VIDYASAGAR UNIVERSITY

Project Entitled ***: " Wildlife and Forestry Management : A Case Study Of the Simlipal Forest in Mayurbhanj District along the Odisha"***

REMOTE SENSING AND GIS

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Date: 20/07/2021

Certificate

This is to certify that the dissertation entitled, **"WILDLIFE AND FORESTRY MANAGEMENT: A CASE STUDY OF THE SIMLIPAL FOREST IN MAYURBHANJ DISTRICT ALONG THE ODISHA"** is a bona fide record of the project work undertaken and completed by Ms. /Mr. **Ujjwal Sahoo** under my guidance and supervision during the academic session 2020 – 2021 submitted before Vidyasagar University, Paschim Medinipur, for the partial fulfillment of the requirement for the degree of M.Sc. in Remote Sensing and GIS.

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DECLARATION

I certify that

I. The work contained in the thesis is original and has been done by myself under the supervision of my supervisor.

II. The work has not been submitted to any other Institute for any degree or diploma.

III. I have conformed to the norms and guidelines given in the Ethical Code of Conduct of the Institute.

IV. Whenever I have used materials (data, theoretical analysis, and text) from other sources, I have given due credit to them by citing them in the text of the thesis and giving their details in the references.

V. Whenever I have quoted written materials from other sources and due credit is given to the sources by citing them.

Ujjwal Sahoo

.....

Date : 20/07/2021 **Name of the Student**

Place : Paschim Medinipur **Regd :** 1030414

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ABSTRACT

The geographic information system has become a major component of modern life and the contribution of this system to daily life has been increasing by decades with new discoveries but now with the development of landscape the landscape and wildlife have been completely changed. Simlipal in India requires the application of GIS to wildlife and forests and through GIS we prepare and analyze various maps. I have used DEM Data and GIS software as well as Satellite data for forest and biodiversity analysis. Created river and stream maps using DEM data. I have used Google Earth Engine (GEE), Google Earth Engine (GEE) is used to create forest maps in a short time. I created NDVI and EVI maps (2000 - 2021) using Google Earth Engine (GEE). The environment can be destroyed and controlled using remote sensing and GIS. The main components of wildlife conservation are plant conservation, climate, soil conservation etc. Currently a lot of things are being cut down for roads, houses, construction, first we have to control these, then wildlife can be saved for future generations. Community work has now developed into a popular method of forest management worldwide. The main goal of this study is to protect forest resources around the world using remote sensitive GIS. Manage forest resources around the world and create a vision for community-based forest management set This study is a combination of world literature reviewed through remote sensing and GIS. Can be used to create weed maps using remote sensing and GIS applications. The amount of forest and wetlands can be mapped using GIS. The results of this study clearly show us that GIS technologies using community-based forest management can help identify research work. The only way to identify and solve problems using remote sensing GIS is to collect GIS and community knowledge based information and plan and review forest resources through proper planning.

Keywords: **Wildlife, Forestry, Satellite Data, DEM Data, GEE (Google Earth Engine), Remote Sensing, Geospatial Technology.**

CONTENTS

CONTENTS

List of Table

Page No.

List of Figures ***Page No.***

Chapter – I *Introduction to the study Area*

1. *Introduction to Forest and Wildlife*

1.1.Introduction about Simlipal Forest and Wildlife

Simlipal National Park in the Mayurbhanj district of the state of Orissa, one of the wildlife and green states of India . Simlipal National Party is located in the center of Mayurbhanj district in the northeastern part of Orissa. Surrounded by shrubs and willows. There are 12 rivers flowing in Simlipal National Park. It can be called a dense wood jungle. The park is characterized by luxurious meadows and beautiful waterfalls. This park is located in the middle of the hill. The park is home to many fragrant plants. The park is located 250 km from Kolkata and 300 km from Bhubaneswar. Simlipal was recognized as a tiger sanctuary in 1973. It is one of the 18 archives in India. The total area of Simlipal National Park is 2750 km.

Photo no. – 01 : Simlipal Forest & Wildlife

Simlipal National Park is home to leopards, gourds, elephants, langurs, barking and spotted deer, sloth bears, flying squirrels, porcupines, turtles, monitor lizards, pythons, sambars, pangolins, crocodiles and crocodiles. About 230 species of birds such as Gray Hornbill, Indian Pied Hornbill, Malabar Pied Hornbill, Indian Trogan, Red Jungle Fowl, Mountain Maina, Peephul, Alexandron Parquet and Crest Serpent Aggull have been found. The national park is home to a large number of reptiles, including snakes and turtles.

Major mammals include tigers, leopards, Asian elephants, sandbars, barking deer, gaur, jungle cats, wild boar, chaussingh (four-horned deer), giant squirrels and conventional langurs. These forests are home to 231 species of birds. Red junglefowl,

mountain myna, peacock, alexandrine parakeet, crest snakegal are commonly seen. Gray Hornbill, Indian Pied Hornbill, Malbar Pied Hornbill and Indian Trogan are also available in the reserve. In addition to the large number of mammals and bird species, the park has a huge population of reptiles, including snakes and turtles. The "Mugger Crocodile Management Program" has helped mugger crocodiles survive and thrive on the banks of the Khagi River.

Sal, Khayer and Sisu are the most visible trees in Simlipal. However, there are several other species that contribute to Jim Simlipal's sound diversity that are scattered throughout the park. The only evergreen cone found in the park. Some parts of Simlipal are affected by bamboo forests.

Photo no. – 02 : Elephant

Flowering tree:

The basic color of green nature and the beautiful flowering plants of Simlipal give a beautiful color to the forest. Also known as forest flame, mother or Indian coral with red flowers and immortality with bright yellow flocks like flowers.

Shrub:

Photo no. – 03 : Forest

The floor of the Simlipal forest is also predominant by the open species of various species found in the open, and many birds and animals provide food and shelter for them. If you look at the fruits of this amazing shrub, they are in the form of twisted spiral pods. Various types of shrubs along the Ramganga basin in Zhou sandy or rocky soils.

Bamboo:

Exploring the plant species of Simlipal National Park is quite interesting. We can see that some parts of Simlipal tree are covered with bamboo forest. The existing main species are named male bamboo which contains cluster stout stems and glossy paper stem sheets.

Photo no. – 04 : River

Photo no. – 05 : Animal

1.2. Aim & Objectives

Our main Aim and objectives in wildlife and forest conservation are-

1.2.1. Aim of the Study **: -**

II. Communicate and exchange information among members of the community interested in restoring wildlife habitat in the forest.

III. Increase wildlife general knowledge and technical capacity in the reconstruction area.

IV. Increase public awareness and technical capacity for wildlife population recovery and habitat creation.

V. Develop a viable ecosystem management that enables wildlife recovery.

VI. Recovery Strategies Identify effective monitoring and evaluation to determine success-failure.

VII. Create topographic maps by generating forest type, density and information through remote sensing and GIS.

VIII. Use of Satellite Data to evaluate land use for wildlife and forest conservation.

IX. Using the latest Satellite Data and Satellite Sensors for Advanced Natural Resource Mapping.

X. Keep an eye on water, food, supplies, wildlife and their species in the forest so that they do not become extinct.

XI. Assess GIS to allow sunlight and air to enter the forest.

1.2.2. Objectives : -

II. Provide regular communication, newsletters, employment, workshops, meetings, various publications, among the members of the society.

III. Promote membership in wildlife and forestry professional communities interested in reconstruction.

IV. Pricing for wildlife and forest conservation and specific actions of society.

V. Technical review with community members to expand position and provide various assistance.

VI. Journalists, government employees, other agencies, provide technical assistance to public works in reconstruction.

VII. Ensure and implement long-term forest conservation based on the use of GIS.

VIII. Ensure long term forest productivity and conservation of forest resources through soil conservation, forest cover and other monitoring.

IX. Emphasize the environmental importance of wildlife and wildlife program participants.

X. Create new maps using various data and sensors and manage them in the community.

XI. Provide specific laws in the society by creating new habitats for wild animals.

XII. Review endangered animal species and forests in a scientific manner and through GIS.

XIII. Preservation through new scientific methods and GIS by stopping the increase of urbanization and deforestation along the forest.

1.3 Limitation of Work :

Although it was originally intended to develop some of GIS's advanced modeling applications for community-based afforestation using spatial analytics (visual effects assessment, recreation and ecotourism planning, and wildlife practice suitability modeling), General database access was interested.

Access to the appropriate GIS software was delayed due to administrative and other issues - so some software was not available for the project, ArkGIS 10.5. While waiting for the crack and full version of ArkGIS 10.5, the researchers managed to use the evaluated version of ArkGIS software and some other free software available on the Internet. The simplicity and practical nature of the community's preferred GIS applications means they can be managed using available software.

Other barriers (e.g., transportation, funding, data availability and logistics, especially Lockdown and Pandamic seatuion) have been overcome with the help of academic supervisors and Creswick campus administration. Qualifying for a Victorian driving license was one of their face-to-face researchers, working in isolated rural communities for this work. Another was that foreign students needed time to gain the trust of local rural community groups.

Perhaps the most serious limitation of this study was the inability to conduct a full action research cycle to work with community groups on all GIS applications. Due to limited time and visibility from the groups, it was not possible to ensure that the groups accurately reflected on the results and process of their activities. When planning and action are usually accomplished effectively, the reflection phase is quite weak. Thus, it may be argued that a classical approach was not conducted, and that the method used could more accurately be called "participatory mapping". However, the principles of action research and literature provide a valuable guide throughout the research process.

1.4. Review of Literature

The transfer of animals to GPS devices has proven to be accurate and has helped restore wildlife, a process that requires a capable GPS device through which to store data and record data. A real map can be created via GPS and satellite. Wildlife can be easily tracked with GPS, using this GPS they can be recovered if they are in danger.

The GPS tracking system is connected to a receiver. A receiver can easily understand the habitat of animals, and a receiver can easily understand the location of animals by connecting GPS through his mobile. A GPS updates data every second, enabling researchers to create real-time maps.

Many state and private development agencies are now able to assess the natural resource management involved in the forest sector using GPS systems and remote sensing. Forest Fire & Private Land Regulations and subsidiary land agencies operate

using geographical data. It is very important to understand forest planning and mapping, proper use of land, etc.

Remote sensing technology can detect and map forest changes by panchromatic and multispectral image data processing, Geo-referencing, image enhancement. And based on that map, there can be urban growth development.

Remote Sensing GIS can be used to understand the effects of hydrology, road infrastructure, emergency zones and land, fire mapping and forest fires, soil quality, and climate in forests. Forests, classification, rainfall, etc. can be easily mapped using geospatial data.

Affects multi-Spectral maps including, forest identification, urbanization, GIS maps using various remote sensing GIS data. It also provides various information including forest cover, forest expansion, forest deforestation using temporal satellite map. GIS graph, maps and other GIS are required to manage the forest to represent the size of statistical modeling. Forest cover through GIS is understood using dam data. RS and GIS data are very useful for understanding forest characteristics, soil, amount of plants from small to large and their productivity.

Another important management of forest resource fire effects. Fire prevention, wildlife control, scheduled combustion, etc., have become much more effective through GIS. GI has been used to create forest fire maps. Weather maps and fire hazards can be used to determine the cover of fire plants, animals, plants, soil, climate, etc. in the forest. Crops can be planned in the forest using GIS. The location of the wetlands and the soil can be mapped for crop production. Roads can be improved using geospatial technology.

GIS is very important in forest resource management. GIS can provide fuel for logging, syllabic and fire management and other agencies. GIS can solve forest management problems. Using geospatial data can create a favorable environment for plants and preserve them.

Remote sensing and GIS can be used to expand the natural resources of the forest area, wildlife pastures, wildlife habitats and various other activities. The use of GPS is required to locate and store minerals in the forest. For example, GIS has been used by the National Forest for various purposes such as DEM data, Landsat data, plant memory, wooden bogies, land type, rainfall, timber collection, habitat conservation and improved road planning.

In the last 8 to 10 years GIS technology has widely adopted the needs of public and forest agencies and private foresters. GIS technology has been used to create a forest map for the most part. In America, GIS are required for timber production and harvesting and storage of primary equipment harvesting schedules. GIS and remote sensing techniques have been used to collect new forest listings.

Managed Forest Innovation GIS is used every year to explore small areas of forest. It usually takes 20 years or more to update a forest cover map, but remote sensing GIS's maps and forests can be updated in much less time. Remote Sensing and GIS.GIS technology can now be used to provide more data in a shorter period of time than the data previously collected by surveying can be done from 20 years to a few weeks, just in time and without wasting time. The amount has increased.

GIS is used to manually update forest list maps. Different models of GIS forest cutting, forest fires and forest conservation can be created, which used to be very time consuming and expensive. New insights into the fire situation are gained through the integration of the models dealing with the GIS model. The possibility of damage spreads from sensitive objects and buildings, railways. These models are created through GIS Proximiti.

The need for accurate and reliable equipment for forest fire management, the need to fight fires has created GIS. This GIS can be used to control forest fires and to preserve the natural resources of the forest.

A development in remote sensing has been the increased availability of high-spatial- and high-spectral-resolution remotely sensed data from a wide range of sensors and plat forms including photographic and digital cameras, and airborne and space borne multispectral sensors. Hyper spectral imagery promises to provide improved discrimination of forest cover. New technologies such as LIDAR can provide estimates of forest biomass, height, and the vertical distribution of forest structure with unprecedented accuracy (Lim et al. 2003). Wildlife is not caused by human activity. GIS determines where migratory mammal habitats can be created and where wildlife can be housed. Roads in the forest, the location of wildlife can be traced using GIS Data. GPS and GIS have been used to identify the location of the white bear and its crossing in a Canadian national park (Gunson in 2002).

Conservation Biology emphasizes the conservation of biodiversity. Like animals, plants and man-made streams do not recognize boundaries. GIS was used to map residential areas and maps of endangered trees in a survey of endangered tree species in Egypt (Alam 2003). This study could optimize the conservation boundaries of biodiversity conservation, the use of GIS maps, and plant and wildlife management. The use of GIS is very important to balance the economic needs as well as the habitat of wildlife.

GIS has been used to preserve ecological research biology at the National Center of the University of California. Made various models using Remote sensing and GIS data. The use of GIS is essential for the identification of hotspot areas for conservation of biodiversity, where emergency measures are needed, based on the GIS application. Many beautiful species are already extinct, and many are on the verge of extinction, requiring a robust database for wildlife research conservation practice. Most endangered species have been used in dense forests, mountains, GIS. Many wildlife studies have already been done using GIS. It sheds light on the distribution of different species, pasture effects of habitat modeling. Habitat must be the source of wildlife at the time of proper mapping

and can be found accurately through GIS. GIS is used to find the right habitat when wildlife habitat locations do not match the environment.

Important factors for researchers are the impact of species on the environment. Many of them died or were injured while trying to control the fire. GIS Data is used to create an accurate map of land cover types, heights, road distances, by combining different levels to identify and store high traffic as well as roads by mapping a fire risk area. GIS technology is used to determine low water quality, low water levels, relocation of animals in search of water, to determine the weather and climate. Various satellite sensors are used to measure water depth, fish pointers, aquatic flora and fauna, to measure ponds.

A map was prepared using Landsat, multi-temporal and multi-spectral and survey data in various laboratories around the world. Which was used for Planning and Preservation. Using techniques such as satellite images, radar, remote cameras, etc., animal observation helps in calculating, tracking their movements, mapping density, and making many changes in wildlife.

Coastal floods, deserts, salinity, ice sheet observations, lava flows from volcanoes are some of the natural hazards that severely affect wildlife. Geospatial applications such as optical remote sensing, radar, SAR data, damage assessment, geomorphological studies help planners to reduce natural disasters.

Residential entry into flood life is not only dangerous for humans, it also disturbs wildlife. Their observation gives a complete view of a large area preserving the ecosystem from afar. It needs to be monitored remotely with human intervention. These are one of the wildlife.

Chapter – II *About the study Area*

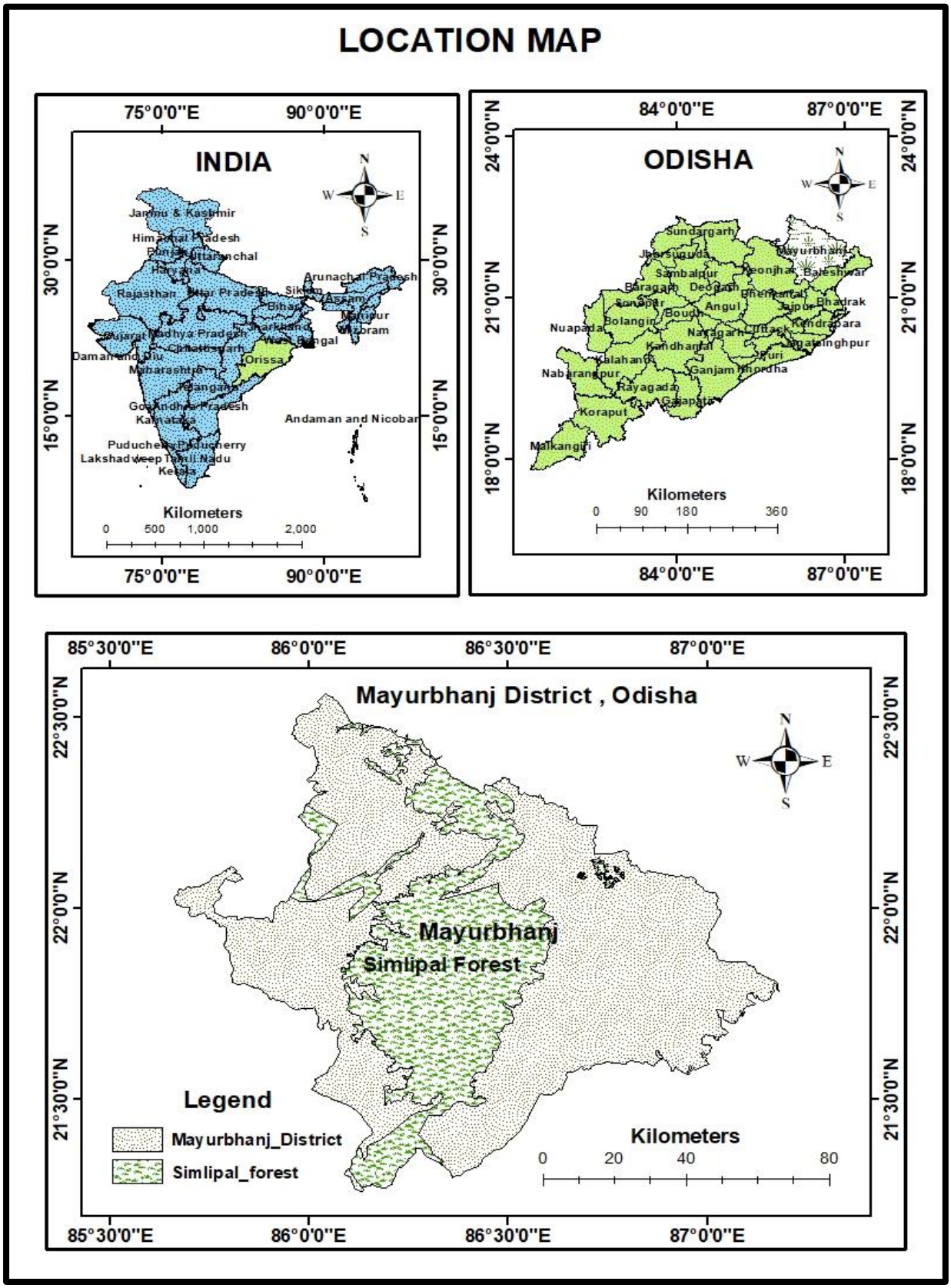
2.1. About of the Study Area

2.1.1. Geographic Location of the Study Area : -

The sections of this study have been explained by linking geographical, topological information, providing complete and spatial information for the purpose of choosing the field of study. This project has been taken from descriptions of wild plant and animal species and various end data.

