds the normal size. Due to the fact that the precipitation is allocated irregularly throughout the year, a range of lakes have been intended to maximize use of available water supplies. A flood-restrained lake in the center of Don-shi Park successfully keeps the rain precipitation of 0.3 million cubic meters once or twice a year. The household disposals are increased through sewage tubes, purified through a range of advanced habitats, and kept in the dry season retention lake. This will play the most important part in keeping the unfamiliar and feasible idea.

Hydrological Strategies-Water Resources Management

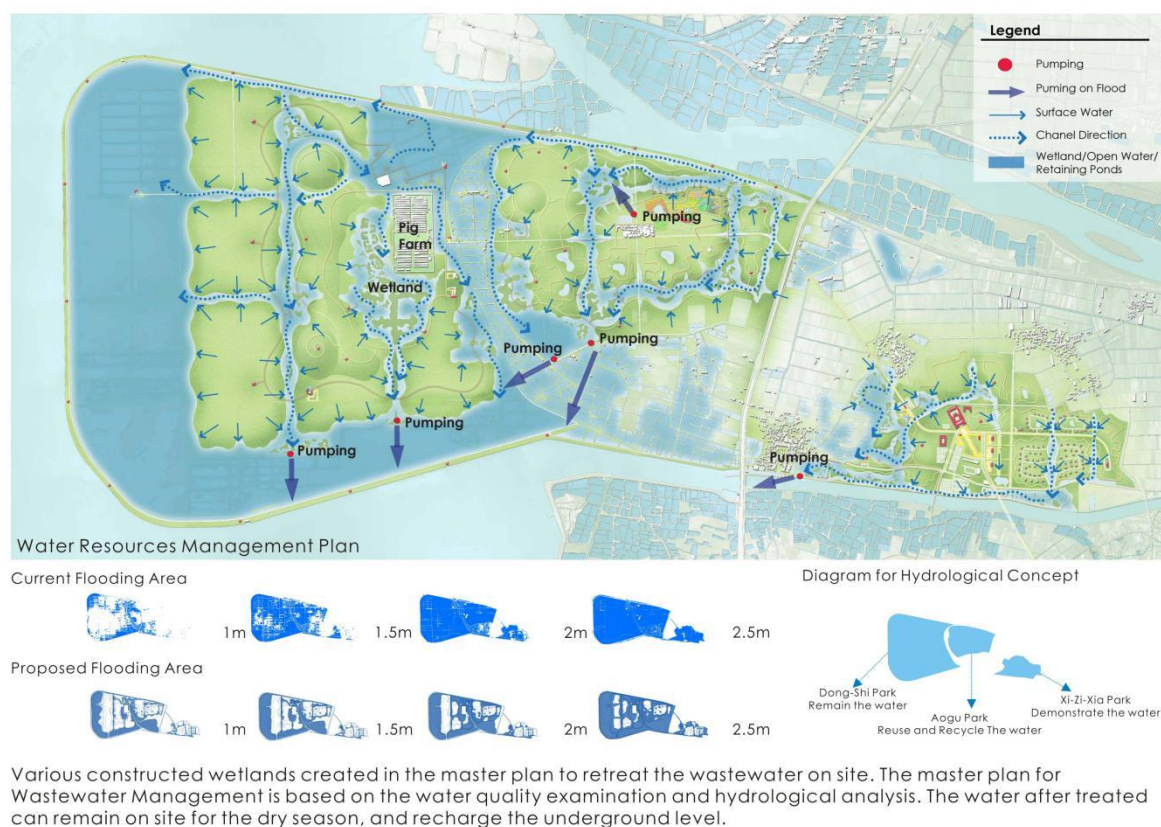


Figure 16 Hydrological Design Approach

- f. Planting approach: The small variety of forests and many animals are no longer in a healthy condition because of the dry and humid land, owing to the afforestation initiative. The master scheme modifies the micro topography and uses the indigenous fauna to gradually restore the surrounding forest. The building methods include ecological replanting, tamping, wind breaking and historic replanting strategies. With the following series, the grasp scheme strategically focuses on the increasing coastal environment:
 - i. Obtain assigned tree species surveys with 400 meter soil plot in each one hundred.
 - ii. Get assigned tree species studies every cent with the support of a property plot of 400 metres;
 - iii. Get tree species surveys every penny, supported by a 400-meter estate plot;
 - iv. Combine different scenarios and related operations.

