Bhadrak Wildlife Division

Working Plan

2021-22 to 2030-31

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PART-I

SUMMARY OF FACTS ON WHICH PROPOSALS ARE BASED

EXECUTIVE SUMMARY

Bhadrak Wildlife Division came into existencefrom 1st October, 2003. This Division was formed by carving out a portion of the Baripada Forest Division and a portion of Mangrove (Wildlife) Forest Division, Rajnagar. The Jurisdiction of Bhadrak (Wildlife) Division is the entire geographical area of Bhadrak Revenue District with an area of 2,505 Km^2 and thus boundary of the Division is co-terminus with boundary of the Revenue District. The Division shares its boundary with Balasore Wildlife Division on the North, Mangrove Wildlife Division on the South, Bay of Bengal on the East and Kendujhar Wildlife Division & Cuttack Forest Divisions on the West respectively. Previously, this Division was regulated as per the Working Plan of Athgarh Forest Division and Baripada Forest Division. However, there are no prescriptions in the outgoing Working plans for this Division as there is no Reserved Forests in the Division. Hence, there is a need to prepare the Working Plan of Bhadrak (WL) Division for the first time for scientific management of the existing small cover of forests to protect and rejuvenate it. The present revision of Working Plan of Bhadrak (WL) Division is for the period 2021-22 to 2030-31. This Working Plan suggests the systemic management of one Proposed Reserve Forest (PRF), nine Un-demarcated Protected Forests (UDPF), twenty-one Village Forests and wildlife of this Division. However, Shri Amlan Nayak, ex-the Divisional Forest Officer and Ms Poornima P IFS, DFO, Bhadrak WL Division, along with team of officers undertook the entire field work including Forest resource Assessment in Sample Plots, bio-diversity surveys, soil studies, regeneration surveys and illicit felling surveys meticulously and the said data have been elaborately analyzed. The data on rainfall, temperature, humidity, human & cattle population and changes in land use patterns etc. are collected and keeping these parameters in mind this revision of Working Plan is chalked out.

Therefore, substantial efforts have been made in preparation of the revised Plan which shows considerable improvement over the previous Plan. Though, always there remains further scope for improvement in preparation of the Plan, lack of resources, shortage of skilled personnel and lack of infrastructure have significantly constrained the capacities to bring in such additions to this Plan.

Some salient features of this Plan are as follows:

- It includes a comprehensive historical analysis of forest resource use in the Division.

- This Plan includes bio-diversity surveys with regard to the floral and faunal species richness. It suggests the restoration of degraded Mangrove areas and conservation of vulnerable species of Olive Ridley turtles and Salt water crocodiles.
- The trees outside forest and plantation area under different schemes also contribute to a great extent towards general floristic composition of crop of the Division. Hence this includes the management of trees outside Forests.
- As this Division has a very small part of Forest area, this working plan involves the use Revenue lands for plantations.
- This plan also includes the involvement of local communities in conservation of biodiversity of this Division with their socio-economic development by Joint Forest Management system.
- This Plan offers greater flexibility to the Divisional Administration. An innovative and enterprising DFO can use this Plan to achieve the objective of conservation and propagation with involvement of local communities.

Many of the Staffs like Asst. Conservator of Forests, Forest Range Officers, Deputy Rangers and Official Staffs have contributed to the completion of this Plan. Their efforts and assistance are gratefully acknowledged. Smt. PusaMekro IFS Ex- RCCF Bhubaneshwar Circle, Shri. Dibakar Mishra, Ex-RCCF, Bhubaneshwar Circle, Shri Manoj Mohapatra IFS, present RCCF, Bhubaneshwar Circle have contributed to this working plan through their constant guidance and encouragement. In fact, this PWPR laid the foundation for the main plan. Mrs. Rebecca Nayar, IFS Ex- Regional Chief Conservator of Forests, Bhubaneswar Circle has given valuable suggestions and comments on the PWPR which have also been duly incorporated in the Plan. In fact, the directions of the Conservator of Forests, Working Plans, O/o the Principal Chief Conservator of Forests, Odisha, Bhubaneswar and for necessary co-operation in regular review of the progress of the revision work provided much needed impetus to this herculean task of revision of the plan. The assistance and efforts of these officers are gratefully acknowledged.

Sh. Sisir Kumar Ratho, IFS, the Principal Chief Conservator of Forests (PCCF), Odisha, has contributed to this Plan in many ways. As the chairman of Working Plans Committee, he offered many practical comments and suggestions that were of immense help. As the PCCF, Orissa, he has always encouraged and provided necessary support without which this Plan would not have completed in time. The contributions of these officers are of immense value and sincerely acknowledged. Thanks, are also due to all the members of the Working Plans

Committee for their composite wisdom and guidance.

The Asst. Conservator of Forests and all the Forest Range Officers of Bhadrak Wildlife Division also rendered considerable help and support. And also, All Forest Range Officers of this Division rendered assistance in providing the required documents and support. I am grateful to them and their staffs. I am also thankful to all the officers and staffs of this Division who has provided excellent support while writing of this Plan.

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Divisional ForestOfficer,

Bhadrak Wildlife Division.

VISION 2030-31

The present Working plan has been drafted with a vision to achieve different goals on various sectors by 2030-31 i.e., by end of the plan period. The sector wise vision for Bhadrak Wildlife Division perceived is as follows-

1. **Increasing Tree Cover:**

   As this division is having very less forest cover as compared to the total geographical area, the tree cover can be increased by tree outside forests mostly. So, this can be achieved by promoting agroforestry and people's participation in afforestation activities. A massive tree planting activity by Forest Department with help of VSS, local NGO and other organizations will be ensured so as to restore the PRFs, VFs, Coastal belt and all roadside avenues.

2. **Conservation & protection of Wildlife:**

   As this Division is bordering the Bhitarkanika National Park, it has also a good population of Salt water crocodile. The saltwater crocodiles are endangered species belonging to the Order *Crocodylia* and Family *Crocodylidae*.The broad activities to be carried out to conserve crocodile will be- to protect the remaining population of crocodilians in their natural habitat by protecting them from human interference, public-relation should be among the local people to make aware of the importance of the crocodiles in ecosystems, habitat development should be done like plantations, digging and renovation of creeks and natural water bodies.

   The Gahirmatha sanctuary acts as a temporary habitat for migrating Olive Ridley turtles, which is in Rajnagar Wildlife Division, whereas nesting happens on Dr. Abdul Kalam Island, which is in Bhadrak Wildlife Division. The numbers of turtles participating in mass nesting are variable. Sporadic nesting by a few individuals of *L. olivacea* along the coast is common. The Kanika Island witnessed sporadic nesting for the first time in 2020-21. So, in the next working plan period hatcheries may be established in sporadic nesting sites such as Kanika Island to enhance the hatching and survival rate.

3. **Secured Forest Boundary and encroachment eviction:**

   The boundary of PRF, UDPF and VF will be demarcated through DGPS survey, concrete pillars will be posted and maintained perfectly within the plan period. Many village forests and PRF are under encroachment and prevent future encroachment by amicable discussion and settlement with the Revenue Authority concerned and community.

4. **People's participation:**

   All Forests of Social Forestry Project and Degraded Forest Area assigned to VSS will be managed through people's participation of highest order. Micro plans prepared initially will be revisited and integrated village development plan will be incorporated in the micro plan as to provide alternative livelihood to the rural people and help infrastructure development for building mutual confidence.

5. **Climate change:**

   Adequate measures will be taken to combat climate change and increase carbon sequestration through afforestation.

SWOT ANALYSIS

SWOT analysis or SWOT matrix is a strategic planning and strategic management technique used to help a person or organization identify strengths, weaknesses, opportunities, and threats related to business competition or projectplanning. It is sometimes called situational assessment or situational analysis.

The Four Quadrants of SWOT Analysis

SWOT analyses are often presented as a grid-like matrix with four distinct quadrants – one representing each individual element. This presentation offers several benefits, such as identifying which elements are internal versus external, and displaying a wide range of data in an easy-to-read, predominantly visual format.

Here's the SWOT analysis of Bhadrak Wildlife Division:

STRENGTHS	**WEAKNESSES**
❖ Situation of the Division is along the coast of Bay of Bengal. ❖ Good marine biodiversity	❖ The Division is devoid of good natural forest except Mangrove forests. ❖ Flood and cyclone prone area.
OPPORTUNITIES	**THREATS**
❖ Olive Ridley turtle Conservation ❖ Salt Water crocodile population ❖ Mangrove restoration	❖ Forests are in various stages of degradation due to anthropogenic pressures. ❖ Functioning of Illegal timber depots and saw mills.

Acting On Strengths:

A good study on marine flora and fauna can be done in the prescribed Working plan to acquire knowledge on them and to conserve them in their habitat.

Shoring Up Weaknesses

In the next working Plan, the focus should be on restoration of existing mangrove forests. Also new forests can be added to the Division by taking up mass plantation drive in VFs and UDPFs. Also, coastal shelter plantation can be taken up to provide protection against frequent cyclonic storms.

Seizing Opportunities

More scientific management strategies should be followed up to protect the Olive Ridley turtles, salt water crocodiles and other marine faunas. Their habitat must be restored and managed properly to ensure their multiplication in the next few years.

Mitigating Threats

Forest protection and surveillance should be strengthened to ensure zero illegal activities related to timber transportation, storage and sawing in the division. The frontline staffs should be engaged in patrolling and monitoring of illegal activities.

LIST OF FLORA

HERBS:

Sl.No	*Scientific Name*	Local Name	Family
1	*Acalypha hipsida*	Sibajata	Euphorbiaceae
2	*Acalypha indica*	NA	Euphorbiaceae
3	*Acanthus ilicifolius*	Harkanch	Acanthaceae
4	*Acantospermumhispidum*	Gokhura	Asteraceae
5	*Ageratum conyzoides*	Poksunga	Asteraceae
6	*Alocasia macrorhizos*	Badasaru	Araceae
7	*Aloe vera*	Gheenkunwari	Xanthorrhoeaceae
8	*Alstoniascholaris*	Chatian	Apocyanaceae
9	*Amorphophallus paeonifolius*	Olua	Araceae
10	*Ananus comosus*	Sapuri	Bromeliaceae
11	*Androphagispaniculata*	Bhuinimba	Acanthaceae
12	*Aponongetonnatans L.*	Jhechu	Aponogetonaceae
13	*Aponongeton undulatus L.*	Kesarkanda	Aponogetonaceae
14	*Argemone mexicana*	Kantakusum	Papaveraceae
15	*Bidens pilosa*	NA	Asteracease
16	*Caladium bicolor*	NA	Araceae
17	*Casuarina equisetifolia*	Jhaun	Casuarinaceae
18	*Centella asiatica*	Thalkudi	Apiaceae
19	*Chenopodium album*	Bathuasaga	Amaranthaceae
20	*Chloris barbata*	NA	Poaceae
21	*Chrysopogonaciculatus*	Guguchia	Poaceae
22	*Chrysopogonzizanoides*	Bena	Poaceae
23	*Cissus quadrangularis*	Hadabhanga	Vitaceae
24	*Colacasia esculenta*	Saru	Araceae
25	*Comneliabenghalensis*	Kansiri	Commelinaceae
26	*Corchorus aestuans*	Bananalita	Malvaceae
27	*Corchorus capsularis*	Nalita	Malvaceae
28	*Corchorus olitorius*	NA	Malvaceae
29	*Corchorus trilocularis*	NA	Malvaceae
30	*Crinum asiaticum*	Arsa	Amaryillidaceae
31	*Curcuma amada*	Amada	Zingiberaceae

32	*Curcuma aromatica*	Palua	Zingiberaceae
33	*Curcuma longa*	Haldi	Zingiberaceae
34	*Cymbopogon flexuosus*	Dhanatwari	Poaceae
35	*Cynodondactylon*	Duba	Poaceae
36	*Cyprus alopecurioides*	Hensuati	Cypreaceae
37	*Cyprus difformis*	Swonli	Cypreaceae
38	*Cyprus rotundus*	Mitaghas	Cypreaceae
39	*Dactylocteniumaegyptium*	NA	Poaceae
40	*Desmostachyabipinnata*	Kusa	Poaceae
41	*Digitariasanguinalis*	NA	Poaceae
42	*Echinochloacolona*	Swanghas	Poaceae
43	*Echinochloacrusgalli*	Dhera	Poaceae
44	*Echinopsechinatus*	Batresh	Asteraceae
45	*Echliptaprostrata*	Bhrungaraj	Asteraceae
46	*Eichhornia crassipes*	Bilatidala	Pontederiaceae
47	*Elettaria cardamomum*	Gujurati	Zingiberaceae
48	*Eleusine indica L.*	Anamandia	Poaceae
49	*Elicharispatustris*	NA	Cypraceae
50	*Eragrostisgangetica*	NA	Poaceae
51	*Evolvulusalsinoides*	Bichhamalia	Convolvulaceae
52	*Euphorbia hirta*	Harharika	Euphorbiaceae
53	*EurayleferosS*alisb	KantaBadam	Nymphaeceae
54	*Helenia speciosa*	Kokola	Zingiberaceae
55	*Heteropogoncontortus*	NA	Poaceae
56	*Hydrilla verticillata L.*	Chingudiadala	Hydrocharitaceae
57	*Ipomea mauritiana*	Bhuinkakaru	Convolvulaceae
58	*Ipomea sepiaria*	Mushkani	Convolvulaceae
59	*Lippiajavanica*	Naguari	Verbenaceae
60	*MyriostachiaWightinana*		
61	*Nelumbo nucifera*	Padma	Nelumbonaceae
62	*Nymphaea nouchali*	Kain	Nymphaeceae
63	*Nymphaea pubescens*	Rangakain	Nymphaeceae
64	*Oxalis corniculata*	Ambiliti	Oxidales
65	*Oplismensisburmanii*	NA	Poaceae
66	*Otelia alismoides*	Panikundri	Hydrocharitaceae

67	*Oryza rufipogon*	Balunga	Poaceae
68	*Parthenium hysterophorus*	Gajargas	Asteraceae
70	*Paspalidiumflavidum*	NA	Poaceae
71	*Pedalium murex*	Gokara	Pedaliaceae
72	*Pennisetum alopecuros*	NA	Poaceae
73	*Peperomia pellucida L.*	NA	Aponogetonaceae
74	*Pistia stratiotes L.*	Borajhangi	Araceae
75	*Sacchaarumspontaneum*	Kashtakundi	Poaceae
76	*Scadoxusmultiflorus*	NA	Amaryillidaceae
77	*Scirpusarticulatus*	NA	Cyperaceae
78	*Scirpusgrossus*	Na	Cyperaceae
79	*Sesamum indicum*	Khasa	Pedaliaceae
80	*Sesuviumportulacastrum*	Godabani/ Daluadhana	Aizoceae
81	*Seteria verticillata*	NA	Poaceae
82	*Sporobolus indicus*	NA	Poaceae
83	*Suaeda maritima*	Jirisaga	Amaranthaceae
84	*Suaedamonoica*	NA	Amaranthaceae
85	*Synedrellanodiflora*	NA	Asteraceae
86	*Tradescantia spathacea*	NA	Commelinaceae
87	*Trianthemaportulacastrum*	Purinisaga	Aizoceae
88	*Tribulus terrestris*	Gokhara	Zygophyllaceae
89	*Tridax procumbens*	Bisalyakarani	Asteraceae
90	*Typha angustifolia*	Hangla	Typhaceae
91	*Vicoa indica*	Banasebati	Asteraceae
92	*Zingiber officinale*	Ada	Zingiberaceae

SHRUBS:

Sl no.	Species Name	Common Name	Family
1	*Adenium obesum*	NA	Apocyanaceae
2	*Agave americana*	Baramasi	Asperagaceae
3	*Atrabotryshexapetalous*	Chinichampa	Magnoliaceae
4	*Barleriaprionitis*	Daskeeranta	Acanthaceae
5	*Bougainvillea spectabillis wild*	Kagazphoola	Nyctaginaceae

6	*Calamus rotung*	Betta	Arecaceae
7	*Calotropis gigantea*	Arakha	Apocyanaceae
8	*Celastruspaniculata*	Leibehada	Celastrales
9	*Cissus Quandrangularis*	Hadabhanga	Vitaceae
10	*Coixlacryma-jobi*	Gagara	Poaceae
11	*Crotolariajuneca*	Chanapata	Fabaceae
12	*Euphorbia antiquorum*	Deuliasiju	Euphorbiaceae
13	*Euhorbiathymifolia*	Patrasiju	Euphorbiaceae
14	*Euphorbia tirucalli*	Dangulisiju	Euphorbiaceae
15	*Euphorbia tithymaloides*	NA	Euphorbiaceae
16	*Ipomea carnea*	Amari	Convovulaceae
17	*Ixora coccinea*	NA	Rubiaceae
18	*Jatropha curcas*	Jada	Euphorbiaceae
19	*Jatropha gossypifolia*	Baigaba	Euphorbiaceae
20	*Juasticaaadhatoda*	Basanga	Acanthaceae
21	*Lawsoniainnermis*	Menjuati	Lythraceae
22	*Martynia annua*	Baghanakha	Martyniceae
23	*Nerium olender*	Karabira	Apocyanaceae
24	*Ocimumsantum*	Tulasi	Lamiaceae
25	*Opuntia stricta*	Nagapheni	Cactaceae
26	*Paederiafoetida*	Prasaruni	Rubiaceae
27	*Pandanus fascicularis*	Kia	Pandanaceae
28	*Pandanus foetidus*	Lunikia	Pandanaceae
29	*Rauwolfia serprntina*	Patalagaruda	Apocyanaceae
30	*Riccinus communis*	Jada	Euphorbiaceae
31	*Sida acuta*	Sunakhadika	Malvaceae
32	*Sidarhombifolia*	Sahabehada	Malvaceae
33	*Solanum trilobatum*	Nbhiankuri	Solanaceae
34	*Ziziphus oenoplia*	Kankoli	Rhamnaceae

CLIMBERS:

Sl no.	Species Name	Common Name	Family
1	*Abrusprecatorius*	Kaincha	Fabaceae
2	*Aristolochia indica*	Balbolena	Aristolochiaceae

3	*Asperagusacemousus*	Satabari	Asperagaceae
4	*Basella alba*	Poi	Basellaceae
5	*Caesalpinia bonduc*	Gilo	Fabaceae
6	*Caesalpinia crista*	Nantei	Fabaceae
7	*Capparis zeylanica*	Asadua	Capparaceae
8	*Cardiospermum halicacabum*	Kanphuta	Sapindaceae
9	*Cassytha filliformis*	Nirmuli	Lauraceae
10	*Cissampelos pareira*	Akanbindi	Menispermaceae
11	*Clitoriaternatea*	Aparajita	Fabaceae
12	*Cuscutareflexa*	Nirmuli	Convovulaceae
13	*Derris scandens*	Mohagano	Fabaceae
14	*Dioscoreaalata*	Khambaaalu	Dioscoreaceae
15	*Dioscorea pentaphylla*	Tungiaalu	Dioscoreaceae
16	*Gloriosa superba*	Ognisikha	Colchicaceae
17	*Gymneasylvestre*	Gudmari	Apocyanaceae
18	*Ipomea spp.*	Kunduri, Kansari	Convovulaceae
19	*Luffa acutangula*	Pitataradi	Cucurbitaceae
20	*Mucuna pruriens*	Baidanka	Fabaceae
21	*Passiflora foetida*	Jhumaklata	Passifloraceae
22	*Pergulariadaemia*	Uturundi	Apocyanaceae
23	*Piper longum*	Pipalli	Piperaceae
24	*Tiliacoraracemosa*	Kalajotinai	Menispermaceae
25	*Tinosporia cordifolia*	Guluchilata	Menispermaceae
26	*Trichosanthestricuspidata*	Mahakalaphala	Cucurbitaceae
27	*Vigna unguiculata*	Jhudanga	Fabaceae

TREES:

Sl No.	***Scientific Name***	**Local Name**	**Name of the Family**
1	*Acacia auriculoformis*	Acasia	Fabaceae
2	*Acacia leucophloea*	NA	Fabaceae
3	*Acacia nilotica*	Babul	Fabaceae
4	*Acacia mangium*	Mangium	Fabaceae
5	*Achyranthes aspera*	Apamaranga	Amaranthaceae
6	*Adina cordifolia*	Kuruma	Rubiaceae

7	*Agelemarmelos*	Bela	Rutaceae
8	*Aervlllanata*	NA	Amaranthaceae
9	*Albizia lebbeck*	sirisa	Mimosaceae
10	*Albizia procera*	Tentra	Mimosaceae
11	*Allophylus serratus*	Khandakoli	Sapindaceae
12	*Alstoniascholarris*	Chhatian	Apocynacea
13	*Amaranthus viridis*	NA	Amaranthaceae
14	*Amorphophallus bulbifera*	Ban olua	Arecaceae
15	*Anacardium occidentale*	Lanka Badam	Anacardiaceae
16	*Andrographis paniculate*	Bhuin Neem	Acanthaceae
17	*Angeiosusaccuminata*	Phasi(Puntia)	Mimosaceae
18	*Alangiumsalvifolium*	Ankula	Cornaceae
19	*Annona reticulata L.*	Atta	Annonaceae
20	*Annona squamosa L.*	Neuwa	Annonaceae
21	*Anogeinsuslatifelia*	Dhaura	Combretaceae
22	*AnthocephalusKadamba*	Kadamba	Arecaceae
23	*Areca catechu L.*	Gua	
24	*Argyreiabella*	NA	Convolvulaceae
25	*Argemone maxicana*	Kantakusuma	Papaveraceae
26	*Artocarpus heterophyllaus*	Panas	Moraceae
27	*Artocarpus lakoocha*	Jeutha	Moraceae
28	*Aspargusracemosus*	Hateri Kanda	Liliaceae
29	*Avicennia alba*	Bani	Avicenniaceae
30	*Avicennia marina*	Bani	Avicenniaceae
31	*Avicenniaofficianalis*	Bani	Avicenniaceae
32	*Averrhoa carambola*	Karmanga	Oxalidaceae
33	*Azadirecta indica*	Limba	Meliaceae
34	*BambusaArundinacea*	Dababans	Poaceae
35	*Bamubsa nutans*	SundiriBaunsh	Poaceae
36	*Bambusa Vulgaris*	Baunsa	Poaceae
37	*Baringtoniaacutangala*	Hinjal	Lecithydaceae
38	*Bauhinia purpurea*	Naliakanchana	Fabaceae
39	*Bauhinia variegata*	Kanchan	Fabaceae
40	*Boerhaviadiffusa*	Atikapudi Saga	Nyctaginaceae
41	*Boerhavia vitis-idaea*	Pohalakuli	Euphorbiaceae

42	*Bombax ceiba*	Simuli	Bombacaceae
43	*Borassus flabellifera*	Tal	Arecaceae
44	*Bridelia retusa*	Kasi	Euphorbiaceae
45	*Bruguiera cylindrica*	Kaliachua	Rhizophoraceae
46	*Bruguiera parviflora*	Dot	Rhizophoraceae
47	*Butea monosperma*	Palasa	Fabaceae
48	*Caesalpinia pulcherrima*	Krushnachuda	Fabaceae
49	*Calophylluminophyllum*	Polang	Calophyllaceae
50	*Calotropis gigantea*	Arakha	Asclepiaceae
51	*Carissa spinarum*	Ankukoli	Apocynaceae
52	*Casearia elliptica*	Benimonj	Flacourtiaceae
53	*Cassia auriculata*	NA	Fabaceae
54	*Cassia fistula*	Sunari	Fabaceae
55	*Cassia occidentalis*	Chakundea	Caesalpinlaceae
56	*Cassia Siamia*	Chakunda	Mimosaceae
57	*Cassytha filiformis*	Nirmuli	Lauraceae
58	*Casuarina equisetifolia*	Jhaun	Casuarinaceae
59	*Catharanthus roseus*	Sadabihari	Apocynaceae
60	*Cinnamomum tamalaNees.*	Tejpatra	Aristolachiaceae
61	*Cinnamomum zeylanicum Blume*	Dalchini	Aristolachiaceae
62	*Citrus medica*	Tabha	Rutaceae
63	*Citrus maxima*	Tabha	Rutaceae
64	*Chromolaena odorata*	Pokasunga	Asteraceae
65	*Clerodendrumviscosum*	Bada rasna	Verbenaceae
66	*Cocos nucifera*	Nodia	Arecaceae
67	*Commelinabenghalensis*	Ranasiri	Commelinaceae
68	*Couroupitaguianensis*	Nageswar	Lecithydaceae
69	*Crateveanurvala*	Baruna	Cleomaceae
70	*Crotalaria labumifolia*	NA	Fabaceae
71	*Croton bonplandianus*	Bana mirchi	Euphorbiaceae
72	*Cryptocoronciliata*	NA	Araceae
73	*Cucumis melo*	NA	Cucurbitaceae
74	*Datura stramonium*	Duddura	Solanaceae
75	*Diospyros melanoxylon*	Kendu	Ebenaceae

76	*Dillenia Indica*	Oau	Dilleniaceae
77	*Dolichondronespathcea*	Gocinga	Bignoniaceae
78	*Erythrina Indica*	Paldhua	Fabaceae
79	*Euphorbia Neriifolia*	Siju	Euphorbiaceae
80	*Euphorbia nivulia*	Bad Siju	Euphorbiaceae
81	*Excoecariaagallocha*	NA	Euphorbiaceae
82	*Eucalyptus tereticornis*	Eucalyptus	Myrtaceae
83	*Ficus bengalenses*	Bara	Moraceae
84	*Ficus hipsida*	Dimiri	moraceae
85	*Ficus religiousa*	Aswasth	Biraceae
86	*Gliricidiasepium*	NA	Fabaceae
87	*Heliotropiumcurassavicum*	NA	Boraginaceae
88	*Ipomea cornea*	Amari	Convolvulaceae
89	*Ipomoea turbinata*	Bina	Con vol vulaceae
90	*Ipomea pes-capreae*	Kansarilata	convolvulaceae
91	*Gmelina arborea*	Gambhari	Verbenaceae
92	*Heritoriakanikensis*	Kanika sundari	Sterculiaceae
93	*Hibiscus tiliaceus*	Bania	Malvaceae
94	*Kandeliacandel*	Sinduka	Rhizophoracea
95	*Lantana camara*	Naga auri	Verbenaceae
96	*Leucaenialeucocephala*	Rajakosundari	Fabaceae
97	*Limoniaacidissima*	Kaitha	Rutaceae
98	*Lumnitzeralittorea*	NA	Combretaceae
99	*Madhuca indica*	Mahula	Sapotaceae
100	*Magnolia champaca*	Champa	Annonaceae
101	*Mangifera Indica*	Amba	Anacardiaceae
102	*Melia azadirachta*	Maha neem	Meliaceae
103	*Mimusopselengi*	Baula	Sapotaceae
104	*Morindapubescens*	Acchu	Rubiaceae
105	*Moringa pterygosperma*	Sajana	Moringaceae
106	*Morus Alba*	Tutkoli	Moraceae
107	*Myriostachiawightiana*	NA	Poaceae
108	*Murrayakoenigii*	Bhrusinga	Meliaceae
109	*Nerium olender*	Kaniaro	Apocynaceae
110	*Nyctanthesarbor-tristis*	Gangaseoli	Oleaceae