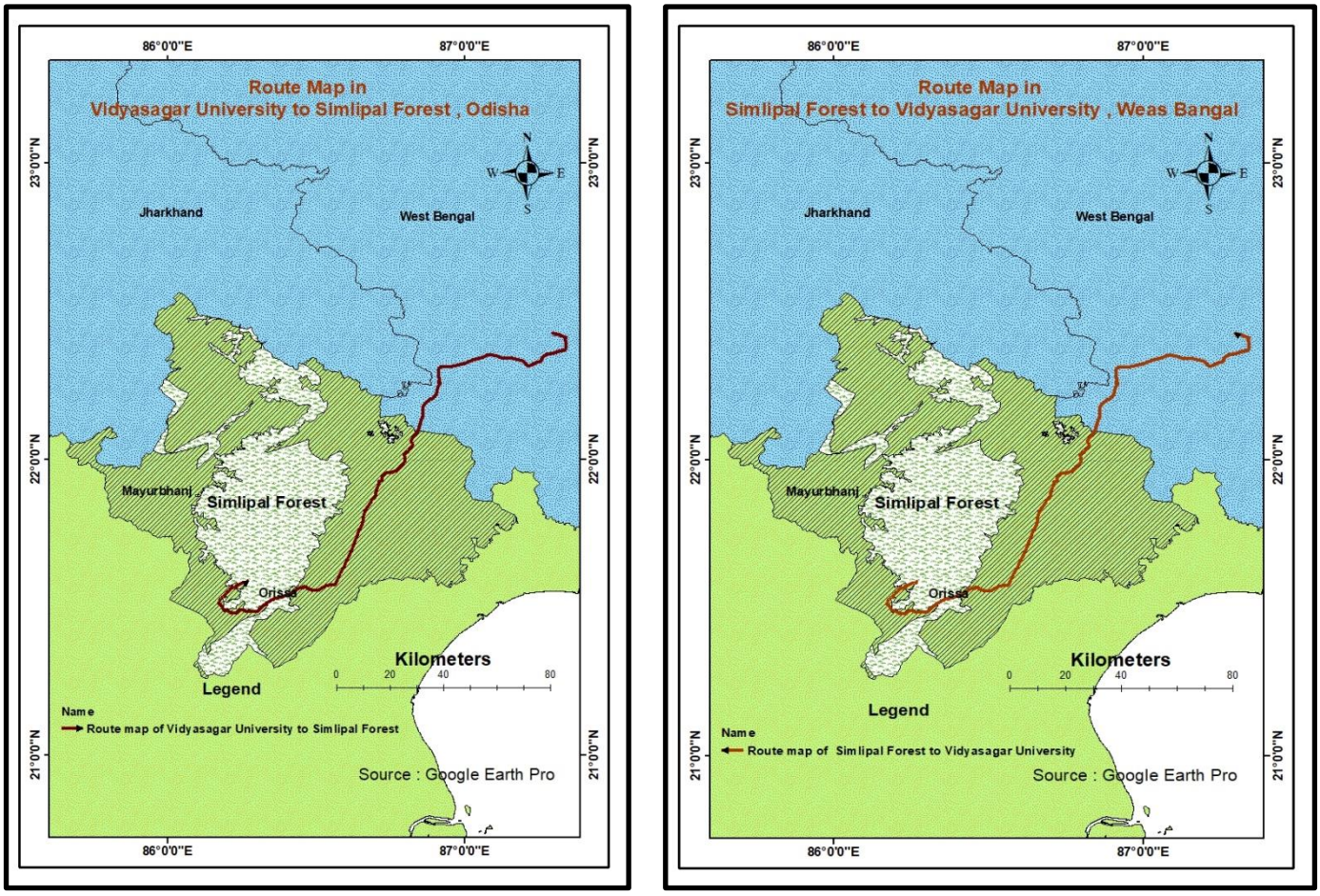
Simlipal forest in Mayurbhanj district of Orissa state. It is located on the 21 degree 50 minute N (21º50′ N) and 86 degree 20 minute E (86º20′ E) of the state of Orissa. Its total area is 2750 square kilometers or 1060 square miles. It has become a region of seats in various trees by shawl, sagun, mixed forests. About 300 sq.km or far away from the main region, a reserve sanctuary and a national park to preserve a tiger project of India. Starting dry thin, greenest forest has surrounded it. Here are 42 types of mammals, 29 types of reptiles, and 231 different species of birds. The average height of this forest land is 900 meters. There are many tall trees here, one of them is Khaiiriburu (1178 metre), Maghasani (1158 metre), and trees in others trees.

The government of Orissa declared Simlipal as a wildlife sanctuary in 1979. In 1980, the state government proposed 303 sq.km of the park as a national sanctuary. In 1986, the area was increased to 845 sq.km. The Government of India declared Simlipal as a wildlife reserve in 1998. UNESCO added it to the list of biosphere reserves in 2009.


LOCATION MAP
INDIA
75°0'0"E
90°0'0"E
30°0'0"N
15°0'0"N
N
S
W
E
Jammu & Kashmir
Himachal Pradesh
Punjab
Uttaranchal
Haryana
Rajasthan
Uttar Pradesh
Sikkim
Arunachal Pradesh
Assam
Bihar
Manipur
Mizoram
Jharkhand
Gujarat
Madhya Pradesh
Chhattisgarh
West Bengal
Daman and Diu
Orissa
Maharashtra
Andhra Pradesh
Goa
Karnataka
Andaman and Nicobar
Puducherry
Lakshadweep
Tamil Nadu
Kerala
Kilometers
0 500 1,000 2,000
ODISHA
84°0'0"E
87°0'0"E
24°0'0"N
21°0'0"N
18°0'0"N
Sundargarh
Jharsuguda
Mayurbhanj
Sambalpur
Baleshwar
Baragarh
Deogarh
Dhenkanal
Sonapur
Angul
Jajpur
Bhadrak
Bolangir
Boudh
Kendrapara
Nuapada
Nayagarh
Cuttack
Kandhamal
Jagatsinghpur
Kalahandi
Puri
Nabarangpur
Ganjam
Khordha
Rayagada
Gajapati
Koraput
Malkangiri
Kilometers
0 90 180 360
Mayurbhanj District , Odisha
85°30'0"E
86°0'0"E
86°30'0"E
87°0'0"E
22°30'0"N
22°0'0"N
21°30'0"N
Mayurbhanj
Simlipal Forest
Legend
Mayurbhanj_District
Simlipal_forest
Kilometers
0 20 40 80

2.2. Route Map of the Study Area

Simlipal Wildlife Sanctuary is a popular tourist destination in Orissa. It is basically located in Mayurbhanj district. Driving distance from Medinipur to Simlipal Wildlife Sanctuary is 215.7 km.

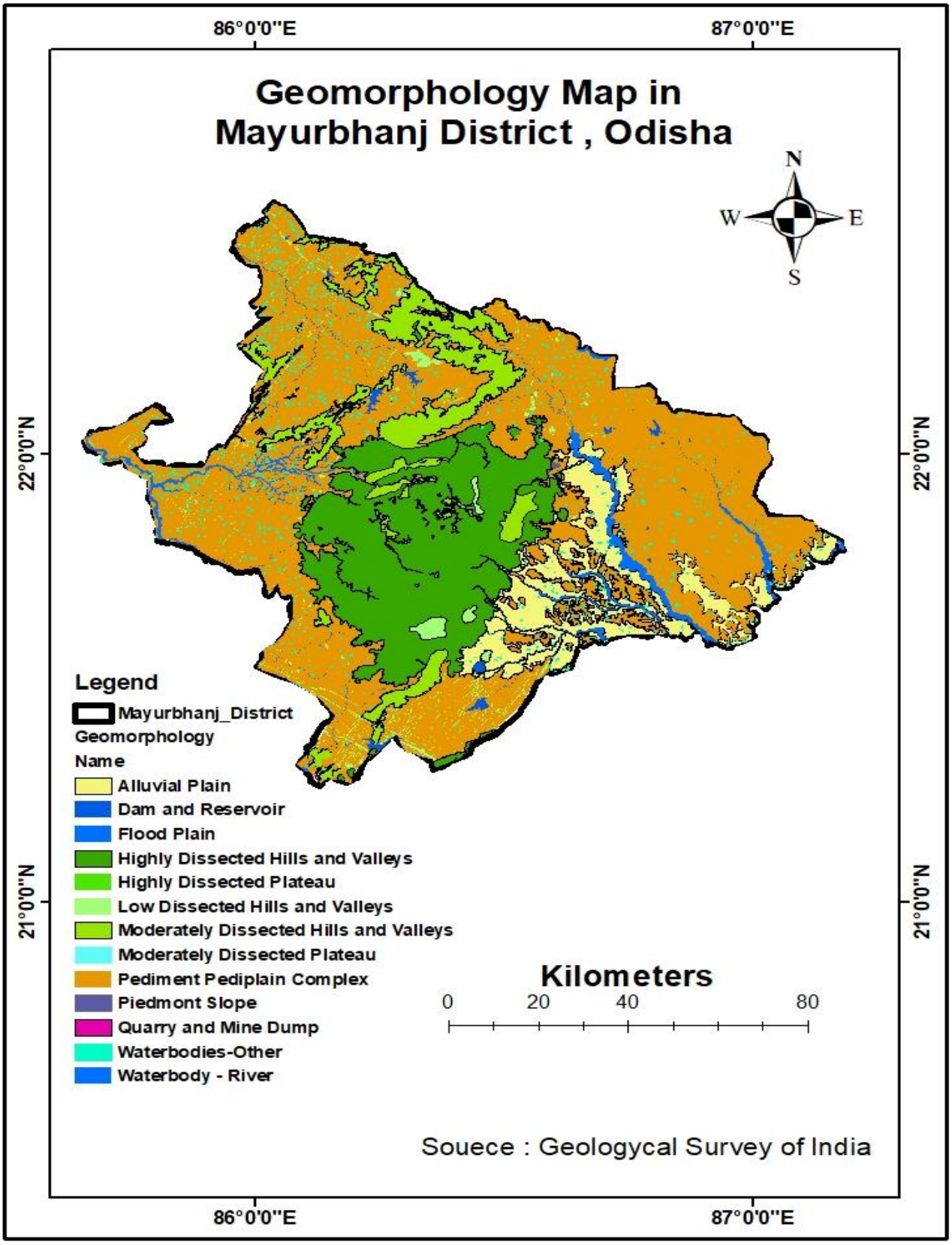


A. Route Map of Vidyasagar University to Simlipal Forest

B. Route Map of Simlipal Forest to Vidyasagar University

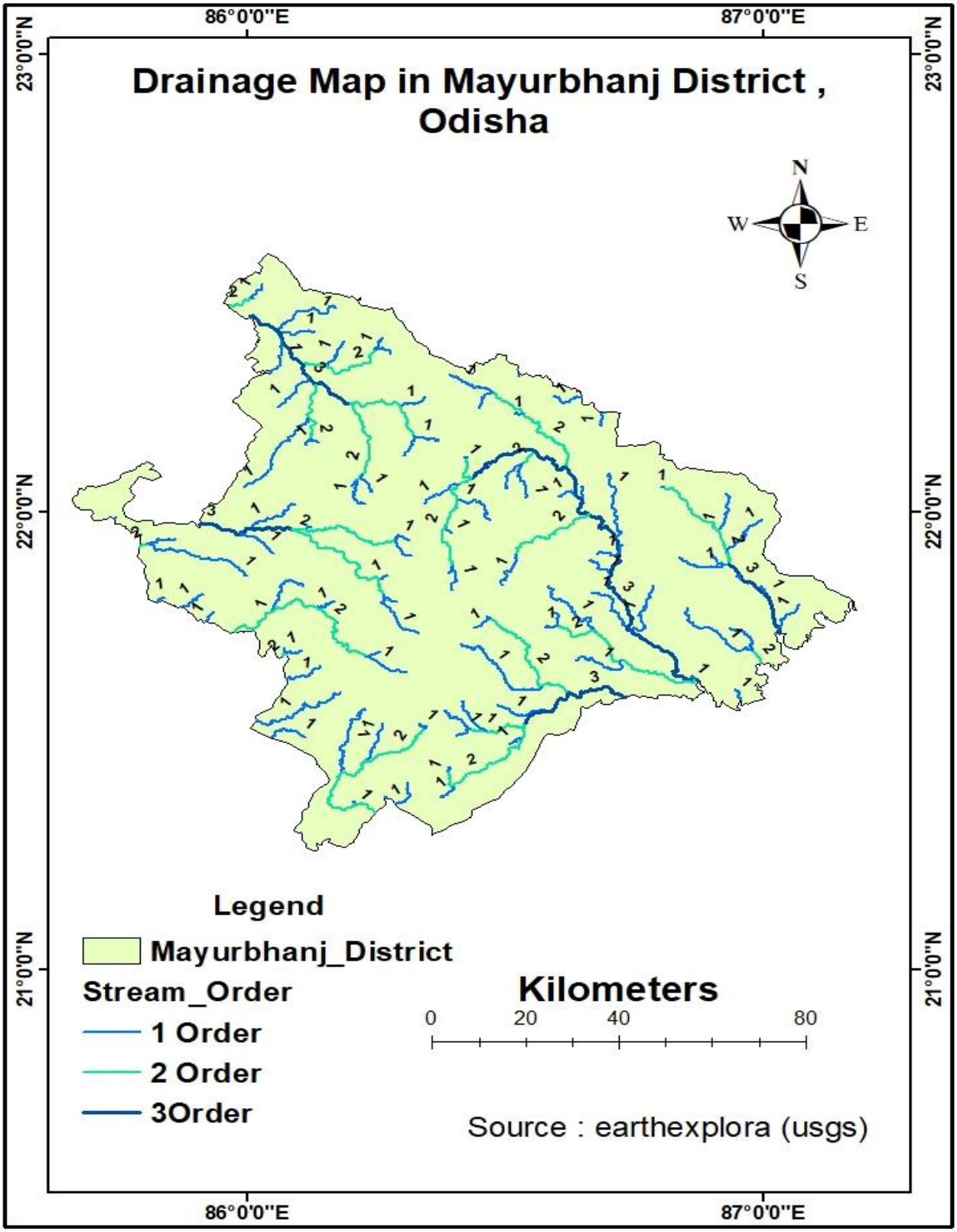
2.3. Geomorphological Background

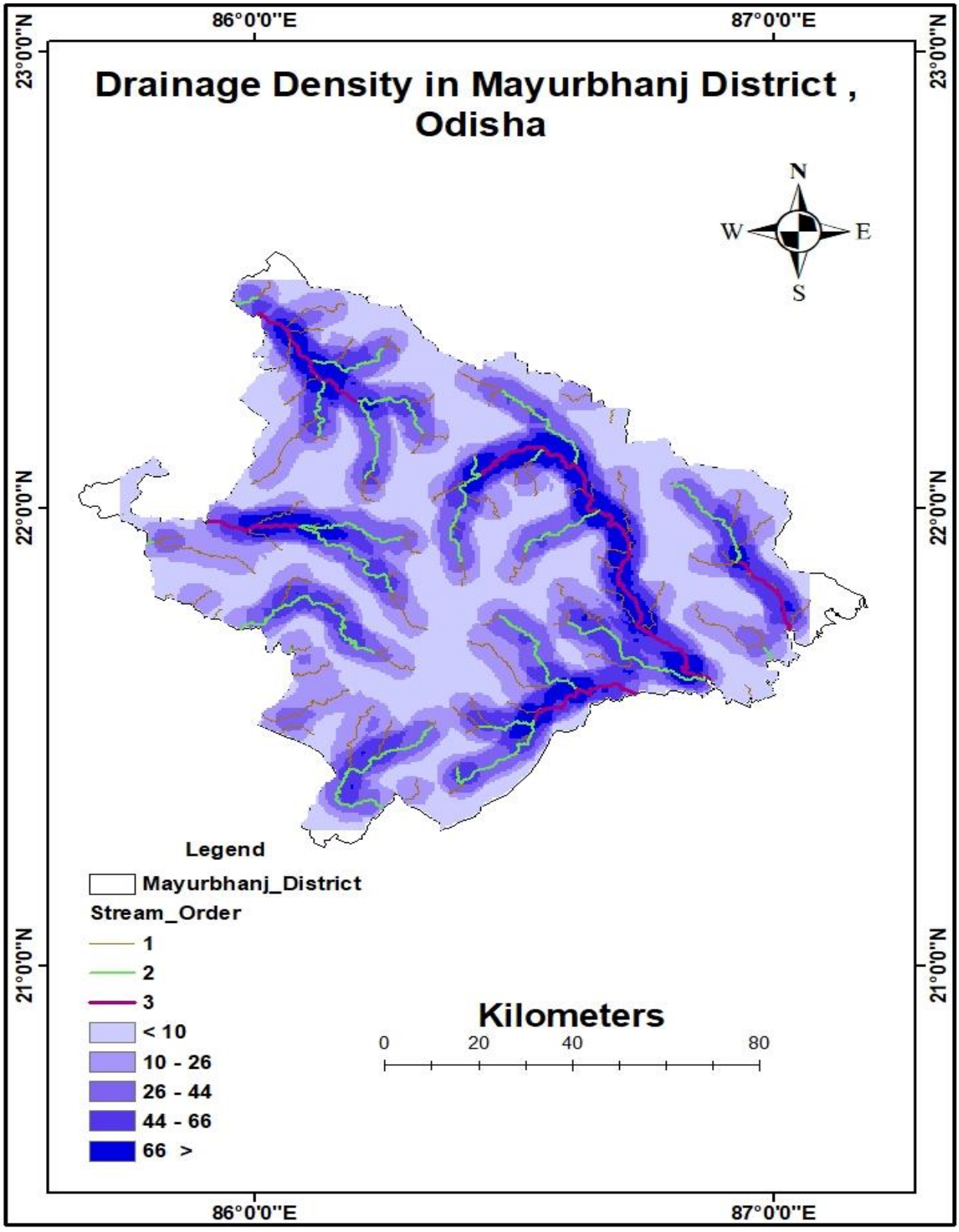
Biosphere reserves can take part in geology. Ages, evidence of long processes, huge geomorphic and evolutionary changes. Interestingly Suffice it to say, the Similipal Meghasan Complex, a part of the Gondalvana continent (Paleozoic era, 550 million years ago). Mesozoic period (Cretaceous period, 120 million). See more total changes connecting the Similipal-Budhbalang river, inconsistently with the oldest peninsula in India, Africa, 28. Presence of plant species in the African region in the Similipal National Park. In addition, the efforts of the evolutionary biologists of the regular regions are bound for more interesting expressions. Many of these stones are transformed. These include three pitches of quartzite with rock, Similipal volcanic rock filling, increasing water holding capacity (Iyengar et al., 1964). Similipal. Tiger / Biosphere: Again the archetypal system of reserve stones. The magnetite at Similipal is estimated to be 1200 million years old. The converting rock helps increase the holding capacity of bedded water with sub-conversion layers. The rock system consisted of granite, basalt, and dorite, which were connected to the Himalayas by a chain of similipal hills, now a part of the eastern ghats, the intermediate mountain range.


86°0'0"E
87°0'0"E
Geomorphology Map in
Mayurbhanj District , Odisha
N
W
E
S
22°0'0"N
21°0'0"N
Legend
Mayurbhanj_District
Geomorphology
Name
Alluvial Plain
Dam and Reservoir
Flood Plain
Highly Dissected Hills and Valleys
Highly Dissected Plateau
Low Dissected Hills and Valleys
Moderately Dissected Hills and Valleys
Moderately Dissected Plateau
Pediment Pediplain Complex
Piedmont Slope
Quarry and Mine Dump
Waterbodies-Other
Waterbody - River
Kilometers
0 20 40 80
Souece : Geologycal Survey of India

2.4. River System and Drainage Pattern

Most rivers pass through undulating hills; Emergence of Glorious Falls - Two important interesting waterfalls providing breathtaking views of the Bayaripani (400 m, MSL) and Jorand (150 m, MSL) valleys. The Similipal forest is well combined with the deep folds of the hills with a good timber, rolling, plateau, annual flow and numerous networks of rivers. Ten perennial streams have flowed in all directions. The Khadeki, Gangahar, Sona, Purba Deo, Sanjo, Palpala streams flow eastwards, joining the Vudbalanga river, which eventually flows into the Bay of Bengal. Khairi, Bandan, West Deo Streamf 5 joins the Byterani River. The Salandi River originates between Similipal and the Bay of Bengal. Several other streams also drain into the river submarine (Sahu, 1985). Therefore, similipal is naturally done with a rich 'lvatershed - river and flow. SW. During our field research in September 2003, the season was active in 2003. Curiosity led to a massive increase in growth in most parts of Khairi, resulting in the distribution of aquatic animal life forms in abundant climates. It causes flooding in the lowlands. The floods destroyed wildlife habitats. Many plants and wild animals died at that time. Therefore, in order to preserve wild plants and wild animals, it is necessary to control the water in the river with dams.