Planting Strategies

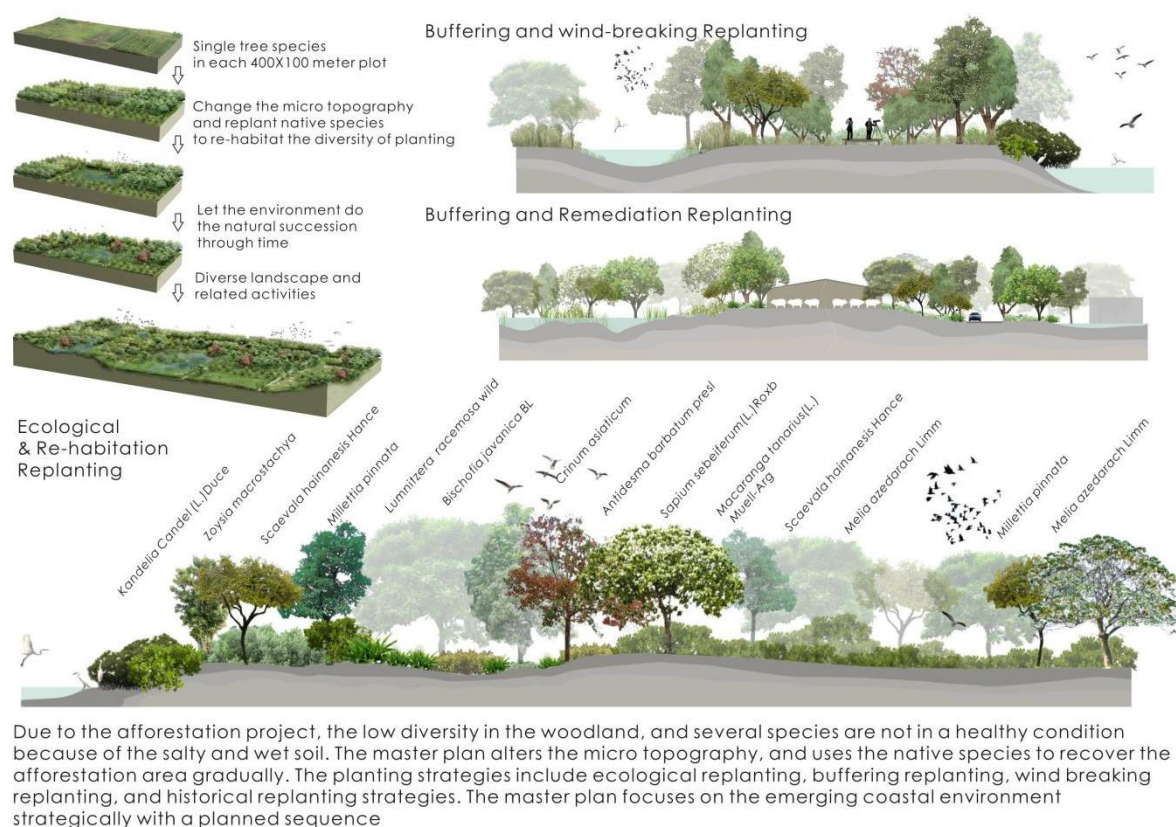


Figure 17 Planting Design Approach

g. Zoning approach: The Park Aogu Wetland and Forest is geared to inexperienced gradient thinking. The park is designed to provide an additional variety of the environment and has rigid and increased security indicators for the east and south. Three vital parks are possible in the park. Don-Shi Park, Don-Shi Park and Xi-Zi-Xia Park are located in sequence from south to south. Don-Shi Park is ideal for preservation and variety. The aim is to change the artificial channel to natural waters, and to restore as much precipitation as necessary at some stage in the wet season and to purify all available disposals for increasing countless habitats. Park Aogu is located in the middle of the town (300 individuals). In the main scheme, this park is used as a Wise Use Area. People living here can sustainably use their fishing farm and use this area as a medium for outdoor schooling. Through the generated rivers around the town a ring-wetland scheme will be connected to prevent floods and treat house disposal. The use of flood irrigation engines to maintain creativity and biodiversity throughout the dry season will flow through the loop. In Xi-Zu-Xia Park, the entire adventure region is protected and a well-known sanctuary is established afterwards. This park is accessible to the public and includes a profound accessible water park in the scheme of access. The middle of the visitors floats on the waters and allows visitors to travel the nature and become competent before they enter the park with excessive environmental sensitivities. The public can provide basic services and facilities.

Local people can use this site to finally establish their business growth and facilities for the entire company.