111	*Nymphoides indica*	Barachuli	Menyanthaceae
112	*Opuntia stricta*	Nagphani	Cactaceae
113	*Oxytenanatheranigrociliata*	Balangibans	Poaceae
114	*Phoenix syllvetris*	Khajuri	Arecaceae tree
115	*Phoenix Paludosa*	Hental	Arecaceae
116	*Phyllanthus emblica*	Anola	Phyllanthaceae
117	*Phyllanthus niruri*	BhuinAnla	Euphorbiaceae
118	*Pithecellobium dulce*	Simakaina	Fabaceae
119	*Plumeria rubra*	Katha Champa	Apocynaceae
120	*Polyalthia longifolia*	Debdaru	Annonaceae
121	*Pongamia pinnata*	Karanja	papilonaceae
122	*Prosopis juliflora*	Bilatijhaun	Mimosaceae
123	*Prosopsis cineraria*	Sami	Fabaceae
124	*Pterocarpus marsupium*	Piasala	Fabaceae
125	*Rhizophora mucronata*	Rai(Mangrove)	Rhizophoraceae
126	*Samanea Saman*	Chakunda	Fabaceae
127	*Sapindusemarginatus*	Reetha	Sapindaceae
128	*Saraca Indica*	Ashoka	Ceaesalpinaceaa
129	*Sesbania grandiflora*	Agastha	Fabaceae
130	*Sonneratia apetala*	Kerua	Lythraceae
131	*Spathodeacampanulata*	African tulip tree	Bignoniaceae
132	*Spondiasmangifera*	Salma	Anacardiaceae
133	*Sonneratiacaseolaris*	Kerua	Lythraceae
134	*Spondias pinnata*	Ambada	Anacardiaceae
135	*Stercullariafoetada*	Kata Badam	Malvaceae
136	*Strychnosnux-vomica*	Kochila	Loganiaceae
137	*Streblus Asper*	Sahada	Moraceae
138	*Syzygiumcumini*	Jamu	Myrtaceae
139	*Syzygiumjambos*	Gulabjamun	Myrtaceae
140	*Syzygiumsamarangense*	Jambos	Myrtaceae
141	*Tamarindus Indica*	Tentuli	Caesalpiniaceae
142	*Tamarixtroupii*	Jaula	Tamaricaceae
143	*Tectona giandis*	Teak	Verbenaceae
144	*Terminelia arjuna*	Arjun	Combretaceae

145	*Terminalia bellerica*	Bahada	Combretaceae
146	*Terminalia catapa*	PistaBadam	Combretaceae
147	*Terminalia chebula*	Harida	Combretaceae
148	*Thespesia populnea*	Habali	Malvaceae
149	*Thevetia peruviana*	Kaniyara	Apocynaceae
150	*Trewianudiflora*	Panigambhari	Euphorbiaceae
151	*Ziziphus mauritania*	Barakoli	Rhamnaceae

INVASIVE ALIEN SPECIES:

Sl no.	Name	Family
1	*Acanthospermumhispidium*	Asteraceae
2	*Ageratum conyzzoides*	Asteraceae
3	*Altenantheraphiloxeroides*	Amaranthaceae
4	*Amaranthus spinosus*	Amaranthaceae
5	*Annona reticulata*	Annonaceae
6	*Antigononleptopus*	Polygonaceae
7	*Argemone mexicana*	Papaveraceae
8	*Boerhaviadiffusa*	Nyctaginaceae
9	*Blumealacera*	Asteraceae
10	*Borassus flabellifer*	Arecaeae
11	*Calotropis gigantea*	Apocyanaceae
12	*Calotropis procera*	Apocyanaceae
13	*Cannabis sativa*	Cannabaceae
14	*Cassia absus*	Fabaceae
15	*Cassia alata*	Fabaceae
16	*Cassia occidentalis*	Fabaceae
17	*Cassia tora*	Fabaceae
18	*Catharantheus roseus*	Apocyanaceae
19	*Chamaesycehirta*	Euphorbiaceae
20	*Cissampelos pareira*	Manispermaceae
21	*Chenopodium album*	Amaranthaceae
22	*Chloris barbata*	Poaceae
23	*Cleome gynandra*	Cleomaceae

24	*Cleome monophylla*	Cleomaceae
25	*Cleome rutidosperma*	Cleomaceae
26	*Cleome viscosa*	Cleomaceae
27	*Corchorus aestuans*	Malvaceae
28	*Corchorus tridens*	Malvaceae
29	*Croton sparciflorus*	Euphorbiaceae
30	*Cuscutareflexa*	Convovulaceae
31	*Cynodondactylon*	Poaceae
32	*Cyperus rotundus*	Cyperaceae
33	*Datura metel*	Solanaceae
34	*Eclipta alba*	Asteraceae
35	*Eichhornia crassipes*	Pontederiaceae
36	*Euphorbia hirta*	Euphorbiaceae
37	*Gomphrena serrata*	Amaranthaceae
38	*Ipomea cornea*	Convovulaceae
39	*Ipomea pestigirdis*	Convovulaceae
40	*Kigeliaafricana*	Bignoniaceae
41	*Lantana camara*	Verbanaceae
42	*Ludwigia perennis*	Onagraceae
43	*Momosapudica*	Fabaceae
44	*Mirabillisjalapa*	Nyctaginaceae
45	*Ocimumcannum*	Lamiaceae
46	*Opuntia stricta*	Cactaceae
47	*Parthenium hysterophorus*	Asteraceae
48	*Passiflora foetida*	Passifloraceae
49	*Plumbago zeylanica*	Plumbaginaceae
50	*Portulaca quadrifida*	Portulaceae
51	*Prosopis juliflora*	Fabaceae
52	*Saccharum spontaneum*	Poaceae
53	*Sida acuta*	Malvaceae
54	*Solanum torvum*	Solanaceae
55	*Solanum viarum*	Solanaceae
56	*Synedrella oleraceus*	Asteraceae
57	*Tribulus terrestris*	Zygophyllaceae
58	*Tridax procumbens*	Asteraceae

59	*Typha angustata*	Typhaceae
60	*Xanthium indicum*	Asteraceae
61	*Ziziphus mauritiana*	Rhamnaceae

LIST OF FAUNA

MARINE SHELL SPECIES:

Sl. No.	*Scientific Name*	Family
1	*Architectonica laevigata*	Architectonicoidea
2	*Cerithiumechinatum*	Cerithidae
3	*Cerithiummorus*	Cerithidae
4	*Heniifuscuspugilinus*	Melongenidae
5	*Meretrix meretrix*	Veneridae
6	*Murex tribulus*	Muricidae
7	*Naticalineata*	Naticidae
8	*Naticauuiculosa*	Naticidae
9	*Naira polita*	Naticidae
10	*Placenta placenta*	Placunidae
11	*Potamidescingulatus*	Pyramidellidae
12	*Pteriabrevilata*	Pteridae
13	*Tonna galea*	Tonidae
14	*Turbo brunneus*	Turbinidae
15	*Turritella duplicata*	Turritellidae
16	*Xenophora solaris*	Xenophoridae

FISHES OF DHAMRA ESTUARY:

Sl No.	***Species Name***	***Family***
1	*Sillagopanijus (Hamilton-Buchanan)*	Sillaginidae
2	*Siltugosihania (Forsskul)*	
3	*Sauritlaundosquaniis (Richardson)*	Synodldae
4	*Nemipterusjapouicus (Bloch)* *Nemipteridae*	Nemiptcridae
5	*SphvraenajelloCuvicr*	Sphyracnidae
6	*Cyanoglosusdubius Day*	Cyanoglossidae

7	*Sctipinnaphasa (Hamilton-Buchanan)*	Coilinae
8	*Hemiramphusuntfasctatus*	Hemiramphdae
9	*Harpodonuehereus (Hamilton-Buchanan)*	Scopclidac
10	*Tylosuruschoram (Riipell)*	Belonidae
11	*Kurtus indicus Bloch*	Kurtidae
12	*Ponuulasvsliasta (Bloch)*	Pornadasjidae
13	*Drcpane punctate (Linnaeus)*	Ephipadae
14	*Ephippusorbis (Bloch)*	
15	*Loxodonniurorhlnes Muller and Ilenle*	Carcharinidae
16	*Congresoxtalabououles (B lcekcr)*	Muracnesacidae
17	*Lutjanus kasmira (Forsskal)*	Percidae
18	*Epiniphalousbleeker! (Vaillant and Bocourt)*	scranidae
19	*Lutjanus bleekeri (25apan25nt and Bocourt)*	Lutjanidae
20	*PolyneousparadesousLinnacus*	Polyncruidae
21	*Eleutheronlematetradactylum (Show)*	
22	*MgilcephalusLinnacus*	Mugilidae
23	*Liza vaigicnsis (Quoy and Gaimard)*	
24	*Pampuschineueis (Euphrasen)*	Stromatidae
25	*p.argenteus (Euphrasen)*	
26	*A riusarius (Hamilon and Buchanan)*	Ariidac
27	*A.subrostratus Valenciennes*	
28	*Eupieurogranunusglossodon (Blecker)*	Trichiuridac
29	*l.epturanctltussavala*	
30	*(Cuvier)*	
31	*Tcraponjarbua (Forsskal)*	Tcraponidac
32	*Gerresoyena(Forsskal)*	Gerreidac
33	*Otolithus cuvieri Trewavas*	Sciaenidae
34	*Otolithoidesbiauritus*	
35	*Daysciaenaalibida (Cuvier)*	
36	*Pterotolithusnuiculatus*	
37	*Johniusnuicropterus (Bleeker)*	
38	*J. belangerii (Cuvier)*	

39	*Panna niicrodon (8 leekcr)*	
40	*NibeachuiTrewavas*	
41	*Mcgalaspiscordyla (Linnaeus)*	Carangidae
42	*Atule mate (Cuvier)*	
43	*Carangoidesmalabaricus (Bloch)*	
44	*Alectis indicus (Riippel)*	
45	*Argyropsspinifer (Forsskal)*	Sparidae
46	*Lethrinusfrenatus*	Lethrinidae
47	*Gytnuora26apanica (Schlegel)*	Dasyatidae
48	*Racotula /usseliana (Gray)*	Clupcidae
49	*llishamegaloptera (Swainson)*	
50	*Hilsa ilisha (Hamilton-buchanan)*	
51	*Sardiuellaleiogaster Valenciennes*	
52	*S. lougiceps Valenciennes*	
53	*S. clupeoides (Bleeker)*	
54	*Si fimbriata (Valenciennes)*	
55	*S.Fimbrita (Valenciennes)*	
56	*Anodontostomachacunda(Hamilton-buchanan)*	
57	*Pellonaditchalavanenciennes*	
58	*Coiliaramcarati (Hamilton-buchanan)*	Engraulidae
59	*C. dussumieri Valenciennes*	
60	*Tliryssaluuniltonii (Gray)*	
61	*T.malabarica (Bloch)*	
62	*Setipinnalenuifilis Valenciennes*	
63	*Pterois miles.*	Scorplonidae

AMPHIBIANS:

Sl No.	**Scientific Name**	**Common Name**	**Family**
1	*Duttaphrynusmelanostictus*	Common toad	Bufonidae
2	*Bufo fergusonii*		Bufonidae

3	*Fejervaryasyliadrensis*	Paddy field frog	Dicroglossidae
4	*FejervaryaOrissaensis*	Paddy field frog	Dicroglossidae
5	*Haplobatracustigerinus*	Indian bull frog	Dicroglossidae
6	*Hoplobatracuscrassus*	Jerdon's bull frog	Dicroglossidae
7	*Euphlyctiscyanophlyctis*	Skipper frog	Dicroglossidae
8	*Euphlyctislicxadactylus*		Dicroglossidae
9	*Microhylaornata*	Ornate frog	Microhylidae
10	*Uperodousystouia*	Balloon frog	Microhylidae
11	*Kaloulapulclira*	Painted frog	Microhylidae
12	*Polypedates maculates*	Tree frog	Rhacophoridae

REPTILES:

Sl No.	***Scientific Name***	**Common Name**	**Family**
1	*Sitanaponticeriana*	Fan throated lizard	Agamidae
2	*Calotes versicolor*	Garden Lizard	Agamidae
3	*Chatnaeleon zeylanicus*	Indian Chameleon	Chamaeleonidae
4	*Mabuyamacularia*	Little Skink	Scincidae
5	*Varanus bengalensis*	Common Indian Monitor	Varanidae
6	*Varaunaflavescens*	Yellow monitor lizard	Varanidae
7	*Ramphotyphlopsbraminus*	Brahminy Worm Snake	Typhlopidae
8	*Eryxconica*	Common Sand Bo	Boidae
9	*Ahaetullanasuta*	Common VineSnake	Colubridae
10	*Dendrarelaphis tristis*	Common Bronzcback Tree Snake	Colubridae
11	*Ptyas mucosa*	Indian Rat Snake	Colubridae
12	*Lycodonaulicus*	Common Wolf Snake	Colubridae
13	*Boiga trigonata*	Common Cat Snake	Colubridae

14	*Xenochrophis piscator*	Checkered Keelback	Colubridae
15	*Cereberusrhynchops*	Dog faced water Snake	Homalopsidae
16	*Gerardaprevostiana*	Glossy Marsh Snake	Homalopsidae
17	*NajaNaja*	Monocellate Cobra	Elapidae
18	*Tricmercsurusgramineus*	Bamboo pit Viper	Viperidae
19	*Common krait*	Chitti	Elapidae
20	*Russels Viper*	Boda	Viperidae
21	*Melanochelystrijuga*	Katha kainch	Geoemydidae
22	*Pangshura tentoria*	Pankakainch	Geoemydidae
23	*Lampropholisguichenoti*	Champeineula	Scincidae
24	*Varanus bengalensis*	Godhi	Varanidae
25	*Indotyphlopsbraminus*	Telia sapa	Typhlopidae
26	*Lepidochelysolivaceae*	Olive Ridleys	Chelonidae
27	*Crocodylusporosus*	Salt Water Crocodile	Crocodilydae

BIRDS:

Sl No.	**Scientific Name**	**Common Name**	**Family**
1	*Phalacrocorax niger*	Little Cormorant	Phlacrocoracidae
2	*Anliinga melanogaster Pennant*	Oriental Darter	Anhingidae
3	*Egrettagarzetta*	Little Egret	Ardeidae
4	*Casiuerodius albus*	Large Egret	Ardeidae
5	*Mesophoyx intermedia*	Median Egret	Ardeidae
6	*Bubulcus ibis*	Cattle Egret	Ardeidae
7	*Ardeolagrayii*	Indian Pond heron	Ardeidae
8	*Anas platyrhyncltos Linnaeus*	Mallard	Anatidae
9	*flaliasturindus*	Brahminy Kite	Acciptridae
10	*Haliaeetus lellcogasrer*	White-bellied Sea-eagle	Acciptridae

11	*Circnetusgallicus*	Short-toed Snake-eagle	Acciptridae
12	*Accipiter badius*	Shikra	Acciptridae
13	*lctinaetustnalayensis*	Black Eagle	Acciptridae
14	*Amaurornisakool*	Brown Crake	Rallidae
15	*Amarurornisphoenicurus*	White-breasted Water hern	Rallidae
16	*Hydrophasianuschirurgus*	Pheasant-tailed Jacana	Jacanadae
17	*Metopidius indicus*	Bronze-winged Jacana	Jacanadae
18	*Charadrius dubiusScopoli*	Little Ringed Plover	Charadriidae
19	*Charadrius alexandrinus Linnaeus,*	Kentish Plover	Charadriidae
20	*Charadrius mongolus Pallas*	Lesser Sand Plover	Charadriidae
21	*vanellusmalabaricus*	Yellow-wattled Lapwing	Charadriidae
22	*vanellus indicus*	Red-wattled Lapwing	Charadriidae
23	*Gallinagogallinago*	Common Snipe	Scolopacidae
24	*Limosalimosa*	Black-tailed Godwit	Scolopacidae
25	*Actitishypoleucos*	Common Sandpiper	Scolopacidae
26	*Larus canus*	Common Sea Gull	Laridae
27	*Sterna acuticauda*	Black-bellied Tern	Laridae
28	*Chlidoniashybrida*	Whiskered Tern	Laridae
29	*Columbalivia*	Blue Rock Pigeon	Columbidae
30	*Spilophelia chinensis*	Spotted dove	Columbidae
31	*Chalcophaps indica*	Emerald dove	Columbidae
32	*Psittaculakrameri*	Rose ringed parakeet	Psittaculidae
33	*Hierococcyxvarius*	Common hawk-cuckoo	Cuculidae
34	*Eudynamysscolopacea*	Asian Koel	Cuculidae
35	*Athene brama*	Spotted Owlet	Strigidae
36	*Alcedoatthis*	Small Blue Kingfisher	Alcenidinidae
37	*Halcyon pileata*	Black-capped Kingfisher	Alcenidinidae

38	*Todiratnphuschloris*	Collared Kingfisher	Alcenidinidae
39	*Halcyon smyrnensis*	White-breasted Kingfisher	Alcenidinidae
40	*Cerylerudis*	Lesser Pied Kingfisher	Alcenidinidae
41	*Meropsorientalis*	Small Bee-eater	Meropidae
42	*Meropsphilippiuus*	Blue-tailed Bee-eater	Meropidae
43	*Meropsleschenaulti*	Chestnut-headed Bee-eater	Meropidae
44	*Coracias benghalensis*	Indian Roller	Coraciidae
45	*Upupa epops*	Common Hoopoe	Upupidae
46	*Megalaimaliaemacephala*	Coppersmith Barbet	Megalaimidae
47	*Megalaimazeylanica*	Brown-headed Barbtet	Megalaimidae
48	*Motacilla flava*	Yellow Wagtail	Motaciliadae
49	*Anthusrufulus*	Paddyfield Pipit	Motaciliadae
50	*Coracinamacei*	Large Cuckoo-shrike	Campaphagidae
51	*Pycnonotusjocosus*	Red-whiskered Bulbul	Pycnonotidae
52	*Pycnonotuscafer*	Red-vented Bulbul	Pycnonotidae
53	*Saxicoloidesfulicata*	Indian Robin	Muscicapidae
54	*Copsycliussaularis*	Oriental Magpie-robin	Muscicapidae
55	*Chrysommasinense*	Yellow-eyed Babbler	Paradoxonithidae
56	*Turdoides striatus*	Jungle Babbler	Leiothrichidae
57	*Lonchurapunctulata*	Spotted Munia	Estrildidae
58	*Passer domesticus*	House Sparrow	Passeridae
60	*Ploceusphilippinus*	Baya Weaver	Ploceidae
61	*Acridotheres tristis*	Common Myna	Sturnidae
62	*Dendrocittavagabunda*	Indian Treepie	Corvidae
63	*Corvus splendens*	House Crow	Corvidae
64	*Corvus macrorhynchos*	JungleCrow	Corvidae
65	*Diciurusmacrocercus*	Drongo	Dicruridae

MAMMALS:

1	**Scientific Name**	**Common Name**	**Family**
2	*Felis chaus*	Jungle cat	Felidae
3	*Canis aureus*	Jackal	Canidae
4	*Hyaena hyaena*	Striped hyena	Hyaenidae
5	*Vivericula indica*	Small Indian Civet	
6	*Paradoxurus hermophroduus*	Common palm civet	Viverridae
7	*Herpestessmithii*	Ruddy mongoose	Viverridae
8	*Sus scrofa*	Wild Boar	Suidae

LIST OF ALGAE, LICHEN & FUNGI

ALGAE:

Sl.No	Scientific Name	Family
1	*Chaetomorphalinum*	Cladophoraceae
2	*Cladophora glomerata*	Cladophoraceae
3	*Enteromorpha compressa*	Ulvaceae
4	*Enteromorpha intestinalis*	Ulvaceae
5	*Enteromorpha usneoides*	Ulvaceae
6	*Enteromorpha linza*	Ulvaceae
7	*Enteromorpha clathrata*	Ulvaceae
8	*Ulva lactuca Linn.*	Ulvaceae
9	*Ulva fasciataDelile*	Ulvaceae
10	*Colpomeniasinuosa*	Scytosiphonaceae
11	*Dictyotadichotoma*	Dictyotaceae
12	*Ceramiumdiaphanum*	Ceramiaceae
13	*Centrocerasclavulatum*	Ceramiaceae
14	*Gracilariaverrucosa*	Gracilariaceae
15	*Polysiphoniasubtilissima*	Rhodomelaceae
16	*Grateloupiafilicina*	Halymeniaceae
17	*Grateloupialithophila*	Halymeniaceae
18	*Catenellaimpudica*	Caulacanthaceae
19	*Compsopogonaeruginosus*	Compsopogonaceae
20	*Gelidiumdivaricatum*	Gelidiaceae

LICHENS:

Sl no.	Scientific Name	Family
1	*Dirinariapicta*	Ciliciaceae
2	*Lecanoratropica*	Lecanoraceae
3	*Lecanoraspp*	Lecanoraceae
4	*Dirinariaaegialita*	Ciliciaceae
5	*Pertusaria spp.*	Pertusariaceae
6	*Pyrrhosporaquernea*	Physciaceae

7	*Ramalinacalicaris*	Ramalinaceae
8	*Cryptothecia scripta*	Arthoniaceae
9	*Physciapumilior*	Physciaceae
10	*Permotrema spp.*	Parmeliaceae
11	*Pyxinesorediata*	Physciaceae
12	*Permotrema spp.*	Parmeliaceae
13	*Pyrenulaspp*	Pyrenulaceae
14	*Graphis scripta*	Graphidaceae
15	*Ramalinacalicaris*	Ramalinaceae
16	*Parmeliasulcata*	Parmeliaceae
17	*Chrysothrix spp.*	Chrysothricaceae

FUNGI:

Sl No	Scientific Name	Family
1	*Acremonium byssoides*	Hypocreaceae
2	*Alternaria alternata*	Pleosporaceae
3	*Aspergillus flavus*	Trichocomaceae
4	*Aspergillus niger*	Trichocomaceae
5	*Aspergillus oryzae*	Trichocomaceae
6	*Cladosporium oxysporum*	Cladosporiaceae
7	*Choanophoracucurbitarium*	Choanophoraceae
8	*Curvularialunata*	Pleosporaceae
9	*Fusarium oxysporum*	Nectriaceae
10	*Drechslerahawaiiensis*	Pleosporaceae
11	*Termitomyces spp.,*	Lyophyllaceae
12	*Volvariellavolvacea*	Plutaceae

LIST OF ANNEXURES

LIST OF TABLES

CHAPTER-1

THE TRACT DEALT WITH

1.1. Name and situation: Bhadrak (Wildlife) Division came into existence with effect from 1st October, 2003 in pursuant to reorganization of Forest & Environment Department Notification No.1F (A)-100/2003-13228 dated 08th August, 2003 of Govt. of Orissa, F&E Department. This Division was formed by carving out a portion of the Baripada Forest Division and a portion of Mangrove (Wildlife) Forest Division, Rajnagar with headquarters at Bhadrak.

1.1.1 The Headquarters of Bhadrak (Wildlife) Division is presently located at Chandbali with effect from 05.04.2006. However, the Divisional Forest Officer has to attend the camp office at Bhadrak three days a week as per Govt. of Odisha, F&E Department Notification No.1F (A) Misc-2/2013-4674 dated 04th March, 2013.

1.1.2 The Division is devoid of good natural forest except Mangrove forests along the coast of Bay of Bengal starting from border of Balasore district *i.e.,* Kansabansa river in the North up to Dhamara river in the south, which are in various stages of degradation due to anthropogenic pressures.

1.1.3 The Forest area of the Division comes under Working Plan areas of Athgarh Forest Division and Baripada Forest Division. However, there are no prescriptions in the outgoing plans for the areas of this Division. This could be due to the reason that there are no Reserved Forests in the Division. Hence, attempt has been made to prepare the Working Plan of Bhadrak (WL) Division for the first time for scientific management of the existing forests, however small it may be.

1.2 Configuration of the Ground:

1.2.1 The Jurisdiction of Bhadrak (Wildlife) Division is the entire geographical area of Bhadrak Revenue District and thus boundary of this wildlife Division is co-terminus with boundary of the Revenue District. The area of the Division lies between 20° 43'N to 21° 15'N Latitude and 86° 14'E to 87° 05'E Longitude. The division shares its boundary with Balasore (Wildlife) Forest Division on the North, Mangrove (Wildlife) Forest Division, Rajnagar on the South, Bay of Bengal on the East and Kendujhar (Wildlife) Forest Division & Cuttack Forest Divisions on the West respectively. In the coast of Bay of Bengal its boundary starts from border of Balasore district *i.e.,*Kansabansa river in the North up to Dhamara river in the South. The total Geographical area of the Division is 2505 Sq. Km. The total forest area of Bhadrak Forest Division is 53.32 Sq. Km as per district statistical report.

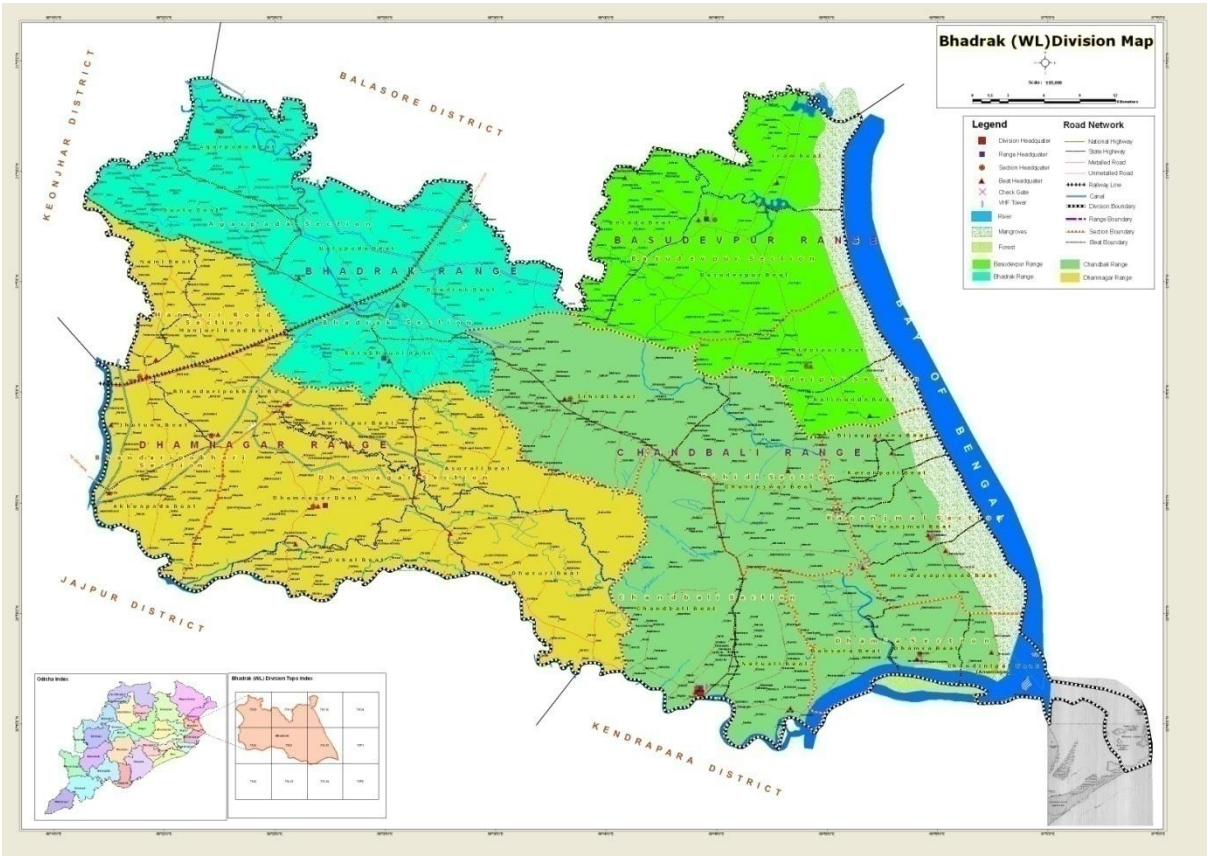


Fig. 1.1Administrative map of Bhadrak (WL) Division

1.2.2 The Division is divided into two nearly equal parts by the Salandi river flowing from the North-West to South. The topographical feature comprises the extensive plains which are irrigated by the Hadagarh Dam project and intensively cultivated throughout the year.