Drainage Map in Mayurbhanj District , Odisha
86°0'0"E
87°0'0"E
23°0'0"N
22°0'0"N
21°0'0"N
N
W
E
S
Legend
Mayurbhanj_District
Stream_Order
1 Order
2 Order
3Order
Kilometers
0
20
40
80
Source : earthexplora (usgs)

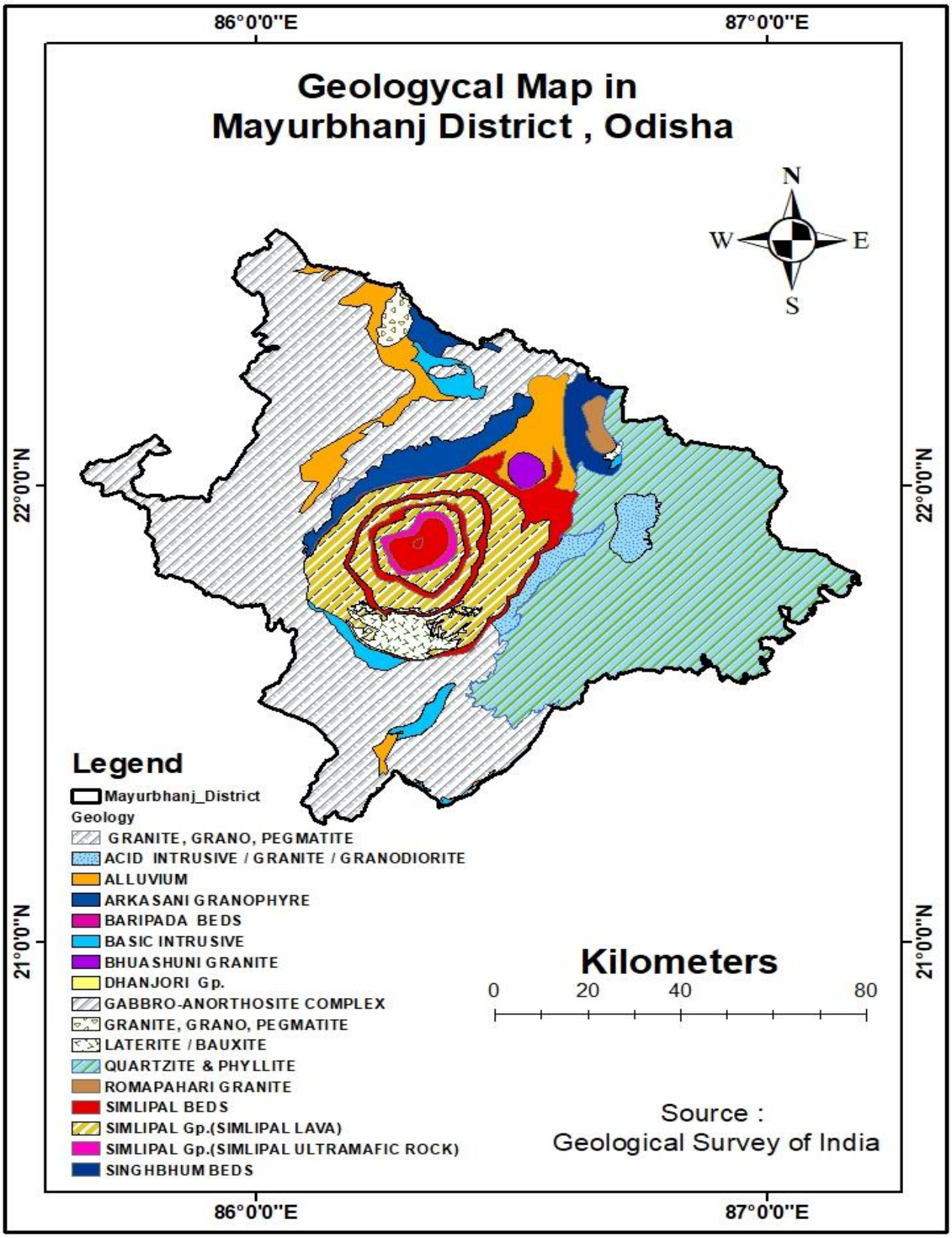

Drainage Density in Mayurbhanj District , Odisha
86°0'0"E
87°0'0"E
23°0'0"N
22°0'0"N
21°0'0"N
N
W
E
S
Legend
Mayurbhanj_District
Stream_Order
1
2
3
< 10
10 - 26
26 - 44
44 - 66
66 >
Kilometers
0
20
40
80

2.5. General Geology

The district is the main rock type facing Gneiss Gneiss, Quartzite, Orthoquartzite, Arcos, Shell, Phylite, Gabbro, PX-Granite. Its geology The district is formed by the simlipal complex on its central Parts belonging to the Archaean age, Singbhum granite and band iron formation. It is The volcanic alluvial unit consists of three alternative bands Settled in a ring like a uniquely formed round pattern Sub-marine conditions. Most simlipal swamps Consists of Orthoquartzite, Arkoses and minor bands Ferruginous shell and phyllite. Quartzites are useless No volcanic materials and well preserved display in it The cross bed and palaeo-current structure indicate shallow Water sub-marine origin. Dive of quartzites The center of the Similipal Basin. Three consecutive bands Volcanic quiescence indicates 3 times. In the center Similipal amjori sill lies which covers an area 130 sq km. Following the volcanic phase, Gabbro, Granophyre and pyroxene were intruded along the granite Peripheral cracks in Simlipal complex, Baripada bed Mio-Pliocene occurs east of Simlipal, formed by age Marine deposits in the form of continental shelf. After that Eocene age is found overlying others. Some parts are Covered by the underlying soil of recent age. One of the prominent volcanic rocks in the Simlipal Basin Round features in geological maps. This is the litho sequence Basal group, consisting of phylite, Volcanic breccias, intercalated with spilitic lavasand tuffs Overlays the group of Quartzite Gorumahisani Badamahara Rocks. In the type area, Gorumahisani-Badampahar group Rock, consisting of pillow metabasatts with interbeded chert Quartzite, BMQ, Hornblende Schist, Epidiorite, Phylite, Acid Volcanoes and tuffs.

Geological map of Mayanbanj district Baripada bed: sub horizontal quarter outcrops the surface The formation took place around the town of Baripada. This consists of Stratified soil and sand with deadly clay or limestone inter The band consists of significant fossil contents such as ostrea sp Crassostrea Gajensis, Vredenburg, Palmoxylon Fragments And Shorexilon. Shark teeth and spinal fossils like Rodent has been recorded along the river Budabalanga. Residues from animal events Baripada

throws some light on the bed palaeogeographical Mio- pliocene age time condition. The sea stretches a hand It is located on the banks of the river Budhabalanga in the north-west At least up to Baripada. Sub-horizontal surface outcrops Quarterly formations occur around the town of Baripada. These Consists of stratified soil and sand with deadly clay or limestone Inter bands consist of significant fossil contents such as ostrea sp Crassostrea Gajensis, Vredenburg, Palmoxylon Fragments And Shorexilon. Shark teeth and spinal fossils like Rodent has been recorded along the river Budabalanga. Residues from animal events Baripada throws some light on the bed palaeogeographical Mio-pliocene age time condition. The sea Stretches a hand It is located on the banks of the river Budhabalanga in the north-west At least up to Baripada.


Geologycal Map in
Mayurbhanj District , Odisha
86°0'0"E
87°0'0"E
22°0'0"N
21°0'0"N
N
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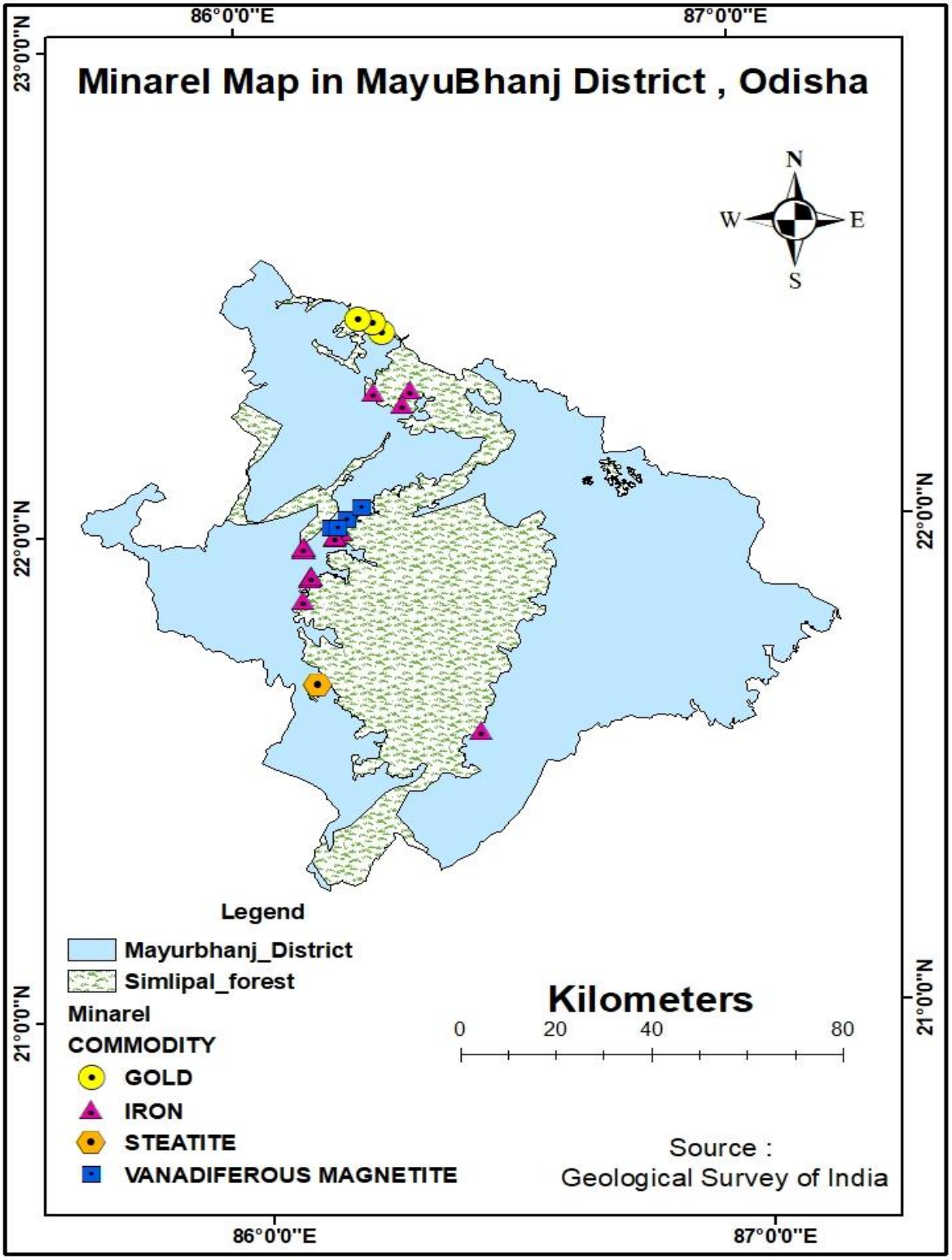
S
Legend
Mayurbhanj_District
Geology
GRANITE, GRANO, PEGMATITE
ACID INTRUSIVE / GRANITE / GRANODIORITE
ALLUVIUM
ARKASANI GRANOPHYRE
BARIPADA BEDS
BASIC INTRUSIVE
BHUASHUNI GRANITE
DHANJORI Gp.
GABBRO-ANORTHOSITE COMPLEX
GRANITE, GRANO, PEGMATITE
LATERITE / BAUXITE
QUARTZITE & PHYLLITE
ROMAPAHARI GRANITE
SIMLIPAL BEDS
SIMLIPAL Gp.(SIMLIPAL LAVA)
SIMLIPAL Gp.(SIMLIPAL ULTRAMAFIC ROCK)
SINGHBHUM BEDS
Kilometers
0
20
40
80
Source :
Geological Survey of India

2.6. Mineral

The reserve is endowed with rich mineral wealth as it lies in the belt of richest mineral deposits within the country, adjacent area to the well-known Chottanagpur Plateau.

1. **China clay** -large pockets are found in the reserve towards the Jashipur end (20°58'-80°5'), decomposed granite has composition of Alumina and Silica.
2. **Lead ore** (Galena) - Pithabata (20°56'-86°34') and adjoining areas have galena deposits.
3. **Kyanite** - This ore occurs in and around Bangriposi belt and near by edges of the reserve.
4. **Steatite** - Lulung, a few kilometers from Pithabata near the entry point, has Steatite deposits.
5. **Gold :** The mid-Archaean Gorumahisani-Badampahar schist belt composed of basic ultrabasic, volcanic rocks and volcanogenic sediments. This belt has been prognosticated as a rift-type of volcanic dominated one and is highly potential for economic grade gold mineralization. Likely targets include: a) auriferous quartz veins close to the contact of sulphide chert volcanics, b) sheared and sulphidised Fe-rich tholeiite with anomalous copper, c) epigenetic vein type of mineralization and BIF volcanic association, and d) sulphidic conglomerate resting over the basic volcanics. Placer gold occurrence are known from rivers and stream of Mayurbhanj district. An area of about 5 square kilometers of alluvium at the headwaters of Sapgora and Borai rivers near Kudersai was indicated as promising.

6. **Iron :** Bose discovered iron ore deposits in Gorumahisani and Badampahar in the eastwhile princely state of Mayurbhanj (now Mayurbhanj District). Gorumahisani deposits were investigated by Perin & Weld (1905). GorumahisaniBadampahar-Sulaipat deposits are associated with banded hematite / magnetite grunerite and BHJ.


Minarel Map in MayuBhanj District , Odisha
86°0'0"E
87°0'0"E
23°0'0"N
22°0'0"N
21°0'0"N
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Legend
Mayurbhanj_District
Simlipal_forest
Minarel
COMMODITY
GOLD
IRON
STEATITE
VANADIFEROUS MAGNETITE
Kilometers
0
20
40
80
Source :
Geological Survey of India

2.7. Soil and Slope

Soil in a region depends largely on different types of geology. There is a large spread of red loam in most parts of Simlipal. Laterite soils are found in some places in this region. Heavy soil width is seen. A wide variety of forest vegetation occupies this soil throughout the plains river basin. According to SBR, this clay PH capacity is 4.8 to 6.8. Riched soil rich from Haematic rock. Laterite is seen in the deeper level of soil. Because of this soil low-level depth, big trees can cause weak growth. The soil that appears in the tran areas is very important for ecosystems. In addition to other soils, clay shoots are very suitable for flowering and reddish sandy soils. The reddish sandy soil alsofavours plants, animals and micro-organismal growth, however, if present in thin layers, it supports good grass growth.

Biosphere Reserve's theoretical features are found in the presence of a wide range of clay –

a. Red and Yellow soil (Alfisols)- These are moderately acidic and deficient in organic matter, Nitrogen and lime with low water holding capacity, found in upper basins of river Budhabalanga, at an altitude of 2500-3250ft, and play host to moist deciduous and semi-evergreen type of vegetation.

b. Laterite soil (Ultisols and Oxisols) composed essentially of hydrated oxides of aluminum and iron, these soils are exclusively drained and porous and occur in Kharkhai, Badampahar regions having Sal as climax vegetation, besides mixed and scrub forest type of vegetation.

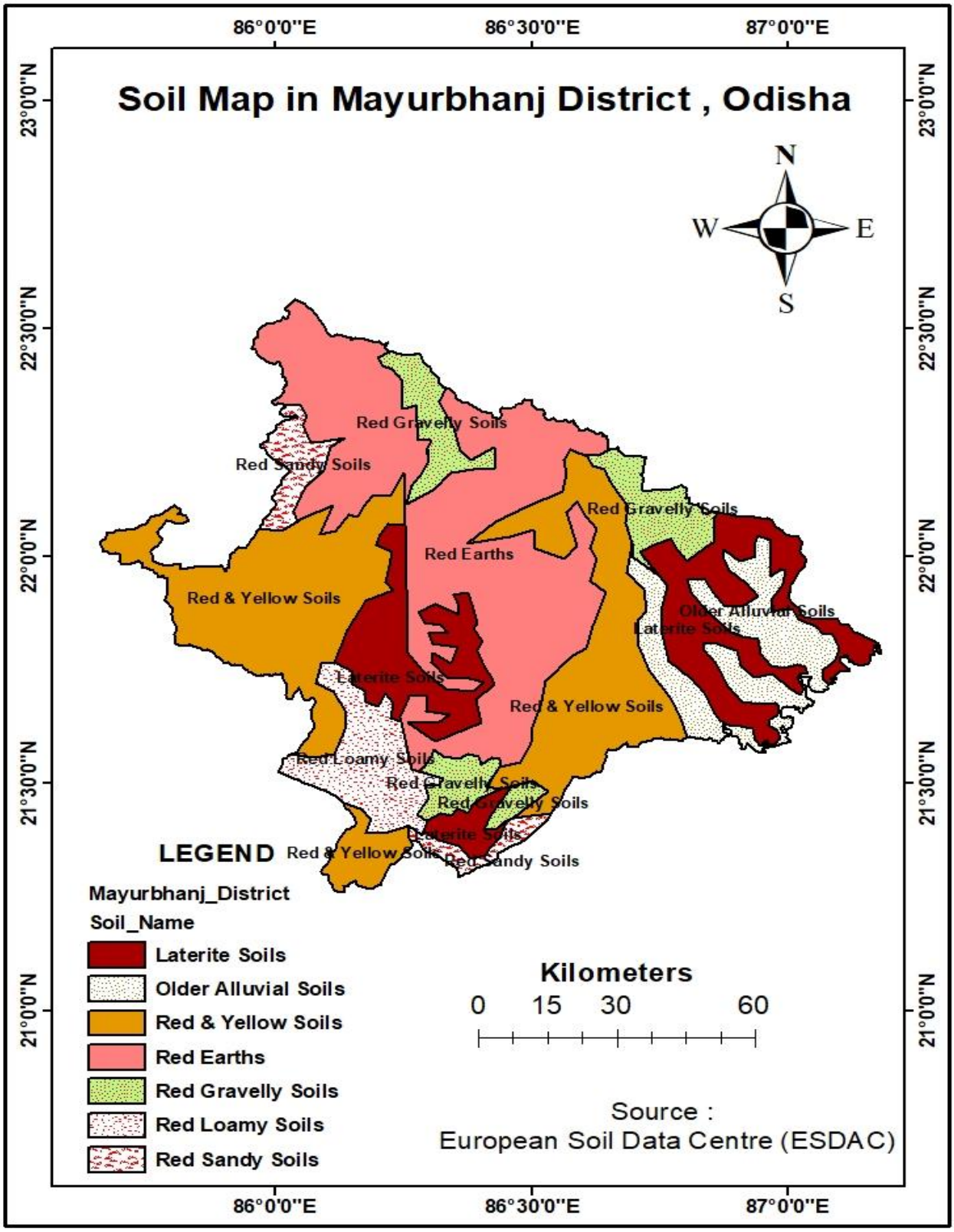
c. Black soil (Vertisols) have a depth range from 1-2 ft., are loamy to clayey, found in the West Deo basin having Sal climax forest type.

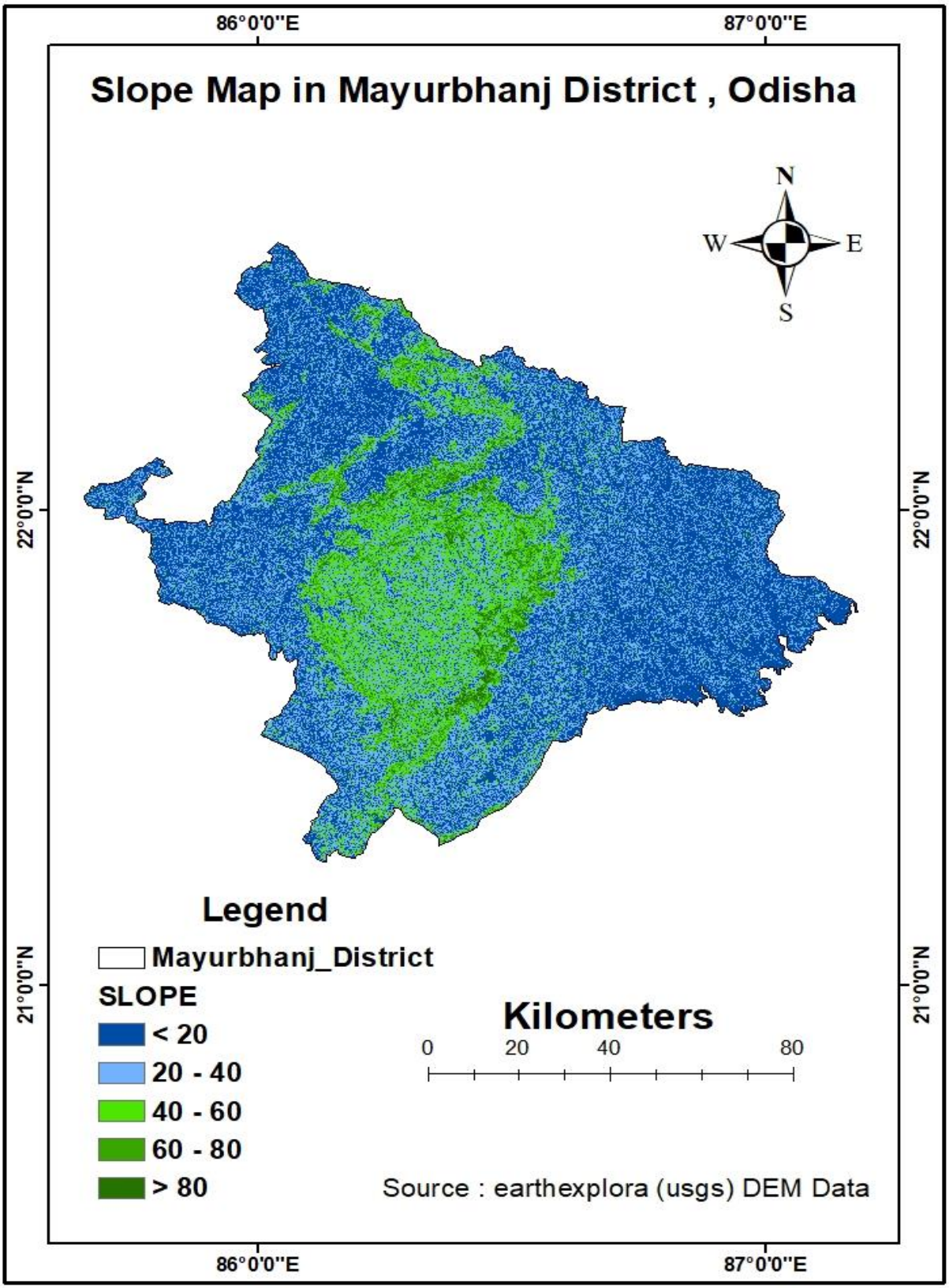
d. Brown forest soil (HumuIts)-Humults has high organic matter content and are found in the Khairi-Bandhan watershed having moist deciduous vegetation.

e. Grey Yellow soil- This soil type ranges from sand to clay type and is less fertile, occurring in Jenabil having savann frost tolerant association low grade Sal forest.

f. Rendzina soil found in Thakathaki East Deo and Sanja basins, having moist deciduous and orchid climbers.

g. Planosol soil- This soil type is found in Dundruchampa, Palapala watershed having dry deciduous, semi-evergreen scrub fore


Soil Map in Mayurbhanj District , Odisha
86°0'0"E
86°30'0"E
87°0'0"E
23°0'0"N
22°30'0"N
22°0'0"N
21°30'0"N
21°0'0"N
N
W
E
S
Red Gravelly Soils
Red Sandy Soils
Red Earths
Red & Yellow Soils
Older Alluvial Soils
Laterite Soils
Red Loamy Soils
LEGEND
Mayurbhanj_District
Soil_Name
Laterite Soils
Older Alluvial Soils
Red & Yellow Soils
Red Earths
Red Gravelly Soils
Red Loamy Soils
Red Sandy Soils
Kilometers
0 15 30 60
Source :
European Soil Data Centre (ESDAC)


86°0'0"E
87°0'0"E
Slope Map in Mayurbhanj District , Odisha
N
W
E
S
22°0'0"N
21°0'0"N
Legend
Mayurbhanj_District
SLOPE
< 20
20 - 40
40 - 60
60 - 80
> 80
Kilometers
0
20
40
80
Source : earthexplora (usgs) DEM Data

2.8. Climatic Conditions

The Simlipal region enjoys a humid tropical monsoon climate. The Simlipal region is affected by the southwest monsoon. Usually from mid-June to mid-October. This region is prone to cyclones. Cyclones from the Bay of Bengal bring heavy rainfall. From July to October the low pressure from the Bay of Bengal which flows through the highlands lies in the Balasore and Simlipal Meghasan ranges, if the range had been absent Orissa would have turned into a desert like Rajasthan.