Zoning Strategies

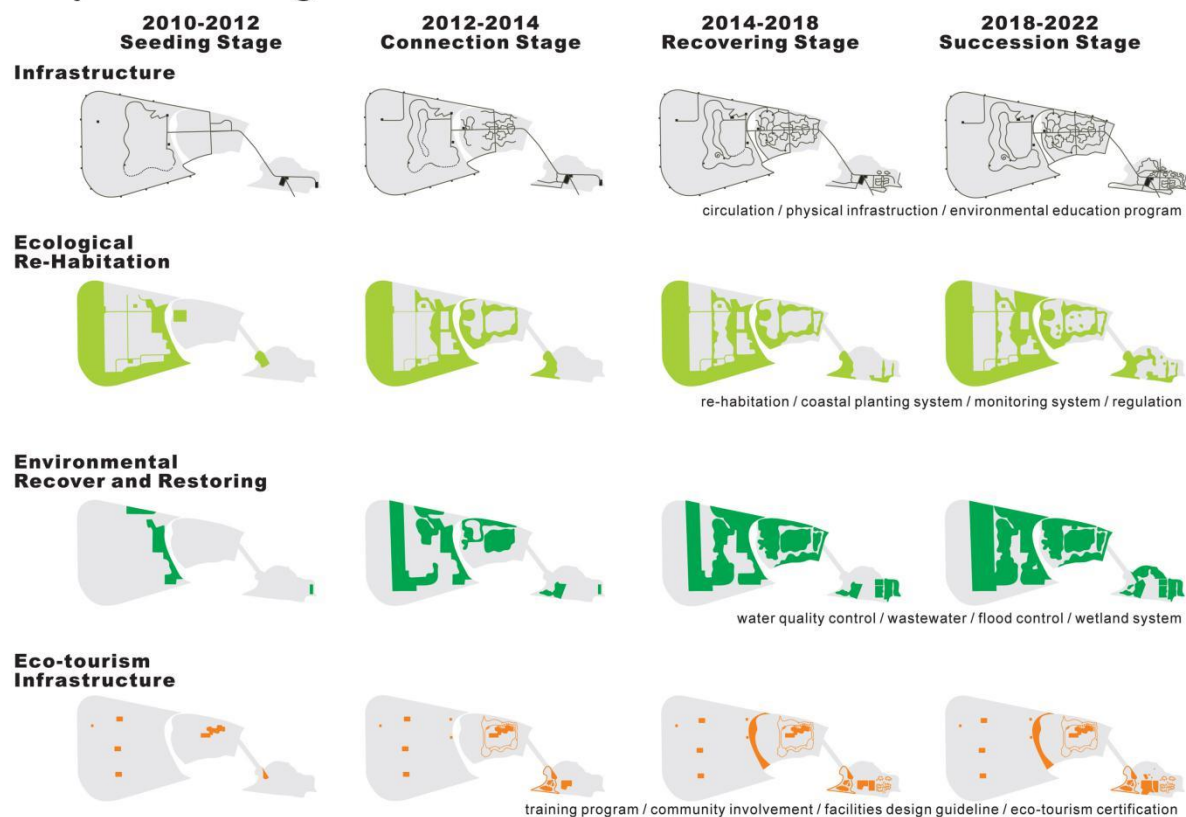


The Aogu Wetland and Forest Park is zoned with the idea of green gradient. The park is planned for more environmental diversity, with strict and higher protection guidelines from east to west sides of the site. The park can be divided into five various zones with different program

Figure 18 Zoning approach of Aogu Park

- h. Implementation of project: A severe government participation, conferences and consultations with specialists will contribute to the detection of main difficulties and composition of the scheduling method. The master scheme includes the least-informed phasing methods for significant problems, enabling natural succession to take over gradually within the context of surveillance, education and management. Organizational structures like non-governmental organisations, groups, the state and commissions. The grasp diagram is provided etc., to promote and maintain the park's operation.

Project Phasing



The master plan is developed through a serious public involvement, meetings, and consultations with experts that helped identify key issues and shape the planning process. The phasing strategies with the least input regarding significant issues, and let natural succession take over gradually within a monitoring, educational, and management framework.

Figure 19 Project phasing of Aogu Park

4 Site

4.1 Silver City / Cuttack City History

Etymologically, the term 'Katak' signifies cantonment of the military and the capital. Cuttack's history amply warrants its name. The town of Cuttack began out as an army cantonment due to its impregnable position, which became the capital of Odisha. The original town is referred to as Abhinab Baranasi –Katak in the inscriptions in Anangabhimadeva III. Cuttack is located between the Mahanadi and Kathajodi Rivers, like the town of Baranasi, between Baruna and Asi and therefore was named the Abhinab Baranasi (fresh form of Baranasi). From five villages Cuttack has created into a town. Katak, Katak, Sarangagarh Katak, Katak, Viraja and Katak Amaravati. Cuttack was linked to famous medieval ships such as Chelitalo, Palur and Tarmalipti both on roads and rivers in the distant past.



Source : OrissaCuttack.png

Figure 20 Location of Cuttack District

4.2 Geography

Cuttack is located at 20°31'23" N 085°47'17" E and has an average elevation of 36 metres (118 ft.). The city is spread across an area of 192.5 km² (74 sq mi). The city is a Cuttack Municipal Corporation which consists of 59 wards.



Figure 21 Base Plan of Riverine Island at Mahanadi

4.3 Geology & Soil

a. Physiography: Physiographically the district can be divided into two distinct units viz-deltaic plain and lateritic uplands and hilly tract.

i. Lateritic uplands and hills: in the southern portion of the county the lateritic uplands and hills are visible. A mildly undulating terrain supporting certain plants distinguishes the Laterite terrain that surrounds the mountainous streak. A collection of separate mountain areas of the Pre Cambrian and Upper Gondwana formation are part of the mountainous path. The median height is between 50 and 100 m. Up to a maximum of 337 m over msl. Upper than msl.

ii. Deltaic plains: In the eastern portion of the county that forms under the river setting, the deltaic hills occupy. Parallel to the radial drainage model, the region is characteristic. It is the district's most productive component.

b. Soil Types: Three types of soils, viz. Alfisols, Ultisols and Entisols occur in the district. As per agroclimatic classification, the district falls under North Eastern Coastal plain.

i. Alfisols: The red soil in the mountainous region of the westerly portion of the county and ancient alluvial soil in small areas in southern areas can be further divided into red loamy ground, red alluvial ground, and newer alluvial groves. In many areas of the county the deltaic land is located.

ii. Ultisols: This included laterite and lateritic rocks discovered in the pocket and distinguished in subsoil horizon by a compact to vesiculose structure, consisting mainly of a hydrated alluminous and metal oxide mix.

4.4 Climate

The tropical moist and dry environment is experienced in Cuttack. In the winter months, the weather is warm and wet from March to June. Thunderstorms are common at the height of summer this season at 35 ° C to 40 ° C. The months of monsoons are July-October, when most of its Southwest Monsoon precipitation takes place in the town. The precipitation is approximately 144 cm per year. In the rainy season, temperatures averaged around 30 ° C are substantially smaller. The summer season is gentle temperatures and occasionally swimming, from November to February. Winter months are characterized by cool winds from the North which bring the temperature down to 15 ° C, but the light sunlight keeps the climate nice. At the summer height temperatures may be greater than 45 ° C and in winter may be less than 10 ° C.