1.2.3 The Range-wise Forest blocks proposed to be covered in the new Working Plan is furnished in the Tablebelow:

Table No. 1.1 Forest Blockwise Area			
Sl. No.	**Name of the Range**	**Forest Block**	**Area in Ha.**
Reserve Forest- NIL			
Proposed Reserve Forest			
1.	Chandbali	Garmal	294.958
		Total	**294.958**
Undemarcated Protected Forests			
1.	Chandbali/ Basudevpur	Banipahi	2125.51
2.	-do-	Bijayapatana	93.12
3.	Basudevpur	Banijungle	404.69
4.	Chandbali	Outer wheeler	66.72
5.	-do-	Long wheeler	19.24
6.	-do-	Coconut Island	12.85
7.	-do-	Small wheeler	3.90
8.	-do-	Short Island	15.30
9.	-do-	Udabali (new)	485.83
		Total	**3227.16**
Village Forests			
1.	Chandbali	Arjunbindha Santhapur	4.0
2.	-do-	Bhatapada Gudpal	1.044
3.	-do-	Bodakasan	10.0
4.	-do-	Aruha	0.536
5.	-do-	Kamaria	1.98
6.	-do-	Mirjapur	0.56
7.	-do-	Deola	5.0
8.	-do-	Arjunbindha	3.0
9.	-do-	Kabirpur	5.0
10.	-do-	Haripur	0.68
11.	-do-	Babanbindha	5.0
12.	Bhadrak	Amargadia	3.68
13.	-do-	Belnta	1.0

14.	-do-	Dianary	1.84
15.	Dhamnagar	Sibapur	1.6
16.	-do-	Bansar	0.42
17.	-do-	Jalahari	3.0
18.	-do-	Chatrubhujapur	1.6
19.	-do-	Goudabisanuapada	2.2
20.	-do-	Belgadia	2.8
21.	Basudevpur	Alboga	0.2
		Total	**55.14**
		Total Forest Area	**3577.258**

1.2.4. The total Forest area as per DLC and total Forest area as per Revenue Record in Bhadrak District is given below-

Table No. 1.2 Showing Tahasil wise DLC Area		
Sl. No.	**Name of Tahasil**	**Area in Ha.**
1	Bhadrak	281.24
2	Bonth	509.108
3	Basudevpur	1473.6732
4	Dhamnagar	877.00
5	Tihidi	608.1800
6	chandbali	2262.5800
	Total	**6011.7812**

1.3 Geology, Rock, and Soil:

1.3.1 The Bhadrak Wildlife Division/ Bhadrak District shows more or less flat topographic expression with gentle slope towards coast. Salandi river and its tributaries Reba, Kapali and Nunajhor forms the major drainage system. Baitarani river marks the southern boundary of the district. The drainage pattern of the area is sub parallel to sub dendritic. The Division is almost entirely covered by Quaternary sediments of fluvial, marine and fluviomarine origin. Geomorphologically the Division forms a part of Baitarani sub-basin of Mahanadi basin and can be divided in to several geomorphic units. These are:

i) Bolgarh surface, forming a lateritic upland occupying a very small portion at the north-western corner.

ii) Kaimundi surface, exhibiting hummocky topography covering the central and western parts.

iii) Upper deltaic plain, gently sloping easterly and occupying south-central part of the Division.

iv) Lower deltaic plain, gently sloping easterly.

v) Dunel surface, represented by linearly oriented older stabilized dune followed by present day dunes more towards east.

vi) Plain surface bordering the coast at extreme east.

Geologically the area is represented by a thick sequence of quaternary sediments ranging in age from Early Pleistocene to Late Holocene. Two distinct facies can be identified, viz. fluvial facies and coastal facies. Fluvial facies include Bolgarh and Kaimundi formation. Bolgarh formation is represented by transported laterite soil containing pebbles of quartz, chert and basic rocks, Kaimundi formation comprise caliche bearing hard, sticky sandy to silty clay. In western part of the Division, around Bhadrak, Dhamnagar and Banta, Kankar bearing older alluvium at places contain upto 80% of clay. Size of the calcareous nodules (kankars) vary from few milimeters to more than 10 cm in diameter. Marine and fluvic marine facies which are time equivalent to Bankigarh formation include

i) Older beach and older dune deposit comprising oxidized compact sand and silt.

ii) Lower deltaic deposit containing clay with fine sand and silt, presence of black clay being conspicuous.

iii) Upper deltaic deposit with alternating layers of sandy silt and silty clay indicative of flood regime.

iv) Younger beach deposit represented by present day dune, linearly disposed parallel to the beach. Very fine sand, silt and clay are sediment content of these dunes.

v) Present day coastal deposit forms flat surface containing sand and silt; tidal marsh and occasional dunes are also found.

Bolgarh surface is suitable for plantation. The Kaimundi surface and the upper deltaic surface are highly fertile and yield double crops. The lower deltaic surface supports thick vegetation and yields single crops. The dunal surface also supports thick plantation. The major part of the district has fairly thick unconfined to confined and regionally extensive aquifers down to the depth of 300m, with large yield prospects. Depth of the water in unconfined aquifer or dug well varies from 4.0m to 7.3m b.g.l. In western peripheral part of the aquifers are

moderately thick upto a depth of 150m. The yield is also moderate. The depth of water table fluctuates from near surface to 6m in pre-monsoon to 4m during post monsoon.

The resources of the district include, a) Morrum from Bolgarh formation suitable as raw material for unmetalled road construction, b) Hard crust laterites used as building materials, c) Silt and clay from upper deltaic deposit used as raw material for brick making and d) grey plastic clay of Kaimundi formation utilized in pottery industry.

Natural hazards of the district include, a) soil and gully erosion in Bolgarh surface, b) sheet erosion in Kaimundi surface, c) over siltation in Baitarani and Salandi river bed, d) flooding of substantial part of the district by Baitariniriver during monsoon, e) water logging and risk of inundation in the strip of low land parallel to the coast and f) bank erosion on the banks of Baitarani.

During the field exercise, different types of soils occurring in different forest blocks were collected and studied as detailed below.

Table No1.3: Types of soil of Bhadrak

Sl. No.	Type of soil	Blocks where occurring
1	Clay	Garmal, Banipahi, Banijungle&Bijayapatana.
2	Sandy loam	Outer wheeler
3	Silt	Long wheeler, Short Island &Udabali (new).
4	Silty loam	Coconut Island & Small wheeler.

Soil samples collected from all the forest blocks and these samples were tested to determine different parameters like pH value, organic carbon content, phosphorous content and potash content. The soil analysis result is summarized as detailed below.

Table No1.4: Result of Soil analysis

Block	Type of soil	Texture Classification			pH	Organic carbon (% by Wt.)	P (Kg/Acre)	K (Kg/Acre)
		Sand	Silt	Clay				
Chandbali Wildlife Range								
Garmal	Clay	20	30	50	6.3	0.72	11.04	35.68
Banipahi (part)	Clay	19	28	53	6.3	0.71	10.61	39.89
Bijayapatana	Clay	18	34	48	6.2	0.71	10.21	51.54
Outer wheeler	Sandy loam	70	21	9	6.5	0.65	9.24	158.63
Long wheeler	Silt	14	80	6	6.6	0.64	9.54	159.21

Coconut Island	Silty loam	31	60	9	6.6	0.63	9.78	158.24
Small wheeler	Silty loam	30	60	10	6.7	0.65	9.07	158.95
Short Island	Silt	13	78	9	6.5	0.68	9.15	158.80
Udabali (new)	Silt	17	75	8	6.8	0.66	23.45	158.87
Basudevpur Wildlife Range								
Banipahi (part)	Clay	19	28	53	6.3	0.71	10.61	39.89
Banijungle	Clay	17	31	52	6.3	0.73	10.64	39.97

The mineral resources available in this Division is provided in the **Table No.-1.5** as follows.

Table No1.5: Minerals found in Bhadrak wildlife Division

Sl. No.	Name of the Range	Forest Block	Type of rocks / minerals
1.	Chandbali	Garmal	Q_2mc Sand & silt (flat surface)
2.		Banipahi (part)	
3.		Bijayapatana	
	Basudevpur		
1.		Banipahi (part)	
2.		Banijungle	
Source: Director Geology, Bhubaneswar.			

1.4 Climatic parameters:

1.4.1 Four seasons distinctly seen in this Division, viz:

a) Hot and dry summer season,

b) Hot and Humid Wet season,

c) Monsoon season, and

d) Winter season.

i) Hot and Dry Summer: It extends from early February to middle or end of June. The temperature shoots up to 40^0 C in May. The humidity is low in April and May. On an average, rainfall received in March and April is less than 50 mm.

ii) Hot and Humid Wet Season: Monsoon breaks in the first fortnight of June and lasts up till September. Maximum rainfall is received in July & August, on an average 300-400 mm rain is received in these months. The relative humidity is also high in this season, and the sky is heavily clouded. The average maximum temperature in July is about 34^0 C and in August is 33^0 C.

iii) Post monsoon season: In this season there are occasional showers. The humidity is high. There is moderate cloud in this season and the temperature starts falling down.

iv) Winter season: This extends from December to last part of January or first fortnight of February. The humidly also reduces in December and January. There are almost no rains in December, January and February**.**

1.4.2 Rainfall:

Average annual rainfall of Bhadrak is 1547.89 mm. This average rainfall has been derived by taking rainfall phenomenon of last two decades. When the rainfall data is analyzed critically, it is found that there is fluctuation in rainfall in different years. If last 20 years rainfall i.e., from 1996 to 2015 is examined, the rainfall is more than 2100 mm during the year 1999 and 2003. The rainfall is above average in 10 years, of which above 2000 mm rainfall is observed in 2 years only. Thus, the rainfall is very erratic with 10 years of less rainfall and 10 years of above. The graphical representation of average annual rainfall is given in **Fig.-1.2**and the rainfall pattern in the last 20 years is given in the bar diagram below in **Fig.-1.3.**

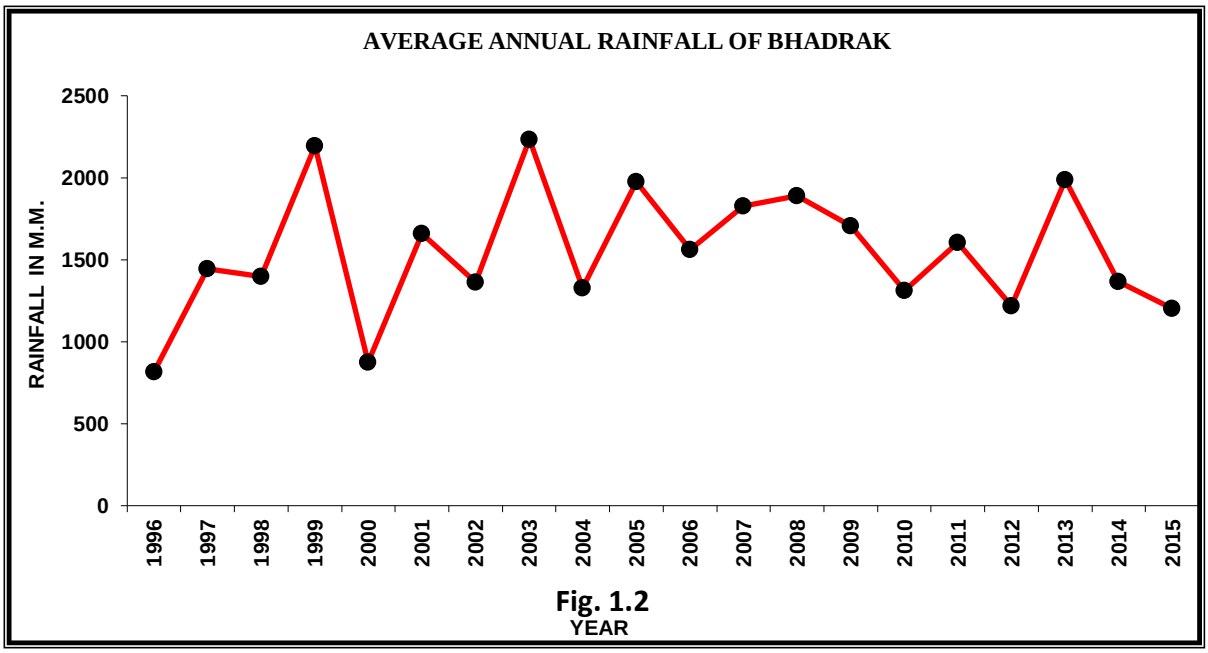


Fig. 1.2

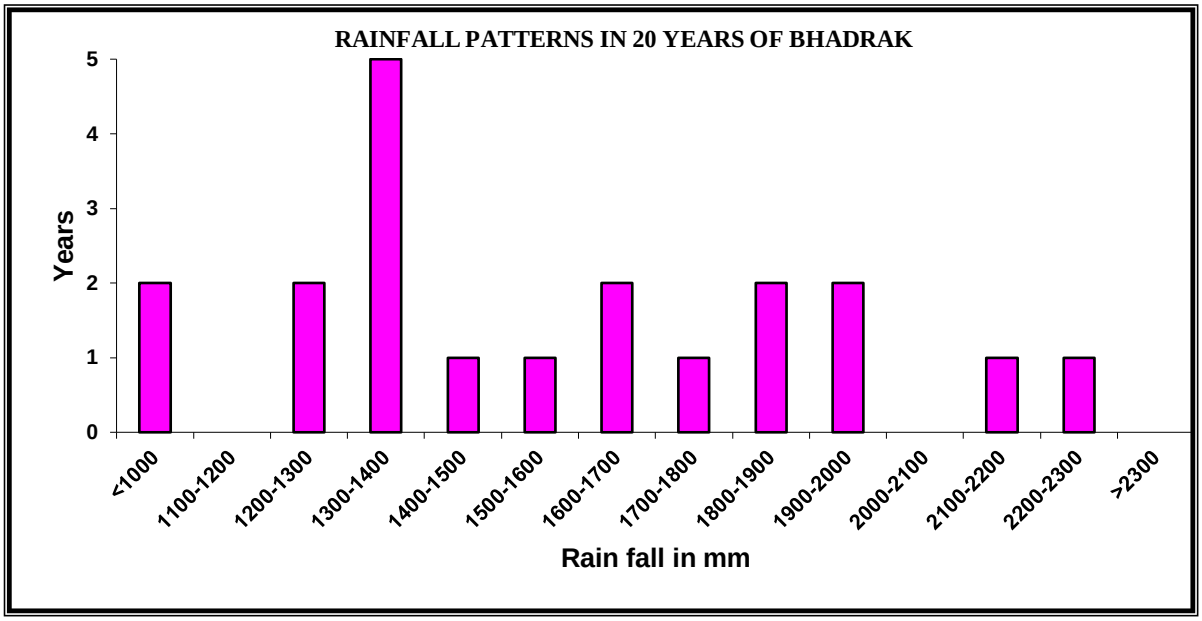


Figure- 1.3

1.4.3 Temperature:

The coldest month is December and January with the minimum temperature falling to 14^0-15^0 C. The maximum temperature is 38^0 C experienced in the month of May. If the temperature figures are closely studied, it is found that in Bhadrak district the average maximum temperature has not risen much in the last 20 years, it was about35^0- 39^0C during the month of May in a fluctuating manner. The year wise and month wise variations in average temperature for the last 20 years are given in the graphical form in **Fig.-1.4 & 1.5** respectively.

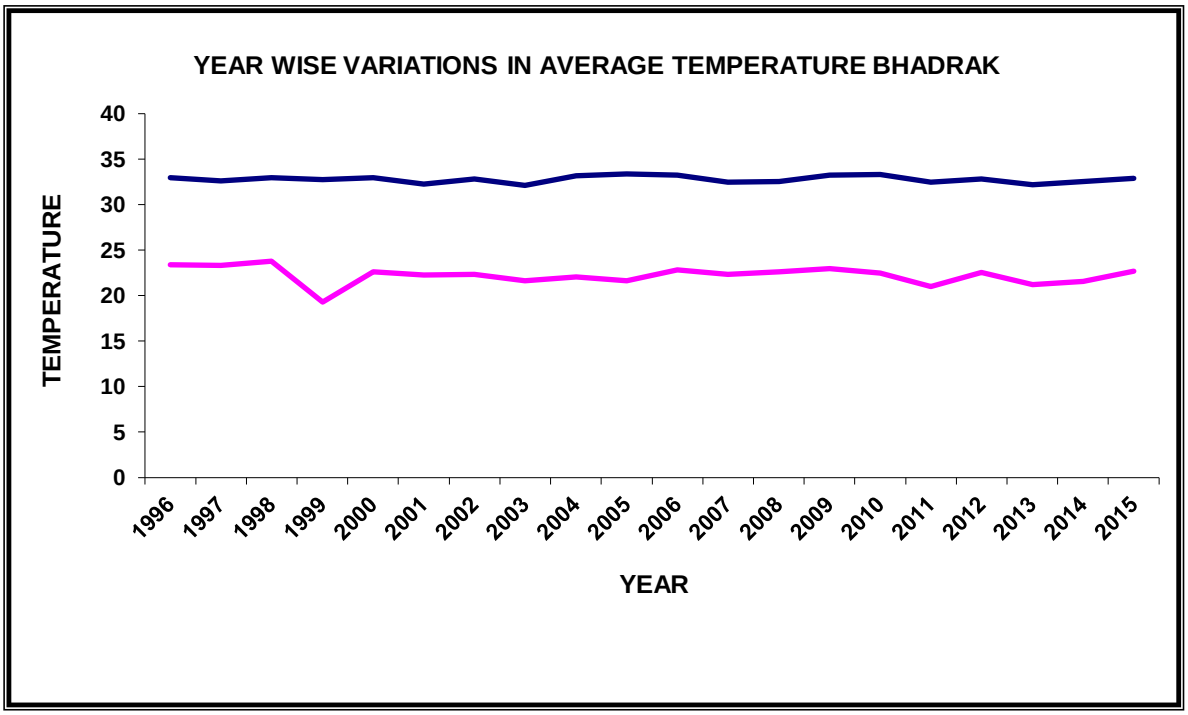


Fig. 1.4

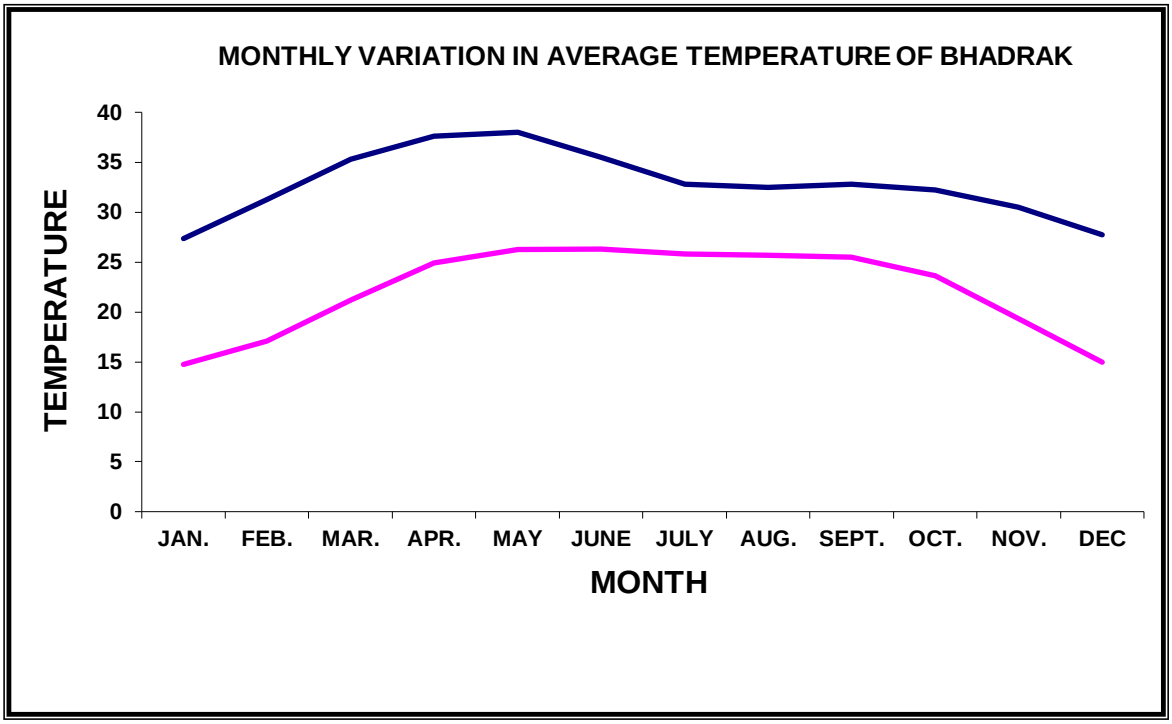


Fig. 1.5

1.4.4 Humidity:

It is generally medium to high in the Division; maximum humidity is seen in the month of August and minimum in April and May. It reaches about 80 percent in July, August, and September, in other months it varies between 50-70%. It reduces towards March, April, and May and is minimum in April and May. This is indicated in **Fig.-1.6** & **1.7.**

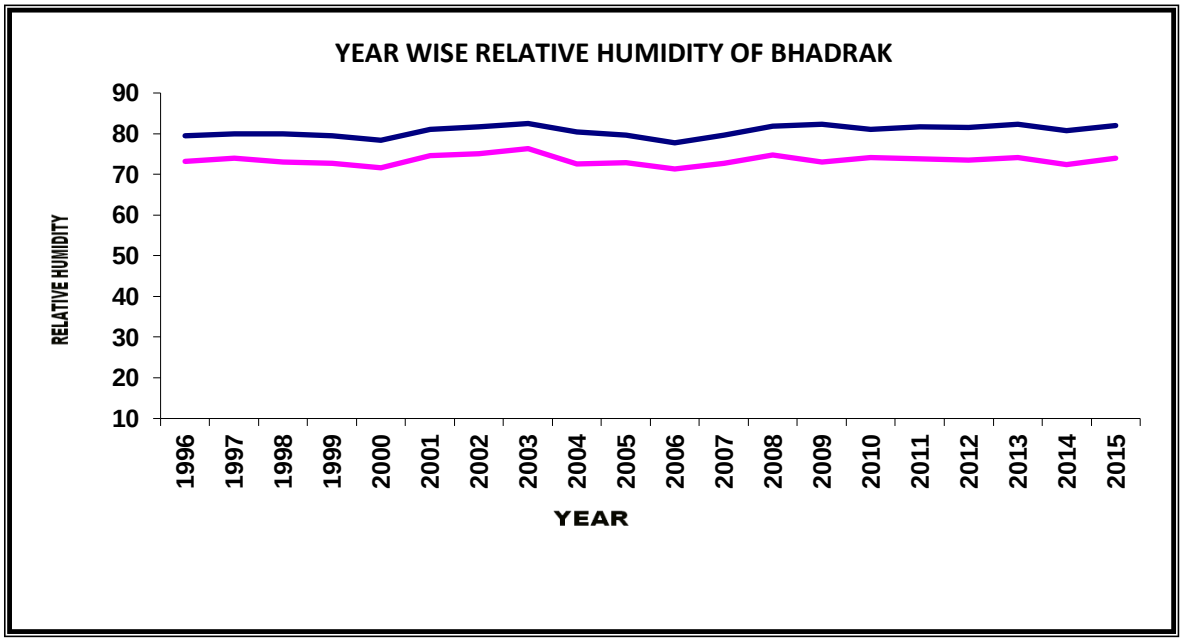


Fig. 1.6

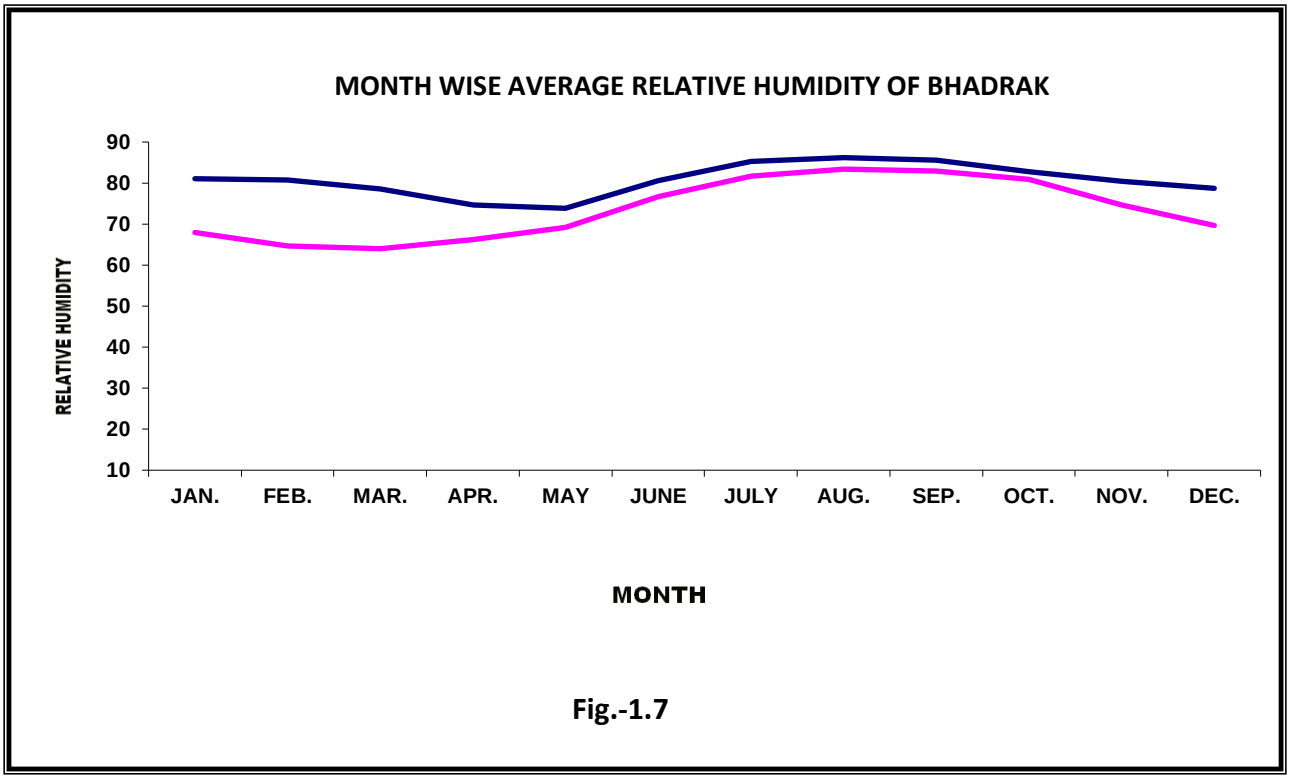
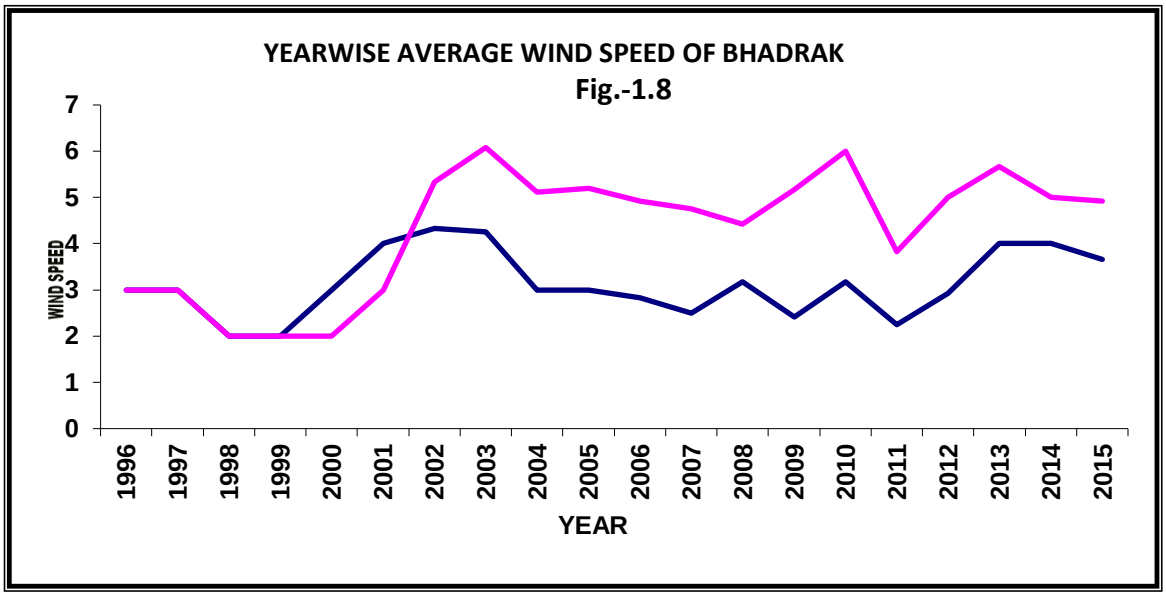


Fig.-1.7

1.4.5 Winds:

Light to moderate speed of wind prevails in this Division, with slight increase in summer. When the wind speed data is analyzed critically, it is found that the wind speed at Chandbali both in WS (0830) & 03WS (1730) is same from 1996 to 1999 and then there is fluctuation in different years. In the monsoon season, winds usually blow from South West and North West directions. In the post monsoon and cold seasons wind blows between the West and North. In summer the winds become variable in direction**.** The month wise and year wise average wind speed at Chandbali is represented in **Fig.-1.8** &**1.9.**



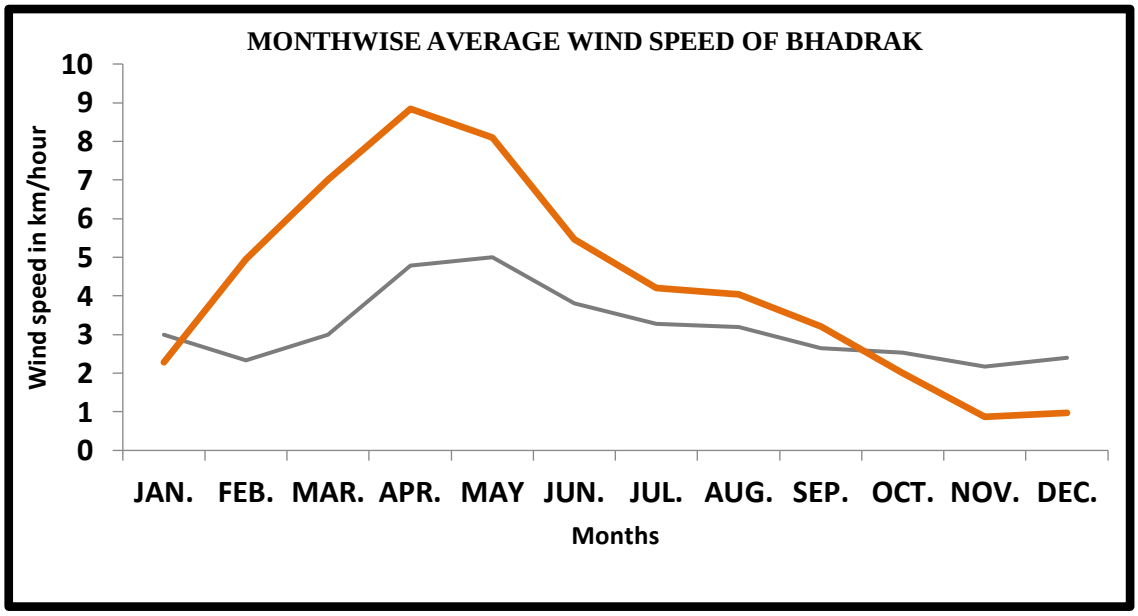


Fig. 1.9

1.4.6 Special weather phenomenon: Hailstorms and depressions occur in monsoon season and in October when the wind force is high. Thunderstorms occur mostly in the afternoon in the summer months and in October.