2.8.1. Rainfall : -

Simlipal Reserve Forest is located a few kilometers away from the Bay of Bengal. There is a lot of rainfall during the rainy season, this is in the middle of the year, usually from June to October. The highest rainfall between 2001 and 2020 was in 2013. The rainfall in 2013 was 1936.71 mm. The average rainfall in this year is 107.29 Milimetre. The lowest rainfall between 2001 and 2020 was recorded in 2010, with a total rainfall of 1160.42 mm. The average rainfall this year is 46.15 mm.

However, the high rainfall in 2013 led to frequent floods in Sanardi and Baitarani. Resulting in loss of agricultural land, soil erosion of land, nutritional arrangement of plants, etc. In the year when there is heavy rainfall in the Simlipal reserve area, the habitat of the animals living in the forest is destroyed. Then they run around looking for shelter. At that time if GPS tracking is installed on them then their movements can be easily noticed.

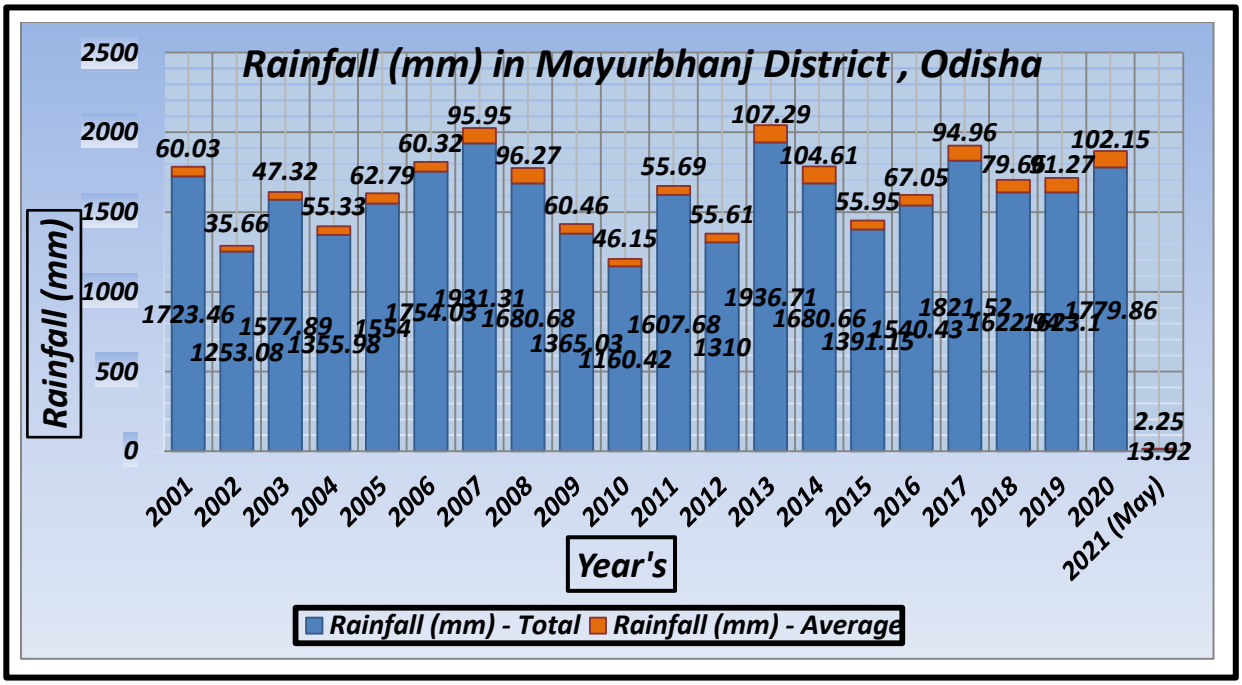
Table for Rainfall Data in Mayurbhanj District , Odisha

Year	Rainfall (mm) - Total	Rainfall (mm) - Average
2001	1723.46	60.03
2002	1253.08	35.66
2003	1577.89	47.32
2004	1355.98	55.33
2005	1554	62.79

2006	1754.03	60.32
2007	1931.31	95.95
2008	1680.68	96.27
2009	1365.03	60.46
2010	1160.42	46.15
2011	1607.68	55.69
2012	1310	55.61
2013	1936.71	107.29
2014	1680.66	104.61
2015	1391.15	55.95
2016	1540.43	67.05
2017	1821.52	94.96
2018	1622.94	79.66
2019	1623.1	91.27
2020	1779.86	102.15
2021 (May)	13.92	2.25

Table No. – 01

Bar Graph Showing Rainfall (mm) in Mayurbhanj District , Odisha



Graph No. – 01

2.8.2. Temperature

Due to its location in the Simlipal Reserve Forest, a short distance from the Bay of Bengal, it is very hot in the year when the monsoon is late. This heat is usually felt from April to June. The hottest period between 2001 and 2020 was in 2002. About 45.57 degrees Celsius. The minimum temperature in that year was 6.81 degrees Celsius. Depending on the temperature throughout the year, which is extremely hot in the monsoon season, many small shrubs die this year due to lack of water vapor.

If the Bay of Bengal is near and the monsoon is late, a balanced climate will not be observed that year. Which is to cause many problems in small shrubs and insects in the forest . Some organisms or insects and plants die due to lack of water. Drains, canals or rivers that flow through the Simlipal Reserve Forest have no water in summer or the water level drops too low, resulting in a drinking water crisis for the animals in the forest.

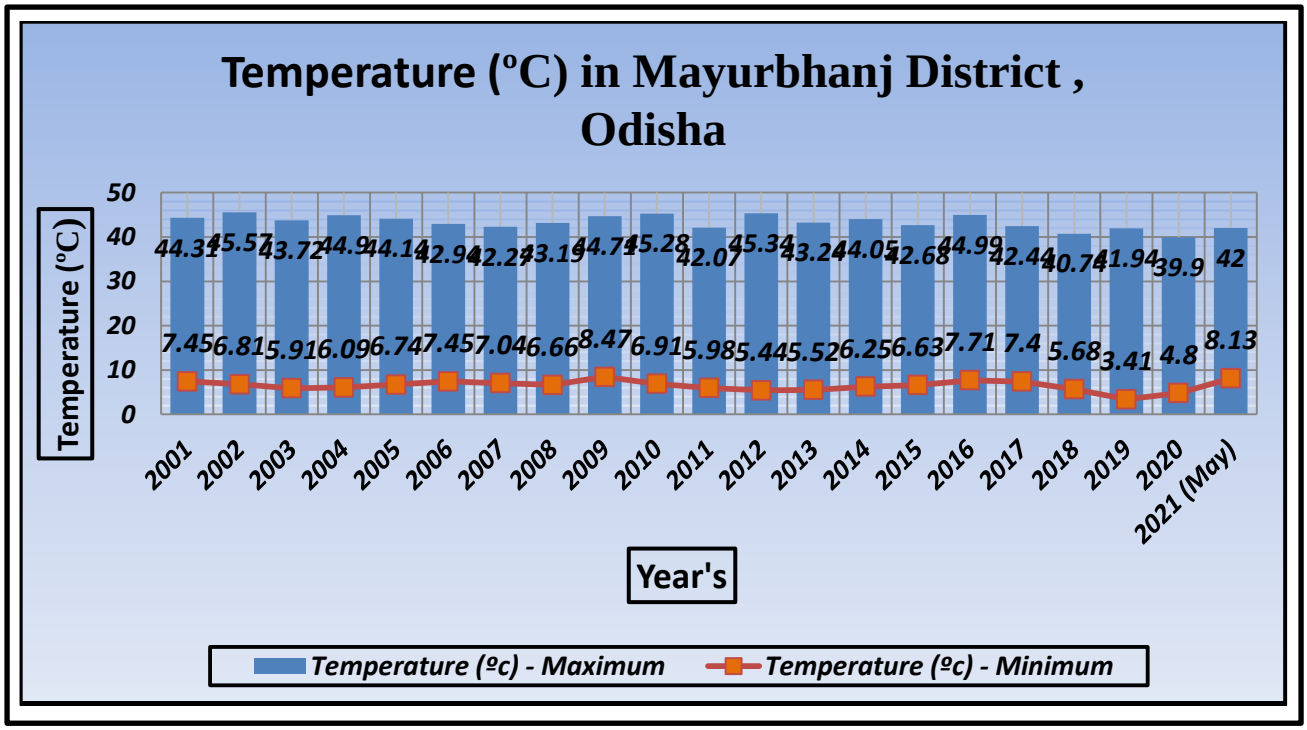
Table for Temperature in Mayurbhanj District , Odisha

Year	Temperature (°c) - Maximum	Temperature (°c) - Minimum
2001	44.31	7.45
2002	45.57	6.81
2003	43.72	5.91
2004	44.9	6.09
2005	44.14	6.74
2006	42.94	7.45
2007	42.27	7.04
2008	43.19	6.66
2009	44.71	8.47
2010	45.28	6.91
2011	42.07	5.98
2012	45.34	5.44
2013	43.24	5.52
2014	44.05	6.25
2015	42.68	6.63
2016	44.99	7.71
2017	42.44	7.4

2018	40.74	5.68
2019	41.94	3.41
2020	39.9	4.8
2021 (May)	42	8.13

Table No. – 02

Bar & Line Graph Temperature (ºC) in Mayurbhanj District , Odisha



Graph No. – 02

2.8.3. Relative Humidity

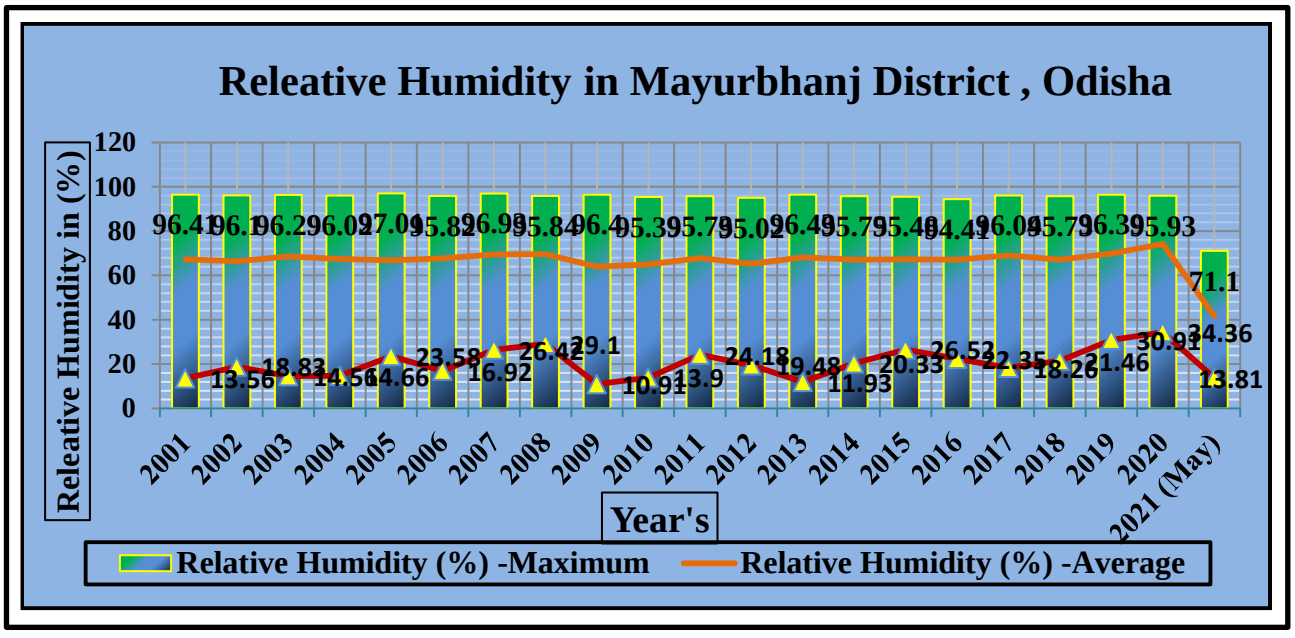
Table for Relative Humidity in Mayurbhanj District , Odisha

Year	Relative Humidity (%) - Average	Relative Humidity (%) - Maximum
2001	67.24778082	96.41
2002	66.41942466	96.1
2003	68.49835616	96.29
2004	67.44497268	96.02
2005	66.79778082	97.01

2006	67.65767123	95.82
2007	69.43923288	96.93
2008	69.53256831	95.84
2009	63.96389041	96.4
2010	64.88632877	95.39
2011	67.82468493	95.73
2012	65.30991803	95.02
2013	68.1600274	96.43
2014	67.13884932	95.75
2015	67.30660274	95.48
2016	67.16811475	94.41
2017	68.99863014	96.04
2018	67.1449863	95.73
2019	69.84608219	96.39
2020	74.21969945	95.93
2021 (May)	41.65682927	71.1

Table No. – 03

Bar & Line Graph Relative Humidity in Mayurbhanj District , Odisha



Graph No. – 03

2.9. Socio – economic & cultural condition

2.9.1. Transport Network :

There are several entrance points in Simlipal, all of them are easily accessible from the Baripada city nearly 108 kilometers away from sanctuary. To help you plan your trip, there is a detailed description here for the most convenient ways to reach the Simlipal National Park.

- ***Airport :***

People from outside the country can go to the Netaji Subhas Chandra Basu International Airport of Kolkata, or Biju Patnaik International Airport of Bhubaneswar; Located 3 365 km and 191 km respectively from each similipal. Two buses and taxis are available from the airport to take advantage of the national parks. Both airports include domestic terminals, the nearest internal airport from the park is Sonary Airport of Jharkhand Jamshedpur. It is about 190 kilometers away from the similipal and about three hours away from a bus or car.

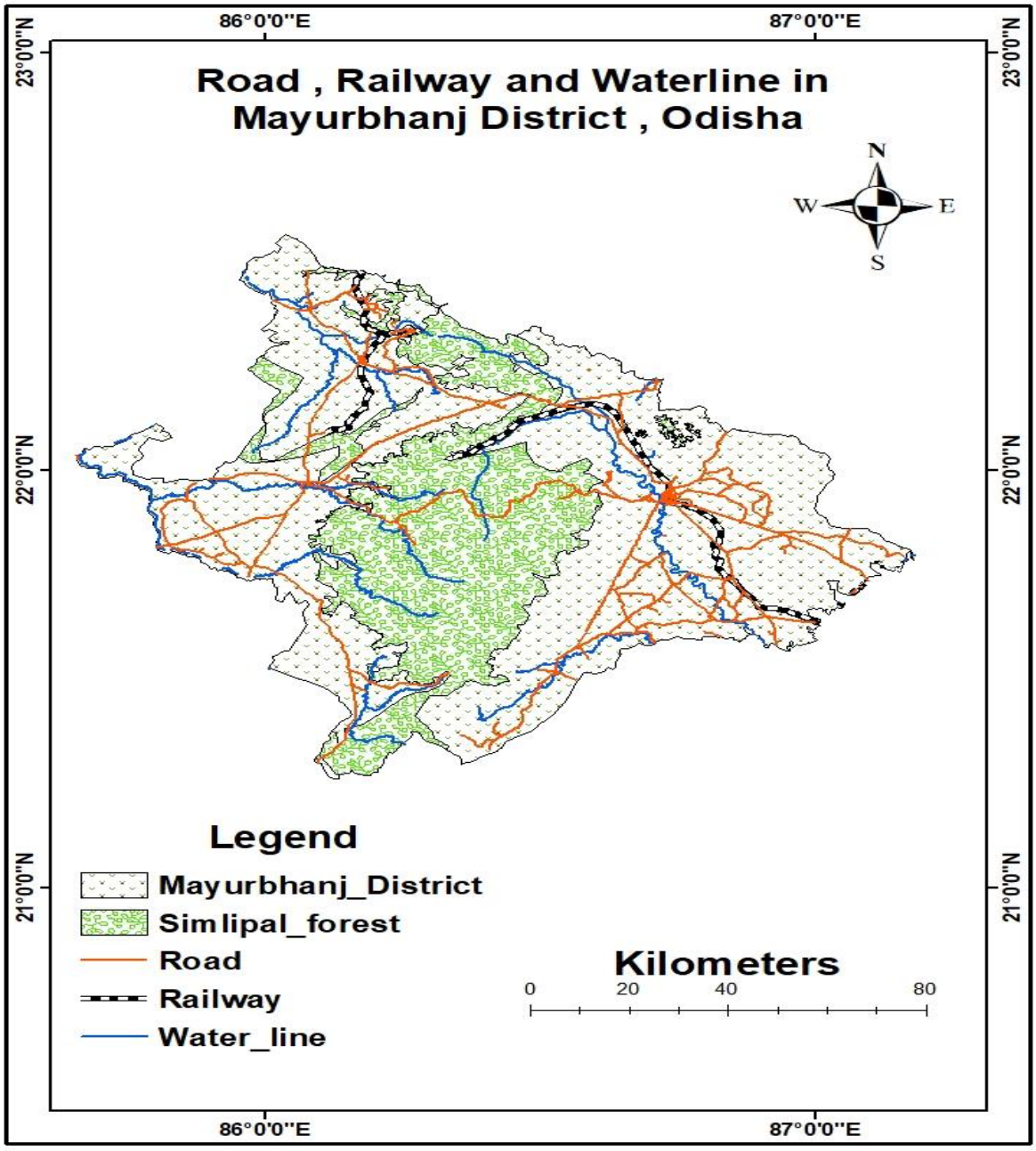
- ***Railway :***

About 100 kilometers away from the similipal, Balasore railway station closest railway head near the park, it is located in the original Howrah-Chennai line and connected with several large cities through the ongoing trains in the south-east railway. The Baripada railway station is located nearly the same distance from the similipal and connecting railway junction.

- ***Road :***

Baripada to the nearest city from simlipal; At the National Highway 5 and 6, it is about 250 kilometers from Bhubaneswar, 235 kilometers from Calcutta and 60 km away from Balasore. Public buses operated by OSRTC, all kinds of personal transport are

available to reach Baripada from nearby large cities nearby. Different entrances of national parks can be reached through buses, taxi and zips available from Baripad - the entrance is 21 km away; Josphere is 95 kilometers away with NH6; 20 km away with Lulung NH5.