4.5 Hydrology

The river Mahanadi and its distributors control the region's drainage scheme and run through the region from south to south. The Mahanadi River and its dispensaries create an anastomosing irrigation pattern in the southern portion, that is, in the Deltaic plain. Koakhye, Kathjuri, Chitolpala and many others are the main distributors.

4.6 Cultural

The city and the area are prevalent characteristics of the observance of many socio-religious cultural celebrations.

- a. Akshaya Trutiya this is a major agrarian festival occurs in Vaishakha month and marks the beginning of Chandan Yatra and Car festival building, on this auspicious day, with ritual sowing of rice. Akshaya Trutiya is observed very piously by rural families in the district Cuttack. Rathayatra: It is celebrated on the 2nd day of the month of Asadha. In Cuttack Town, the Car festival is being observed at Dolamundai Jagannath Temple, Chandini Chowk Jagannath Temple, Ranihat Jagannath Temple along with many other places of the District like at Jagannath Temple, Dampada, Athagarh Jagannath Temple etc. with huge gatherings.
- b. Kumar Purnima every year the day of Aswina's Full Moon is marked. In Choudwar and Banki Laxmi Puja is popular let alone in Cuttack. Banki Mahotsav has been celebrated with great pleasure and enthusiasm for around 5 days each year at banki since 2000 CE, and from 5 to 9 October this year Banki Mahotsav took place.
- c. Kartik Purnima/Rasa Purnima and Baliyatra in Kartik's Odia month is the most favourable month of the year. The foolish day of the sun i.e., Kartik Purnima has

since old times been held at Bandana Divas. The memory of the Maritime Odisha is very closely related to the celebration of Kartik Purnima. The Sadhavas (merchants), like the nations of Eastern Asia in Kartika Purnima, started their ship trip from the Kalingan coast to Java, Borneo, Sumatra, and Ceylon. Even today, soon in evening, the individuals of Odisha put a boat on the stream or in the reservoir to celebrate the day, in which the ships produced from the Banana tree with the lights and betel leaves and betel sticks.



Figure 22 Women celebrating Kartik Purnima



Figure 23 Festival of Odisha, Kartik Purnima



Figure 24 Night View of Bali Yatra Festival

5 Cultural & Natural Resources Assessment of Mahanadi

5.1 Introduction: Mahanadi River

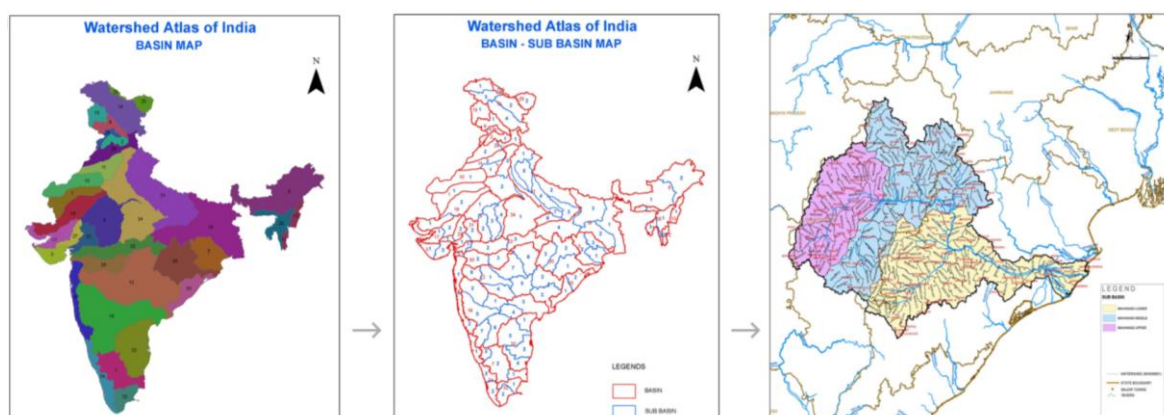


Figure 25 Watershed Basin of Mahanadi River

The rivers Mahanadi originate in Dhamtari county of Chhattisgarh, about 6 km from the Pharsiya town and meet the Bay of Bengal, following a range of 851 km (India-WRIS, 2016). For the individuals of Chhattisgarh and Odisha, the Mahanadi, which also implies "a strong and large stream." The Mahanadi Basin covers a region of 141,589 square kilometres, representing 4.3 percent of the country's complete geography (India-WRIS, 2016). The reservoir includes the bulk of the countries of Chhattisgarh and Odisha and includes the counties of Jharkhand (0.45 %) and Maharashtra (0.07 %) (Figure 13). There are 38,606,665 people in the Mahanadi river who are relying on them for their home requirements and living conditions (Census, 2011). Agriculture, industry, fisheries, shipping and tourism are other significant uses of the river. The next chapter describes additional information on its physiography, ecology and hydrology.