1.4.7 Natural Calamities: Most of the streams remain in spate during the rains. Minor flood is a common phenomenon in the riverine tract especially in Baitarani; the major floods have become rare after the construction of Dam at Hadagarh on river Salandi. No doubt, the floods cause severe damage on the forests. However, no such reports on Natural Calamities are

available in Bhadrak Wildlife Division, since forests (Mangroves) are mainly existing in the coast of Bay of Bengal.

1.5 Water Supply:

1.5.1 The main sources of water supply are ground water supply in this Division and pipe supply of water by the Public Health Engineering Department. Water supply through pipe does not only confine to urban area but also it has been expanded to rural area. The said information is furnished below in **Table No. 1.6.**

Table No 1.6: Urban water supply in Bhadrak WL Division

Place (Name of ULBs)	Population as per last census (2011)	Source of water supply	Qty. of water demand and supply in MLD	No. of stand posts	No. of house connec-tion	No. of tube wells	
						Running	Defunct
BHADRAK DISTRICT							
Bhadrak Municipality	107463	Ground water (24 bore wells)	Demand- 18.04 Supply- 6.82	102	1327	231	-
Basudevpur Municipality	33690	Ground water (9 bore wells)	Demand- 5.55 Supply- 1.99	67	1044	182	7
Chandbali Census Town	13775	Ground water (5 bore wells)	Demand- 2.26 Supply- 1.87	71	1187	47	-
Source: Executive Engineer (PH), Balasore.							

Table No 1.7: Rural water supply in Bhadrak WL Division							
Sl. No.	**Name of Block**	**Population as per last census (2011)**	**Stand post (No)**	**Tube well (Number)**	**Supply Hour (in hours)**	**Water Source**	**House Connection**
1	Bhadrak	207142	331	2186	8	Ground water	0
2	Bonth	144823	356	1792	8	Ground water	170
3	Bhandari-pokhari	129580	325	1834	8	Ground water	0
4	Dhamnagar	198697	464	2187	8	Ground water	195
5	Chandbali	234535	1026	2311	8	Ground water	1318
6	Basudevpur	214450	392	2289	8	Ground water	1265
7	Tihidi	195123	761	2655	8	Ground water	2208
Total		**1324350**	**3655**	**15254**			**5156**
Source: Executive Engineer, RWS&S, Division Bhadrak.							

1.5. The annual rivers of BhadrakWildlife Division are furnished below in **Table No.-1.8**

Table No 1.8: Rivers of Bhadrak WL Division		
Sl. No.	**Name of the river**	**Remarks**
BhadrakDistrict		
1	Baitarani	Perennial
2	Salandi	-do-
3	Mantei	-do-
4	Kansabasa	-do-
5	Gamei	-do-

6	Genguti	Rain fed river
7	Reba	-do-
8	Nuanai	-do-
9	Kochila	-do-
10	Kanchidi	-do-
11	Nalia	-do-
12	Kapali	-do-

1.6 HEALTH:

1.6.1 There is one district Headquarters Hospital at Bhadrak. Apart from that, there are 7 Community Health Centres, 50 Primary Health Centres and 178 sub centres. Besides, there is one Ayush infrastructure (Homoeopathic) at Bhadrak with 25 nos. of Dispensaries and 23 nos. of Ayurvedic/Unani Dispensaries available in this Division. The list traditional healthcare practitioners who use various indigenous plants and animals in medicinal practices are provided in People's Biodiversity Register in Annexure XVIII. Different categories of health centres (Allopathic) available in different places in this Division are tabulated below in **Table No.-1.9.**

Table No.- 1.9Availability of health centres (Allopathy)

Sl. No.	Block / Urban	Dist. Head Qtr. Hospital	Community Health Centres	Primary Health Centres	Sub Centres	Private Hospitals/ Nursing Homes	Total
BHADRAK DISTRICT							
1	Bhadrak (Urban)	1	1	7	23	7	39
2	Basudevpur (Urban)	-	1	7	31	-	39
3	Bhandari-pokhari	-	1	6	18	-	25
4	Bonth	-	1	4	20	-	25
5	Chandbali	-	1	8	32	1	42
6	Dhamnagar	-	1	11	31	-	43
7	Tihidi	-	1	7	23	1	32

	Total	**1**	**7**	**50**	**178**	**9**	
Source: District Statistical handbook.							

1.7 State of Boundaries:

The onlyPRF Garmal has a boundary length of 13.62 kms out of which 6.66 kms is artificial and 6.96 kms is of natural boundaries. As regard to maintaining of boundary line only 3 kms have been maintained during 2010-11 by constructing 20 masonry pillars. The boundary of other UDPFs is to be demarcated and measured in the field with posting of pillars on the boundary line. All forest boundaries shall be verified with the help of GPS/ DGPS and maintained during the Plan period.

1.8 Encroachments:

The area of encroachment has not been ascertained on an alibi that most of the boundary pillars in the field of the forest blocks were not maintained properly. However, the forest blocks mostly the VFs and few UDPFshave been partially encroached for human settlement & cultivation.

1.9 Rights and Concessions:

With regard to Rights and Concessions, there is no any Rights and Concessions over these forests in the absence of any prescription in the outgoing Plan.

1.10 JOINT FOREST MANAGEMENT, COMMUNITY FOREST MANAGEMENT & FRINGE FOREST MANAGEMENT:

Management of forest including its conservation and protection has become a herculean task due to emergence of a large deficit situation in meeting the huge demand of ever-rising population with limited permissible supply of forest produce. Participation of local people in the management was very much felt. Odisha was perhaps the pioneer state to involve the local people in protection and management of forests through constitution of Forest Protection Committee during 80's of last century.

Subsequently the process was culminated with Joint Forest Management Resolution No.16700-10-F (Pron)-20/93 F&E of Government of Orissa, Forest and Environment Department dated 3rd July 1993, published in Orissa gazette on 5th July 1993. In the said resolution the detailed procedure regarding constitution of Vana SurakhyaSamiti (VSS) and related matters have been prescribed along with the provision of usufructuary benefits to the VSS like collection

of fodder, grasses, fencing materials, brushwood, fallen lops & tops and twigs used as fuel wood. All intermediate yields in shape of small wood, Poles, firewood etc. as may be obtained from silvicultural operation will also be available to the members. Timber and poles as may be obtained from a major harvest or final felling shall be shared between Forest Department and VSS in equal proportion.

The Vana Surakhya Samitis (VSS) / Eco-Development Committees (EDC) have been constituted and strengthened in this Division under FDA & OFSDP intervention. The number of VSS/EDCs constituted so far along with the assignment of area is furnished as Annexure IX.

Amenities provided to these VSS/EDCs under Entry Point Activities of the aforesaid scheme are construction of community hall, bathing ghat, repair of village road, digging of tube wells, renovation of pond and supply of usable articles like chair, table, Almirah, power tiller, genset, Durrry, etc. The details shall be furnished in the proposed plan. Awareness campaign, training and exposure visit have also been conducted to enhance the capacity building of the VSS for strengthening the institution of JFM. The impact of this system has been felt for conservation and sustainable management of the forests. On the whole JFM is acting panacea to the problems faced by the forest officials alone in ensuring effective protection of the forests. The scope is vast and furtherance of this system is imperative for smooth management of forests of Bhadrak Wildlife Division.

1.11 Topographic configuration:

The toposheets covering Range-wise and forest block-wise of the Division is provided in Table No.1.11

Table No. 1.10 List of toposheets covering all Ranges		
SL. No.	**NAME OF THE FOREST BLOCK**	**TOPOSHEET REFERENCE IN 1: 50 000 SCALE**
CHANDBALI WILDLIFE RANGE		
1	Garmal	F45U13
2	Banipahi (part)	F45U13
3	Bijayapatana	F45U13
4	Outer wheeler	F45V1&V2
5	Long wheeler	F45V1&V2
6	Coconut Island	F45V1&V2
7	Small wheeler	F45V1&V2
8	Short Island	F45V1&V2
9	Udabali (new)	F45U13
	BASUDEVPUR WILDLIFE RANGE	
1	Banipahi (part)	F45O16, F45U13
2	Banijungle	F45O16

CHAPTER-2

MAINTENANCE /INCREASE IN THE EXTENT OF FOREST AND TREE COVER

2.1. Area of forests under different legal classes (RF, PF, UF and others): -The total forest area of Bhadrak Wildlife Division is 3753.59 Ha which includes one Proposed Reserve Forest, nine Un-demarcated Protected Forests & 21 Village Forests.

2.1.1. The details of forest area under different legal status are furnished on a tabular format as detailed below: -

Table No. 2.1 Details of Forest Blocks under different legal status

Sl. No.	Name of the Range	Forest Block	Notified Area in Ha.	Notification No. & date
Reserve Forest- NIL				
Proposed Reserve Forest				
1.	Chandbali	Garmal	400.65	12557/R, Dt. 10.3.71 & as per DLC record
		Total	**400.65**	
Undemarcated Protected Forests				
1.	Chandbali/ Basudevpur	Banipahi	2125.51	Govt. of Orissa Devt. (Forest) Dept. No. 33233 dt. 4.10.1961
2.	-do-	Bijayapatana	93.12	
3.	Basudevpur	Banijungle	404.69	
4.	Chandbali	Outer wheeler	106.53	
5.	-do-	Long wheeler	21.25	
6.	-do-	Coconut Island	39.67	
7.	-do-	Small wheeler	04.30	
8.	-do-	Short Island	16.90	
9.	-do-	Udabali (new)	485.83	
		Total	**3297.80**	
Village Forests				
1.	Chandbali	Arjunbindha Santhapur	4.0	No.10618-AFFN (SIDA) 15/92 E & F Dated 05.05.1992
2.	-do-	Bhatapada Gudpal	1.044	
3.	-do-	Bodakasan	10.0	
4.	-do-	Aruha	0.536	
5.	-do-	Kamaria	1.98	
6.	-do-	Mirjapur	0.56	
7.	-do-	Deola	5.0	
8.	-do-	Arjunbindha	3.0	

9	-do-	Kabirpur	5.0	
10.	-do-	Haripur	0.68	
11.	-do-	Babanbindha	5.0	
12.	Bhadrak	Amargadia	3.68	
13.	-do-	Belnta	1.0	
14.	-do-	Dianary	1.84	
15.	Dhamnagar	Sibapur	1.6	No.1315-AFFN (SIDA) 15/92 E & F Dated 15.01.1993
16.	-do-	Bansar	0.42	
17.	-do-	Jalahari	3.0	No.3779-AFFN (SIDA) 15/92 E & F Dated 15.01.1993
18.	-do-	Chatrubhujapur	1.6	
19.	-do-	Goudabisanuapada	2.2	
20.	-do-	Belgadia	2.8	
21.	Basudevpur	Alboga	0.2	
		Total	**55.14**	
		Total Forest Area	**3753.59**	

2.1.2 DLC Report: According to the DLC report, forest area in Bhadrak district comprises of 6011.7812 ha as per Revenue records. The list of DLC land is separately enclosed as a separate volume II.

Table 2.2: Forest Area as per DLC Record

Sl. No.	Name of Tahasil	Area in Ha.
1	Bhadrak	281.24
2	Bonth	509.108
3	Basudevpur	1473.6732
4	Dhamnagar	877.00
5	Tihidi	608.1800
6	Chandbali	2262.5800
Total		**6011.7812**

2.1.3 List of Unclassed Forests-

Table No. 2.3: List of Unclassed Forests

Sl. No	Name of Range	Plot No	Khata No.	Mauza	Area (ac)
1	2	3	4	5	6
	CHANDBALI (WL) RANGE	345	127	Chandbali	0.25
1	Divisional Forest Office at Chandbali				

2	D.F.O residance quarter at chandbali				
3	Range Office quarter at Chandbali				
4	Forester quarter at chandbali				
5	Forest Range Office at chandbali				
6	Divison Office staff quarter at chandbali				
7	Divison Office staff quarter at chandbali (Ground Floor)				
8	Divison Office staff quarter at chandbali (1st Floor)				
9	Division Office Chandbali quarter Chandbali				
10	Extention to ChandbaliRanhe Office Rest Sheed				
11	Forest Guard quarter & Boat jetty house	280,195	127	Chandbali	0.75
12	Forest Guard quarter Bijayaptana at karanjamal	201,203	136	Karanjamal	0.54
13	Forester quarter at Karanjamal	313	66	Karanjamal	0.34
14	Rest sheed at Karanjamal (Ground Floor)				
15	Rest sheed at Karanjamal (1st Floor)				
16	Forest Guard shed				
17	Forest Guard quarter				
18	Permanent travel camp shed	176	89	Dhamara	0.50
19	Forest Guard Quarters				
	BHADRAK (WL) RANGE				
20	Old Division Office building now Range Office at Satabhauni	3284	1207	Garadpur	2.90
21	Bhadrak (WL) Range Office Satabhauni				
22	Permanent Nursery shed Satabhauni				
23	Forest Guard quarter at Satabhauni				
24	Forester quarter	2285	107	Routraypur	0.015
	BASUDEVPUR (WL) RANGE				
25	Basudevepur (WL) Office Range				
26	Forest Guard quarter at Basudevpur	1862 7431	1307	Basudevpur	0.5
	DHAMNAGAR (WL) RANGE				
27	Range Office	1252			1.4

28	Forest Guard Quarter	1353 Dhamnagar	0.011
29	Forester Quarter		0.015
		TOTAL	**7.221acres / 2.922 ha**

2.2 Forest area under different working circle / management plan: -

2.2.1 Rehabilitation Working Circle: This working Circle includes 3398.998Ha including all the degraded forest blocks having potential to be rejuvenated. So, the area needs to be taken up for plantation under Assisted Natural regeneration throughout the working plan period. The focus of management will be to restock the mangrove forests of the Division by plantation and protection.

2.2.2 Plantation Working Circle: This working circle includes an area of 178.26 Ha. In mangrove areas where areas poorly stocked, degraded, deficient in regeneration and having blanks or gap plantation can be undertaken**.** The focus of management will be in the past plantations & new plantations to be undertaken in all the working circles. This also includes all the areas on both sides of the roads passing through the forest division as these require scientific management.

2.2.3 **Protection Working Circle:** This circle includes the entire working plan area i.e. 3577.258 Ha encompassing all the ecologically fragile areas and those situated mostly along the Coast line and composed of most of the Floral and faunal diversity of the Division. Though these areas have plants like different mangroves and aquatic animals like several precious fishes, crabs and Salt water crocodiles, regular biotic interference has led to loss in biodiversity. Thus, most of the protection measures are required in these areas.

2.2.4 JFM (overlapping) Working Circle: This working circle i.e., 3739.0 Ha is applicable to villages having Van Suraksha Samitis for protection and management as per JFM resolution of the state. The area under this plan will be managed through micro-plans prepared by village committees for each VSS area.

2.2.4. Wildlife Management (overlapping) Working Circle: This circle covers the entire working plan area of the division i.e., 3577.258 Ha The important wildlife present are Olive Ridley Turtles, Salt Water crocodiles, Asian elephants, Gangetic dolphins, Common South Asian dolphin, several precious fish species etc.

2.2.5. Range wise area covered under working plan-

Table No. 2.4 Showing Range wise area under different Working Circle					
Name of Working Circle	**Rehabilitation WC**	**Plantation WC**	**Protection (O) WC**	**JFM (O) WC**	**Wildlife Management (O) WC**
Name of Range	**Area allotted in Ha**				
Basudevpur	2530.200	0.200	2623.52	1478.00	2623.52
Bhadrak	0.000	6.520	6.520	138.00	6.520
Chandbali	868.798	159.920	935.398	1994.50	935.398
Dhamnagar	0.000	11.620	11.620	128.50	11.620
Total	**3398.998**	**178.260**	**3577.258**	**3739.000**	**3577.258**

2.3 Percentage of Forest with secured boundaries: -Garmal PRF has a boundary length of 13.62 Kms. out of which 6.66 Kms is artificial and 6.96 Kms is of natural boundaries. During the year 2010-11, 3 RKM have been maintained by constructing 20 masonry pillars. However, during the year 2017-18 10 nos. of boundary pillars have been repaired. The GPS Reading of masonry boundary pillars are reflected below.

Table No. 2.5 Status of boundary pillars of Different Forests					
Sl. No.	**Type of Forest**	**Name of Forest**	**No. of boundary pillars present**	**% Coverage of total boundry**	**Remarks**
1	PRF	Garmal	20	48.89%	Pillars are in intact condition, but need to be maintained annually
2	UDPF	All	0	0	Need to be demarcated & pillars to be posted
3	VF	All	0	0	

To protect the forests from encroachment and illegal entry the boundary needs to be demarcated and pillars have to be there to mark the boundary of the Forests. **As all the UDPFS and Village Forests are devoided of any boundary pillar, these forests have to be demarcated**

by GPS/DGPS survey in the field and after that, pillars need to be duly posted on the boundary lines.

So, construction/maintenance is required for the pillars in regular interval. So, a five-year plan can be prescribed for the pillars.

Table no. 2.6 Five-year Construction/maintenance Series for pillars

Sl. No	Name of Forest blocks	Year of operation
1	Garmal, Bijaypatna, Banijungle, Banipahi	2021-22 & 2026-27
2	Outer wheeler, Long wheeler, Short wheeler, Coconut Island, Short Island, Udabali	2022-23 & 2027-28
3	Arjunbindha-Santhapur, Bhatapada-Gudapal, Bodak sasan, Amargadia, Belnta, Dianary, Sibapur	2023-24 & 2028-29
4	Aruha, Kamaria, Mirzapur, Bansar, Jalahari, Chaturbhujpur, Alboga	2024-25 & 2029-30
5	Deola, Arjunbindha, Kabirpur, Haripur, Babanbindha, Goudabisi-Nuapada, Belgadia	2025-26 & 2030-31

2.4 Land use, Land use change and forestry (LULUCF): There has been substantial increase in the human population and the cattle population in the Division. The pressure of demand on forest is steadily increasing day by day. A lot of ecological changes have taken place. However, there are some exceptional areas where forest cover has increased due to protection by VSS/EDC members. The division is devoid of good natural forest except Mangrove forests along the coast of Bay of Bengal starting from border of Balasore district i.e., Kansabansa river in the North up to Dhamara river in the south, which are in various stages of degradation due to anthropogenic pressures.

Table 2.7 Year wise change in Land Utilisation Pattern in Bhadrak district

Sl no.	Year	Forest	Land put to non-agricultural work	Barren & non-cultivable land	Grazing lands & pastures	Land under misc. tree cover and groves
1	2015-16	534	36973	3132	11282	2863
2	2016-17	543	38959	337	11749	1628
3	2017-18	809	43685	1673	10124	3192
Source: District Statistical Handbook 2018, Disaster Management Plan 2018)						

2.4.1. FOREST AREAS DIVERTED FOR NON-FORESTRY PURPOSES

The forest areas diverted for non-forestry purposes is 176.332 Ha. (Out of which 105.692 Ha. from PRF, 70.64 Ha. from UDPF).

Table No 2.8: List of forest land diverted for non-forest purposes

Sl No.	Name of the Proposal	User Agency	Proposal Status		Area diverted in Ha.	
			Stage-I approval	Stage-II approval	Name of the Block	Area
1	For setting up incremental facilities to Interim Test Range	Defence Research & Development Organization, Chandipur	Stage-I clearance issued on 13.09.1995/GoI, MoEF.	Stage-II clearance issued vide no.8-21/9F-FC dt.04.06.1996 of GoI, MoEF.	Garmal PRF	105.36
					Long Wheeler	2.01
					Outer Wheeler	39.81
					Coconut Island	26.82
					Small Wheeler	0.4
					Short Island	1.6
					Total	**176.0**
2	Establishment of a New Light House near Village Jyostnamayee under ChandbaliTahasil of Bhadrak District	Director of Light House & Lightships, Ministry of Shipping	Stage-I clearance issued vide No.5-ORB315/2017-BHU dated 12.10.2017 of GoI, MoEF&CC	Stage-II clearance issued vide No.5-ORB315/2017-BHU dated 24.07.2019of GoI, MoEF&CC	Garmal PRF	0.332
					Total:-	**0.332**

2.5 Threats to the Forests: -

Forests have long been threatened by a variety of destructive agents. Today, the frequency, intensity and timing of fire, flood, hurricanes, droughts and insect outbreak are shifting as a result of human activities and global climate change, making forest eco-system even more prone to damage.

2.5.1 Threat to mangrove forests and their habitats: -

i. **Changes in water salinity**- If salinity becomes too high, the mangroves cannot survive. Fresh water decrease can also lead to mangroves drying out. In addition, increased erosion due to land deforestation can massively increase the amount of sediment in rivers.

ii. **Increase demand of wood**- Mangrove trees are used for firewood, construction wood, charcoal and animal fodder and their over harvesting /exploitation are threatening the future of the forest.

iii. **Increase in cattle population**- Although, there is no high forest in this Division except mangroves, there has been threat on the existing mangrove vegetation along the coast of Bay of Bengal and other forests due to substantial increase in the human and cattle population. The burgeoning pressure of demand on forest is steadily increasing day by day.

iv. **Invasive Alien Specie (IAS)-** Also, invasive alien species like ***Prosopis juliflora*** reduces the biodiversity by replacing the *indigenous species* through aggressive growth.

v. **Shrimp Culture**- Another possible threat in the future would be the increasing shrimp farming in artificial ponds by diverting water from the rivers and streams which may affect the natural flow to water to many channels which serves as inland habitat for mangroves.

2.6 Distribution of different forest types: -

2.6.1 The forests of this Division belong to 4B-Tidal Swamp Forests. Mangroves of Bhadrak Division serve as roosting, nesting, feeding, breeding and nursery for several faunal groups and playing a very key role in the estuarine food web. Since food and shelter is plenty in the coast, the number of animals of particular species are also very high. Mangrove plants are the source of rich food for the organisms associated with the mangrove ecosystem. The animals that are associated with the mangroves include a variety of mammals, reptiles, birds,
amphibians, wide variety of fishes, crustaceans, protozoan, zooplanktons &molluscs. These animals meet their food requirement from the leaves, grasses, degraded products of mangrove litter. The degraded product of mangrove litter act as food for detrivores (viz. shrimps, prawns, nematodes, mud skipper, grey-mullets and other crustaceans). Many fish and crab species feed either directly on detritus or on detrivores. Most of the wildlife which find places in the higher order of biological pyramid feed on the lower order animals thereby maintaining the food web.

2.7 Tree cover outside forest area

Trees outside forests, together with forests and other woodlands play on essential role in solving important problems of rural and urban population. They contribute to the structure of the land scape, generate numerous environmental and social service and yield important

food products for the people and for meeting other domestic needs. People however are not fully benefiting from these important sites because trees outside forest are neither well perceived nor well documented and receive little attention in the formulation of National Forest Policy and Planning. The concept and role of trees outside forests have now been explored and the challenges in promoting the habitat have been properly visualized with appropriate site-specific management plan suitable to the locality.

Several plantation Programmes have been undertaken under different schemes like National Afforestation Programme, Central Plan, State Plan, MGNREGS, OFSDP, Avenue Plantation, Urban Plantation by this Division. The list of such plantations 2003-04 to 2020-21 is listed in the table below-

Table No. 2.9 Showing abstract of Tree out Side Forest

Sl. No.	Components	Schemes	Work executed in past years
1	Distribution of Seedlings under different schemes	MGNREGS, IGC, OEMF, CAMPA	2705500 nos.
2	Avenue Plantation	MGNREGS, GMM	656 RKm.
3	AR/ANR plantation under different schemes	NAP-FDA, UTP	1515 Ha

2.8 Shifting cultivation (Jhuming): -

No shifting cultivation practice is prevailing in this Division.

CHAPTER -3

MAINTENANCE, CONSERVATION AND ENHANCEMENT OF BIODIVERSITY

3.1 Forest composition and distribution:

There is only one PRF named Garmal PRF, which covers 400.65 Ha. of forest area, out of which 105.692 Ha had been diverted. Apart from PRF, various Un-demarcated Protected Forests are spread throughout the coasts and islands. The mangrove vegetation is covered by *Avicennia alba, Avicennia marina, Avicenniaofficianalis, Acanthus illicifolius, Lumnitzeralittorea, Aegialitis rotundifolia, Exoecariaagallocha, Phoenix Palludosa, Sonneratia apetala, Sonneratiacaseolaris, Derris scandens, Ceriopsdecandra, Kandeliacandel, Aegicerascorniculatum, etc w*hich are commonly distributed. Most part is impenetrable and provides congenial niche for many wildlife. Along the river bank the vegetation is also luxuriant and quite expensive. The dominant species are *Avicennia alba* and *Sonneratia apetala* and commonly found shrubs are *Ceriopesdecandra, Kandeliacandel, Agicerascorniculatum and cynometraiiripa.*

The composition and distribution of mangrove vegetation is mainly influenced by the salinity of water, the duration and frequency of tidal inundation they receive, degree of constant supply of fresh water, erosion and accretion of land which is a regular phenomenon in this area, Along the fringes of creeks and channels the tree species are most luxuriant. The water channels are mostly silted, which demands proper management to ensure tidal inundation.

The vegetation of the area has the typical littoral and tidal swamp character. Mangroves are influenced by the river dominated setting where the dominant influence is of fresh water and sedimentary materials from upland catchments and tidal dominated settings towards the sea which often restricts both ariel extent of mangroves and their rate of growth. In this condition, growth rate is reduced due to high salinity. The vegetation also represents conspicuous zonation of pure patches and also mangrove association distributed along the salinity gradient and distance to the water course. The area surrounded by water is well protected whereas the other side of inland area is prone to encroachment with non-forest activities.

Apart from mangroves, Bhadrak Wlidlife Division is comprised of a wide variety of flora and fauna present in various locations such as village forests, community land, surrounding water bodies, etc. The trees outside forest and plantation area under different schemes also contribute to a great extent towards general floristic composition of crop of the district.

There are no forest species available in harvestable girth class in forest blocks because the forest vegetation consists mostly of mangroves.