2.9.2. Land Use & Land Cover

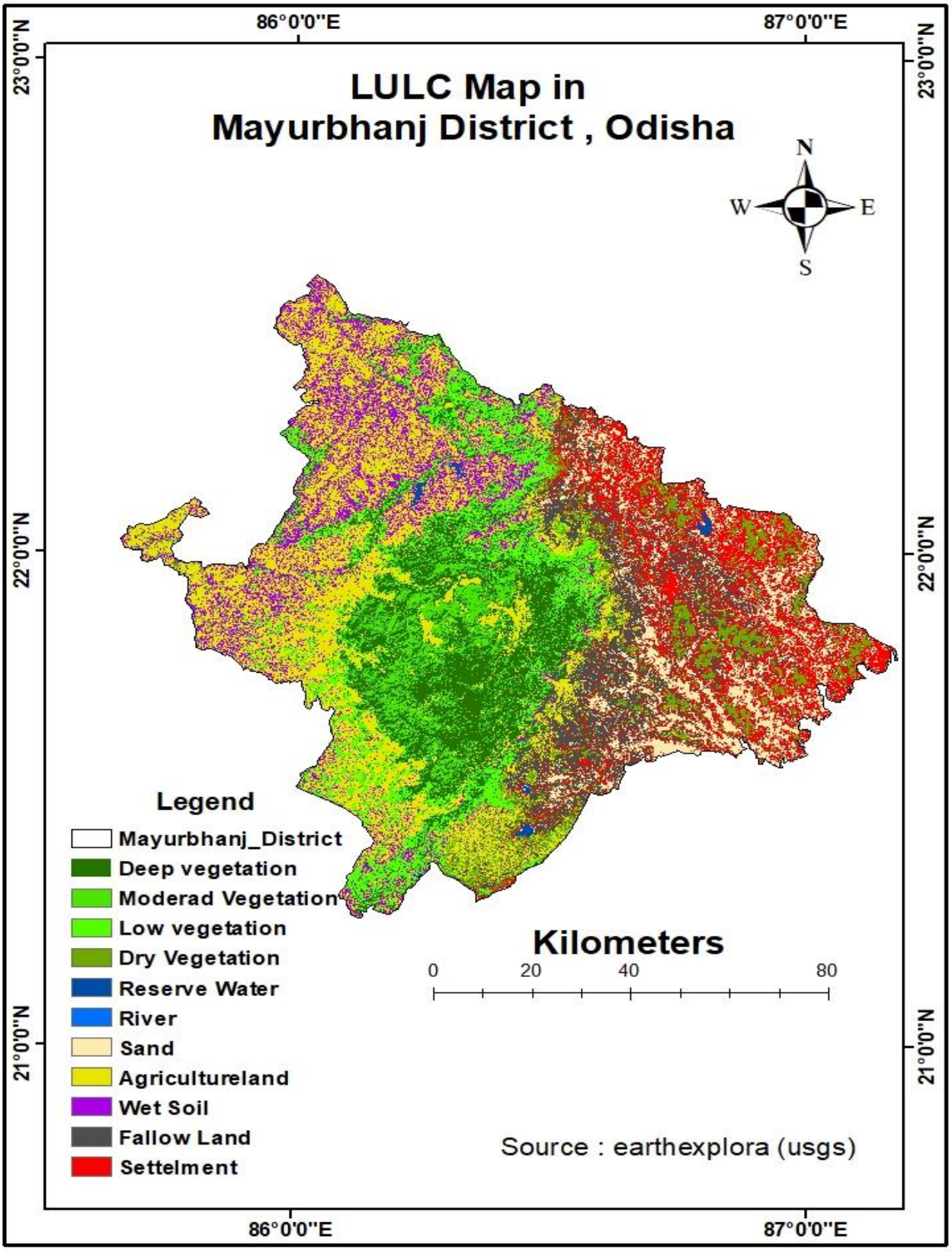
Land use is the raw material of a site, which is defined in forms of a number of natural characteristics, viz. climate, geology, soil, topography, hydrology and biology (Aldrich 1981). On the other hand in remote sensing terminology, the land use is defined as human activities on and in relation to the land, which are usually not directly visible for the imagery. Another important term in this context is land cover, which describes the vegetation and artificial conservation covering the land surface (Burley 1961). The success of land use/land cover mapping is dependent on the selection of appropriate classification schemes, out of a number of such schemes developed and adopted to describe the different land use/land cover changes in the interpretation of satellite/airbome imageries.

2.9.2.1. Agriculture Land

The farmlands were characterized by pink tones, smooth textures, sharp borders and irregular shapes. It is primarily defined as land used for the cultivation and production of food, fiber and other commercial and horticultural crops. The type of land use 149 is mainly agricultural which is mainly found in the backshore region of the coastal plain. The use of agricultural land in the present region includes crop lands, fallow lands and agriculture. The total area of agricultural land in Mayurbhanj district is 270 sq.km.

2.9.2.2. Forest

The plantation was characterized by smooth texture with its bright red tones thick and located at the foot of the hill and upstream. It has been described as a region of natural forest, which includes eucalyptus, casuarinus, bamboo, palm, etc. It appears as light red to red tones in satellite imagery. Such land use classes are observed in the coastal plains of the research field. During 2020, it occupies 168.50 sq km of dense forest, and 250 sq km of other forests.


LULC Map in
Mayurbhanj District , Odisha
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87°0'0"E
23°0'0"N
22°0'0"N
21°0'0"N
Legend
Mayurbhanj_District
Deep vegetation
Moderad Vegetation
Low vegetation
Dry Vegetation
Reserve Water
River
Sand
Agricultureland
Wet Soil
Fallow Land
Settelment
Kilometers
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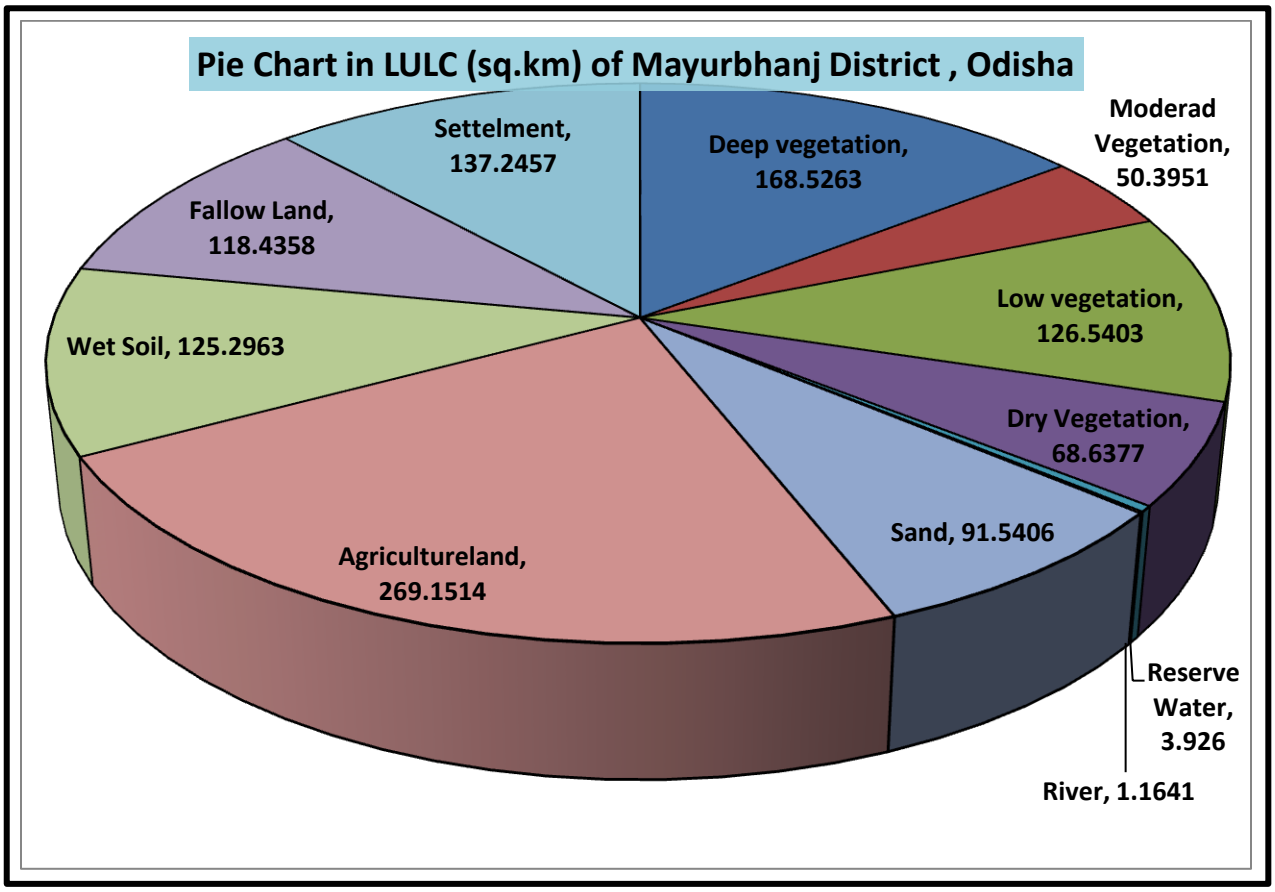
Source : earthexplora (usgs)



Graph No. - 04

2.9.4. Settlement & Literacy

Based on official statistics and reports, and from our own field data, it can be said that there is a very close relationship between the similipal biosphere reserve and the surrounding tribal peoples. About two decades ago, there were only 75 villages (40 in Koranjia, 15 in Baripara) and 2750 km2 (Mishra, Purohit and Subba) in both Kor and Buffer, 20 in Udala and Tahsil 1985). However, the current situation is very different as it now has only 3966 villages and 32 police stations and 404 gram panchayats. In Mayurbhanj district, the ratio of women to men is almost equal in each block.

Earlier there were 10 villages in the main area but now there are only 4 more This is due to the eviction of settlements by the government. Out of Orissa and their rehabilitation reserve. Thus, there is a gradient drop in human settlements. Implementation of forest

authority conservation regulations, conservation of tribal rehabilitation in areas outside the park has had positive results in reducing wildlife in the reserve and ethnographic impact on wildlife. Four villages

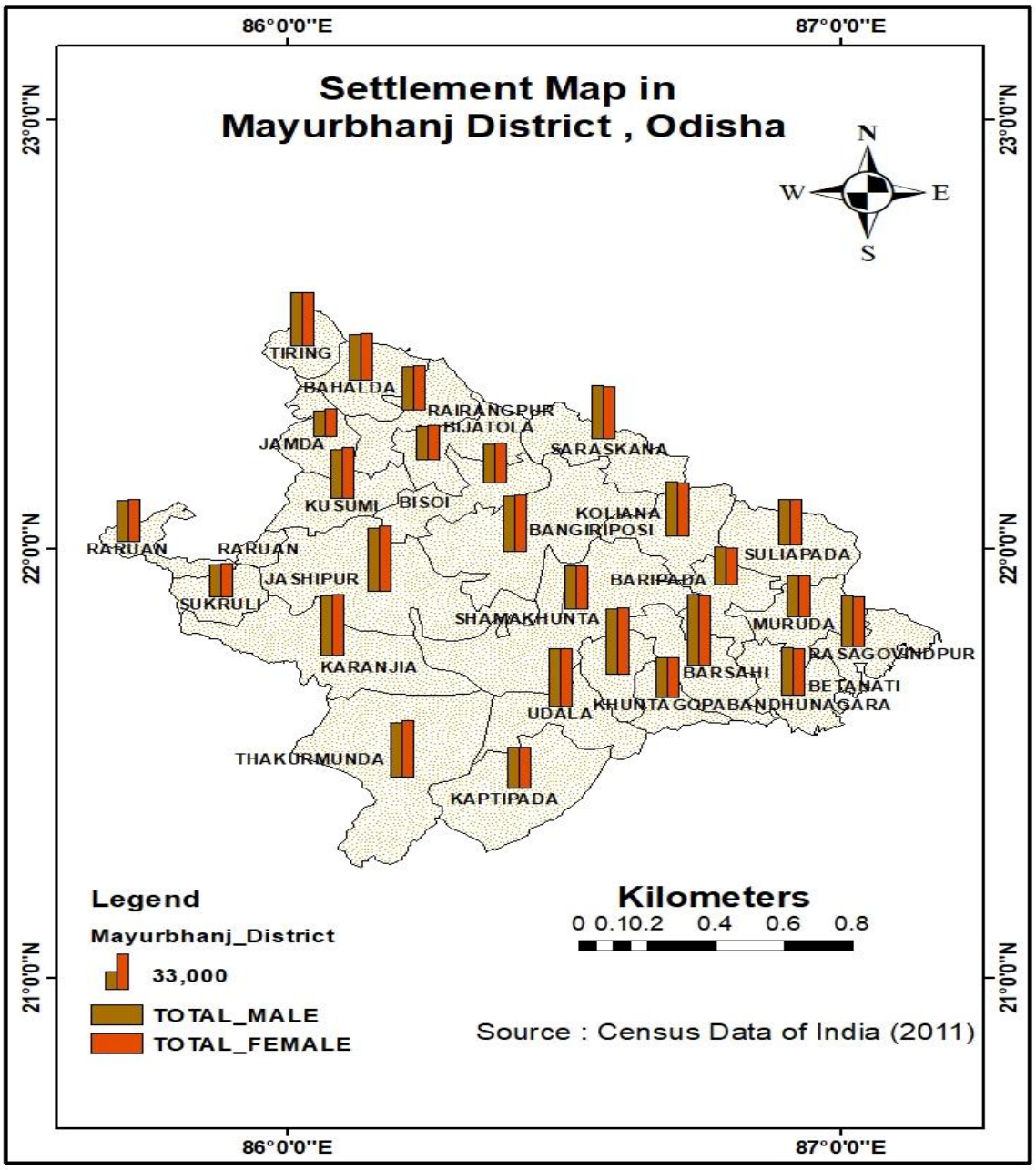
The main areas registered by the Orissa government are Zenabil (with 22 houses), Jamuna, Bakua and Kabaghaghai (14-16 houses), all other misguided / illegal settlements are the following tribals, scattered in different parts of the region are 5.210 / 0 Scheduled Castes and 21 .35% other races. In this Mayurbhanj district, men have higher educational qualifications than women in every block. There is a great lack of education for women.

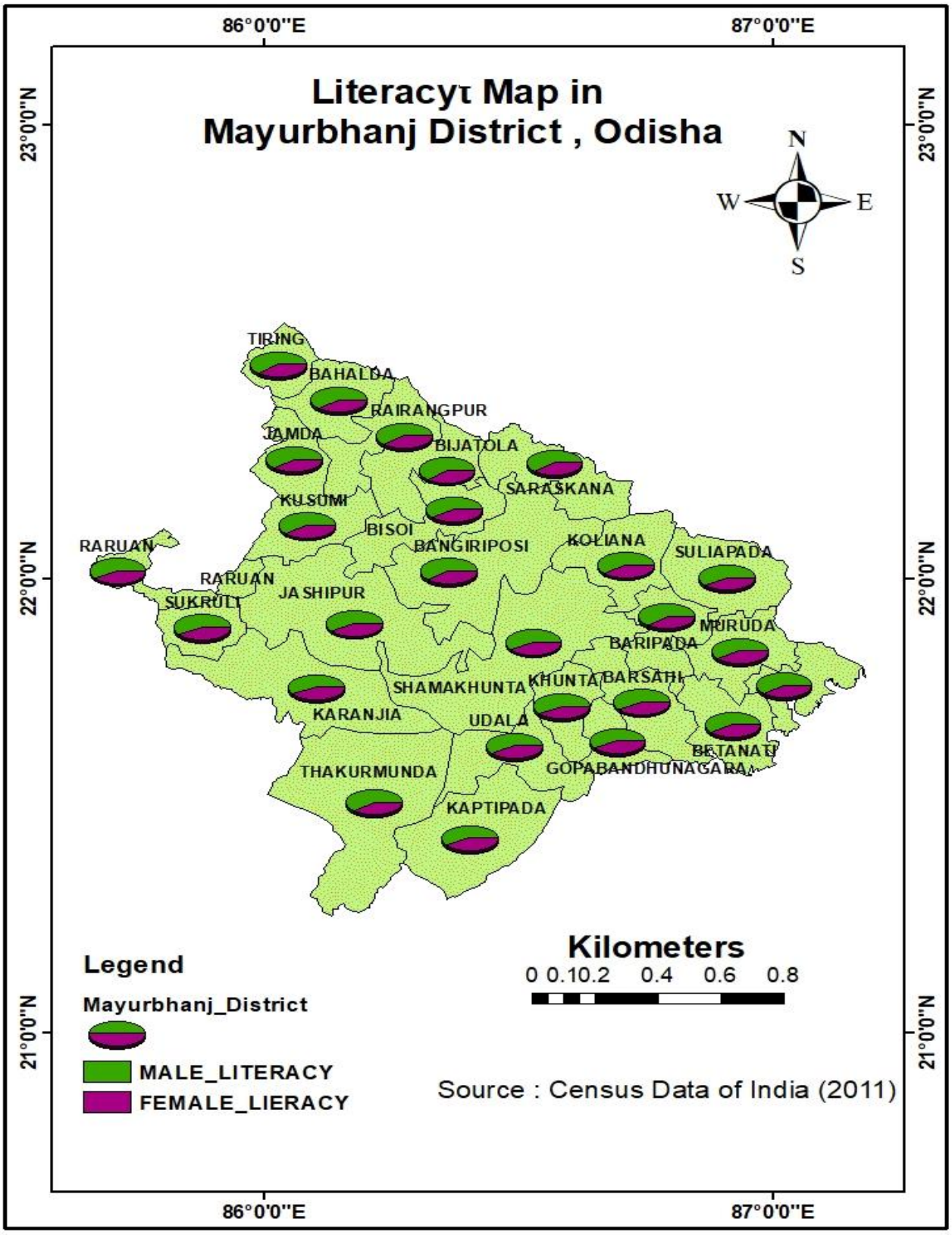
Table for Total Male , Female & Literacy of Mayurbhanj District , Odisha

Block Name	*TOTAL MALE*	*TOTAL FEMALE*	*MALE LITERACY*	*FEMALE LIERACY*
BAHALDA	*42727*	*43354*	*27906*	*19523*
BANGIRIPOSI	*52367*	*52535*	*31323*	*21260*
BARIPADA	*35587*	*34195*	*20962*	*13764*
BARSAHI	*66782*	*65798*	*42656*	*31095*
BETANATI	*45159*	*44507*	*29825*	*21884*
BIJATOLA	*31684*	*32509*	*18407*	*11899*
BISOI	*36357*	*38215*	*22647*	*15963*
GOPABANDHUNAGARA	*37452*	*37893*	*24467*	*18187*
JAMDA	*23500*	*25311*	*14505*	*9970*
JASHIPUR	*59626*	*61404*	*34436*	*24929*
KAPTIPADA	*38507*	*37920*	*25716*	*19348*
KARANJIA	*56644*	*57739*	*36046*	*27921*
KHUNTA	*61119*	*62497*	*38643*	*28437*
KOLIANA	*50722*	*50429*	*32056*	*22487*
KUSUMI	*45530*	*47586*	*27769*	*19451*
MURUDA	*38420*	*38917*	*25285*	*18307*
RAIRANGPUR	*40324*	*41398*	*25730*	*17658*
RARUAN	*38739*	*39470*	*24853*	*18506*
RASAGOVINDPUR	*48808*	*47718*	*32337*	*22842*
SARASKANA	*50904*	*49912*	*32585*	*22221*
SHAMAKHUNTA	*39892*	*39991*	*23693*	*17252*

SUKRULI	*29823*	*30754*	*18915*	*14343*
SULIAPADA	*43238*	*43117*	*29182*	*21224*
THAKURMUNDA	*51220*	*53474*	*26873*	*18129*
TIRING	*49836*	*50681*	*31569*	*20718*
UDALA	*54939*	*55165*	*35176*	*26041*

Table No. – 04 (Census Data of India)




Literacyτ Map in
Mayurbhanj District , Odisha
86°0'0"E
87°0'0"E
23°0'0"N
22°0'0"N
21°0'0"N
N
W
E
S
TIRING
BAHALDA
RAIRANGPUR
JAMDA
BIJATOLA
SARASKANA
KUSUMI
BISOI
BANGIRIPOSI
KOLIANA
SULIAPADA
RARUAN
RARUAN
JASHIPUR
SUKRULI
MURUDA
BARIPADA
SHAMAKHUNTA
KHUNTA
BARSAHI
KARANJIA
UDALA
BETANATI
GOPABANDHUNAGARA
THAKURMUNDA
KAPTIPADA
Kilometers
0 0.10.2 0.4 0.6 0.8
Legend
Mayurbhanj_District
MALE_LITERACY
FEMALE_LIERACY
Source : Census Data of India (2011)

3.1. Material and Method

3.1.1. Materials (Data Used)

To execute the present study and to fulfill the objectives and goals different data set are used. To the execute this project use Google earth from Google, ASTER Dem data and Landsat 8 OLI data from earth explorer. In this study project based on Field survey data.

3.1.1.1. Satellite Data

Landsat- 8 OLI/ TIRS Data

The Landsat 8 payload consists of two science instrument sensors: the Operational land imager (OLI) and the Thermal Infrared Sensor (TIRS). OLI will collect band name, bandwidth (μm) and resolution (m). These two sensors converge of the global landmass at a spatial resolution 30 meters in visible, NIR, SWIR and 100 meters for thermal and 15 meters for panchromatic band. A standard false colour composite (FCC) was generated from bands 5, 4, 3(Near Infrared, Red, Green) coded in red, green, blue colour scheme through in ERDAS imagine. The area falls in Path/Row of 134/52.