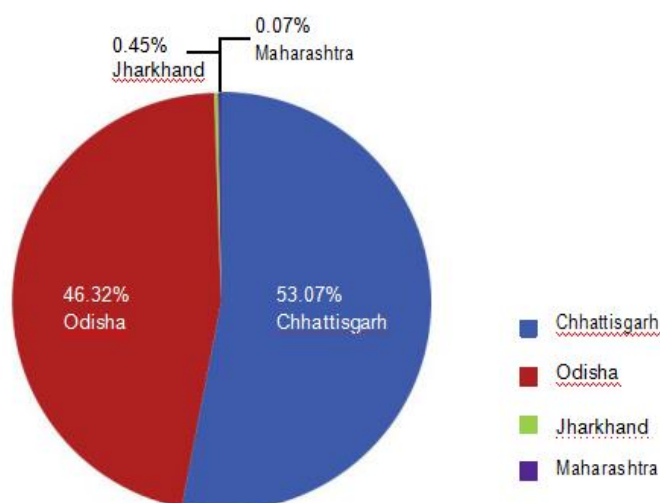


Figure 26 Catchment Area of Mahanadi River

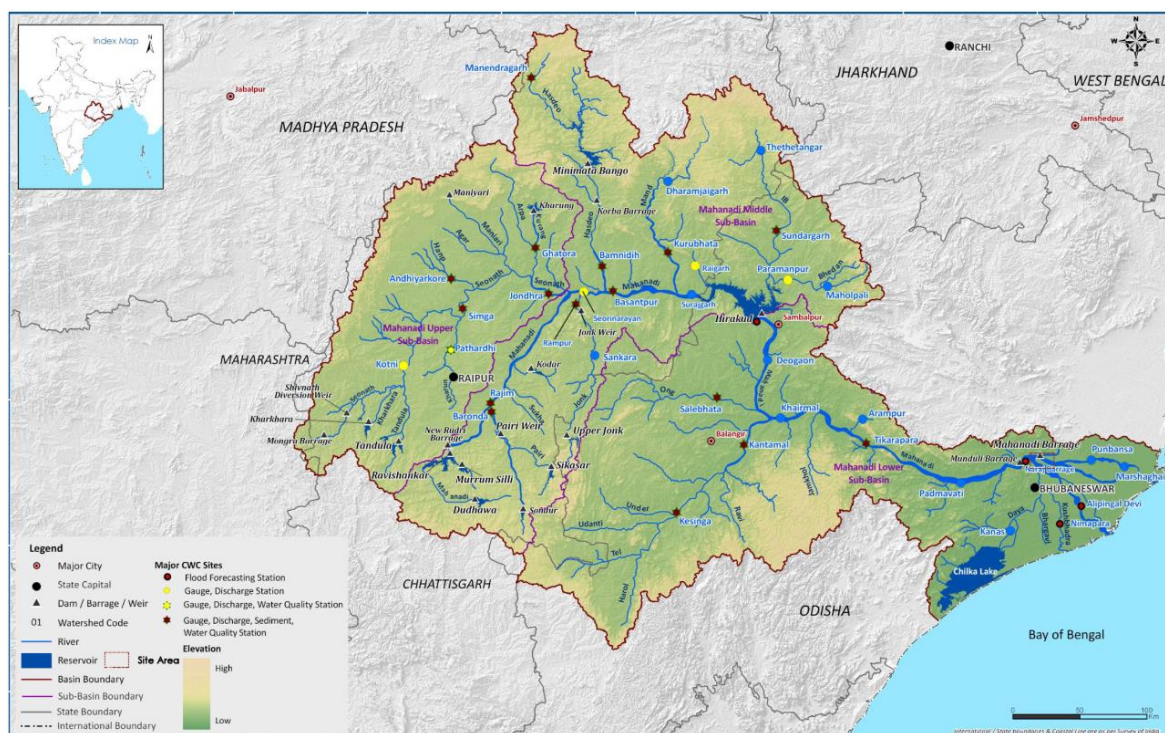


Figure 27 Mahanadi Basin- Drainage & Sub Basin

5.2 Physiographic Property

The basin is physically bordered in the north by Central India Hilly, Eastern, South, and Maikal Hills in the west by $80^{\circ} 30' E - 86^{\circ} 50' E$ Geo and $19^{\circ} 20' N$ to $23^{\circ} 35' N$ geographically. The basin is bordered by the Eastern Ghats of the north. The Mahanadi watershed can therefore be split physiographically into four areas:

- the northern plateau;
- The Eastern Ghats;
- The coastal plain; and
- The erosional plains of the central table land (India-WRIS, 2016)

The two first areas are mountainous. The coastal plains are a very rich delta area, whereas the core line is the main internal area of the watershed which runs through the stream and its effluents.

A digital altitude model (DEM) indicates an altitude of 800 meters up to 20 meters higher than the average sea level (MSL). The woods regions in the watershed correspond to Chhattisgarh and certain sections of the Odisha that are in an elevated altitude. The rise in the Odisha Delta begins to decrease.

5.3 Physiographic Features

A broad range of geological structures with a broad ranging range of stone kinds characterize the Mahanadi watershed. The era of rocks in the world extends from archaean to new, covering the whole of the earth's geological time scope. Gneissen and sedimentary rocks in the Gondwana Super group—mostly sandstones, shales and calcareous peaks—are among the main kinds of rocks in the watershed. Khondalites, carnockites, Leptynits, Querts and minor fundamental granulites are also found in the watershed of the Eastern Ghat Supergroup, such as gneisses, migmatites, anorthosites, granites and minor fundamental precambrian era intruders. In the catchment basin, sedimentary rocks consist mainly of clusters, sandstone, quartzites, shales and calestones (Ray, Mohanti and Somayajulu, 1984). Recent alluvium created in the Mahanadi Delta covers the western portion of the watershed. The loop is in the form of the Arquate¹ and is filled with trending lines northeast-southwest, east-west and north-south.

5.4 Biodiversity

Odisha State has a freshwater region of six hundred and seventy-seven lakes, coastline of four hundred kilometres and brackish water assets of four and eight lakes (Odisha Government, 2014), which provides significant income to its individuals. Inland fishing is conducted in dams, ponds, waterways, canals, ponds, ponds, etc. while Chilika and estuaries are resourced with brackish water.