3.2 Plant species Diversity

3.2.1 All species provide some kind of function to an eco-system. They can capture andstore energy, produce organic material, decompose organic material, help to recycle water and nutrients throughout the eco-system, control erosion or pests, fix atmosphere gases and help regulate climate. The physiological processes are important for ecosystem function and human survival.

Diverse is an eco-system, the better the ability of it to withstand environmental stress and consequently more productive. The lots of species are thus likely to increase the ability of the system to maintain itself or recover from damage or disturbance. Just like a species with high genetic diversity, an eco-system with high biodiversity may have a greater chance of adopting to environment change. In other words, more the species in an eco-system, more stable the ecosystem is.

3.2.2 During the working plan preparation, biodiversity assessment in forms of density, frequency, total basal cover, dominance etc. was assessed in respect of forest blocks of Bhadrak (WL) Division. The components assessed were

a) Frequency

Frequency denotes the homogeneity of distribution of various species in an ecosystem, it was calculated as follows and expressed in percentage.

$$\text{Frequency} = \frac{\text{Total number of quadrates in which species occurred}}{\text{Total number of quadrates studied}}$$

The species which is well distributed and have a chance of being recorded in any part of the ecosystem will have frequency 100 %. While a species which is restricted to certain areas will be encountered in low frequency value.

b) Relative Frequency

Relative frequency is calculated by the following formula.

$$\text{Relative Frequency} = \frac{\text{Frequency of a species}}{\text{Sum of frequency of all the species}} \times 100$$

c) Density

Density is defined as the number of individuals of a species in a unit area and is an expression of the numerical strength of a species in a community. From the sampling data the density was calculated as follows

$$\text{Density} = \frac{\text{Total number of individuals of the species (per quadrate)}}{\text{Total number of quadrates studied}}$$

d) Relative Density

Relative Density (RD) is the study of numerical strength of a species in relation to total number of all species and is calculated as

$$\text{Relative Density} = \frac{\text{Density of a Species}}{\text{Sum of density of all the species}} \times 100$$

e) Basal Area

The average basal area was calculated out of the average diameter of the stem at breast height using the following formulae:

$$\text{Basal area} = \frac{(GBH)^2}{4\pi}$$

f) Relative Dominance

Relative dominance is calculated by the following formula.

$$\text{Relative dominance} = \frac{\text{Total stand basal cover of the species}}{\text{Total stand basal cover of all the species}} \times 100$$

g) Importance Value Index

Importance Value Index provides an overall importance of a species in a community. It is the sum of Relative Density, Relative Basal area and Relative Frequency for each species involved. It is assessed by the following formula:

Importance Value Index = Relative Density (RD) + Relative Frequency (RF) + Relative Dominance (RD)

h) Simpson's Index

A community dominated by one or two species is considered to be less diverse than one in which several different species have a similar abundance. Simpson's Diversity Index is a measure of diversity which takes into account the number of species present, as well as the relative abundance of each species. As species richness and evenness increase, so diversity increases.

$$D = 1 - \left(\frac{\Sigma\, n(n-1)}{N(N-1)} \right)$$

n = the total number of organisms of a particular species

N = the total number of organisms of all species

The value of *D* ranges between 0 and 1. With this index, 1 represents infinite diversity and 0, no diversity.

i) Shanon Weiner Index

The Shannon-Wiener diversity index (H) is a measure of diversity that combines species richness (the number of species in a given area) and their relative abundances. It tells the level of diversity in that particular area, i.e. it is possible to say the diversity is low or high (since H generally ranges between 0 and 5). H also helps to compare diversity between communities within an area/ecosystem and diversity between different areas (e.g. A1 and A2). Species richness, i.e. the number of different species in a quadrat is the most commonly used measure of diversity, but H is strong indicator of diversity.

$$H' = \left(N ln\, N - \sum (n_i ln\, n_i) \right) / N$$

where *N* is the total number of species and *n*i is the number of individuals in species *i*. The Shannon-Weiner index is most sensitive to the number of species in a sample, so it is usually considered to be biased toward measuring species richness.

For the biodiversity assessment, forest areas were roughly divided in to three parts i.e., Garmal PRF, Kanika Island, Other UDPFs. The biodiversity assessment for Garmal PRF and Kanika Island was done through quadrat sampling of 0.1 Ha with 10 and 6 quadrats in Garmal PRF and Kanika Island respectively. The results of biodiversity assessment are given below.

Table 3.1: Biodiversity Assessment of Garmal PRF

Sl No	Plant Species	Total	Frequency	Density	RF	RD	Basal Area/ Tree (cm^2)	Total Basal Area (cm^2)	Relative BA or Relative Dominance	Importance Value Index
1	*Phoenix paludosa*	**150**	70	15	21.88	9.25	324.22	48633	42.15	73.27
2	*Exocoecariaagallocha*	**1029**	70	103	21.88	63.50	21.73	22364.05	19.38	104.76
3	*Aegicerascorniculatum*	**30**	10	3	3.13	1.85	18.48	554.4	0.48	5.46
4	*Avicennia marina*	**175**	30	17.5	9.38	10.79	122.78	21,487	18.62	38.79
5	*Avicennia alba*	**170**	30	17	9.38	10.48	121.12	20,591	17.85	37.70
6	*Avicennia officinalis*	**25**	10	2.5	3.13	1.54	32.88	822	0.71	5.38
7	*Kandeliacandel*	**32**	30	3.2	9.38	1.97	18.48	591.36	0.51	11.86
8	*Sonneratiaapelata*	**2**	20	0.2	6.25	0.12	73.93	147.86	0.13	6.50
9	*Ceriopsdecandra*	**1**	10	0.1	3.13	0.06	8.21	8.21	0.01	3.19
10	*Casuarina*	**4**	30	0.4	9.38	0.25	22.08	88.3	0.08	9.70
11	*Habali*	**3**	10	0.3	3.13	0.18	32.88	98.64	0.09	3.40
		1621	320	162.2	100	100		115385.8	100	

1. Simpson's Diversity Index, 1–D = 0.565
2. Shanon Weiner Index, H = 1.241

Table 3.2: Biodiversity Assessment of Kanika Island

Sl No	Plant Species	Total	Frequency	Density	RF	RD	Basal Area/ Tree (cm^2)	Total Basal Area (cm^2)	Relative BA or Relative Dominance	Importance Value Index
1	*Acanthus ilicifolius*	**80**	0.166	13.3	4.55	9.31	50.375	4030	12.83	73.27
2	*Avicennia alba*	**31**	0.666	5.17	13.6	3.61	286.77	8890	28.34	45.59
3	*Avicennia marina*	**662**	0.666	110.33	18.18	77.07	15	9930	31.66	126.91

4	*Avicenniaoffici analis*	**2**	0.166	0.33	4.55	0.23	135	270	0.85	5.63
5	*Derris scandens*	**18**	0.333	3	9.09	2.1	6.11	110	0.35	11.53
6	*Excoecariaaga llocha*	**4**	0.333	0.66	9.09	0.47	252.5	1010	3.22	12.78
7	*Hibiscus tiliaceus*	**5**	0.333	0.83	9.09	0.58	160	800	2.54	12.21
8	*Ipomea pes-capreae*	**21**	0.166	3.5	4.55	2.44	0.48	10	0.01	7.01
9	*Pongamia pinnata*	**6**	0.333	1	9.09	0.70	423.33	2540	8.10	17.89
10	*Prosopis juliflora*	**1**	0.166	0.16	4.55	0.23	1960	1960	6.25	11.03
11	*Sesuviumport - ulacastrum*	**22**	0.166	3.66	4.55	2.56	0.909	20	0.06	7.16
12	*Thespesia populnea*	**6**	0.333	1	9.0	0.7	303.33	1820	5.79	15.58
		859	3.661	142. 94	100	100		31,370	100	
1. Simpson's Diversity Index, 1–D = 0.393 2. Shanon Weiner Index, H = 0.954										

In Garmal PRF, *Excoecariaagallocha* was the dominant species followed by *Phoenix palludosa* and *Avicennia marina* whereas in Kanika Island, *Avicennia marina* and *Avicennia alba* are the dominant tree species. Garmal PRF has Simpson's Diversity Index value of 0.565 whereas Kanika Island has 0.393. Hence, it can be deduced that Garmal PRF is more diverse than Kanika Island with respect to biodiversity.

In other UDPFs, as per sample plots data provided to NRSC, *Avicennia marina* is the dominant species with most presence. Other mangrove species are significantly absent. In the sample plots data, the trees are wrongly mentioned as *Avicennia officianalis* since the staffs used the local name 'bani' for identification and it was mentioned as *Avicenniaofficianalis* in the application. But, *Avicennia officianalis* is absent in other UDPFs and only *Avicennia marina* is present.

3.2.3. For overall biodiversity assessment of Bhadrak Wildlife Division, the PBR was prepared. According to People's Biodiversity Register, the landscape and waterscape include agricultural land, fallow lands, marshy land, swamps, riverine tracts, creeks, estuary, oceans and ponds and it sustains wide array of biodiversity. Bhadrak Wildlife Division is comprised of 92 species of herbs, 34 species of shrubs, 27 species of climbers and more than 150 species of trees. Bhadrak Wildlife Division is not an exception when it comes to areas affected by invasive alien species.

There are more than 60 invasive alien species affecting land, coastal, riverine and water habitats.

In agricultural biodiversity, various varieties of *Oryza sativa, Vigna radiata, Vigno mungo, Brassica nigra and Helianthus annu*us are the main crops, which are accompanied by various fruit varieties and fodder crops. (Format 2 &3 of Annexure XVIII). Agricultural diversity is affected by 16 species of weeds which includes nut grass, pig weed, finger grass, devil's horsewhip, chick weed, etc and 14 species of pests spotted in agricultural lands. (Format 4 & 5 of Annexure XVIII). 17 species of fish are raised in aquaculture ponds along with shrimp farming.

In forest biodiversity, coastal flora and fauna play an important role since the forest blocks are mostly adjoining sea coasts. Few species are abundant in occurrence whereas few others are rare to be spotted*. Avicennia alba, Avicennia marina, Avicenniaofficianalis, Sonneratia apetala, Sonneratiacaseolaris, Kandeliacandel, Excoecariaagallocha, Acanthus ilicifolius*, *Phoenix palludosa*, etc are plentily available from riverine tracts, seas coasts to islands. Whereas, *Rhizophora mucronata, Lumnitzeralittorea, Heritierakanikensis, Heritiera fomes* are rarely available. One tree of *Lumnitzeralittorea* was spotted in Kanika Island on the beach, but not anywhere else. Similarly, one tree of *Heritierakanikensis* is present in Chandbali range. Mangrove halophytes include *Myriostachyawightiana, Suaeda maritima, Sesuviumportulacastrum, Porteresiacoarctata, Ipomea pes-capreae*. Apart from mangroves, **back mangals** or **mangrove associates**also inhabit forest areas, which includes *Pongamia pinnata, Thespesia populnea, Hibiscus tiliaceus, Dolichondronspathaceae, etc.*

Apart from mangroves, other species are distributed over the entire Division. More than 23 species of fruit trees, 51 species of medicinal plants, few ornamental species are present.

3.3. Status of biodiversity conservation in forests: -

3.3.1 Plant Biodiversity Register (PBR)-

For conservation of bio-diversity, Biodiversity Act 2002 has been enacted with an aim to provide conservation of biological diversity and sustainable use of its components & equitable sharing of benefits arising their form.

This Act creates a three-tier structure of authorities to manage the biodiversity of the country. This includes National Biodiversity Authority (NBA), the State Biodiversity Board of State level and the Bio-diversity Management Committees of Regional Level.

Odisha Biodiversity Board is authorized to implement the legal provisions of Biological Diversity Act 2002 in the State. To conserve the biological resources of the State, Odisha

Biological Diversity Rules were made by the State Government in 2012. As per Section 41 of the Act, the local bodies shall constitute a Biodiversity Management Committee at GP, Block, District, Urban areas like Municipal Corporation and District Level.

As per Rules 21 of the OBD Rules 2012 BMCs shall prepare People's Biodiversity Registers at all the local bodies level. The BMCs have the power and responsibilities to protect and conserve the native biodiversity in their respective jurisdiction and they can levy charges on any companies, traders and manufactures against the commercial collection of bioresources under Acess and Benefit Sharing Agreement (ABS) fees which is 3 to 5% of the exfactory grass sale of the total value of the bioresources. This ABS fees shall be utilized for protection conservation and restoration of native biodiversity and the money shall be kept in a joint account named Local Biodiversity Fund (LBF).

The PBRs shall consists of detailed information on local biological resources and it's associated traditional knowledge including flora fauna and agricultural diversity of the local areas for monitoring and evaluation.

People's Biodiversity Register has to be prepared for each Gram Panchayat, which should include biodiversity survey, socio-economic survey in various formats such as agricultural crops, weeds, fruit trees, timber trees, fodder plants, medicinal plants, coastal and marine flora and fauna, landscape, waterscape, seascape, types of communities and their livelihood based on biodiversity, etc. The survey was completed in Bhadrak Wildlife Division by the division staffs in 2020. A compiled PBR (People's Biodiversity Register) has been attached in Annexure XVIII.

Biodiversity is the biological diversity which includes the variety of the whole species present on earth. It includes animals, plants, micro-organism and their genes, water eco-system, terrestrial and marine eco-systems in which they are all present.

Biodiversity is necessary for our existence as well as valuable in its own right. This is because it provides the fundamental building blocks for the many goods and services which provides a healthy environment to lead our life.

Biodiversity includes fundamental thing to our health like fresh water, clean air and food products as well as the many other products such as timber and fiber. It also includes various other important things and services such as cultural recreational, and spiritual nourishment that play an important role in maintaining our personal life as well as social life. Biodiversity conservation is managed through following methods

1. Planting indigenous and mixed species in forest areas.

2. Formation of Vana Surakhya Samitis and Eco Development Committees in protecting the biodiversity.
3. Protection duty by staffs in forest blocks to prevent illicit felling, poaching, smulline, etc.
4. Agro forestry through distribution of saplings of different species.
5. Encouraging medicinal use of plants so as to conserve bio-diversity.

3.3.2 The special objectives of management to address biodiversity conservation are:

i. To improve cover and food value of forests.
ii. To create favorable condition for wildlife.
iii. To develop the forest blocks near villages through rehabilitation and afforestation measures and to create recreation opportunity.
iv. To develop the ground flora and middle storey even in plantation in order to attract more wild animals.
v. To increase population of wild animals by creating favorable conditions for them.
vi. To assess and recommend prescriptions for substance of biodiversity
vii. To identify and map the water resources of the division.

3.4 Status of species prone to over exploitation:

3.4.1 Presently there is no harvesting practice of forest produce in forest blocks. However, harvestable trees planted in Govt. revenue land under various schemes shall be harvested scientifically & keeping in mind of over exploitation followed by replanting the gaps and usufruct rights of Vana Surakhya Samiti members of villages. This will be in such manner and at such rate that it will not lead to the long-term decline of the biological diversity thereby maintaining its potential to meet the needs and aspirations of present and future generations, fair and equitable sharing of the benefits arising out of use of biological resources.

3.5 Conservation of genetic resources:

3.5.1 Prescription shall be made for research studies with the help of research organizations on preservation plots, sample plots, medicinal plants conservation areas, community conservation areas, etc. for genetic diversity and documented for monitoring as far as possible especially for NTFPs including MAPs.

3.6 Fauna and their habitats: -

3.6.1 The faunal diversity of Bhadrak (WL) Division can be broadly classified into two major groups i.e., vertebrates and invertebrates. The vertebrate fauna includes fish, reptiles, amphibians, aves and mammals. The invertebrate fauna includes micro fauna and macro fauna. The faunal diversity was also assessed during preparation of People's Biodiversity Register.

Major fauna includes *Lepidochelys olivaceae* (Olive Ridley Turtles) and *Crocodylusporosus* (Salt water crocodiles). Olive Ridleys are present in Gahirmatha sanctuary of Rajnagar Wildlife Division and adjoining waters of Bhadrak Wildlife Division. The nesting site is Dr. Abdul Kalam Island in Bhadrak district, where 3–4 lakh turtles arrive for arribada or mass nesting every year. Another major fauna includes the salt water crocodiles, which inhabit Baitarini and Mantei rivers. As of 2021 census, 62 crocodiles are counted which has increased from 17 in 2010. In Agarpada section of Bhadrak WL range, elephants from Hadagarh sanctuary of Kendujhar Wildlife Division, visit 3 villages (Patakana, Routraypur and Mohantypada) for 5 months in a year (April–August). Apart from these three, there are 16 marine shell species, 63 estuarine fish species, more than 12 species of amphibians, more than 27 species of reptiles, more than 65 species of birds and 8 mammalian species.

3.7 Threatsand challenges towildlife:

3.7.1 Threats to Wildlife in the mangrove system are manifold. It can be broadly classified into two categories.

Human induced threats viz. poaching, disturbance to habitat, teasing of animals, Illegal fishing, encroachment, illicit felling, transmission of disease, Grazing, use of pesticides, chemical discharges, bunding of creeks, growth of Industries in the periphery and natural calamity like drought, flood, cyclone, beach erosion, changes in landscape etc. Main impacts of those threats are given below.

- Degradation, fragmentation and loss of habitat.
- Spreading of invasive weeds.
- Unsustainable use of natural resources
- Change of climate.
- Changes within aquatic environment and water flows.

3.7.2 Man-animal conflict

It is a rare phenomenon in this division. However, some man-crocodile and man-elephant conflict have been recorded in past few years. This management issue is beingaddressed through approaches such as training the staffs to handle such situations. Also, awareness among people is very much needed to handle these situations.

3.8 Protection and management of fauna:

3.8.1 Even though there are dedicatedstaff for protection/management of the wild fauna, the intervention at present is limited to patrolling the area during turtle migration season. Olive Ridley sea turtles arrive in the small islands like Babubali island, Wheeler Island, Coconut Island etc. and the sea coast in 2nd half of October every year. They mate in shallow waters and wait for right weather and proper beach to lay their eggs. Mass nesting takes place between February to April. The eggs hatch approximately 50 days after the nesting and the hatchlings go back to the sea during the month of April/May.

3.8.2 During this period, patrolling is organized by the Division with help of government trawlers and hired trawlers to prevent unauthorized entry of fishing vessels. Indian Coast Guard also carries out its own patrolling and at times joint patrolling is carried out. Illegal fishing vessels when apprehended are prosecuted under Wildlife (Protection) Act, 1972. Onshore and offshore camps are established to monitor turtle mortality, movement of illegal fishing vessels and organizing movement into the sanctuary area. These camps are mostly manned by daily waged workers from the local community. Movement pattern of turtle congregation is monitored in the water during the course of patrolling. The beach is monitored and suitable sites for nesting are cleared of debris. At the time of mass nesting, census of nesting turtles are carried out scientifically and the number is estimated. Steps are taken to prevent damage of eggs by dogs, wild animals like jackals and wild boars. At the time of hatching, steps are taken to prevent mortality by seagulls, crows etc. and if required the hatchlings are helped manually to enter into the sea. During the time of nesting and hatching, lights on the seaward side are switched off by DRDO authorities.

3.8.3. Also, wildlife protection squad along with vehicles and equipment are deployed for elephant anti-depredation in Agarpada section of Bhadrak WL Range for 5 months in a year from April to August. Also, awareness meetings are conducted with the villagers of Patakana,

Routraypur and Mohantypada about the importance of keystone pachyderm species and its conservation. Also, as entry point activities, solar lamps and challahs are distributed among the households.

3.8.4 Rescue of Wild animals-

Wild animals suffer from injuries and sickness, and are also found in orphaned state. Such animals would otherwise perish if their rescue and rehabilitation is not provided. In urban areas, depleting natural habitat, unavailability of prey and urban expansion cause wild animals such as common leopards, small mammals and many bird species to venture into human settlements. In such cases, wild animals are at risk of being injured and killed, and may also pose threat to humans. Similarly, in the buffer zones around protected areas, wild animals frequently enter human settlements requiring rescue operations almost on a daily basis. Successful rescue operations need timely response executed by a well-equipped and organized team, and rescues may need to be executed at any time of the day. Rehabilitating rescued animals with optimum treatment and care, and keeping them in nurturing captive environment ensures such wild animals recover and survive after their safe release in their natural habitat. The rescue of Wild animals of past ten years of this division is given in the table below:-

Table No. 3.3 Showing Range wise data of rescue of wild animals

Year	Name of the Range	Name of the Species	No. of animals Rescued
2011-12	Bhadrak (WL)	Monkey	2
	Chandbali (WL)	Monkey	4
	Dhamnagar (WL)	Monkey	1
	Basudevpur (WL)	Monkey	1
2012-13	Bhadrak (WL)	Cobra	5
	Chandbali (WL)	Cobra Monkey	8 1
	Dhamnagar (WL)	Monkey Cobra	2 4
	Basudevpur (WL)	Monkey Cobra	2 8
2013-14	Bhadrak (WL)	Cobra	10
	Chandbali (WL)	Monkey	1
	Dhamnagar (WL)	Monkey	1
	Basudevpur (WL)	Cobra Monkey	2 1
2014-15	Bhadrak (WL)	Cobra Monkey	6 2
	Chandbali (WL)	Monkey	1

	Dhamnagar (WL)	Monkey	3
	Basudevpur (WL)	Cobra Monkey	7 1
2015-16	Bhadrak (WL)	Cobra	4
	Chandbali (WL)	Monkey	2
	Dhamnagar (WL)	Monkey	6
	Basudevpur (WL)	Cobra Monkey	5 2
2016-17	Bhadrak (WL)	0	0
	Chandbali (WL)	Monkey	1
	Dhamnagar (WL)	Monkey	6
	Basudevpur (WL)	Cobra	5
2017-18	Bhadrak (WL)	Black Faced Ape (Presbytis piluatus) Honey Badger Small Indian Civet Sambar Monkey Saliapatini	1 1 1 1 1 2
	Chandbali (WL)	Crocodile	1
	Dhamnagar (WL)	Monkey Python	5 1
	Basudevpur (WL)	Monkey Chandramani Boda Snake Cobra	2 1 1
2018-19	Bhadrak (WL)	Monkey Cobra Chandra Boda Rana	2 7 1 2
	Chandbali (WL)	0	0
	Dhamnagar (WL)	Cobra Snake Krait Snake Monkey Eagle	65 06 04 01
	Basudevpur (WL)	Monkey Cobra Chandra Boda Snake	07 11 01
2019-20	Bhadrak (WL)	0	0
	Chandbali (WL)	Monkey	1
	Dhamnagar (WL)	Monkey	4
	Basudevpur (WL)	Cobra Monkey	12 3
2020-21	Bhadrak (WL)	0	0
	Chandbali (WL)	0	0

	Dhamnagar (WL)	Cobra Monkey	2 4
	Basudevpur (WL)	Cobra Monkey	8 4

CHAPTER - 4

MAINTENANCE AND ENVIRONMENT OF FOREST HEALTH AND VITALITY

4.1 Status of regeneration: -

4.1.1 The deforestation is still continuing and takes a heavy toll of forest wealth. This not only affects the forests but the wildlife and the whole eco-system also. Deforestation is on alarming rate despite all conservation and protection measures. The regeneration is basically devised into two categories i.e., natural and artificial.

For carrying out artificial regeneration there are some preliminary considerations which are urgently needed. The following are the basic steps in artificial regeneration:

(1) Choice of species.

(2) Choice of method like showing, planting.

(3) Site selection

The artificial regeneration by vegetative method includes cuttings, stumps, root-suckers. Since Bhadrak (WL) Division has only one PRF covering 294.958 Ha. of area having mangrove vegetation, there is very little scope for plantation programme in forest area. However, each year substantial no of seedlings raised in the nursery were distributed with nominal price and even free of cost on many occasions for plantation programme in Govt. land as well as private land. Avenue Plantation and Urban Plantation have also been raised under various schemes as per the availability and feasibility of the site. Plantation programme along the side of the railway line is going to be executed very shortly by this Division.

As regards natural regeneration, it is noticed that the mangrove species like *Exoecaria, agallochha, Phoenix palludosa, Herteriafoames, Avicennia officinalis, Derris scandens* available in Garmal PRF show tendency of natural regeneration which need to be well protected. The data on population dynamics of seedlings, saplings and young trees shall be collected during plan period to monitor the status periodically and find out the conditions in which species regenerate best. Depending upon the status of regeneration, reserve plots for regeneration study may be provided and maintained regularly.

4.2 Area affected by forest fire: -

4.2.1 There is no evidence of forest fire in Bhadrak (WL) Division.

4.3 Area damaged by natural calamities: -

4.3.1 Among the major disasters in the district, flood is the most frequent and devastating over last 10 years. The district has faced 8 floods in last 10 years which leads to death of 53 parsons and loss of infrastructure, livestock and crop. Major floods in Bhadrak district occur due to heavy rainfall in catchments of Baitarani River, heavy siltation, absence of embankments and sometime poor discharge of flood water in to the sea which leads to breach of embankments. Though the district has not faced any major cyclone over the period of last 10 years, the entire district is highly vulnerable to cyclone as the entire district is coming under very high damage risk Zone-B (Vb-50m/s) and its presence in east coast of Bay of Bengal. The proneness of district to cyclone can be witnessed from severe damage caused by 1999 cyclone to all ULBs and villages. Among other disasters to which district are vulnerable are drought, heat wave, Tsunami, Thunder Storm/Lightening, snake bite, drowning and fire accident. The district has faced 3droughts which led to loss and damage of 45364.31 hectare of crop area. Around 100 and 22 people have lost their life due to lightening and heat wave respectively in last 10 years. Within last two years,80 peoples have lost their life due to drowning and 70 have lost their life due to snake bite. 17 numbers of villages of Basudevpurand 24 numbers of villages of Chandbali block are vulnerable to Tsunami.

4.3.2 Vulnerability Index: To know the relative proneness of 7 blocks to different disasters like Cyclone, Flood and Tsunami, the vulnerability index has been calculated taking physical and socio-economic parameters. The parameters taken for above 3 disasters are different depending on the nature of disaster. The vulnerability index value in respect of each parameter has been calculated using the following formula.

$$\text{Index Value} = \frac{\text{Actual Value - Minimum Value}}{\text{Maximum Value -Minimum Value}} \times 100$$

The individual numeric index value indicates the relative proneness of the block to the disaster in respect of particular parameter. The average vulnerability index (V) so calculated taking all the index values has been sorted in ascending order to find out the ranking of blocks from maximum to least proneness to the particular disaster.

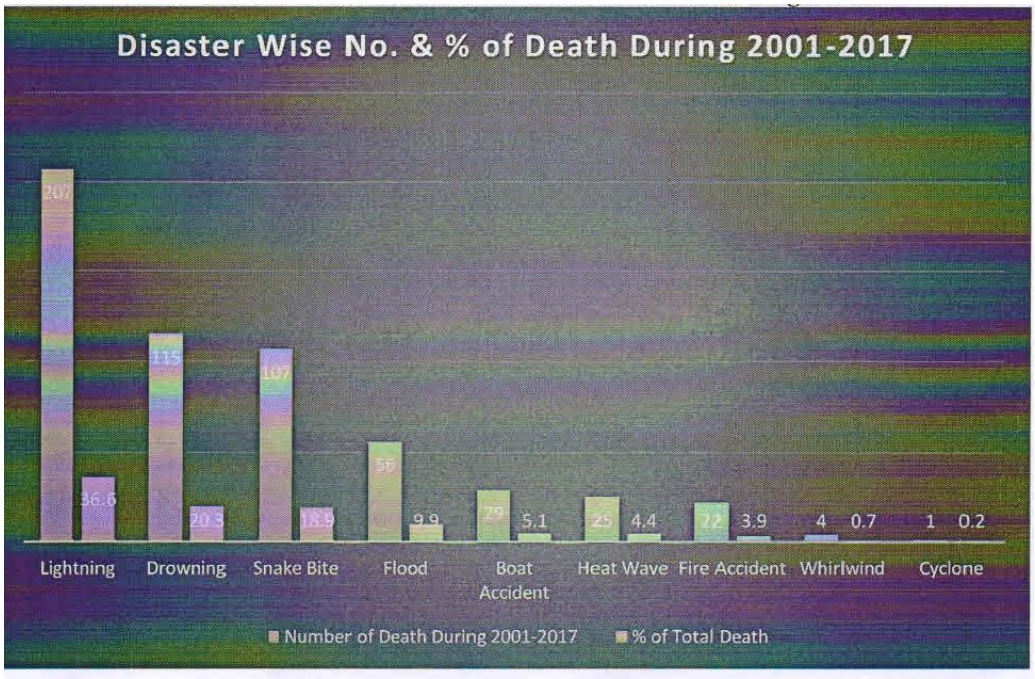
4.3.3 Major Disasters/ Incidents during 2007-2016

A brief profile of major disaster of this division from the year 2007 to 2016 is listed below-

Table 4.1: Major disasters in Bhadrak district from 2007 to 2016							
Sl. No.	Disaster/ Incident	No. of incidences	No. Of Deaths	Affected Population	Live stock Loss	Houses Damaged	Damage and loss of crop Area (in ha)
1	Flood	8	43	3071945	6	27133	187279
2	Drought	4	0	434698	0	0	45156.6
3	Fire	4409	20	0	57	5938	0
4	Cyclone	1	1	145000	0	0	0
5	Lightning	96	120	126	0	0	0
6	Heat wave	13	13	0	0	0	0
7	Boat Accidents (Other than during flood	1	2	0	0	0	0
8	Drowning (Other than during flood)	60	60	60	0	0	0
9	Snake bite (other than during flood)	26	26	26	0	0	0
10	Road accident	532	303	884	0	0	0
Source- District Adminstartion, Bhadrak							

4.3.4 Death Analysis Due to Different Disasters

By analyzing number of deaths in Bhadrak District during the period 2001 to 2017 due to different disasters, it was found that a total 566 number of people have lost their life due to different disasters. Out of total deaths, 207, 115 and 107 have lost their life due to lightning, drowning and snake bite respectively. In terms of percentage 36.6%, 20.3% and 18.9% of person have lost their life dueto lightning, drowning and snake bite respectively.