In the present study area, ERDAS imagine and ENVI software were used for Digital image processing(Atmospheric correction in FLAASH model) and statistical spatial analysis studies in high resolution multispectral data obtained firm landsat 8 oli. Geocoded Landsat 8 OLI data were interpreted using supervised classification techniques to perform the land use land cover analysis and also identify Geomorphic features of the study area and NDVI image prepared to identify in specific forest area.Landsat 8 OLI /TIRS image for the study area April 25th, was selected 2017, which was obtained from

Earth Explorar, United States Geological Survey (USGS) site (http://glovis.usgs.gov/). Landsat 8 band information are given in the table

Band Name	*Spectral Resolution (µm)*	*Spatial Resolution (m)*
Band - 1	*0.435 – 0.451*	*30*
Band – 2	*0.452 – 0.512*	*30*
Band – 3	*0.533 – 0.590*	*30*
Band – 4	*0.636 – 0.673*	*30*
Band – 5	*0.851 – 0.879*	*30*
Band – 6	*1.566 – 1.651*	*30*
Band – 7	*2.107 – 2.294*	*30*
Band – 8	*0.503 – 0.676*	*15*
Band – 9	*1.363 – 1.384*	*30*
Band – 10	*10.60 – 11.19*	*100*
Band - 11	*11.50 – 12.51*	*100*

Table No 5 : Band information in Landsat 8 OLI Satellite Image

3.1.1.2. ASTER DEM

The Advanced Space borne Thermal Emission and Reflection Radiometer (ASTER) Global Digital Elevation Model (GDEM) is available at no change to users worldwide. On the 29th june 2009 “version 1” GDEM was released to the public. A joint operation between NASA and Japan’s Ministry Economy, Trade and Industry (METI), the GDEM is complete mapping of the earth ever made, covering 99% of its surface. As essential parameter used in the study area such as Contour, Slope, TIN and Hillshade derived from the ASTER GDEM (30 m) to analysis beach morphology in the Kanyakumari (**http://glovis.usgs.gov/**)

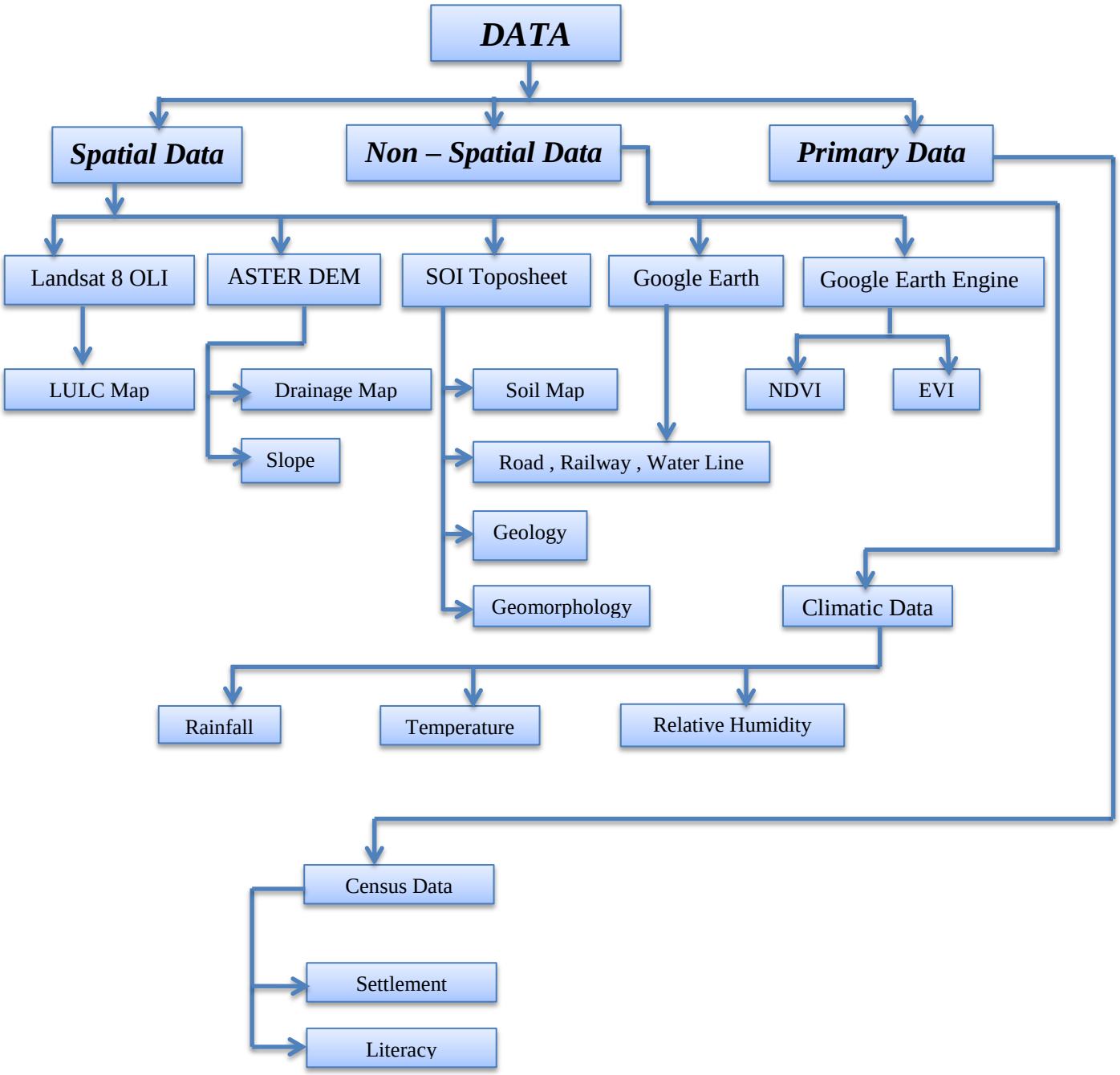
3.1.1.3. Google Earth

Google Earth is a computer program based on Earth that represents 3D satellite imagery. Google Earth was originally developed by Keyhole, Inc. A mountain view-based company was founded in 2001. In the present study, Google Earth is used in the paper Geological Structure and can be divided into sand and shell deposits and the main sections.

3.1.1.4. Software Used

Software packages such as ERDAS IMAGINE, ENVI and ARC GIS were used for image processing, geo rectification, digitizing, mapping, Composition, evaluating and also used in to analyzed probability of grain size in sediment and analysis the Morphological Diversity of the Kanyakumari. To complete the presented study project used some GIS and Remote Sensing software and also used some Microsoft software, this are listed below.

- ***ERDAS IMAGINE***
- ***ENVI***
- ***ARC GIS (10.5)***
- ***MICROSOFT WORD***
- ***EXCEL***


DATA
Spatial Data
Non – Spatial Data
Primary Data
Landsat 8 OLI
ASTER DEM
SOI Toposheet
Google Earth
Google Earth Engine
LULC Map
Drainage Map
Soil Map
NDVI
EVI
Slope
Road , Railway , Water Line
Geology
Geomorphology
Climatic Data
Rainfall
Temperature
Relative Humidity
Census Data
Settlement
Literacy

4. Result and Discussion

4.1. Distribution and change of forest cover

Forest cover distribution and changes are anne ligated using field statistics obtained from many temporary classified maps. There was a significant loss of forests between 2000 and 2020, and the damage was significantly reduced between 2000 and 2020. The total forest cover of the Biosphere Reserve was recorded at 4105.2 km2 (76.1% of the total geographical iliac region) during 2000, 19 while 5 and 5919.7 by 1990, respectively. and 3143.1 km2 forest cover is indicated. Between 1930 and 1975, the forest area decreased by 23% (946.1 km2). Over a period of 20 years (2000-2020) the amount of forest cover decreased to 970.08 km2 (2.6..6% of total forest). Elsewhere in the biosphere reserve, defrosta tuning began primarily after infrastructural structures, dam construction, and rapid population growth.

4.2. Grid-wise analysis of forest cover change

Forests change forest maps with forest cover and time-series maps according to 2000, 2002, 2004, 2006, 2008, 2010, 2013, 2015, 2017, 2019, and 2021 grids. There are full and equivalent grids in the 5656 grid in reserve. The number of forest grids distributed across the biosphere reserve from 2000 to 2021 is presented. It is certain that the largest number of grid changes (damage to forest cover) occurred during the period 2000-2011, which decreased significantly between 2000-2011 and increased further during the period 2013-2012. During the period 200–2010, a total of 7 grids showed damage to forest cover, and during the 200-2013 period, 127 grids showed damage to forest areas. In 2013-2011, the number of grids damaged by deforestation was 24. Overall, 2433 grids showed damage to forests between 2233-2011. Positive change (increase) in forest cover during 200 cover-2013 1.4 km2. During the period 2010-2013, the forest cover of 14 grids was 1.3 km2. The forest cover gains in 2010-11 were estimated to be 1.7 km2 in 2010-11. Thus, a natural regulation and trend in the forest area

has contributed to the increase in forest cover in the reserve, although 0.0 km2 during the 200–2011 period. Its free forest was damaged.

- **Enhanced vegetation index (EVI)**

The enhanced vegetation index (EVI) is an 'optimized' vegetation index designed to enhance the vegetation signal with improved sensitivity in high biomass regions and improved vegetation monitoring through a de-coupling of the canopy background signal and a reduction in atmosphere influences.

$$\mathbf{EVI = G * ((NIR - R) / (NIR + C1 * R – C2 * B + L))}$$

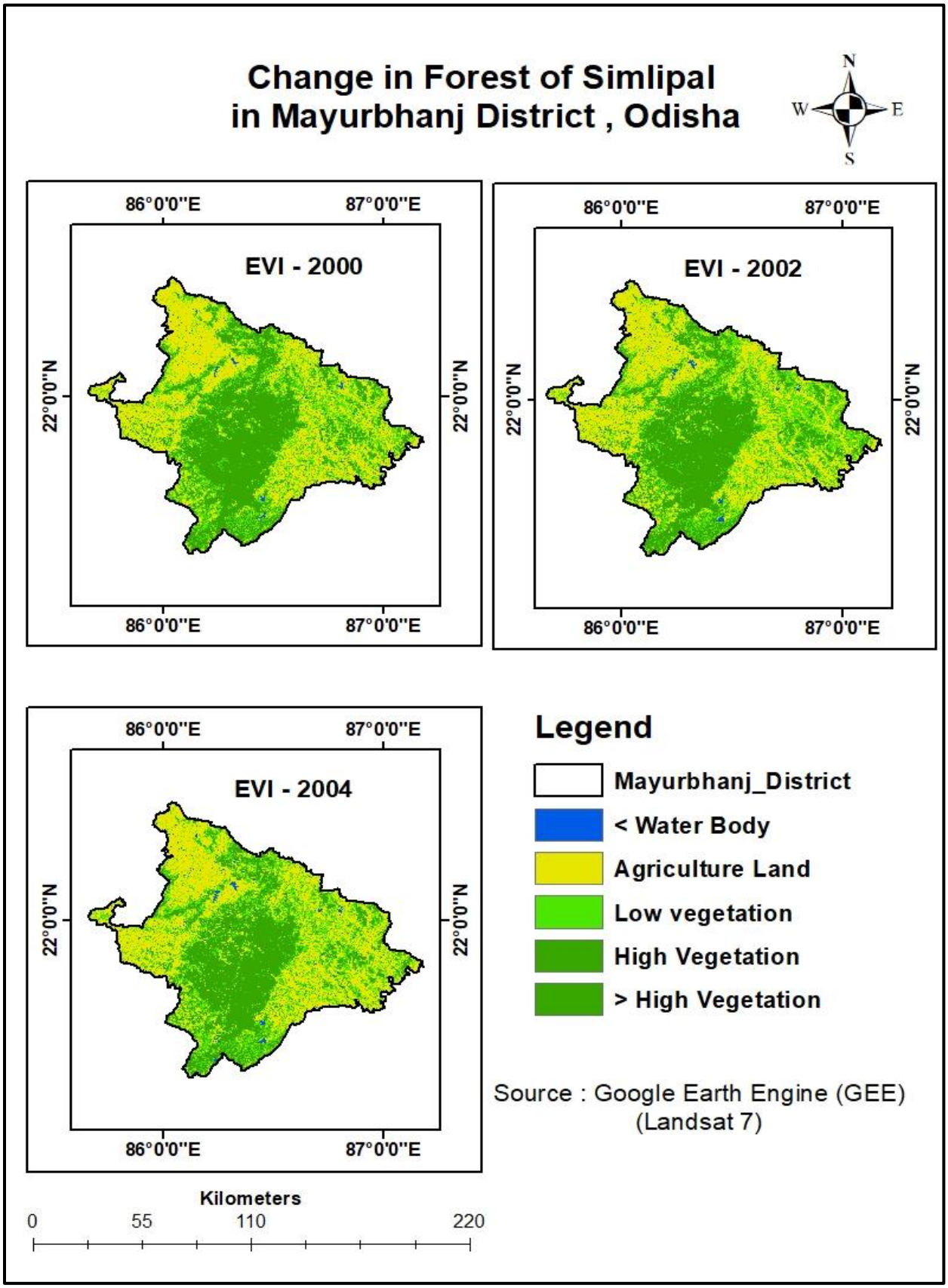
- In Landsat 4-7, EVI = 2.5 * ((Band 4 – Band 3) / (Band 4 + 6 * Band 3 – 7.5 * Band 1 + 1)).
- In Landsat 8, EVI = 2.5 * ((Band 5 – Band 4) / (Band 5 + 6 * Band 4 – 7.5 * Band 2 + 1)).

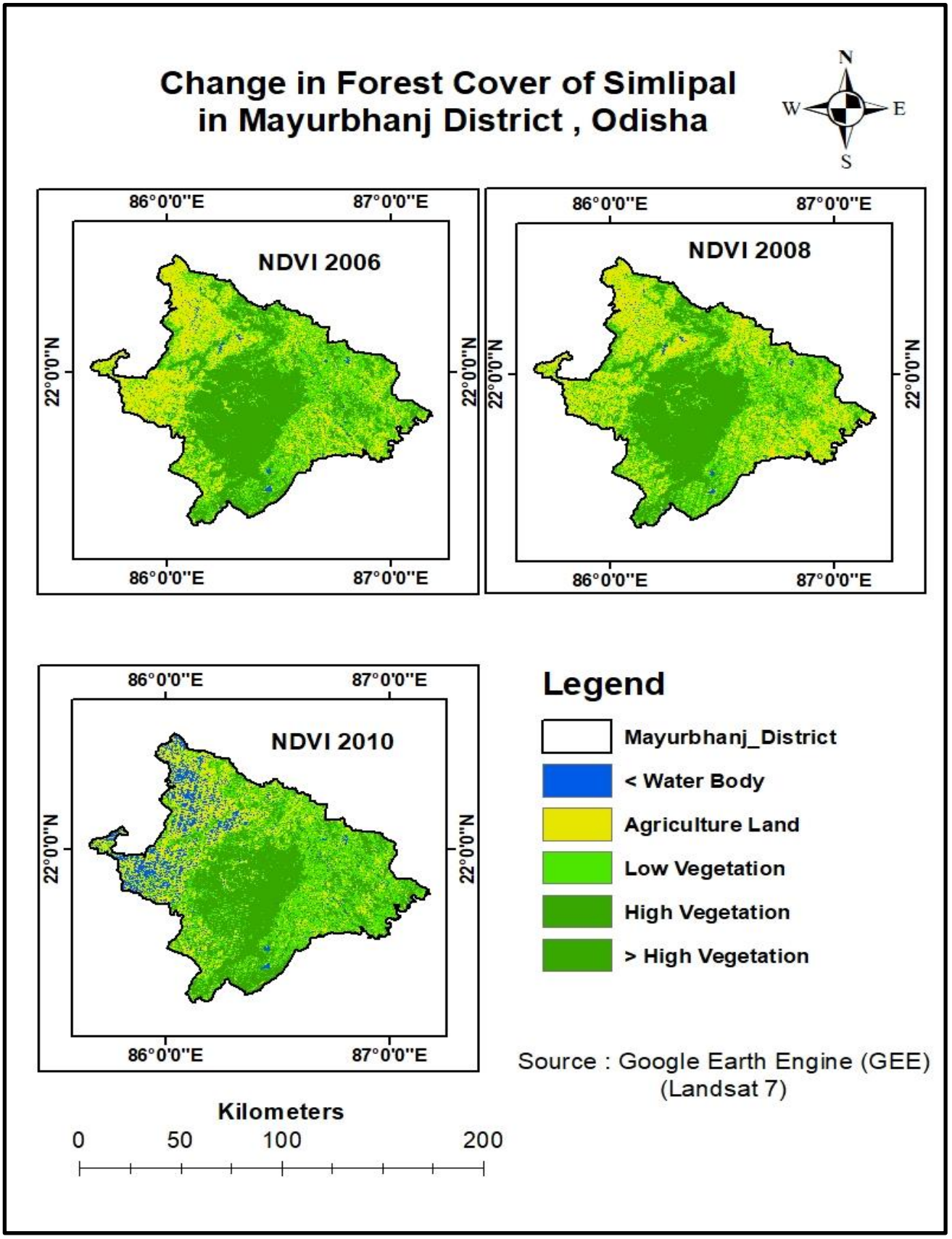
- **Normalized Difference Vegetation Index (NDVI)**

NDVI values range between +1 and -1. Healthy vegetation reflects more NIR and green light whereas unhealthy vegetation reflects more visible light.

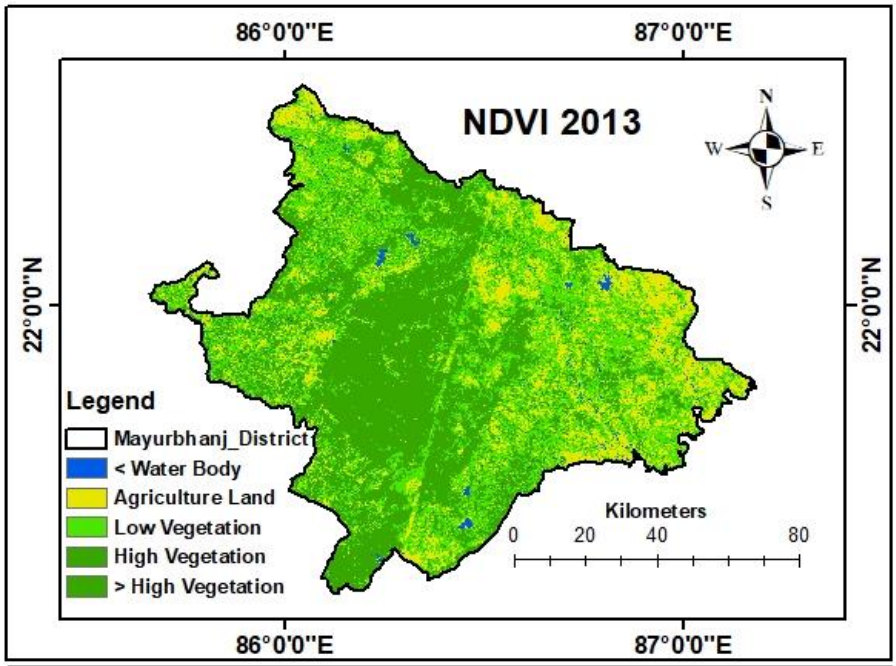
$$\mathbf{NDVI = (NIR – R)/(NIR + R)}$$

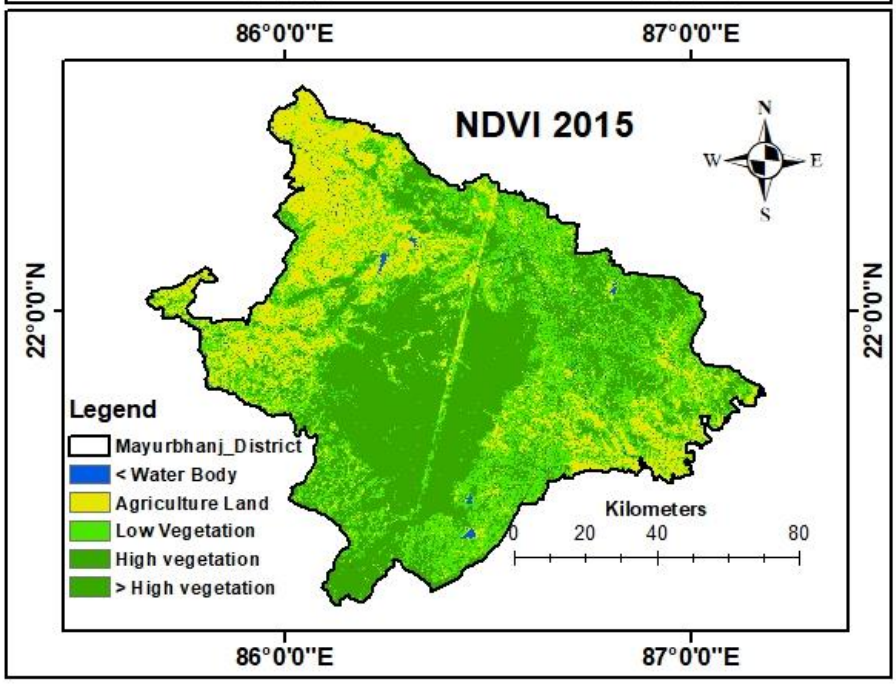
- For LANDSAT-8 digital data, NIR = Near Infrared = Band 5 R = Red Band = Band 4
- For LANDSAT-7 digital data. NIR = Near Infrared = Band 4 R = Red Band = Band 3


Change in Forest of Simlipal
in Mayurbhanj District , Odisha
N
W
E
S
EVI - 2000
EVI - 2002
EVI - 2004
86°0'0"E
87°0'0"E
22°0'0"N
Legend
Mayurbhanj_District
< Water Body
Agriculture Land
Low vegetation
High Vegetation
> High Vegetation
Source : Google Earth Engine (GEE)
(Landsat 7)
Kilometers
0
55
110
220