The study of the HVR suggests that the state supports most of commercial fish such as rohu (*Labeo rohita*), catla (*Catla catla*) or marijuana (*Cirrhinus mrigala*) and native animals such as grass fish (*Ctenopharyngodon idellus*), common cod (*Cyprinus carpio*) and purple carp (*Hypothalmitcthus molitrix*) as well as those of the other countries. The other major fish in the Mahanadi are bata (Mahanadi) and kotri (*puntius sophore*). The khoksi and the snakehead (*channa ponctatus*), kotia and bagrid cod (*Rita rita*), kothy / swamp cod (*Wallago attu.*) are also known (found in the Hasdeo river, Mahanadi tributary). In addition, there are many native species known as decorative fish and that have a higher requirement outside the river. In the Kelo and Mand branches of the Mahanadi River, Jha and Tamboli (2012) recorded 17 species of Catfish. Ompok, Rita, Mystus, Bagarius, Ailia, Clupisoma, Pseudotropius, Silonia, Heteropneus, and the Clarias are some of those animals reported. Some of the following specimens have been reported:

5.5 Cultural significance of Mahanadi River

It runs across the countries of Chhattisgarh and Odisha and is a main stream in eastern central India. The Mahanadi is also respected, like all other streams. It performs a significant role in people's lives and belongs to all the main religious celebrations. The Mahanadi water is regarded as favorable for any occasion. The waters of Mahanadi are thought to be able to transform evil into good.

There are many shrines on the bank of the River Mahanadi that are religiously important or are located in the neighboring region. Cuttack is the highest amount of its followers. The numerous shrines along the banks of that river are also visited by pilgrims from other areas of India. The following are some of the spiritual places.

- a. Laxman Temple : The cultural importance of the stream is enhanced by the nestled Sirpur along the bank of the river Mahanadi. Sirpur is a beautiful spot one hour from Raipur's south. It was the capital of the South Kosala, situated on the shores of the Holy Mahanadi River and in the early days known as ' Shripur.' The Laxman Temple is thought to be one of the best brick Temples in India in the 7th millennium. It was constructed there. The temple is in decent shape. It has lovely sculptures and a accurate building.
- b. Gandheswar Temple : Another must-see place on the Mahanadi River bank. The cultural sanctuary is a hypocritical place for visitors with a wonderful set of unusual sculptures like a Buddha sculpture that touches the world of Natraj, Garud Narayan and Mahishasur Mardini.

6 Site Analysis

6.1 Topography Analysis

Research on Cuttack's topography indicates that the town is situated at 20 ° 30' North and 85 ° 49' 60' East Longitude. The town is situated at an altitude of 36 metres. Cuttack's physiography illustrates that the town is located at the heart of the Mahanadi and Kathajodi Delta, the two major streams that flow across the country.

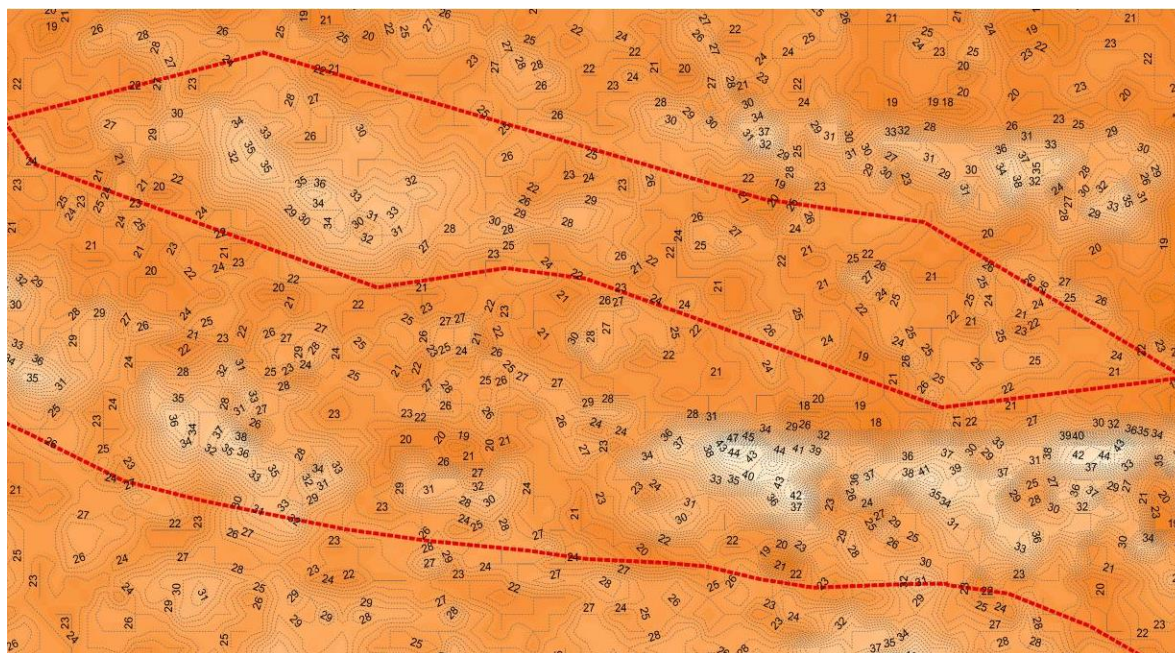


Figure 28 Topography Map

Legend



Scale
1:2500



Inferences

- North-West side of the island is having the highest value.
- Due to the higher elevation, we get a natural view point from the island to city.
- And the same type of value can be seen from the city edge which can act as a visual pause point.
- Due to the undulating terrain on the island, it results in catchment areas and it forms a natural pond.