4.4 Area protected from grazing: -

There are about 150 villages along the cost. These villages obviously have huge livestock population which depends on mangrove forests and forest land in the absence of any pasture land. The livestock population of Bhadrak district as per 2012 census is furnished below: -

Table No 4.2: Livestock population in Bhadrak District as per 2012 census

Sl. No	Category	Number	Vaccination till date		
			HSV	BQV	FMDV
1	Cattle	4,85,138	2,50,200 Nos.	1,78,700 Nos.	1,67,900 Nos.
2	Buffalo	4932			
			PPR	ENT	GPV
3	Sheep	1945	31,300 Nos.	6,500 Nos.	19000 Nos.
4	Goat	1,44,109			
5	Poultry	R.D. Vaccine 56,000 Nos.			
Source: - C.D.V.O, Bhadrak					

4.5 Lopping practices: -

4.5.1 There is no incidence of lopping practices prevailing in this division.

4.6 Area infested by invasive weed species in forests: -

4.6.1 There is no such report regarding invasion of weeds in forest areas of this division. However, weeds like lantana camera Eupatorium odoratum is present in this division.

4.7 Incidence of pests and diseases: -

4.7.1 There is no such information on pest and diseases attack. However necessary details of pests and diseases on forest will be provided if noticed during field exercise.

4.8 Forest degradation and its drivers: -

i. **Changes in water salinity**- If salinity becomes too high, the mangroves cannot survive. Fresh water decrease can also lead to mangroves drying out. In addition, increased erosion due to land deforestation can massively increase the amount of sediment in rivers.

ii. **Increase demand of wood**- Mangrove trees are used for firewood, construction wood, charcoal and animal fodder and their over harvesting /exploitation are threatening the future of the forest.

iii. **Increase in cattle population**- Although, there is no high forest in this Division except mangroves, there has been threat on the existing mangrove vegetation along the coast of Bay of Bengal and other forests due to substantial increase in the human and cattle population. The burgeoning pressure of demand on forest is steadily increasing day by day.

iv. **Invasive Alien Specie (IAS)-** Also, invasive alien species like ***Prosopis juliflora*** reduces the biodiversity by replacing the *indigenous species* through aggressive growth.

v. **Shrimp Culture**- Another possible threat in the future would be the increasing shrimp farming in artificial ponds by diverting water from the rivers and streams which may affect the natural flow to water to many channels which serves as inland habitat for mangroves.

4.9 Pollution Control and protection of environment: -

There are no reports of forest land degradation in Bhadrak WL Division due to pollution (Soil, Water or Air). However, the long-term impact of presence of ports and dredging in Baitarini River Mouth on the mangroves in Kanika Island and Garmal PRF need to be studied.

CHAPTER-5

CONSERVATION AND MAINTENANCE OF SOIL AND WATER RESOURCES

5.1 Area treated under soil and water conservation measures:

5.1.1 The soil of the district falls under red laterite, deltaic alluvial and saline and seem tobe heterogenic in colour, texture and exhibits other physio chemical characters. Soils are mostly loamy and heavy clay type. PH of the soil Ranges from 5.2 to 8.0. Based on the soil test results it is observed that most of the soils of Bhadrak district is acidic. The soils of the district can be divided into following classes: -

(1) Alluvial soil: - It is formed out of soil deposited by flood water. The soil is mostly marked on the river side of Salandi, Kansabansa, Baitarani, Reba and Kapali. Clay and organic matter are the main content of this type of soil as extremely fertile corps like paddy, sugarcane, jute, pulses, oil seed, vegetables and species are grown on this soil.

(2) Sandy and sandy loam: - The sandy and sandy loamy soil is found in a sporadic manner towards the north adjacent to Balasore district. The soil is suitable for cultivation of mustard, mung, biri, ground nut and vegitables.

(3) Saline soil: - It occurs mostly in the low-lying areas near the sea and confined to major parts of Basudevpur, Chandbali, Tihidi and some parts of Dhamnagar Block. The PH of the soil ranges from 5.2 to 8.0. The soil contents high percentage of salts and is therefore unsuitable for cultivation. Only when salinity is washed out by sweet water and floods both high yielding variety and some local varieties of paddy and grown. Accordingly, to local terms these soils may be divided into four classes in the light of their composition. They are Matala or Clay soil, Dorosa or loamy soil, Balia or Sandy soil.

5.1.2 Soil Moisture Conservation-

Bhadrak receives showers from South West Monsoons as well as rainfall due to depressions in Bay of Bengal. It could be noticed from Soil Moisture Map of Odisha **Fig: 5.1** of that while the soil moisture does not change significantly in the month of December compared to July when there is less rainfall. Also, Bhadrak District is a water-logged area with agriculture and prawn cultivation as the mainland occupation. Typical soil moisture conservation activities such as Loose Boulder Check Dams, Graded Bunds, Earthen Dams, Trenches, Pits cannot be done due to unsuitability of the terrain.

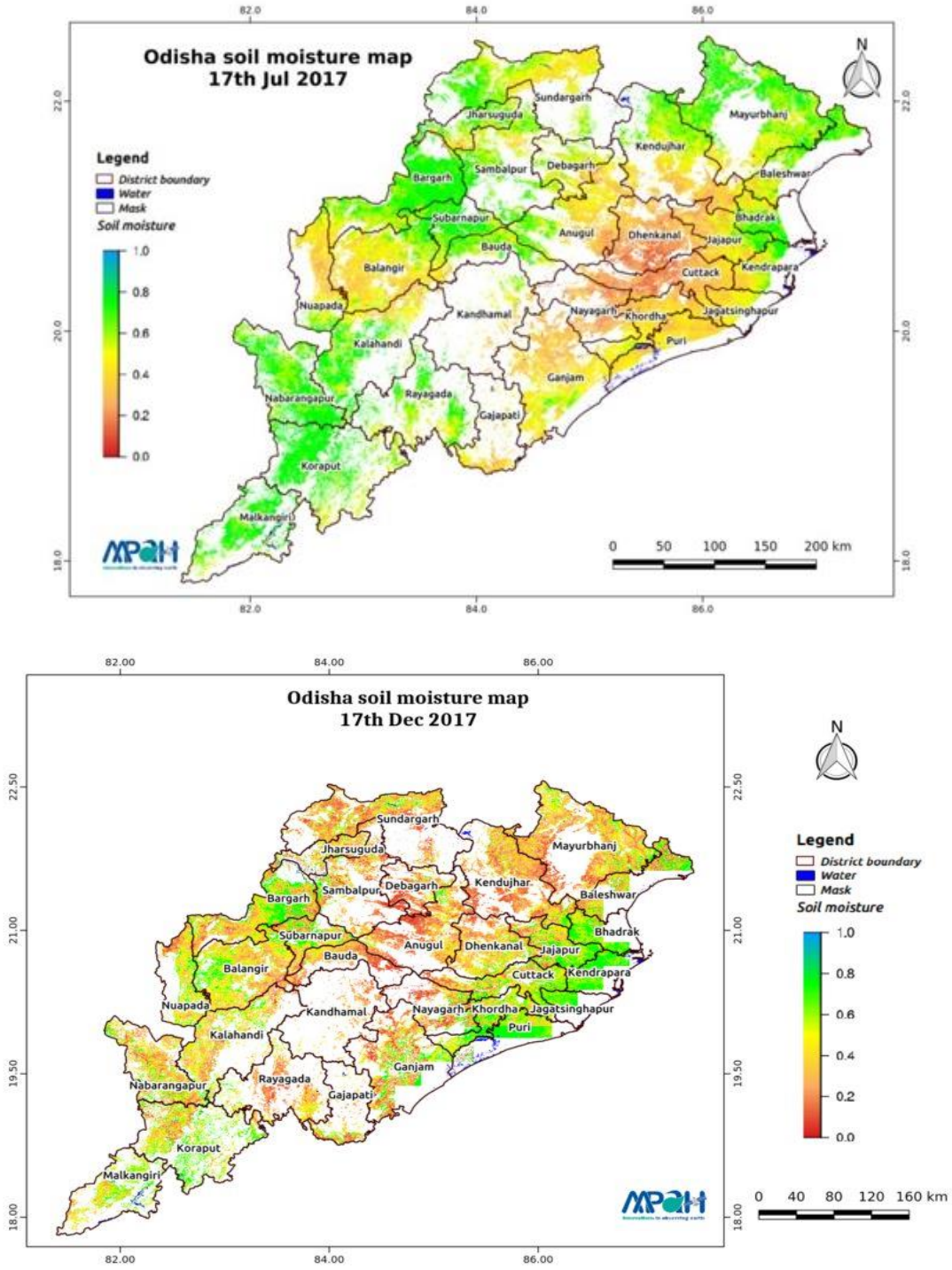


Figure-5.1 (Odisha soil moisture map)

5.2. Duration of water flow in the selected seasonal streams: -

5.2.1. Being a coastal district lying between the Bay of Bengal and the north-eastern corner of the Deccan plateau, the climate of this district is characterized by lesser extremes of temperature and high humidity all the year around. The winter reason December to February is followed by the hot season from March to May. During summer the mean daily maximum temperature is 36.4^{0}C and the mean daily minimum temperature is 24.6$^{0'}$C. During winter the mean daily maximum temperature is about 27 $^{0'}$C and the mean daily minimum

temperature is about 14.0^0 C. The highest maximum temperature ever recorded at Chandbali was $46.7^{0''}$C on 12 June 1942. The lowest minimum temperature ever recorded at Chandbali was 5.1^0C on 14 January 1989. The period from June to September constitutes the southwest monsoon season. October and November constitute the post-monsoon season.

The avenge annual rainfall in the district is 1427.9 mm. In general, rainfall decreases by the coastal region towards the interior. Considering the district as a whole, August is the month with the heaviest rainfall. About 71% of the annual rainfall is received during southwest monsoon months, i.e., dune to September.

The district is directly on the tracks of most of the cyclonic storms and depressions which form in the head of the Bay of Bengal in the monsoon season and cross the Odisha coast. These cause widespread heavy rain and strong winds. A few of the storms and depressions in the post monsoon season also affects the district.

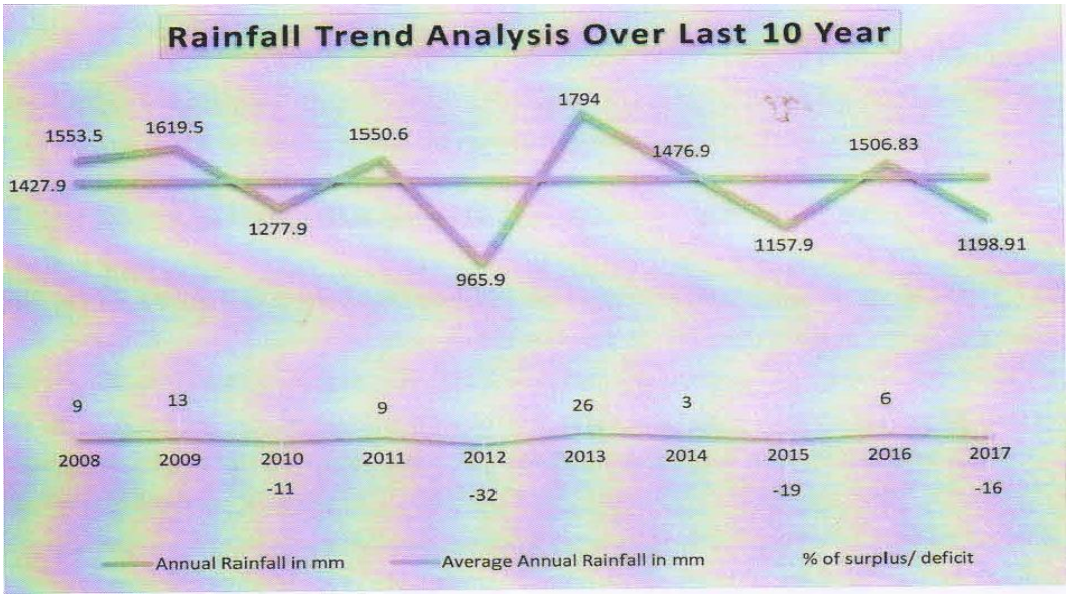


Figure-5.2 map (Rainfall trend analysis for last 10 years)

5.2.2River System:

All the rivers have their source inside the State and thus they are mid streams and short streams. The main Rivers of the District are 1) Baitarani, 2) Salandi, 3) Garnei, 4) Kansbans, 5) Mantei,6) Kochila, 7) Genguti, 8) Reba, 9) Kapali. The river system in the district is classified mainly into two categories i.e. (i) Baitarini River System & (ii) Salandi River System. The main distributary rivers of Baitarini are Genguti & Kochila but Reba, Kapali & Mantei are the

tributaries of Salandi.

Baitarani

It rises among the hills in the north-west of Kendujhar District and enters Baleshwar near the village Balipur. After flowing in a winding easterly course across the delta where it marks the boundary line between Cuttack and Balesswar it passes by Chandbali and joins its water with the Brahmani. After their confluence the united stream is named Dhamara which meets the sea after 8.05 KM. It is navigable as fas as Olekh, 24.15 KM from its mouth but beyond this point, it is not affected by the tide and is fordable during the hot season. The river is subject to annual heavy floods which travel inland to an average distance of 6.44 KM to 19.32 KM, when it causes considerable damage to the standing crop. A large weir has been constructed across the stream at Akhuapada in order to dam the water during the dry season and supply water to the High-Level Canal between that place and Bhadrak.

Kochila

This is a distributary of river Baitarani and bifurcated from the main river at Ramarakul under Dhamanagar block and after running a length of 10 KMs it merges with river Baitarani at Gandhighat sashan near saanlpur village under Dhamnnagar block.

Genguti

This a distributary of riser Baitarani and is bifurcated from the main river near Anandpur under Keonjhar district and after crossing Dhamanagar and Tihidi block it merges with river Salandi at Nandpur under Chnndabali block.

Reba

Its origin is in Keonjhar District from a place called Muduli Pada in Hatadihi block and after running a length of 76.85 KMs through Bont and Bhadrak block of this district it merges with Genguti River at Bhatasahi under Dhamanagar Block.

Kapali

This river is originated from Palasa under Bont Block and after running a length of 67.30 KMs through Bont and Bhadrak of this district block falls into Reba river at Kasimpur under Dhamanagar block.

Salandi

The Salandi possibly a curruption of Sal Nadi takes its name from the Salforest through which it traverses. It rises on the southern slope of the Meghasani mountain of Mayurbhanj and throughout its upper course is a black-water river with high banks and a bottom of muddy sand. In January, it scarcely exceeds anywhere one meter in depth. Luxuriant vegetation clothes its

banks which at places rise almost to the dignity of cliffs and for kilometers, the river runs through continuous groves of mangoes, palms and bamboos. It has no tide but it is navigable for country boats as high as 9.66 KM (6 miles) from its junction with the Baitarani. Its lower cause breaks up into a network of channels which are interacted with those of the Mantei. Among its tributaries mention may be made of the Raba which joins it before it meets the Baitarani.

Nalia

It ia a distributor of Salandi River and is bifurcated from the main river at village Durgapur under Bhadrak block and after running a length of 18.5 KMs it merges with salandi at Baro under Tihidi block.

Mantei

The Mantei brings down the drainage of the country between the Kansbans and the Salandi and after a tortuous course over a muddy bed and between densely wooded banks, enters the Dhamara near its mouth. This river attains a considerable volume at Charbatia, where it is joined by the Coast canal. It is tidal as far as Rukunadeipur, 12.88 KM east of Bhadrak and is navigable up to that point by country boats.

Gamei

The southern branch of the Kansbans receives the name of Garnei and falls into the sea 9.66 KM south of the latter. Due to the Coast Canal, the river has been silted up with its passage to the sea almost closed. About 4.83 k.m from its mouth is situated the old port of Chudamani, once an important centre of export trade but now an insignificant village. Like the Kansbans, the Gamei is liable to heavy floods but a great part of its flood water runs south-westwards along the old Churaman or Ricketts Canal into the Mantei which drains the country east of Bhadrak.

5.3 Wet lands in forest area: -

The forest blocks notified as PRF and UDPF are all part of Mangrove wetlands.

Table 5.1. List of Mangrove wetlands

1.	Chandbali	Garmal PRF	294.958
UN- DEMARCATED PROTECTED FOREST			
1.	Chandbali/ Basudevpur	Banipahi	2125.51
2.	-do-	Bijayapatana	93.12
3.	Basudevpur	Banijungle	404.69
4.	Chandbali	Outer wheeler	66.72
5.	-do-	Long wheeler	19.24
6.	-do-	Coconut Island	12.85

7.	-do-	Small wheeler	3.90
8.	-do-	Short Island	15.30
9.	-do-	Udabali (new)	485.83
		Total	**3522.118**

5.4 Water level in the well in the vicinity (up to 5 Km) of forest area; -

5.4.1 In this District majority of the population depends on agriculture. The existing irrigation facility is defunct and because of this the most vulnerable section of the society the poor rural folks are still agonizingly, vulnerable to the uncertainties of weather.

A part of northern and western sides of the district i.e., Bhadrak, Bonth, Bhandaripokhariand also part of Basudevpur, Tihidiand Dhamnagarblocks the soil condition is more suitable for installation of community L.I. projects, shallow Cluster projects in depth of (80 to 120 mtr.) in average and 50 mtr. tubewellsin case of Cluster Shallow Tubewells. But in ChandabaliBlock and part of Tihidi and Dhamnagar Block the acquiferzone is 30 to 120 mtr.

5.5 Status of aquifers: -

5.5.1 The area of Chandbali, part of the Tihidi and Dhamangar blocks have aquifer ranging from 30 to 120 mtr. Hence it is not suitable for digging of community Lift Irrigation Project. The area is suitable for deep tube wells having depth beyond 120 mt.

CHAPTER 6

MAINTENANCE AND ENHANCEMENT OF FOREST RESOURCE PRODUCTIVITY

6.1 Growing stock of wood:

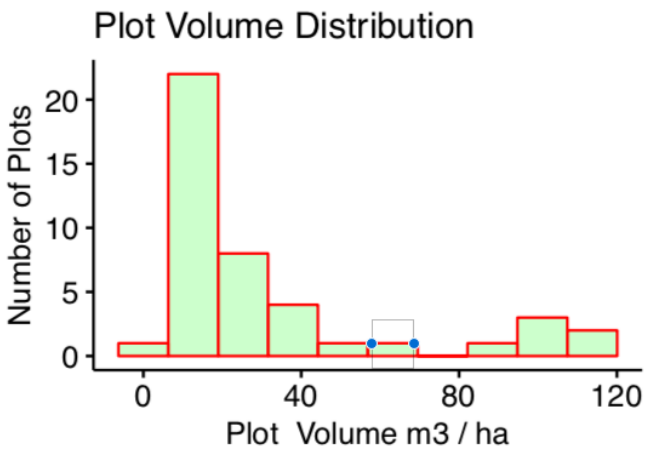
In order to manage the forests scientifically, study of resource utilization and resource growth is essential. It is also essential for the society as well as for the environment. In forest inventory, information on forest growth, condition of stock, composition, drain on resources and changes in stock is collected which forms the basis for preparation of management plan for future forest management and managerial decision for planning, development and monitoring of resources on long term basis. The assessment of changes taking place in a forest cover over a period of time requires periodic or repeated inventory for taking appropriate measure for better forest management.

This division is devoid of good natural forest except Mangrove forests along the coast of Bay of Bengal for quantifying the growing stock of wood.

The Basudevpur Wildlife Range and Chandbali Wildlife Range have Mangrove Forests of this Division. So, the growing stock of Mangrove Forests are given below as per the study conducted by NRSC, Hyderabad-

Table No. 6.1 Stock table (Volume in Cubic meters)

Name of Range	Major species	Girth class in cm					
		30-60	60-90	90-120	120-150	150 or above	Total
Basudevpur	All trees	9001	6041	146	0	0	15188
Chandbali	All trees	8202	25019	1372	0	0	34593
Total							**49781**



Econsps	Mean	SE
Ano lat	0.00	NA
Misc	30.75	0.13
Sho rob	0.00	NA
Ter tom	0.00	NA
Dio mel	0.00	NA

Fig 1: Plot Volume Distribution of Bhdarak WL Division

DENCLASS	SI
40–70	0.245%
10–40	0.178%
<10	0.118%

Status	Plots
No Large Trees	43

	Totals
Trees	0.179
BArea	0.006
Volume	0.029
Area	0.001

Basal area m^2/ha^{-1}
Volume m^3/ha^{-1}
Area ha

Fig 2: Density class, basal area and volume of trees.

6.2 Growing stock of bamboo:

There is no bamboo forest in this Division.

6.3 Increment in volume of identified timber species:

"Increment is the increase in growth, diameter, Basal Area, height, volume, quality or value of individual trees or crops during a given period."

Growth is important because it tells us how much crop is to be harvested or cut, what the condition of the site is and what the comparative efficiency of different species is. Moreover, it is important for making judgments about various silvicultural practices being done or to be done.

Important factors affecting growth in natural forests includes:

- Regeneration density and treatment.
- Spatial distribution.
- Silvicultural treatment.
- Artificial thinning.
- Site condition.
- Climatic condition.

Each year in each growing season, the trees put a new layer on all of its parts (i.e., stem, branches, and roots). In other words, every entity increases its size and volume within a due course of time. However, in Forest management, the interest lies in the growth of diameter, girth, volume and basal Area i.e., the increment.

Mean Annual Increment (MAI)

The MAI (Mean Annual Increment) is the volume of wood growing on one hectare of forest during one year (m^3/ha/year) on an average from the date of establishment of the forest. For a tree plantation, the MAI is the present is total growing stock volume of one hectare divided by the total age. The total age of the natural forest is not known.

Current Annual Increment (CAI)

The CAI is the volume of wood growing on one hectare of forest every year.

When MAI for any species is plotted against its age, a smooth curve results which rise steadily and reaches its highest point. Then it gradually declines but does not drop to zero. When CAI and MAI Curves are drawn, CAI initially remains above MAI and reaches a peak earlier than MAI. The point at which CAI and MAI end each other is called Economic Rotation of the species.

There is no high forest in this division to study the mean annual increment (MAI) of tree species with respect to base year.

6.4 Efforts towards enhancement of forest productivity through quality plantation activities:

6.4.1 Plantations under social forestry have been raised prior to reorganization of the Division and so also afforestation Programme have been taken up under National Afforestation Programme (NAP), Central Plan, State Plan, MGNREGS, OFSDP, Avenue Plantation & Urban Tall

Sapling Plantation. The stock of plantations shall be surveyed over 2% and provision for about 10% of the total forest area will be brought under production forestry by raising quality plantation.

For raising good quality plantation, the following proper planting technique should be adopted: -

(1) Dug a shallow, broad planting hole
(2) Identify the trunk flare.
(3) Place the tree of proper height.
(4) Straighten the tree in the hole.
(5) Fill the hole gently and firmly by applying proper insecticide, fungicide, organic manure, fertilizer etc.
(6) Stake the tree if necessary.
(7) Much the base of the tree.
(8) Provide follow up care.

6.5. Carbon stock: -

6.5.1 Tropical natural forests hold large stores of carbon and biodiversity and are critical formillions of indigenous and local people who depend on forests for their livelihood. However, this carbon is released and the biodiversity is lost when these forests are cleared- otherwise known as deforestation.

6.5.2 The high carbon stock approach is a methodology that distinguishes forest areas for protection from degraded land with low carbon and biodiversity values that may be developed. The methodology was developed with the aim to ensure a practical, trans parent, robust and scientifically credible approach that is widely accepted to implement commitments to halt deforestation in tropics, while ensuring the rights and livelihood of local peoples are respected.

6.5.3 The amount of carbon and biodiversity stored within an area of land varies according to the type of vegetative cover. The HCS approach stratifies the vegetation in an area of land into six different classes using analysis of satellite area and ground survey measurements. These six classes are: - High density forest, medium density forest, Low density forests, young regenerating forest, Scrub and cleared/ open land. The first four classes are considered as potential High Carbon stock forests.

6.5.4 Classification of carbon stock:

In forests enormous carbon is stored which is classified into 5plls by Good Practice Guide of IPCC (Intergovernmental Panel on Climate Change). Both living and dead organic matter of the biomass is classified into two pools each: -

1. Above Ground Biomass.
2. Below Ground Biomass.
3. Dead wood.
4. Litter.
5. Soil organic matter.

Table No. 6.2 Showing Carbon Pools in a Forest

Category	Pools	Description
Living Biomass	Above Ground Biomass	All living biomass above the soil which includes stumps, branches, bark, fruits, flower, seeds and Foliage.
	Below	All living biomass of roots. Fine roots of less.
	Ground Biomass	Then 2mm dia are excluded as they cannot be empirically distinguished from soil organic carbon or litter.
Dead Organic Matter	Deadwood	Includes all non living biomass not include in litter either standing or lying on the ground. Also includes dead wood above 5 cm in diameter.
	Litter	Includes all non living biomass having diameter less than 5cm (FSI), lying dead in various types of Decomposition on ground.
Soil	Soil Organic Matter	Includes organic carbon in mineral and organic Soils in the plot

6.5.4.1 Above Ground Biomass

Estimation of above ground biomass (AGB) has traditionally been based on the use of allometric equations developed for forest trees, using the pan-tropical model by Chave et al. (2014).

Allometric equations for biomass usually include information or trunk diameter at DBH (in cm), total height H (in cm) and wood density p (in g/cm^3).

6.5.4.2 Below Ground Biomass

One of the most common descriptions of the relationship between root (below-ground) and shoot (above-ground) biomass is the root-to-shoot ratio, which has become the standard method for estimating root biomass from the more easily measured shoot biomass. Below ground biomass estimation is much more difficult and time consuming than estimating above ground biomass. Measurements of root biomass are for decades been a major weakness in ecosystem models (Geider et al. 2001). For estimating below-ground biomass Mokany et al. (2006) root-to-shoot ratio model is adopted.