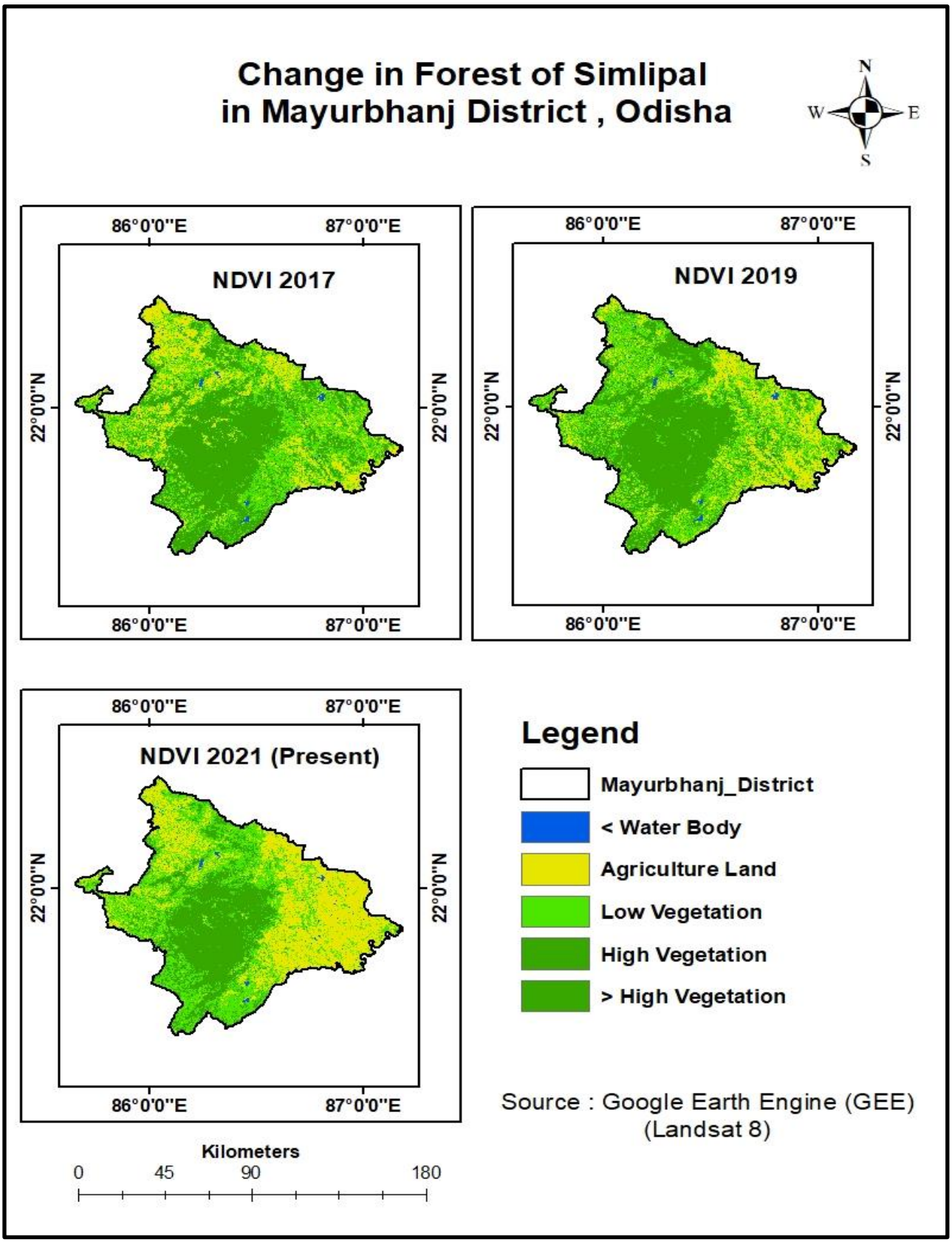

Change in Forest Cover of Simlipal in Mayurbhanj District , Odisha
N
W
E
S
NDVI 2006
NDVI 2008
NDVI 2010
86°0'0"E
87°0'0"E
22°0'0"N
Legend
Mayurbhanj_District
< Water Body
Agriculture Land
Low Vegetation
High Vegetation
> High Vegetation
Source : Google Earth Engine (GEE)
(Landsat 7)
Kilometers
0
50
100
200

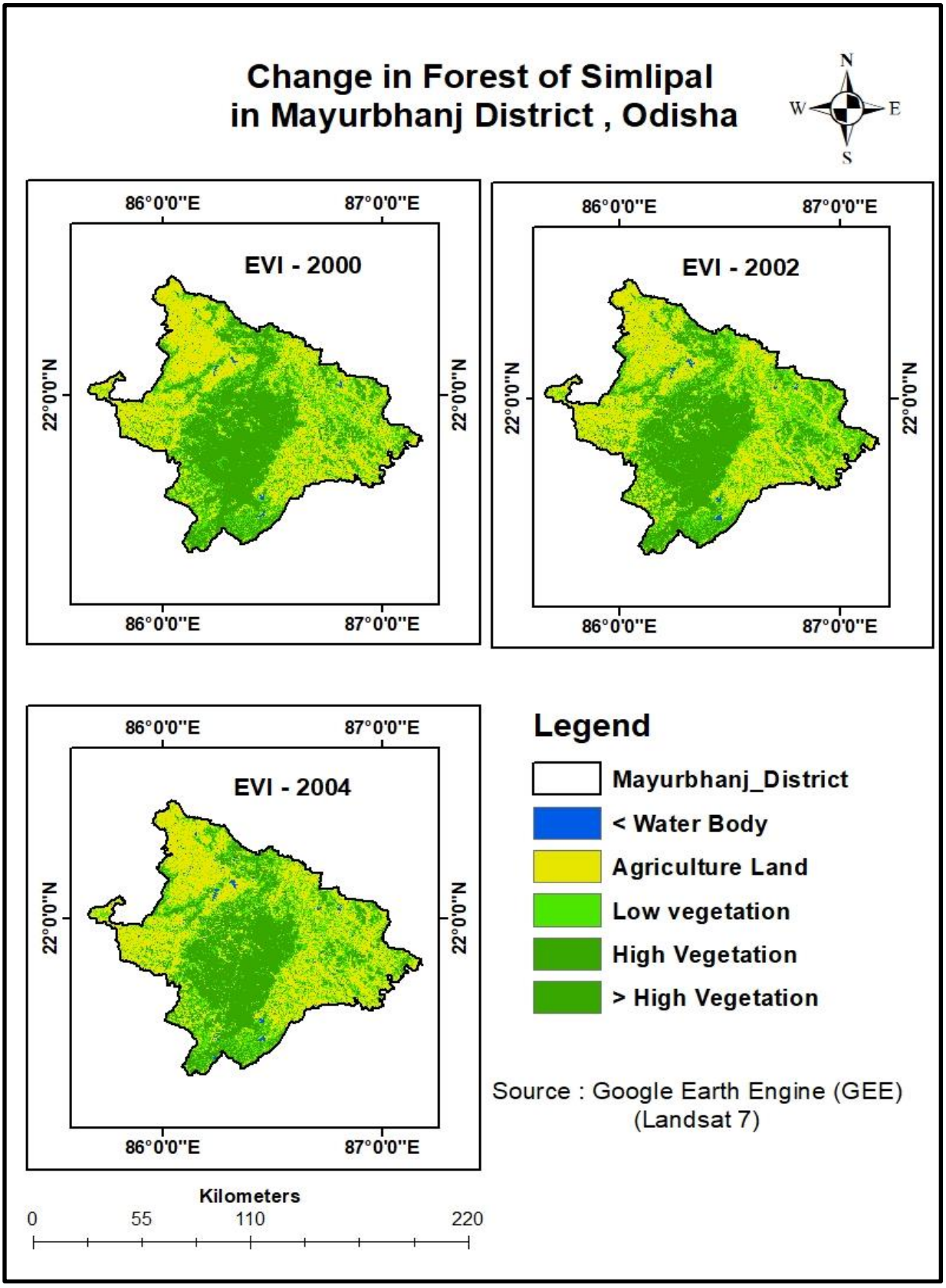
Change in Forest of Simlipal in Mayurbhanj District , Odisha

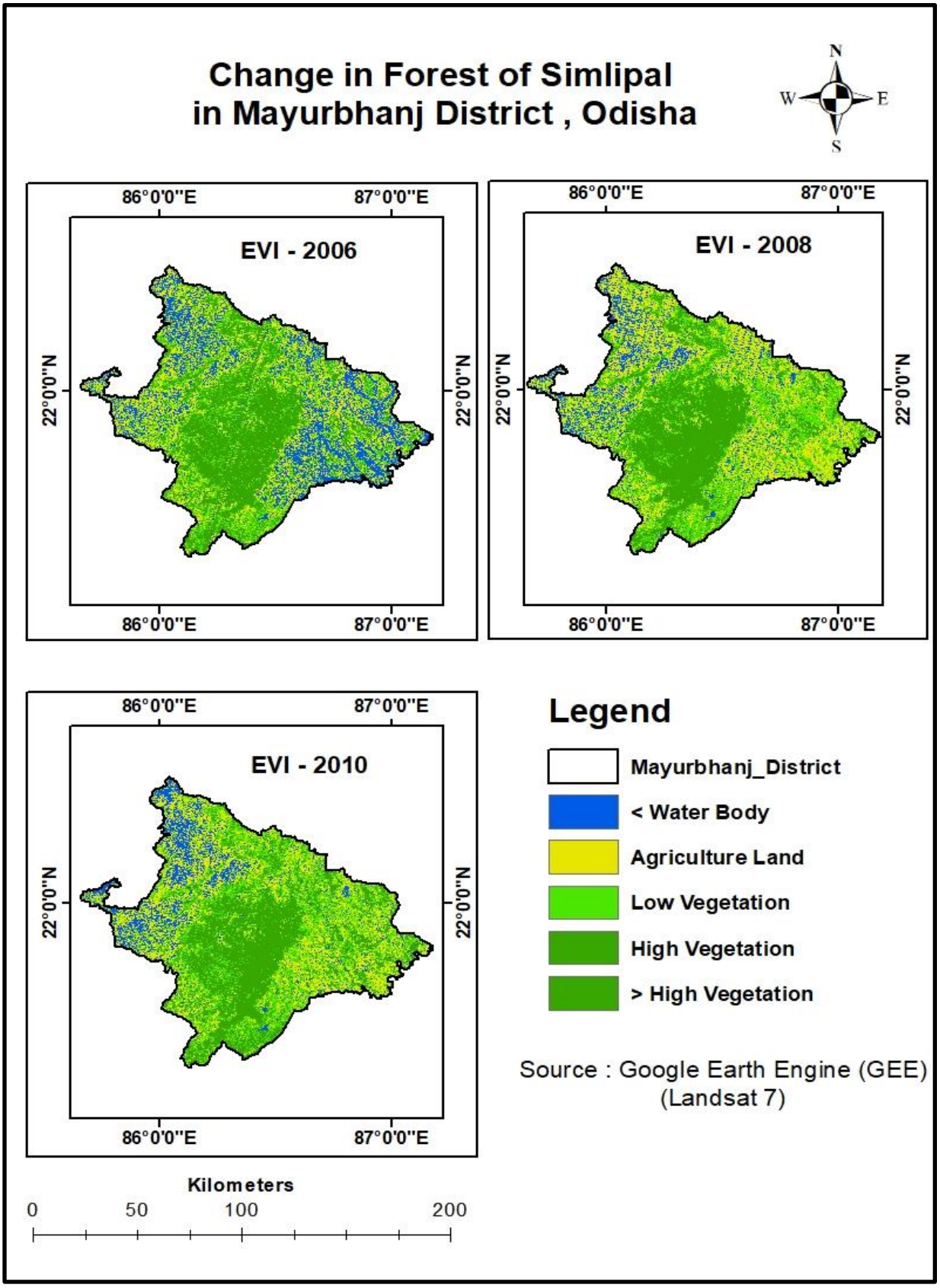




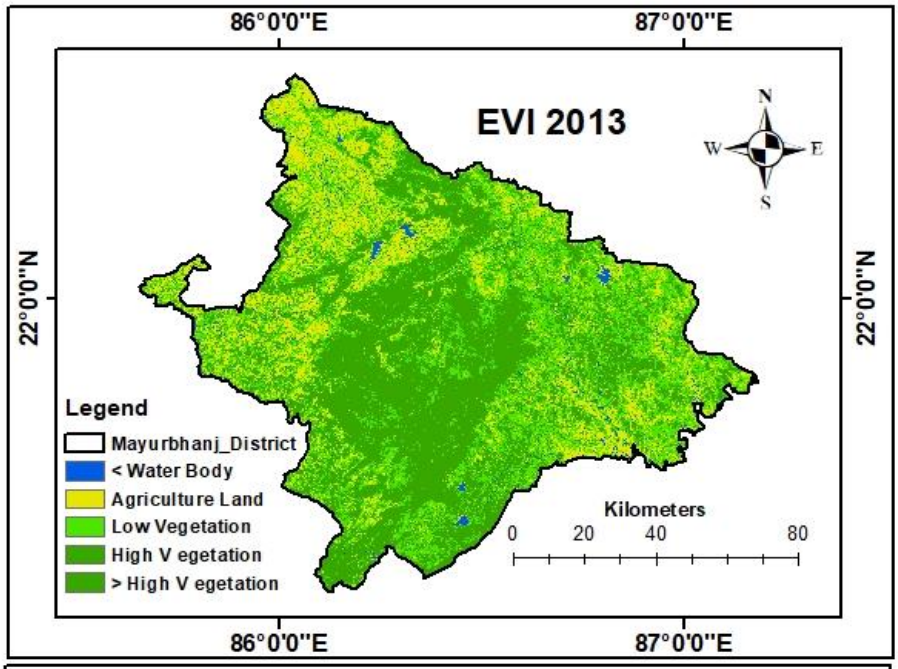
Source : Google Earth Engine (GEE)
(Landsat 8)

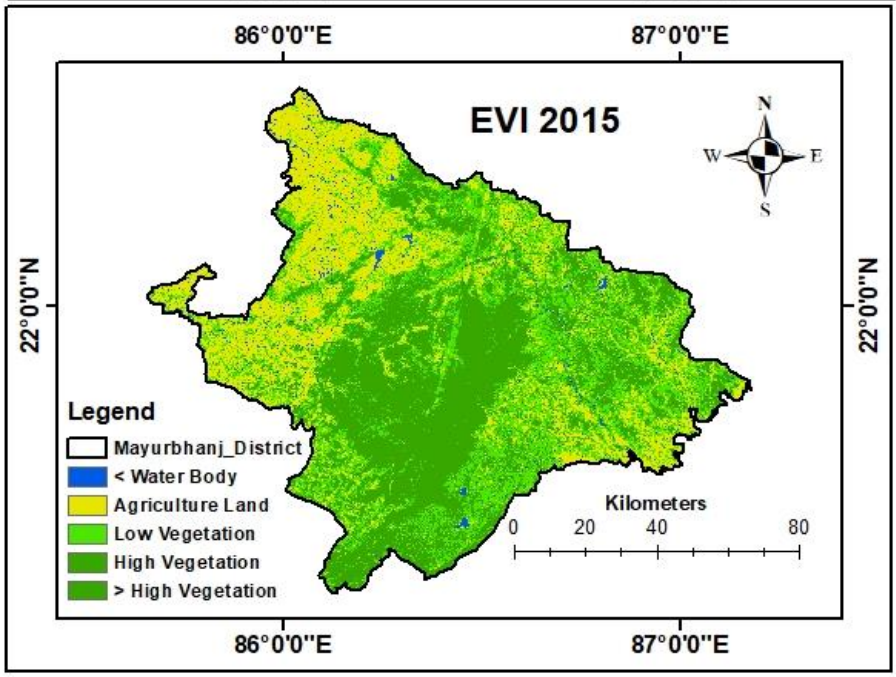

Change in Forest of Simlipal
in Mayurbhanj District , Odisha
N
W
E
S
NDVI 2017
NDVI 2019
NDVI 2021 (Present)
86°0'0"E
87°0'0"E
22°0'0"N
Legend
Mayurbhanj_District
< Water Body
Agriculture Land
Low Vegetation
High Vegetation
> High Vegetation
Source : Google Earth Engine (GEE)
(Landsat 8)
Kilometers
0
45
90
180


Change in Forest of Simlipal
in Mayurbhanj District , Odisha
N
W
E
S
EVI - 2000
EVI - 2002
EVI - 2004
86°0'0"E
87°0'0"E
22°0'0"N
Legend
Mayurbhanj_District
< Water Body
Agriculture Land
Low vegetation
High Vegetation
> High Vegetation
Source : Google Earth Engine (GEE)
(Landsat 7)
Kilometers
0
55
110
220

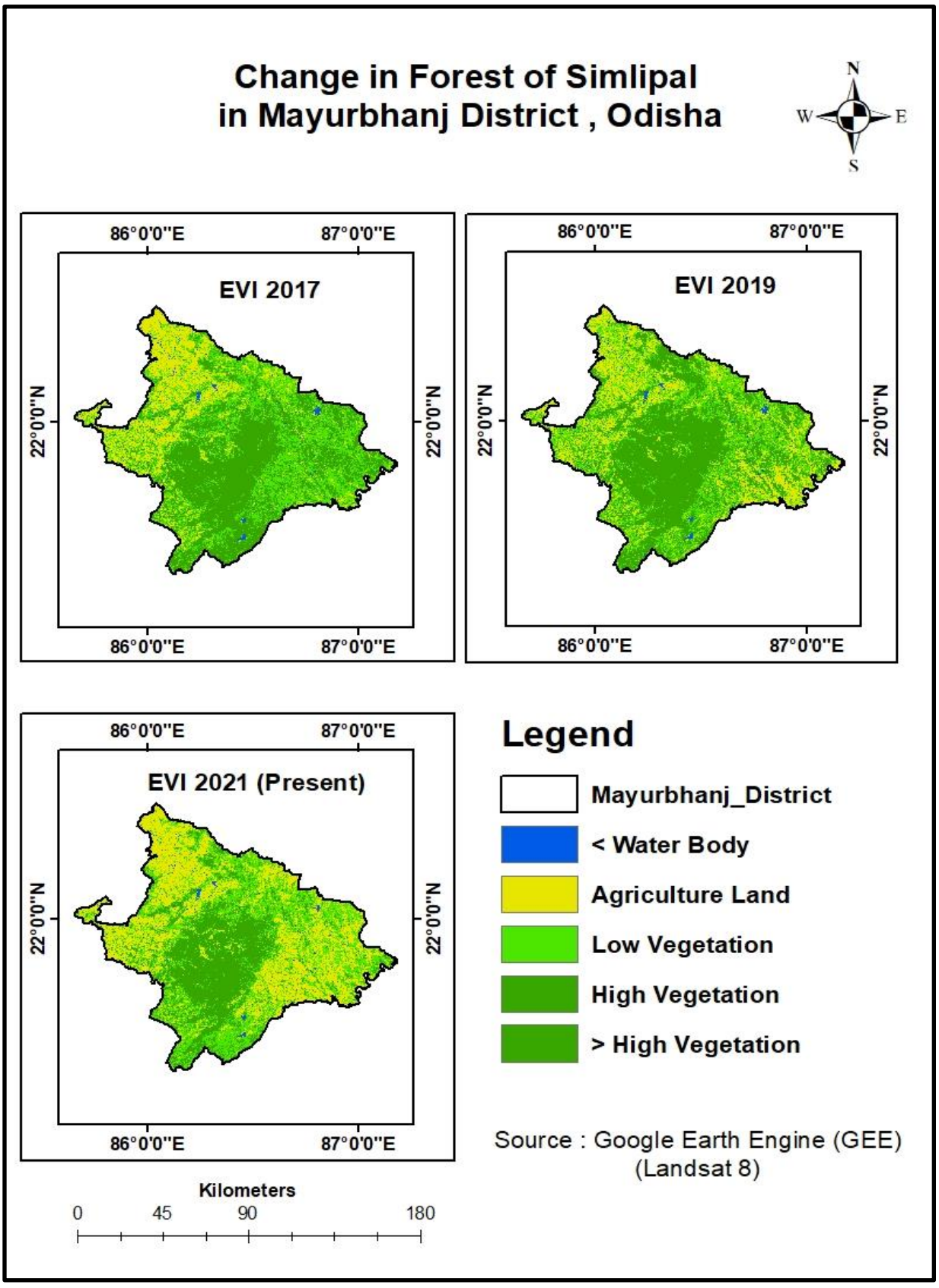

Change in Forest of Simlipal
in Mayurbhanj District , Odisha
N
W
E
S
EVI - 2006
EVI - 2008
EVI - 2010
86°0'0"E
87°0'0"E
22°0'0"N
Legend
Mayurbhanj_District
< Water Body
Agriculture Land
Low Vegetation
High Vegetation
> High Vegetation
Source : Google Earth Engine (GEE)
(Landsat 7)
Kilometers
0
50
100
200

Change in Forest of Simlipal in Mayurbhanj District , Odisha





Source : Google Earth Engine (GEE)
(Landsat 8)


Change in Forest of Simlipal
in Mayurbhanj District , Odisha
N
W
E
S
EVI 2017
EVI 2019
EVI 2021 (Present)
86°0'0"E
87°0'0"E
22°0'0"N
Legend
Mayurbhanj_District
< Water Body
Agriculture Land
Low Vegetation
High Vegetation
> High Vegetation
Source : Google Earth Engine (GEE)
(Landsat 8)
Kilometers
0
45
90
180

4.3. Land use in forested areas

Drivers of deforestation change include agricultural expansion, settlement, mining, gardening, logging, and extraction of fuel wood. The conversion of forest land to agricultural land was estimated at 593.2 km2, and other categories such as grassland, barren land and excavation were 3.2, 0.2 and 1.4 km2, respectively, during 2000-2021. The second biggest ethnographic threat is the conversion of forests responsible for wood extraction into scrubs. The main land use / land cover converted from forest. As presented, low forest cover and high afforestation have been observed in the passage zone and part of the buffer zone of the reserve. Due to agriculture and logging, forests have been seen in the southern part of Similipal. Similipal is seen as a hotspot upstream due to its almond mining activities in the north-west. Before declaring it as a biosphere reserve, more forests have been felt due to human intervention between the similipal buffer and the transition zone.