6.2 Slope Analysis

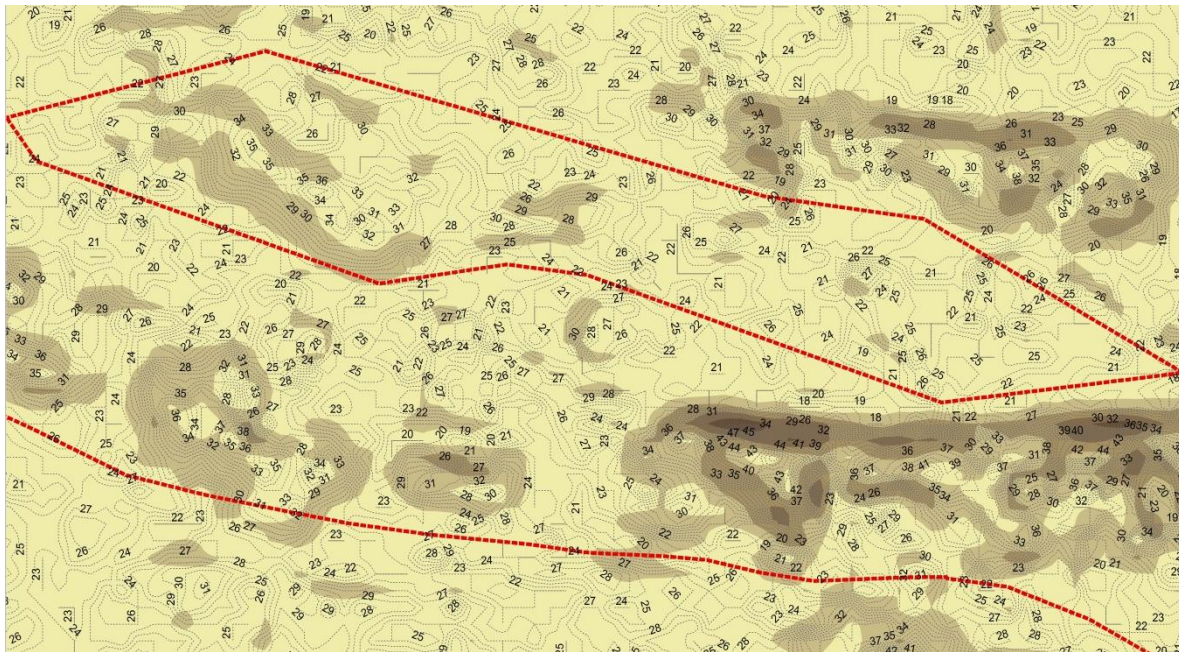
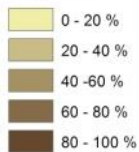


Figure 29 Slope Map

Legend



Scale 1:2500

Inferences

- Maximum area of the site comes under 0-20% slope.
- The elevated land of the site comes under 20-40% slope.
- Central part of the island is quite flat but the edges of the island are having stiff slopes

6.3 Hydrology Analysis



Figure 30 Hydrology Map

Inferences

- a. Central part of the island is acting as a ridge
- b. Major water body are occurring on the side of the island.