6.5.4.3 Basing on the inventory data obtained from the field the carbon stock assessment has been done by National Remote Sensing Centre, Hyderabad by taking 38 sample points in Basudevpur Range and Chandbali Range. The carbon stock assessment based on NRSC Report is described below-

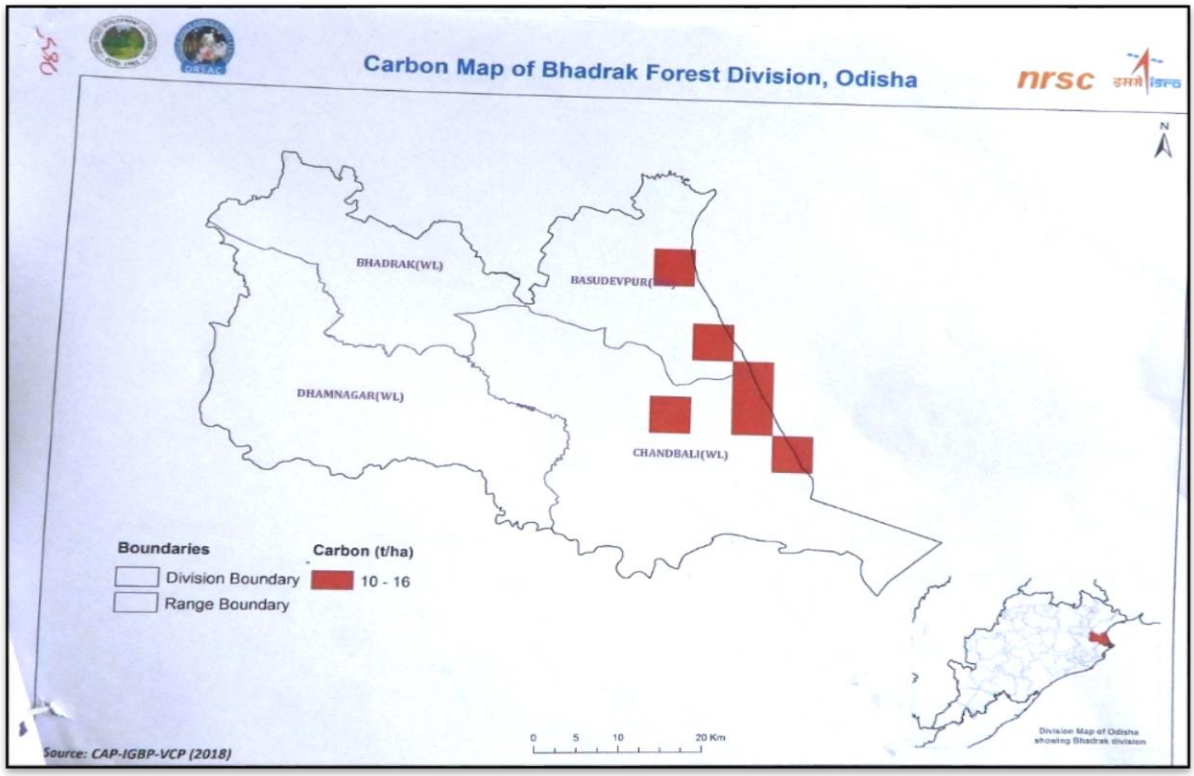


Figure 6.1 Carbon Map of Bhadrak Wildlife Division

From the above map it can be depicted that Bhadrak Wildlife Division has Carbon Stock Range between 10-16 t/ha. So, the total carbon stock of this division can be calculated as below in **table no. 6.3.**

Table No. 6.3 Carbon Stock of Bhadrak WL Division		
Total Forest area in ha	**Carbon stock per unit area in t/ha**	**Total Carbon stock in tonnes**
3577.258	**10-16**	**35772.58 – 57326.128**

Table No.6.4 Forest Block wise carbon stock				
Sl. No.	**Name of PRF/UDPF/ VF**	**Area**	**Carbon stock in t/ha**	**Total Carbon stock in t**
1	Garamal PRF	294.958	10–16	2943–4708.77
2	BanipahiUDPF	2125.51		21255.1–34008.19
3	Bijayapatna UDPF	93.12		931.2–1489.92
4	Bani Jungle UDPF	404.69		4046.9–6475.04
5	Outer Wheeler UDPF	66.72		667.2–1067.52
6	Long Wheeler UDPF	19.24		192.4–307.84
7	Coconut Island UDPF	12.85		128.5–205.6
8	Small Wheeler UDPF	3.90		39.0–62.4
9	Short Island UDPF	15.30		153.0-244.8
10	Udabali (New) UDPF	485.83		4858.3-7773.28
11	ArjunbindhaSanthpur VF	4.00		40.0-64.0
12	BhatapadaGudpal VF	1.04		10.4-16.64

13	Bodakasana VF	10.00		100.0-160.0
14	Aruha VF	0.53		5.30-8.48
15	Kamaria VF	1.98		19.8-31.68
16	Mirzapur VF	0.56		5.60-8.96
17	Deola VF	5.00		50.0-80.0
18	Arjunbindha VF	3.00		30.0-48.0
19	Kabirpur VF	5.00		50.0-80.0
20	Haripur VF	0.68		6.8-10.88
21	Babanbindha VF	5.00		50.0-80.0
22	Amargadia VF	3.68		36.8-58.88
23	Belnta VF	1.00		10.0-16.0
24	Dianary VF	1.84		18.4-29.44
25	Sibapur VF	1.60		16.0-25.6
26	Bansar VF	0.42		4.2-6.72
27	Jalahari VF	3.00		30.0-48.0
28	Chatrujabhujapur VF	1.60		16.0-25.6
29	Goudabisinuapada VF	2.20		22.0-35.2
30	Belagadia VF	2.80		28.0-48.8
31	Alboga VF	0.20		2.0-3.2
Total				**46,504.354 tonnes**

6.5.4.4. Carbon stock of Tree Outside Forests

The total number of trees outside the forest till the year 2008–09 had been requested from FSI's ToF enumeration data of Bhadrak District. After 2009–09, all the AR, ANR, Avenue plantation, UTP and seedling distribution data had been considered to calculate the total number of trees outside forest.

Thereafter, it is converted into block planation by dividing it by 1600. Then the FSI data is used to get the Carbon stock of ToF.

Table No 6.5: Carbon stock of Tree outside Forest					
Sl. No.	**Total No. of ToF**	**Converted into Ha**	**Carbon stock below ground mass for ToF (medium dense) t/ha 7.73**	**Carbon stock above ground mass for ToF (medium dense) t/ha** 35.27	**Total**
1	2188400	4624.00	16916332.00 t	77184868.00 t	**94101200.00 t**

6.6. Carbon sequestration and mitigation:

6.6.1. Utmost care should be taken to enhanced carbon sequestration through recognized and innovative silvicultural practices, eco-restoration of degraded forestlands so as to improve biomass productivity thereby resulting in improving forest health and vitality. Forest soil must be kept as healthy and fertile as possible and the forest crops must be kept as vigorous as possible to produce as rapidly as they can till the biomass production attains its most desirable level. The growing stock of trees must be so constituted that it provides regularly the greatest possible quantity of the desired products including intangible benefits.

CHAPTER-7

OPTIMIZATION OF FOREST RESOURCE UTILIZATION

7.1. Recorded removal of timber: -

7.1.1. This Division has no high forest for harvesting of timber.

7.2. Recorded removal of fuel wood: -

7.2.1There is pressure of people on forests to meet the requirement of fire wood andfodder etc. with the rise of population and emerging changes in their life styles, there is ever increasing demand of forest produces.

7.3. Recorded removal of bamboo/rattans:

7.3.1. There is no bamboo/rattan forest in this Division.

7.4 .Recorded removal of locally important NTFP including MAPs:

7.4.1. There is no important NTFP to cater the need of the people.

7.5. Demand and supply of timber and important non-timber forest produce: -

7.5.1. There is enormous demand for supply of timber and firewood. which is difficult to be fulfilled in full scape. However, attempt has been made to allow opening of licensed Timber and fire wood depots at convenient locations to cater the need of local people to some extent. Detailed list is given in Annexure VII.

In addition to the above 6 Nos. of licensed saw mill have been enlisted at AMPRO Industrial location of the District for sawing of timber procured from genuine sources. Detailed list is given in Annexure VIII.

There is always a huge gap between demand and supply of timber and fire wood and the gap promotes illicit felling and smuggling of timber from outside of the division.

7.6.Import and export of wood and wood products: -

7.6.1. There is no data in import and export of wood and wood products. However, the timber delivered to OFDC ltd, by the Division is reflected below in Annexure XVI.

7.7. Import and export of NTFPS:-

7.7.1**.** There is no import and export of NTFPS.

7.8. Removal of fodder:

7.8.1 .There are many villages along the sea coast and adjoining to mangroves. These villages obviously have huge livestock population which depends on mangrove forests in the absence of any pasture land. These cattle mostly depend on the forest for fodder during the cropping season. During December to May, the cattle graze in the fallow agriculture land in the

neighboring mangrove forests in particular are under heavy pressure due to grazing by the Buffalos. This results in degradation of mangrove forests along the coast.

7.9 Valuation of the products:

7.9.1. There is no scope to get different forest products in the absence of high forests for their valuation by including past and current prices with price trend.

CHAPTER-8

MAINTENANCE AND ENHANCEMENT OF SOCIAL, ECONOMIC, CULTURAL, AND SPIRITUAL BENEFITS

8.1 Number of JFM committees and area(s) protected by them:

8.1.1 3739.0Ha (which includes 3208.5 Ha plan area and 530.5 Ha outside plan area) ofarea is covered to form 44 VSSs and 20 EDCs formed for protection andconservation of forest areas, attached to these committees as per the MOU are alsoincludedin this working circle The list of the VSS and EDC are appended in **Annexure IX**. The following actions are proposed to be taken during the Plan period.

i. Demarcation and survey of the area allotted under each VSS/EDC
ii. Preparation of Digitized map for each VSS/EDC
iii. Preparation of Micro plan for each VSS/EDC
iv. Capacity building of VSS/EDC members
v. Allotment of funds to execute prescription of working circle in each VSS/EDC
vi. Provision of revolving fund for SHG under each VSS/EDC
vii. Entry point activity for each VSS/EDC
viii. Sustainable Income generating Activities for VSS/EDC
ix. Record maintenance for each activity undertaken for each VSS/EDC

8.2 Status of empowerment of JFMCs: -

8.2.1 JFM Resolution 2011:

a. Executive committees consisting of 16 members are constituted in each VSS to carry out day to day business of the VSS
b. At least 50 % members are to be women
c. The composition of SC & ST in Executive Committee is in proportion to their membership in VSS.
d. The EC shall prepare the Micro Plan and Annual Work Plan for the assigned forest area and integrate other developmental activities outside the forest area

Under the JFM, both afforestation and entry point activities have been taken up in the VSSs. These activities have been largely funded by the externally aided projects. Helping SHG's in Income generation activities (IGA), and community-oriented works like

mushroom cultivation training for ladies etc. have been taken up in different VSSs and EDCs. Under this new Joint Management Plan, the protection and management responsibility of the forest patch is wholly entrusted to the members of the forest protection committee. It shall be the duty of the members to prevent forest offenses and pass on relevant information and intelligence in this regard to the forest department officials. The management activities of the forest are to be carried out by the executive committee of the VSS. Each VSS should have its own executive committee comprising ten to fifteen members, which should include Ward Members representing the village, six to eight representatives selected / elected by the villagers, the forester and Forest Guard concerned, and nominee of an NGO functioning in the local area to be selected by the D.F.O. The Forester of the locality concerned and the Naib Sarpanch (Vice-President of the gram panchayat) would be the convener and chairperson of the executive committee respectively. It is stated in the Joint Management plan that usufructs like leaves, fodder, grass, thatch grass, broom grass, thorny fencing materials, brushwood and fallen lops and tops and twigs used as fuel wood shall be available to the members of the VSS free of cost. It shall be the duty of the executive committee of the VSS to ensure equal distribution of all intermediate yields in the shape of small wood poles, firewood, etc. as may be obtained in periodical cleaning of the forest. However, the timbers and poles, as may be obtained from a major harvest or final felling, shall be shared between the Forest Department and the VSS in equal shares.

8.3 Labour welfare:

8.3.1 Both skilled and unskilled labourers are available throughout the year but there is some difficulty in getting unskilled labourers during the cultivation and harvesting seasons of agricultural crops. No precise data is available regarding labourers engaged in various forestry operations exclusively. However, this data is most required in view of the fact that enough opportunities for work have to be created to fully absorb the local labourers throughout the year so that they do not go out of departmental work like MGNREGS, FDA etc.

8.4 Use of indigenous knowledge:

8.4.1 Indigenous traditional knowledge was documented during preparation of People's Biodiversity Register for every Grama Panchayat. However, more information should be collected on the indigenous knowledge not only relating to medicinal plants but also relating to land use, land reclamation, etc.

8.5 Extent of cultural / sacred groves: -

8.5.1 There is no cultural and sacred grove for its management and consideration.

8.6 Ecotourism areas and activities: -

8.6.1 Bhadrak Division is adjacent to Bhitarkanika National Park and Gahirmatha Wildlife Sanctuary. So, a good population of Salt water crocodiles are found in this Division. Also, Irrawady Dolphins are present near Dhamara Estuary area. So, this Division also has ecotourism potential for tourists at Kasturikana along Baitarini river opposite to Nalithapatiya, Bhitarkanika. Also, Kanika Island opposite to Dhamra port boast of good beaches with mangroves and Red Ghost Crabs painting the beach red and is suitable for day-time tourism.

8.7 Social customs: -

8.7.1 There are no specific custom which directly enhances or protects forest cover. It is mostly done through Joint Forest Management.

8.8 Status of compliance of forest Right Act (FRA): -

8.8.1 The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006 enacted to protect the marginalized socio-economic class of citizens and balance the right to environment with their right to life and livelihood and also address the historical injustice mete out to the tribals since British rule.

8.8.2 Salient provisions of the Forest Rights Act 2006:

Section 3(1):

For the purposes of this Act, the following rights, which secure individual or community tenure or both, shall be the forest rights of forest dwelling Scheduled Tribes and other traditional forest dwellers on all forest lands, namely:

(a) right to hold and live in the forest land under the individual or common occupation for habitation or for self-cultivation for livelihood by a member or members of a forest dwelling Scheduled Tribe or other traditional forest dwellers;

(b) community rights such as nistar, by whatever name called, including those used in erstwhile Princely States, Zamindari or such intermediary regimes;

(c) right of ownership, access to collect, use, and dispose of minor forest produce which has been traditionally collected within or outside village boundaries;

(d) other community rights of uses or entitlements such as fish and other products of water bodies, grazing (both settled or transhumant) and traditional seasonal resource access of nomadic or pastoralist communities;

(e) rights including community tenures of habitat and habitation for primitive tribal groups and preagricultural communities;

(f) rights in or over disputes lands under any nomenclature in any State where claims are disputed;

(g) rights for conversion of Pattas or leases or grants issued by any local authority or any State Government on forest lands to titles;

(h) rights of settlement and conversion of all forest villages, old habitation, un-surveyed villages and other villages in forests, whether recorded, notified or not into revenue villages;

(i) rights to protect, regenerate or conserve or manage any community forest resource which they have been traditionally protecting and conserving for sustainable use;

(j) rights which are recognized under any State law or laws of any Autonomous District Council or Autonomous Regional Council or which are accepted as rights of tribal under any traditional or customary law of the concerned tribes of any State;

(k) right of access to biodiversity and community right to intellectual property and traditional knowledge related to biodiversity and cultural diversity;

(l) any other traditional right customarily enjoyed by the forest dwelling Scheduled Tribes or other traditional forest dwellers, as the case may be, which are not mentioned in clauses (a) to (k) but excluding the traditional right of hunting or trapping or extracting a part of the body of any species of wild animal;

(m) right to in situ rehabilitation including alternative land in cases where the Scheduled Tribes or other traditional forest dwellers have been illegally evicted or displaced from forest land of any description without receiving their legal entitlement to rehabilitation prior to the 13th day of December, 2005.

Section 3(2): Notwithstanding anything contained in the Forest (Conservation) Act, 1980, the Central Government shall provide for diversion of forest land for the following facilities managed by the Government which involve felling of trees not exceeding seventy-five trees per hectare, namely: -

(a) schools;

(b) dispensary or hospital;

(c) anganwadis;

(d) fair price shops;

(e) electric and telecommunication lines;

(f) tanks and other minor water bodies;

(g) drinking water supply and water pipelines;

(h) water or rain water harvesting structures;

(i) minor irrigation canals;

(j) non-conventional source of energy;

(k) skill up-gradation or vocational training centers;

(l) roads; and

(m) community centers

Provided that such diversion of forest land shall be allowed only if, (i) the forest land to be diverted for the purposes mentioned in this subsection is less than one hectare in each case; and (ii) the clearance of such developmental projects shall be subject to the condition that the same is recommended by the Gram Sabha.

Section 6(1) : The Gram Sabha shall be the authority to initiate the process for determining the nature and extent of individual or community forest rights or both that may be given to the forest dwelling Scheduled Tribes and other traditional forest dwellers within the local limits of its jurisdiction under this Act by receiving claims, consolidating and verifying them and preparing a map delineating the area of each recommended claim in such manner as may be prescribed for exercise of such rights and the Gram Sabha shall, then, pass a resolution to that effect and thereafter forward a copy of the same to the Sub-Divisional Level Committee.

Section 6(3): The State Government shall constitute a Sub-Divisional Level Committee to examine the resolution passed by the Gram Sabha and prepare the record of forest rights and forward it through the Sub-Divisional Officer to the District Level Committee for a final decision.

Section 6(5): The State Government shall constitute a District Level Committee to consider and finally approve the record of forest rights prepared by the Sub-Divisional Level Committee.

Section 6(6): The decision of the District Level Committee on the record of forest rights shall be final and binding.

Section 11: The Ministry of the Central Government dealing with Tribal Affairs or any officer or authority authorized by the Central Government in this behalf shall be the nodal agency for the implementation of the provisions of this Act.

8.8.3 The Status of implementation of the Forests Right Act, 2006 reveal that revenue land having Jungle Kissam have been allotted to 175 Nos. of individual tiles. The details of allotment are furnished in Annexure X. In addition to the above 27 individual cases have also been

recommended by SDLC to DLC for allotment of “Patta” under FRA. The detailed list is in Annexure XVII.

8.9 Other Rights and Concessions:

8.9.1 Since final notification u/s 21 of OFA have not been made in case of any forest block, the rights and concessions have not yet been settled.

8.10 Dependency of local people on NTFPs:

8.10.1There is no NTFP collection as there is absence of high forests in the Division.

CHAPTER-9

ADEQUACY OF POLICY, LEGAL AND INSTITUTIONAL FRAME WORK

9.1 Existing policy and legal framework and their compliance: For the management strategy of this forest division, National Forest Policy 1988 is the foundation and a guiding factor. Also, Indian Forest Act 1927 and Odisha Forest Act 1972 are invoked for administration of the forests.

9.1.1. National Forest Policy 1988

a. Maintenance of environmental stability through preservation and, where necessary, restoration of the ecological balance that has been adversely disturbed by serious depletion of the forests of the country.

b. Conserving the natural heritage of the country by preserving the remaining natural forests with the vast variety of flora and fauna, which represent the remarkable biological diversity and genetic resources of the country.

c. Checking soil erosion and denudation in the catchment areas of rivers, lakes, reservoirs in the interest of soil and water conservation, for mitigating food and droughts and for the retardation of siltation of reservoirs.

d. Increasingly substantially the forests/tree cover in the country through massive afforestation and social forestry programmes, especially on all denuded, degraded and unproductive lands.

e. Meeting the requirements of fuelwood, fodder, minor forest produce and small timber of the rural and tribal population.

f. Increasing the productivity of forests to meet essential national needs.

g. Encouraging efficient utilisation of forests produce and maximising substitution of wood.

h. Creating a massive people's movement with the involvement of women, for achieving these objectives and to minimise pressure on existing forests.

All the strategies and implementation work done by Bhadrak Wildlife Division has so far been in consonance with the objectives and principles enshrined in National Forest Policy 1988.

9.1.2. National Wildlife Action Plan (2017-2031)

a. Sustained funding for wildlife sector
b. Control of poaching and illegal trade in wildlife
c. Wildlife health management
d. Conservation of threatened species
e. Mitigation of human wildlife conflict
f. Conservation of inland aquatic ecosystem
g. Integrating climate change in wildlife management
h. Tourism management inside wildlife areas and identification of tourism potential
i. People's participation in wildlife conservation
j. Conservation, awareness and outreach
k. Development of human resources
l. Research and Monitoring
m. Improving compliances of domestic legislations
n. Integrating wildlife plan with other sectoral programmes

- The objectives of the plan are partly being followed in the division. The compliances to NAWP (2002-17) and NWAP (2017-31) are mentioned below.

a. Elephant, salt water crocodile and waterfowl census are carried out periodically.
b. In wildlife protection, the position of offence cases booked are mentioned below. However, more steps should be taken to enhance the number of cases.
c. The ecotourism potential areas are identified and mentioned in the current plan
d. Compensation amount is timely given in cases of any injury/death from human-wildlife conflicts.
e. Compensation is also provided for damages from human-wildlife conflict.
   Human Kill & Injury and compensation paid by this Division during last few years are given in **Annexure XIX.**

9.1.3 Forest Rights Act

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 recognizes the rights of millions of tribals and other forest dwellers in different parts of our country as it provides for the restitution of deprived forest rights across India, including both individual rights to cultivated land in forestland and community rights over common property resources. In Bhadrak WL Division, no FRA patta is given in notified forest blocks.

9.1.4. JFM Resolution

The National Forest Policy, 1988 envisaged co-operation of the people in conservation and development of forests. In keeping with this policy Government of Orissa adopted the Joint Forest Management (JFM) approach and sought community participation for protection, regeneration and management of the forest wealth. JFM has not only been a tool for forest regeneration, but also a means of employment generation and social empowerment of the forest-fringe dwellers.

In Bhadrak WL Division, a total of 46 Van Suraksha Samitis and 20 Eco-Development Committes have been formed to take up Joint Forest Management and conservation in which various measures such as preparation of microplans, protection of existing plantations, conservation of wildlife, agro forestry, construction of community buildings, etc are required to be implemented.

9.2. Status of approved working plan and compliance:

9.2.1 This Division was formed carving out a portion of erstwhile Baripada Forest Division and a portion of erstwhile Mangrove Forest Division (WL), Rajnagar. The Forests of this Division had not been covered under the prescription of any Working Circle of the outgoing plans of the above Forest Divisions. This was probably due to absence of any Reserved Forests in the Division.

9.3 Number of forest offences: -

9.3.1 Bhadrak Wildlife Division contains presence of certain unlawful activities which includes

1) Establishment and operation of illegal saw mills
2) Smuggling of timber, especially Sal from outside forests and states.
3) Illegal fishing in and around Gahirmatha sanctuary including eco sensitive zone

The details of cases booked have been furnished in a tabular format as detailed in **Annexure VI.**

9.4. Status of research and Development:

9.4.1 Research on Crab rearing & fish fattening has been carried out under OFSDP intervention. The application of research findings in addressing the problems along with appropriate transfer of technology to field shall be reflected. The island shores of Bhadrak WL Division are known for arribadas of Olive Ridley Turtles. Even though thousands of literatures have been published on their morphology and behavioral characteristic, concrete reasons have

not been found out regarding the factors affecting their time and character of mass nesting. Hence, research institutions could be engaged for studying the above-mentioned topics.

9.5. Human resource capacity building efforts:

9.5.1The skill and the information requirementsof the staff at the Beat, Section and Range level has undergone a lot of change in the last two decades. The interaction of these levels of staff with the public, people's representative, NGOs and officials of other departments has increased manifold. The following steps have been taken in the division for improving the efficiency and performance of the field staffs.

i. Proper training and regular refresher courses for the field executives.

ii. Good communication skill training to the FG/FR level

iii. Regular in-house discussion to update knowledge of the field staff. Important relevant rulings of different Courts & changes brought about in Forest Act and Rules in recent years should be brought to their notice. New techniques of plantation, nursery raising etc. be demonstrated to the field staff.

iv. Monthly meeting at the Range level should give opportunity to Foresters and Forest Guards to express their views and opinions on various current issues. Successful tackling of situations should be discussed and analyzed.

v. Important circulars and changes in methods/ technology/ approach are discussed at length by the DFO during monthly meeting of Range Officers.

vi. Supply of firearms to all Range Officers, Section foresters and Guards and impart arms training to them.

vii. Frequent raids and surprise checks should be conducted in the smuggling prone areas and check gates.

viii. Malkhanas to keep seized produce in smuggling prone areas.

ix. Provision of Books, maps, Equipment, Tools etc. to the staffs for better scientific managements of Forest and equipped themselves with modern tools.

9.6 Forest Resource Accounting:

Forest resources represent a stock of natural capital or wealth with attributes such as growing biomass including wood, carbon, and capability to support human, plant and animal life. They are renewable in nature. As a stock of natural capital, they provide several goods and eco-system services. Left to themselves forests regenerate. They can also be augmented or depleted with human and other interferences. If so, this results in a change in the flow of goods

and services from them. Examples of such goods and services flowing from forest resources are: tree cover provides leaf biomass (as food, shelter, fodder, fuel), barks, roots, herbs, or sequestered carbon, and health of water regimes and soils.

Forest Resource are accounted through the method of Net Present Value developed by Kanchan Chopra Committee and subsequently accepted by Hon'ble Supreme Court order dated 28.03.2008. NPV refers to "the discounted sum of rupee values of eco-system goods and services that would flow from a forest over a period of time net of costs incurred." It does not capture the value of the forest wealth or possible change in it, only the flow of goods and services.

For calculating the average Net Present Value per Ha of forest in India, the following monetary value of goods and services provided by the forest have been considered: -

a. Value of timber and fuel wood
b. Value of Non-Timber Forest Products (NTFP)
c. Value of fodder
d. Value of Eco-tourism
e. Value of bio-prospecting
f. Value of Ecological services of forest
g. Value of Flagship Species
h. Carbon Sequestration Value

Generally, the ecological classifications have broader range because climate is chosen as a primary factor of classification and has a very wide canvas. The physiography (lowlands and mountains) and soil become subsidiary to the climate. Thus, from the point of view of the ecological role and value of the forests, which is different from the management perspectives and silvicultural requirements, the Forests Types of India can be grouped into broad ecological classes. For the purpose of this report, the 16 major Forest types have been grouped into the following 6 ecological classes depending upon their ecological functions. This classification is based on experience and judgment and therefore is not very rigid.

Table No. 9.1: Different Eco classes

Eco Classes	Type of Forest
Eco-Class I	Consisting of Tropical Wet Evergreen Forests, Tropical Semi Evergreen Forests and Tropical Moist Deciduous Forests
Eco-Class II	Consisting of Littoral and Swamp Forests

Eco-Class III	Consisting of Tropical Dry Deciduous Forests
Eco-class IV	Consisting of Tropical Thorn Forests and Tropical Dry Evergreen Forests
Eco-class V	Consisting of Sub-tropical Broad Leaved Hill Forests, SubTropical Pine Forests and Sub Tropical Dry Evergreen Forests
Eco-class VI	Consisting of Montane Wet Temperate Forests, Himalayan Moist Temperate Forests, Himalayan Dry Temperate Forests, Sub Alpine Forest, Moist Alpine Scrub and Dry Alpine Scrub

Atestimated average NPV value of the country's forests as Rs. 8.0 lakh per ha., the NPV for forest falling in various eco-value class and density sub-classes has been found to be (rounded to nearest thousand rupees) as under: -

Matrix showing NPV of the different eco-value / canopy density classes at estimated average NPV value of the country's forest as Rs. 800,000/- per ha.

Table No 9.2: Net Present Value of different eco-value /canopy density classes

Eco-Value class	Very Dense Forest	Dense Forest	Open Forest
Class I	10,43,000	9,39,000	7,30,000
Class II	10,43,000	9,39,000	7,30,000
Class III	8,87,000	8,03,000	6,26,000
Class IV	6,26,000	5,63,000	4,38,000
Class V	9,39,000	8,45,000	6,57,000
Class VI	9,91,000	8,97,000	6,99,000

The forests of coastal regions of Bhadrak WL Division comes under Eco Class II (Littoral and Swamp Forests) and the type of forest cover in this Division is open Forest type (Source NRSC, Hyderabad). As per the report "Increasing Forest Cover of Odisha 2015-17the composition of various types of forest based on density out of total 3577.258 Ha is mentioned below and accordingly the Net Present Value is calculated.