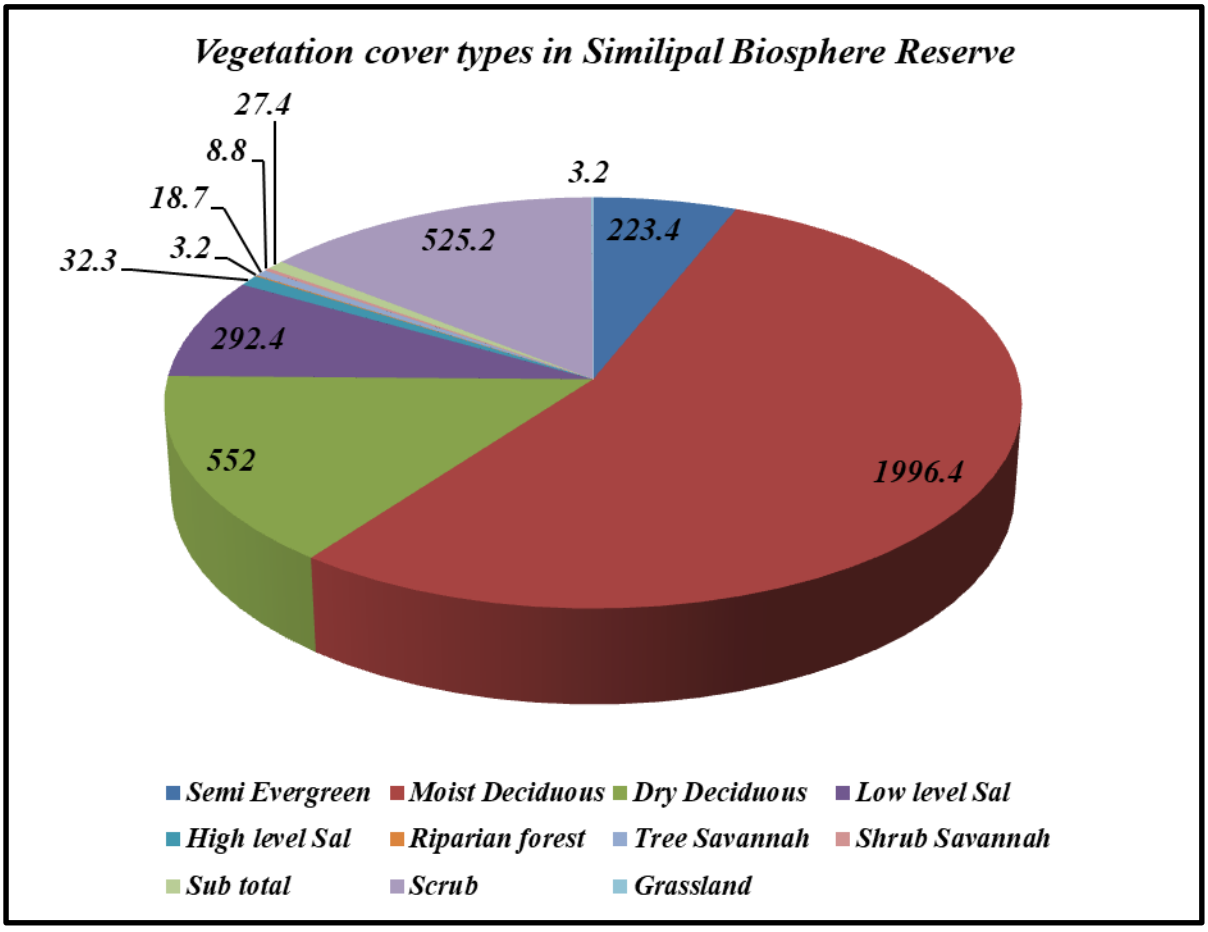
Areal extent of Vegetation cover types in Similipal Biosphere Reserve

Sl.no	Class	Area (km2)	% of area
A.	**Forest**		
1	**Semi Evergreen**	**223.4**	**6.1**
2	**Moist Deciduous**	**1996.4**	**54.6**
3	**Dry Deciduous**	**552.0**	**15.1**
4	**Low level Sal**	**292.4**	**8.0**
5	**High level Sal**	**32.3**	**0.9**
6	**Riparian forest**	**3.2**	**0.1**
	Sub total	**3096.6**	**84.8**
B.	**Savannah**		
7	**Tree Savannah**	**18.7**	**0.5**
8	**Shrub Savannah**	**8.8**	**0.2**

	Sub total	**27.4**	**0.8**
C.	**Scrub**	**525.2**	**14.4**
D.	**Grassland**	**3.2**	**0.1**
	Grand Total	**3652.4**	**100.0**

Table No. 6

Pie Graph of Vegetation cover types in Similipal Biosphere Reserve



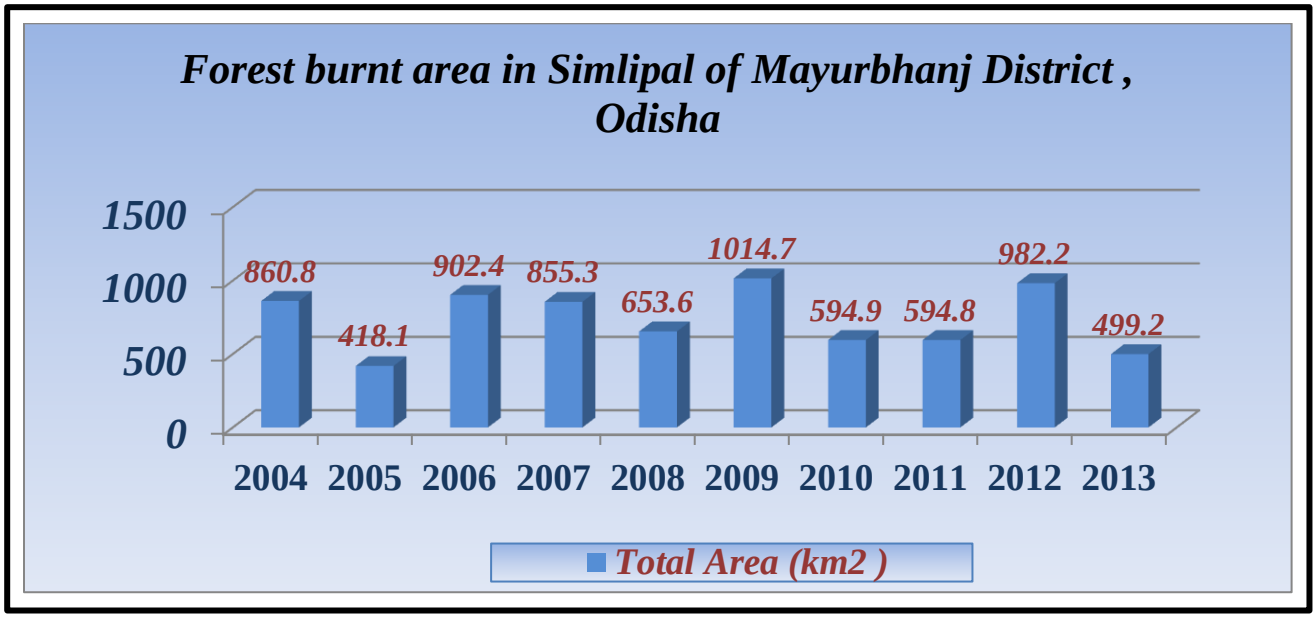
Graph No. - 6

Table for Forest Burnt area in Simlipal of Mayurbhanj District, Odisha

YEAR	< 0.25 km2	0.25 - 0.5 km2	0.5 - 1 km2	1 - 2 km2	2 - 5 km2	> 5 km2	Total Area (km2)
2004	171.2	51.4	51.2	60.5	65.4	461.1	860.8
2005	123	37.4	36.3	31.7	50.8	138.9	418.1
2006	139.5	52.4	41.6	45	64.1	559.8	902.4
2007	94.5	37.4	41.8	28.3	72.4	580.9	855.3
2008	90.2	32.7	35.4	36	66.2	393.1	653.6
2009	129.2	59.3	66.2	59.7	109.8	590.5	1014.7
2010	141.3	54.7	54.3	50	88.8	205.8	594.9
2011	117.7	29.3	35.5	54.1	54.3	303.9	594.8
2012	109.9	56	63.5	49.1	71	632.7	982.2
2013	88	26.4	39.8	28.4	48.9	267.7	499.2

Table No. - 7

Bar Graph of Forest Burnt area in Simlipal



Graph No. - 7

4.4 Similipal Tiger Reserve

The Similipal Tiger Reserve is a compact block of elevated plateau located in central portion of the Mayurbhanj district and lies between 20° 17’ and 22° 34’ north and 850 40’ and 87° 10’ east longitude. The stretch of forest including Similipal RF spread over an area of 2750 km2 was declared as ‘Tiger Reserve’ with effect from 04-12-1973 under ‘Project Tiger’ Scheme of Government of India. It has been conferred with legal status as per provisions of Section 38V of Wildlife (Conservation) Act, 1972 vide of Orissa in Forest & Environment Department. The notification has clearly indicated with boundary description of Critical Tiger Habitat (Core) extending over 1194.75 km2 and buffer area of 1555.25 km². There are 3 inhabitated villages inside the Critical Tiger Habitat and 65 villages in the buffer area.

4.5 Mayurbhanj Elephant Reserve

The Similipal-Kuldiha-Hadgarh Elephant Reserve popularly known as Mayurbhanj Elephant Reserve in the State of Orissa was notified vide Notification No.15806 dt.29.09.2001 and revised vide No.18639 dt.28.11.2001 of Forest and Environment Department, Government of Orissa comprising an area of 7043.04 km². The area includes 3 protected areas i.e. Similipal Tiger Reserve (2750.00 km²), Hadgarh Wildlife sanctuary (191.06 km²) and Kuldiha wildlife sanctuary (272.75 km²). Other Reserve Forests, Protected Forests, Private land and Revenue land including agricultural land lying adjacent to the protected areas measuring 3571.26 km are included in the Reserve to form a compact area of the landscape.

5. Management :

Habitat recovery and management

Habitat management is a primary tool for wildlife biologists to manage, protect and improve wildlife populations. Wildlife diversity in any area can be observed in wildlife management. It is difficult to devise strategies to manage each species separately. Several wildlife species can benefit when an entire ecosystem is developed or preserved intact to meet the needs of endangered species or species groups.

Managers can improve grassland areas by clearing (prescribed burns, cuts, taking herbal remedies) and removing trees. As well as their over-planting with native prairie species. It helps reduce the cover used by edge predators (sconces, raccoon, red-tailed lightning) and improves the habitat quality of grassland animals.

Crops

Managers may seek to reduce or maintain a population so that there is less conflict with human activity. For example, white-tailed deer abound in urban areas. This presents challenges for wildlife managers as hunting with firearms is not allowed. The most effective solution has been Hunt Control. The monkey population in urban India can be controlled by capturing and releasing wildlife.

Management of endangered species

Intensive management of endangered species is required. Critical habitats and existing population locations need to be identified so that they can be managed successfully. Animal species are considered endangered when their numbers are so low that experts believe they could become extinct if conservation measures are not taken.

The population of endangered species is showing signs of unnatural decline or they are in danger of becoming endangered. Many endangered species are experts who need very

controlled habitat and eat specialized food. Habitat loss is one of the main causes of endangered species.

Species Reconstruction

And the goal of a wildlife management might be to replant the species in suitable habitat. Lost species can be reintroduced from other regions in an effort to reintroduce programs and management. The biology and environmental requirements of the species need to be studied before introduction.

Preservation and preservation

Wildlife conservation helps ensure that future generations can enjoy our resources. Conservation may include destructive activities such as collecting natural resources, hunting, fishing, trapping and cutting wood, as well as bird watching, photography and hiking. Conservation must balance issues between wildlife and human populations. Wildlife conservation means that threatened and endangered species take special measures to protect their presence in the future.

Conservation may include the conservation or protection of natural resources that emphasize non-acceptable activities. A habitat or ecosystem can be preserved by manipulation and even an area can be managed without doing anything. For example, a forest can be protected by allowing it to mature without any human intervention such as timber harvesting, grazing or planting trees.

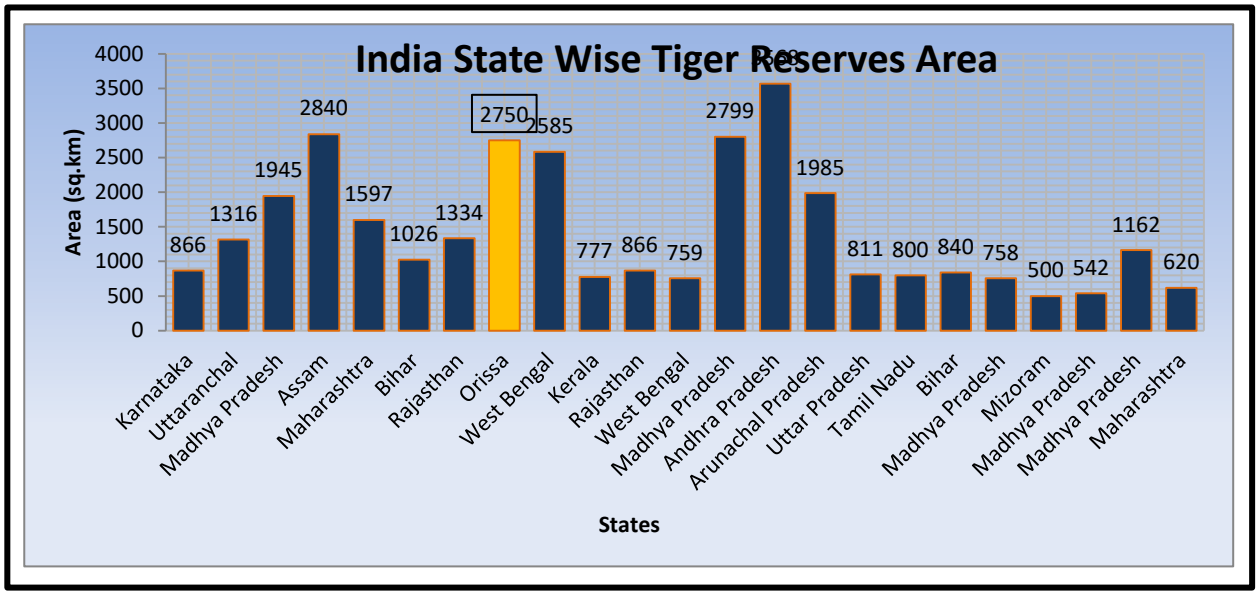
Table for India State Wise Tiger Reserve Area

SI No.	Name	State	Area (km2)
1	Bandipur	Karnataka	866.00
2	Corbett	Uttaranchal	1316.00
3	Kanha	Madhya Pradesh	1945.00
4	Manas	Assam	2840.00
5	Melghat	Maharashtra	1597.00

6	Palamau	Bihar	1026.00
7	Ranthambhore	Rajasthan	1334.00
8	Simlipal	Orissa	2750.00
9	Sundarbans	West Bengal	2585.00
10	Periyar	Kerala	777.00
11	Sariska	Rajasthan	866.00
12	Buxa	West Bengal	759.00
13	Indiravati	Madhya Pradesh	2799.00
14	Nagarjunasagar	Andhra Pradesh	3568.00
15	Namdapha	Arunachal Pradesh	1985.00
16	Dudhwa	Uttar Pradesh	811.00
17	KalakadMundanthurai	Tamil Nadu	800.00
18	Valmiki	Bihar	840.00
19	Pench	Madhya Pradesh	758.00
20	Dampa	Mizoram	500.00
21	Panna	Madhya Pradesh	542.00
22	Bandhavgarh	Madhya Pradesh	1162.00
23	Taroba	Maharashtra	620.00

Table No. – 8

Bar Graph Showing in India Tiger Reserve Area : -



Graph No. - 8

6. Recommendations :

I. The term wildlife encompasses all polluted plants and domestic animals. Every species has the right to survive and every threatened species must be protected to prevent extinction.

II. Water, deserts and wildlife are inextricably linked lin mounting agriculture, including industrial and demographic pressures, the desert region, which has shrunk or disappeared the richest reserves of wildlife and biodiversity. Their uninterrupted existence is important for the long-term survival of biodiversity and for the ecosystems that support them.

III. Effective ecological conservation is the long-term basis Environmental and economic stability. By natural processes, forests and other wild habitats recharge waterlogging, maintain water systems and moderate the effects of floods, droughts and cyclones, they ensure food security and control climate change. These are sources of food, pasture, fuel and other products as a complement to the sustenance of the local community.

IV. Adverse environmental consequences of shrinking and degradation of parks due to population and commercialization pressures are not considered in the national plan. As a result, we have seen alarming erosion of our natural heritage, consisting of rivers, aquatic, forest, grasslands, mountains, wetlands, coastal and marine habitats, arid lands and deserts. It has also affected natural phenomena such as reproduction, reproduction and wildlife migration and geological features.

V. Rural development of forest communities and Other desert regions are both suffering from inadequate resources And inappropriate arrangements. It has failed to address their power Dependence on natural biomass resources to shrink And depletion source base. Farmer productivity has also declined In the absence of proper assistance, poverty and increasing stress on natural areas causing resource poor communities have therefore begun to put more pressure on our forest biomass and isolate people from the goals of nature conservation efforts.

VI. Habitat loss as a result of development projects like dams, mines, etc., further complicates wildlife conservation problems

VII. The limited impact of habitat loss has further fueled the illicit trade in the international market by the growing demand for wildlife products and their lucrative prices.

VIII. Forest. Plan forest management :

With proper management, forests can produce multiple services and products in a way that is sustainable. Forest management planning should also encourage forest conservation and improve efficiency.

Sustainable and consistent periodic assessment of the status and condition of forest resources should be ensured. This should take into account both biotic and aziotic factors that may affect the vitality of forest ecosystems (e.g. parasites, satellites, fires, climate change and pollution). Management plans should consider all resources, user and proprietary rights and be updated periodically. The resources and methods needed to reduce their risk of deforestation should be defined and efforts should be made to rehabilitate previously degraded ecosystems. Their planning should be based on the exchange of advice and information among the various stakeholders affected.

IX. Forest. Forest management practice :

The activities aim to achieve quantitative and qualitative balance in terms of growth and extraction by reducing direct and indirect damage to the source. Regeneration, collection and maintenance activities should be programmed in space and time so as not to reduce the productive capacity of the site. Infrastructural planning should be done so that it minimizes the negative impact on the environment. Silvicultural treatment should promote structural diversity and encourage natural regeneration in forest stands. Every time deforestation or deforestation is considered a priority, there is a possibility of increasing economic, environmental, social and cultural values from such activities. The forest should

rely on suitable species and silicultural methods for each site. Appropriate measures should be taken to maintain the balance of animal stress in animal husbandry and to rehabilitate and develop biodiversity as well.

7. Future Scope :

A key development of remote sensing has increased the availability of high spatial and high spectral resolution capturing sensitive data remotely from a wide range of sensors and platform forms, including photographic and digital cameras, video, and multiple sensitive sensors carrying airborne and space. Distinguish forest cover and physiological qualities providing improved hyperspectral images. Radar applications are being developed that reveal the characteristics of the forest fungus forest floor that enters it. New technology such as LIDAR delivers forest structures with unprecedented precision by providing forest biomass, height and vertical estimates. Math Odd's use of advanced digital analysis and selective use of complementary data have provided more forest structure, function, and ecosystem processes than ever before.

As the availability of versatile solutions increases remotely sensitive image arrays and multisource data, so will the ability to compose forests and continue to improve timely and accurate map production and structure operational capabilities for accurate mapping of forest management scales. This, in turn, will contribute to efforts to assess the sustainability of our forests Through improved forest practices and improved decision making in forest management.

Conclusion :

With forest management becoming increasingly complex due to greater environmental and social involvement and pressure, GIS could probably play an increasingly central role. Larger development band widths, web-based technologies and wireless communication will even provide greater opportunities for access to information in more remote areas. It will capture real time online data and allow cases to ask.

The range of applications reviewed in this article is clear evidence of this Significant value of forests and the potential of GIS in their support Management. Despite the diversity of applications, many broad conclusions can be drawn about the role of GIS in afforestation. GIS applications can benefit strongly from remote sensing and image processing technologies. Forests are complex assemblages of species that lend themselves well to a wide range of inventories through remote sensing. However, there is still a need for strong ground truth and perhaps satellite location systems such as GPS will play an important role in enhancing traditional forest surveying activities.

Forests are a dynamic resource, influenced by many coexistences Environmental processes and direct management interventions. Simulation modeling has been applied to a degree in forestry that is significantly higher than many other branches. Simulation or process modeling is one of the most challenging areas of GIS applications and it is likely that this activity will increase as research and tools become more prevalent to support such applications. It is clear that around the world, forests are subject to many demands. As a result, many forest management problems have the nature of multi-purpose planning methods. Strong tools are needed for the analytical solution of conflicting suitability and for the allocation of resources. In this sense, forest applications embody the full potential of GIS technology. So its study gives a great overview of the state of technology as a management tool for natural resource concerns.

Wildlife management requires knowledge of species ecology, biology, behavior, and physiology. Additional knowledge of plant species, population ecology, habitat restoration, and ecosystem management is required as well. Wildlife management involves working with animals and people. Wildlife management objectives are people oriented and people driven. Landowners, homeowners, farmers, ranchers, outfitters, restaurants, motels, and other businesses may all rely on wildlife for a portion of their income, livelihood, and personal well-being.

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