6.4 Vegetation Mapping



Figure 31 Vegetation Analysis map

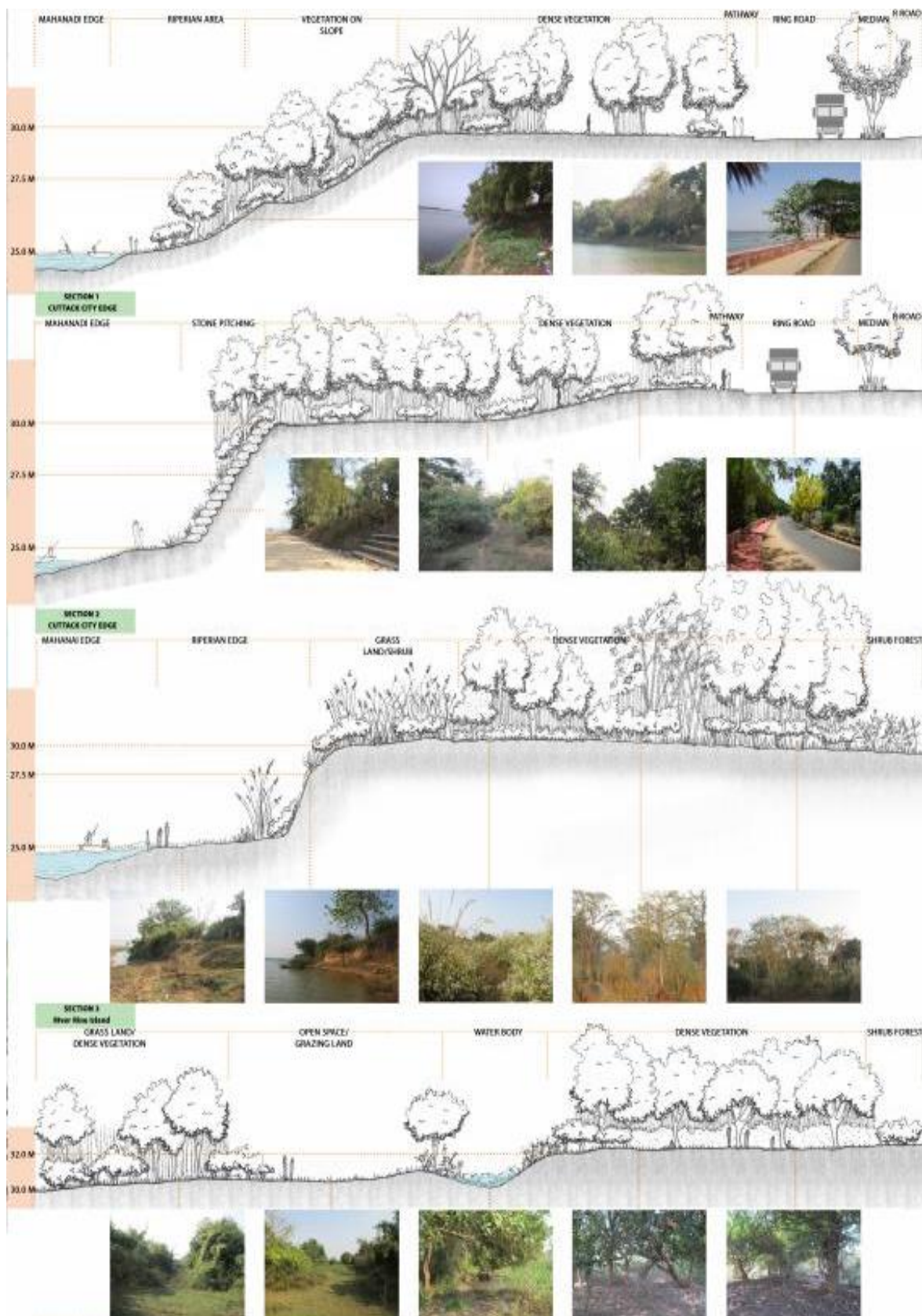


Figure 32 Conceptual Section with site images

Inferences

- a. Majorly the island is dominated by grass land and scrub forest.
- b. It is densely vegetated in the central part of the island.
- c. Bamboo forest is also found in the central part of the island.
- d. Edges of the island have Kaans grasses majorly.

6.5 Soil Susceptibility

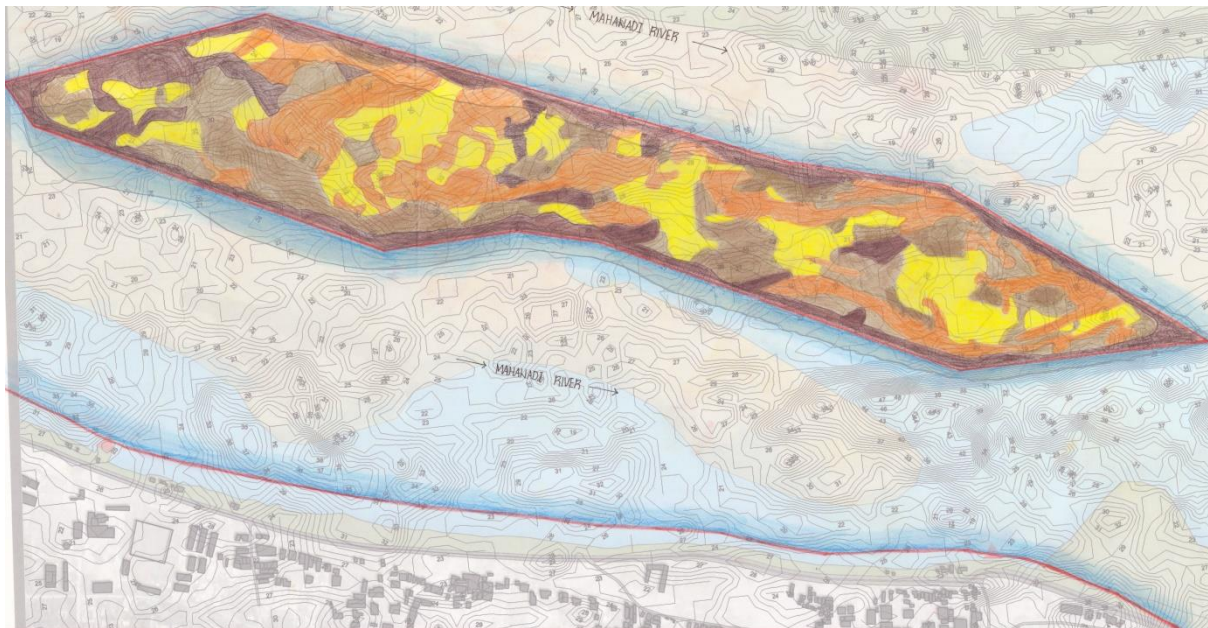
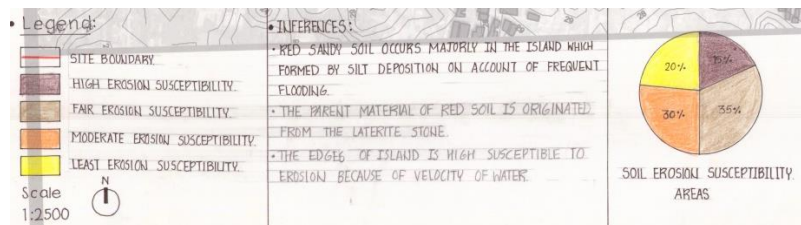


Figure 33 Soil Erosion Analysis

Legend:



Inferences

- Edges of the island are highly susceptible to erosion.
- Central part of the island is least susceptible to erosion due to the densely vegetated.

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8 DESIGN PROPOSAL AND RECOMMENDATIONS