Table No 9.3: NPV of forests of Bhadrak Wildlife division					
SL No	**Type of Forest Cover in Bhadrak**	**Area (in Ha)**	**NPV current rate (per Ha in lakhs)**	**NPV for the entire area (in Lakhs)**	**NPV for the entire area (in Crores)**
1	Open Forest	3577.258	6.26	22393.6351	230.94

The Hon'ble Supreme Court ordered that the rates of NPV for forest diversion should be revised after 3 years. While the Hon'ble Supreme Court did not explicitly state the reason for suggesting this time period, it may be recognized that 3 years period is an appropriate timeframe to revise economic value of forest ecosystem services by accounting for 1) new and more latest tools with advancement of technology to estimate the economic value of forests and 2) reflect the scarcity value of forests. As per this suggestion, Indian Institute of Forest Management was assigned a study on "Revision of rates of NPV applicable for different class/category of forests" by the Ministry of Environment, Forests and Climate Change (MoEFCC), Govt. of India. The 2006 NPV Expert Committee Report on NPV suggested valuing timber benefits from forests based on the stumpage value. While the methodology has its advantages in terms of simplified assumptions and calculations, it ignores a vital aspect of timber production in India – its under-reporting. In an attempt to address this concern and use most recent data on timber production in India, the study uses growing stock estimates in different forest type groups of India further classified by canopy cover density classes. These estimates are sourced from the Forest Inventory Data of the Forest Survey of India.

The calculation of NPV as per the proposed rate of NPV per Ha by IIFM is shown below.

Table No 9.4: NPV of forests of Bhadrak Wildlife Division based on IIFM method					
SL No	**Type of Forest Cover in Bhadrak**	**Area (in Ha)**	**NPV current rate (per Ha in lakhs)**	**NPV for the entire area (in Lakhs)**	**NPV for the entire area (in Crores)**
1	Open Forest	3577.258	11.17	39957.97	399.58

9.7 Budgetary allocation to the forestry sector: -

9.7.1 Budget provision of the last plan proved is not available for want of working plan. However, the budgetary allocation to the forestry sector as forecasted is reflected in **Annexure XII.**

9.8 Existence of monitoring, assessment and reporting mechanism:

9.8.1 For effective monitoring and evaluation proper maintenance of records is highly essential such as,

a) Register of Forest Blocks:

Proper maintenance of this register is vital and most important. Registers of Reserved forests, Protected forests, Village forests are to be maintained as per Orissa Forest Department code. This register should preferably contain copies of the original notification (or an attested copy thereof) declaring the forest blocks under the category that they belong. Accurate maps of the block delineating the boundaries and showing the position of the boundary pillars as they exist on the ground and other details like boundary lengths, number of pillars, GPS readings of the pillars etc. should also be kept as part of this register. All changes / modification in area due to diversion, de-reservation along with copies of such notifications should also be maintained in the register.

b) **Plantation Journals:**

Journals for plantations will be maintained for each plantation / rehabilitation work taken up in the Division showing details of operations and their cost, in the forms prescribed in Orissa Forest Plantation Manual 1977. Maps of the plantations with all details will also be kept in the plantation journal.

c) Plantation Register:

A plantation register shall be maintained at the Division level giving details of every plantation carried out like year of plantation, location, area, species planted and agency involved. A unique index number will be assigned to individual plantation, and this will also be shown in the Plantation journal. This register should not show any detail of operations, which will be shown in the plantation journals. The plantation register should be maintained as prescribed under Plantation manual 1977. The plantations taken up should be reflected in the GIS database for the Division in the Divisional office and the database in the GIS lab of the Principal Chief Conservator of Forests, Odisha should also be updated in October / November each year.

d) Control Forms:

No control forms and deviation statements have been maintained for the working schemes. However, control forms and deviation statements will be maintained by the division for the upcoming working plan as per Rule 132 of the O.F.D. Code and National Working Plan Code 2014.

9.9. Public awareness and Education:

9.9.1 The mangrove forest area along the coast of Bay of Bengal, the area with Crocodile concentration, the nesting place Olive Ridley Turtle are to be protected perpetually. Protection of forest and wildlife shall be done with active involvement of VSSs, NGOs and public. Active protection strategies include deployment of protection squads, Mobile squads, strengthening of VHF network and intelligence gathering with massive awareness programme for people through meetings / workshops to inform them the benefits provided by forests to society and distributing published material such as brochures, pamphlets, leaflets, posters, etc. about the sustainable management of forest. Moreover, imparting forestry / environmental awareness and education programmes for students.

9.10 Adequate manpower in forest Division: -

9.10.1 The detailed staff position of Bhadrak (WL) Division, who are directly or indirectly associated in preparation of this working plan and its implementation of towards is furnished below in a tabular format in Table No. 9.5: -

Table No. 9.5 Sanction & Vacancy position of staff of Bhadrak Wildlife Division

SL. No.	Category of the Post	Sanctioned Strength	Men in position	Vacancy Position.	Remarks
1	D.F. O	01	-	01	
2	A.C.F.	02	02	-	
	Total Group-A	**03**	**02**	**01**	
3	Forest Ranger	04	03	01	
4	Forest Ranger (HM/AD)	01	-	01	
5	Forestry Extension Supervisor	01	-	01	
	Total Group-B	**06**	**03**	**03**	
6	Head Clerk	01	01	-	
7	R.I.	01	-	01	
8	Dy. Ranger	02	04	-	**Excess 2 nos.**

9	Jr. Steno Grapher	01	-	01	
10	Jr. Accountant	05	02	03	
11	Forester	26	19	07	**3nos. Contractual Forester**
12	Jr. Clerk	06	02	04	
13	Driver(L.V)	01	-	01	
14	Amin	01	-	01	
15	Forest Guard	37	21	16	**4 no. Contractual F.G**
	Total Group-C	**81**	**49**	**34**	
16	Mali	01	01	-	
17	Office Peon	01	01	-	
18	Dak Runner	01	01	-	
19	Chowkidar	01	-	01	
20	Boat Majhi	01	-	01	
	Total Group-D	**05**	**03**	**02**	
	Grand total (A+B+C+D)	**95**	**57**	**40**	
NB: Temporary Status (Boat Majhi)		**-**	**01**	**-**	

CHAPTER-10

FIVE YEAR PLANS

10.1 Since independence, regular Five-Year Plans (FYP) have been made till 2017 except for few Annual plans in between. At the time of writing this plan, the 12th FYP (2012 to 2017) has been into its 5th year.

Keeping in view thelarge-scale imports of food grains in 1951, the first FYP accorded highest priority to agriculture including irrigation & power whereas second FYP laid emphasis on industrialization. The 3rd FYP had major objective of achieving self-sufficiency in food grains and the 4th FYP aimed at accelerating the tempo of development to take care of fluctuations in agricultural production & impact of uncertainties of foreign aid. The 5th FYP stipulated achieving self-reliance & adopting measures for raising the consumption standard of people living below poverty line whereas removal of poverty was the foremost objective of the 6th FYP. This plan even laid emphasis on active involvement of people at local level in formulating & implementing the schemes. This laid the foundation for people's participation even in protection of forests. The Orissa Village Forest Rules 1985 also came into existence. So far, all the FYPs had given thrust to agriculture & industry.

The 7th FYP aimed at rapid growth in food grain production & increased employment opportunities; the Jawahar Rojgar Yojana (JRY) was launched during this plan which even earmarked funds for afforestation activities. In fact, from this plan onwards, substantial funds started pouring in for forestry works from other Departments as well. And, the National Forest Policy1988 was formulated giving more emphasis on the indirect benefits from the Forests than the monetary returns. The 8th FYP stipulated faster economic growth through liberalization and 9th FYP laid emphasis on Basic minimum Services including safe drinking water & rural connectivity; number of forest roads were improved during this period under Food For Work Programme besides launching of schemes like Integrated Afforestation & Ecodevelopment Project (IAEP); Area Oriented Fuelwood & Fodder Project(AOFFP); Association of ST & Rural Poor in regeneration of Degraded forests on usufruct basis(ASTRP) and Non Timber Forest Produce including Bamboo plantation & Medicinal plantation(NTFP).

The 10th FYP aims at harnessing the benefits of growth to improve the quality of life of the people by setting targets in reduction in poverty; universalization of primary education etc. It even targets increase in forest/ tree cover to 25% by the end of this FYP; besides, cleaning of

major polluted river stretches; Bamboo mission; Biofuel project and National Afforestation Programme through FDA are other major projects under taken.

It may be worth mentioning that the forestry sector has so far got on an average only 0.67% of the total plan outlay though the forests constitute 22.60% of the geographical area of the Country and contribute about 1.7% to the GDP (Source: Forests & Wildlife Statistics, MOEF: 2004). And, the position with regard to Orissa State for last 6 years is furnished in table below. These statistics shows that only about 1.15% of the State plan outlay is being earmarked for the Forestry Sector. In Orissa, Forests constitute about 31% of its Geographical area and hence, deserve more share of the Plan outlay.

Table 10.1: OUTLAY FOR FORESTRY SECTOR IN STATE PLAN (In Rs Crores)

Year	State Outlay	Forestry Sector	% forestry Sector
1998-1999	2426.75	23.87	0.98
1999-2000	2553.13	34.54	1.35
2000-2001	2555.25	39.62	1.55
2001-2002	2300.00	25.45	1.11
2002-2003	2550.00	19.37	0.76
2003-2004	2714.00	30.45	1.12

Source: Statistical Abstract of Orissa 2002; Orissa Forest Status Report 2003-04 & Govt

Plan investment in forestry and wildlife sector so far, including State and Central plan, has been about 1% of the total plan outlay. The National Forestry Commission (2006) has recommended an investment of 2.5% of the plan outlay in the forestry and wildlife sector.

In 11th Five Year Plan as the State Forest administration is responsible for management of forests, the focus of Central interventions should be on reinforcing the capacity of States to undertake the national policy mandates towards conservation and sustainable use. The strategy for the Eleventh Plan will, therefore, be to create an environment for achieving sustainable forestry and wildlife management with specific focus on the socioeconomic targets. Accordingly, the following scenario will be the core of the forestry sector development strategy:

The objective of enhancing the green cover will be integrated with livelihood

opportunities. Suitable policy and legal measures for this purpose will back-up the programmatic interventions. The Tenth Plan strived to universalize Joint Forest Management (JFM). The resolve of the Eleventh Plan is to strengthen the regime by incorporating the concepts of harvesting, value addition, and facilitated marketing of forest produce.

The Twelfth Plan aims to transition the environmental governance system towards Managing Environment, Forests, Wildlife and challenges due to Climate Change for faster and equitable growth, where ecological security for sustainability and inclusiveness is restored, equity in access to all environmental goods and ecosystem services is assured through institutionalization of people's participation; and a future in which the nation takes pride in the quality of its environment, forests, richness of its biodiversity, and efforts by the State and its people to protect, expand and enrich it, for intra and inter-generational equity and welfare of the local and global community.

10.2 The expenditure on various development programmes, the physical and financial targets, under various schemes and its achievement is reproduced below in **Annexure XI.**

CHAPTER- 11

PAST SYSTEM OF MANAGEMENT

11.1 General history of the forests: -

This Bhadrak Wildlife Division has been formed, constituted during 2003 with effect from dt.01.10.2003 on re-organisation of the Forest Department vide Resolution No. 1F (A) – 100/2003 – 13228 DT. 08.08.2003 of Govt. of Odisha, F & E Deptt. and was formed by carving out a portion of Baripada Forest Division and a portion of Mangrove Forest Division (WL) Rajnagar with Headquarter of Bhadrak. At present the Head quarter of Bhadrak Wildlife Division is located at Chandbali with effect from 05.04.2006.

11.2 Past system of management and their results:

This Division was formed carving out a portion of erstwhile Baripada Forest Division and a portion of erstwhile Mangrove Forest Division (WL), Rajnagar. **The Forest area of the Division had not been covered under the prescription of any Working Circle of the outgoing plans of the above Divisions.** This was probably due to absence of any Reserved Forests in the Division. However, activities like Plantation, Protection of Wildlife and Anti-smuggling activities have been undertaken out of funds made available. In addition to these, forestry activities under OFSDP are being undertaken in Basudevpur and Chandbali Ranges since 2007-08 under JICA assistance in Joint Forest Management mode. As this Division is devoid of natural High Forest, protection activities are restricted to Anti-smuggling only to prevent movement of illegal timber from adjoining Forest Divisions.

Till 2020-21, the division has been managed through different working schemes made every year. The target and achievements furnished below-

Table No. 11.1 Provisions in Annual Action Plan

Sl. No.	Annual Scheme	Target for the years				Achievement for the years			
		2017-18	2018-19	2019-20	2020-21	2017-18	2018-19	2019-20	2020-21
1	Plantation WC (in Ha)	0	5	65	54.2	0	0	0	0
Remark- All the plantation activities carried out during these years are out side Forest Area									

In the past working schemes, the working circles included were

1. Protection Working Circle

2. Plantation Overlapping Working Circle

3. JFM Overlapping Working Circle

4.Wildlife Management and Biodiversity Conservation and Development Working Circle

11. 3 The general objectives of those working schemes include

(a) Sustainable management of Forests and its biodiversity as enshrined in the National Forest Policy.

(b) To encompass the ecological (environmental), economic (production) and social (including cultural) dimensions.

(c) To ensure conservation of forests and reducing forest degradation.

(d) To maintain and enhance of ecosystem services including ecotourism.

(e) To increase forest productivity, establishment of regeneration, improve forest health in progressive manner.

(f) To increase the growing stocks and carbon sequestration potential.

(g) Sustainable yield of forest produce, prevention of soil erosion and stabilization of the terrain.

(h) Manage Coastal Mangrove and Casuarina plantation as effective Shelter Belt.

(i) Forest Fringe management with special thrust.

(j) Improvement and regulation of hydrological regime.

(k) People's involvement in planning and management of forests fulfilling socio-economic and livelihood needs of the people.

(l) To improve wildlife Habitat, population and reduce man-animal conflict.

(m) Adoption of modern technology for better management.

(n) Management of TOF with villagers' participation.

This Division also act as buffer area of Bhitarkanika National Park. The movement of Crocodiles in Baitarani and Mantei River is monitored. Payment of compassionate grant for Human kill, Cattle kill etc. are also made as and when required. The details of compassionate

payment given by this division is reflected in **Annexure XIX**. During nesting of Olive Ridley Turtles, patrolling is conducted by staffs on-shore & off-shore.

11.4 Working scheme for Bhadrak Wildlife Division for the period 2017-18 to 2018-19 (Two Years)

The basis of proposals for this working plan is based on guidance's issued in National Working Plan Code-2014 and National Forest Policy in force. In absence of any previous working plan the following working circle are suggested in the approved PWPR: -

(1) Protection Working Circle-3576.24 Ha.
(2) Plantation overlapping working circle
(3) JFM overlapping working circle-1179 Ha. for VSS and 4752 Ha. for EDC

(4) Wildlife Management and Bio-diversity conservation and development working circle.

11.4.1 General objectives of the working plan: -

(a) Sustainable management of Forests and its biodiversity as enshrined in the National Forest Policy.
(b) To encompass the ecological (environmental), economic (production) and social (including cultural) dimensions.
(c) To ensure conservation of forests and reducing forest degradation.
(d) To maintain and enhance of ecosystem services including ecotourism.
(e) To increase forest productivity, establishment of regeneration, improve forest health in progressive manner.
(f) To increase the growing stocks and carbon sequestration potential.
(g) Sustainable yield of forest produce, prevention of soil erosion and stabilization of the terrain.
(h) Manage Coastal Mangrove and Casuarina plantation as effective Shelter Belt.
(i) Forest Fringe management with special thrust.
(j) Improvement and regulation of hydrological regime.
(k) People's involvement in planning and management of forests fulfilling socio-economic and livelihood needs of the people.
(l) To improve wildlife Habitat, population and reduce man-animal conflict.
(m) Adoption of modern technology for better management.
(n) Management of TOF with villagers' participation.

- **Protection Working Circle: -**

The total area alloted to this working circle is approximately 3576.24 Ha. The mangrove Forest area along the coast of Bay of Bengal the area with crocodile concentration, the nesting place of Olive Ridley Turtle are to be brought under protection working circle. Protection shall be classified into following categories and separate prescription need to be given against each to carryout activities regularly.

(a) Protection from grazing
(b) Protection from illegal removal of forest produce.
(c) Protection of staffs from smugllers and theft (Welfare Scheme)
(d) Provision of separate legal cell to deal with prosecution cases.
(e) Prescription for protection and management of forests outside working plan area.
(f) Protection from Forest Fire.
(g) Capacity building among local youth.

Special objectives of management of the area under this working circle are:-

(i) To keep delicate and eco-sensitive areas ecologically intact by maintaining adequate vegetative cover especially in the catchments area.
(ii) To rehabilitate the area affected by encroachment by taking required social, administrative, and silvicultural measures.
(iii) To enhance soil productivity through soil and moisture conservation measures.
(iv) To demarcate the boundaries of the PRF and resubmit the proposals for notification under Section-21 of Orissa Forest Act., 1972.
(v) To enhance the communication and protection network against illicit felling and poaching.

In absence of High Forest, no felling series and cutting sections are prescribed. However, keeping in view, the objectives stated above the following proposals have been inducted in phase II of ICZMP Project.

Table 11.2 Proposal for Bhadrak Wildlife Division under Phase-II of ICZMP

Sl. No.	Name of Project	Location	Item of work	Objective
1	ICZMP Phase-II	Babubali	(i)Procurement of High-Speed Boat-1 No. (ii)Procurement of Support Boat-2 Nos.	Required for sea patrolling purpose. Olive Ridley Sea Turtle mass nesting protection and conservation, monitoring of Biodiversity conservation
2	-do-	Chandnipal, Karanjmal, Balimunda, Kasia, Mohanpur,	Ant-poaching squad-2 units (20 nos.)	For protection of 2375 Ha. Mangrove plantation created under OFSDP

The area will be rightly protected from all sorts of biotic interference inform of encroachment, illicit felling, grazing, poaching etc., so as to keep it under nature's own care and nursing. Further, the existing growing stock and young generation shall be improved upon by taking suitable site-specific tending and cleaning operations.

- **Plantation (overlapping) Working Circle: -**

The special objectives of management of this working circle are:-

(i) To maintain plantations with stand against the cyclonic wind, tide and to reduce the wild velocity on the leeward side.

(ii) To reduce soil/coast erosion due to rain/wind and tide.

(iii) Arrest sand dune invading to inner lands i.e. inward sand drift.

(iv) To reduce salt spray on nearby agricultural land / habitation.

(v) To meet fuel wood requirement through periodical salvage of fallen, damaged and uprooted trees.

(vi) To maintain forests to have maximum shelterbelt effect.

(vii) Harvesting and restocking of area in a phased manner without creating large permanent gap for a longer period (not more than 2 years)

(viii) To rest back the degraded barren village forests with appropriate species.

(ix) Improve quality of stock and higher per hectare bio-mass production by adopting clonal propagation.

(x) Active Village Forest Committee (VFC) involved during Social Forestry Project (Present version VSS) and involve in creation of more intensive forest management.

(xi) To remix the present crop with other suitable species for improvement and enrichment of crop.

(xii) To enhance the land productivity through soil and moisture conservation measures.

(xiii) To identify the refractory area and proposed necessary requires for reforestation.

The mangrove Forest area along the coast of Bay of Bengal, Plantations under social forestry those have been raised prior to reorganization of the Division, the afforestation Programme taken up under normal afforestation Programme (NAP), Central Plan, State Plan, MGNREGS, OFSDP, Avenue Plantation etc., the plantation of past 20 years, have been allotted to this working Circle. Formation of felling series, cutting sections, Blocks, compartments are not preserved in absence of High Forest.

- **Mangrove Conservation**: -

It requires a special type of treatment to have better regeneration and quick establishment. Creation of fish bone channels will help flow of saline water to the interior areas. Gap Plantation with local species will help in restocking the Forest. Grazing need to be checked with fences, watch and ward,

(a) Conservation of existing Mangrove Forest
(b) Eviction of encroachment.
(c) Planting in open areas
(d) Providing livelihood support to the traditional fisherman.

In Mangrove Forest special attention will be given to

(a) Stabilisation of mudflats.
(b) Restoration of mangrove eco-system.
(c) Stabilisation of embankments
(d) Conservation of threatened species
(e) Afforestation with fast giving and indigenous species.
(f) Land development and improvement of soil moisture.

Some of the Island within the mangrove forest do not experience regular inundation by tidal action, due to turtle back shape at the centre of the islands. This results into increase of salinity

and formation of saline back shape at the centre of the islands. This results into increase of salinity and formation of saline blanks which do not support any vegetation. It is proposed to dig canals across some of these areas to facilitate tidal flooding and increased moisture in such barren areas. Artificial and natural introduction of mangrove seeds may improve the vegetation cover.

- **Treatment of old SFP Plantations: -**

The SFP Plantation area of this Division comprises of a total area of 1641.00 ha., out of which 1638.56 ha. is Govt. land and 2.44 Ha. is private land. In view of very low survival percentage such plantation areas need to be identified and demarcated in the field with the help of revenue staff. After proper identification and demarcation such areas should be declared as VF as per Village Forest Rule, 1985, JFM resolution and its subsequent amendments. Such VF plots are to be coloured in village sheet. Cadastral map (to be proposed during working plan preparation). Small stone cairns of half meter height are to be erected and coal tarring of trees

standing on the boundary are to be made at the time of demarcation. Plantation areas shall be indicated fixing sign boards at strategic points. The matured crop of old SFP Plantation should not be allowed to be harvested without obtaining prior approval of MOEF Govt. of India and F&E Department. Govt. of Odisha as the District is devoid of any good vegetal cover since last supercyclone which ravaged coastal Odisha including Bhadrak District.

The old SFP Plantation areas devoid of any vegetation after demarcation of VF should be restocked with Block Plantation @ Rs.1600/- plants per Ha. and Gap Plantation should be adopted depending on field position and crop/plantation composition as per existing Govt. norm.

The plantation areas shall be strictly protected from grazing and fire suitable areas if any available adjacent to these plantations may be developed into fodder plantation and even encourage stall feeding those by diverting the grazing pressure from the plantation area. The people in the adjoining areas of plantation should be formally or informally associated in the plantation works and they should be asked to prevent their cattle entering the plantation area by setting up future awareness campaigns. Wherever necessary involvement of people should be assured for protection of the plantations in a participatory made.

It is also felt that soil conservation measures specific to the site need to be completed before actual planting so that the benefit of SMC would be made available to plants from the beginning.

Proposal for taking up plantation programme under different schemes and project during scheme period: -

Table11.3Trees outside forest area in Govt. Land applied for non-forestry purpose					
Sl No.	**Year**	**Name of the UA applied for tree felling**	**Khata No./Kissam/ Area**	**No of trees felled**	**Remark**
1	2010-11	Chief Engineer, DPI & Road, World Bank Project, Odisha	Widening of Road fromBasantia to Bhadrak	1199	UA deposited plantation cost with DM, OFDC Ltd., Jajapur(C) Division as per Plantation Scheme for 10 times plantation. The OFDC Ltd. has planted 31800 nos seedling during 2011-12 and 28,200nos during 2012-13 total 60,000 nos in other road of Bhadrak District out of World Bank fund to compensate loss of felling of trees along Anadpur-Bhadrak-Chandbali wideness project.
			Widening of Road fromIcchapur to Chandbali	1655	
	2013-14		Widening of Road fromIcchapur to Chandbali	1840	
2	2015-16	Executive Engineer, Bhadrak (R&B) Division.	Widening of Road fromJamujhadi to Basudevpur	892	UA deposited plantation cost with DM, OFDC Ltd., Jajapur(C) Division as per Plantation Scheme for 10 times plantation.
3	2015-16	Dy. Chief Engineer	Bhadrak railway Station to Baitarani River for	984	UA deposited plantation cost with DM, OFDC Ltd., Jajapur(C) Division as per

		(Con) E.Co. Railway, Jajpur-Keonjhar Road.	construction 3rd Railway Line		Plantation Scheme for 10 times plantation.
4	2017-18	Executive Officer, Bhadrak Municipality	Establishment of Septage Treatment Plant at Balarampur of Amargadia Revenue Village Khata No.828/1 Plot No.1979/3293 Kissam- Patit	Action is being taken for joint verification of 1200no of trees	

N.B:- (i) Permission has been granted as per the decision of Secretary to Govt. of Odisha, Forest & Environment Department for felling of trees for widening purpose from Sl No. 1 to 3.

(ii) As regards to item no.4 application from Executive Officer, Bhadrak Municipality has been received and permission will be granted only after obtaining necessary clearance from MoEF, GoI, and Forest & Environment Department Govt. of Odisha as per rule.

The plantation programme suggested during the scheme period is reflected below in a tabular format:-

Table 11.4: Tentative plantation programme to be raised during scheme period

Sl. No.	Scheme	Range	Year	Type of plantation	Physical achievement	Remarks it any
1	Phase-II ICZMP	Chandbali	2018-19	Casuarina Plantation	2.00 Ha. 3.00 Ha.	Kanika sand, Coconut Island
2	Urban Plantation	Bhadrak	2018-19	Urban Plantation	2000 nos. of seedlings	

	-do-	Basudevpur	2018-19	Urban Plantation	2000 nos. of seedlings	
3	State Avenue Plantation	Chandbali	2018-19	Avenue Plantation	5 RKM	
		Bhadrak	2018-19	-do-	5 RKM	
		Dhamnagar	2018-19	-do-	5 RKM	
		Basudevpur	2018-19	-do-	5 RKM	
4	MGNREGS	Chandbali	-do-	-do-	14 RKM	
		Bhadrak	-do-	-do-	12 RKM	
		Dhamnagar	-do-	-do-	12 RKM	
		Basudevpur	-do-	-do-	12 RKM	
5	Agroforestry	Chandbali	-do-	Nursery	50,000 nos. P.Bag seedlings to be raised	
		Bhadrak	-do-	-do-	-do-	
		Dhamnagar	-do-	-do-	-do-	
		Basudevpur	-do-	-do-	-do-	
6	Phase-II ICZMP	Chandbali	-do-	-do-	1,00,000 seedlings	Grafted Mango, Coconut, Acacia, Jack fruit, Sapeta
		Basudevpur	-do-	-do-	1,00,000 nos. seedlings	Coconut, Grafted Mango, Acacia, Jack fruit, Sapeta

N.B: -The target and location are likely to change depending on scheme and project guideline of Govt. from time to time.

The silvicultural operations to be carried out will include plantation and associated works such as protection, tending and soil and moisture conservation. Rigid protection and closure of grazing, protection against fore and regulations of rights and concessions will be made in accordance with the provisions of the forests and wildlife laws and rules in force.

- **JFM (over-lapping) working circle: -**

The total area allotted to this working circle is 5931.00 Ha. which comprises of 44 VSS and 20 Eco-Development Committees. The following actions are suggested: -

(I) Demarcation and survey at hte area allotted under each VSS/EDC.

(II) Preparation of digitised map to each VSS/EDC.

(III) Preparation of microplan for each VSS/EDC.

(IV) Capacity building of VSS/EDC Members

(V) Allotment of funds to each VSS/EDC

(VI) Provision of revolving fund for SHG under each VSS/EDC

(VII) Entry Point Activity for each VSS/EDC.

(VIII) Sustainable income generating activities for VSS/EDC.

(IX) Record maintenance for each activity undertaken for each VSS/EDC

The VSS and EDC of this Division are now in a dormant stage and not functional at all. They should be sensitised as per JFM Guidline for proper protection of flora and fauna and execution of developmental works including entry point activities as per microplan. Regular meetings, capacity building, exposure visits to successful area etc. should be practised at frequent intervals for better result.

Wildlife Management and Biodiversity conservation and development working circle:-

This basically includes buffer area of Gahiramatha sanctuary, Bhitarakanika national park, movement area of crocodiles in Baitarani and Mantei river, nesting areas of Olive Ridley Turtles and also includes such other areas of specific importance. The wet lands need to be surveyed, protected and developed.

The special objectives of management of this working circle are:-

(I) To improve the cover and food value of forest

(II) To create favourable conditions for wildlife

(III) To develop the forest blocks near villages through rehabilitation and afforestation measures.

(IV) To develop ground flora and middle storey.

(V) To increase population of wild animals by creating favourable condition for them.

(VI) To maintain biodiversity.

(VII) To identify and map water resources of the Division.

(VIII) Protection of Wildlife in general and endangered species in particular

(IX) Resolve man-animal conflict.

The Forest coming within 5 KM radius of Gahirmatha sanctuary and Bhitarkanika National Park should be managed in such a way so as to provide one protective cover to act as buffer zone of the sanctuary and National Park. It has been suggested to provide 1 high speed Boat, 2 nos. Support Boats and (2 units) 20 nos. of patrolling squad for sea patrolling to prevent fishing and trawler movement for protection of sea turtle round the year. Wildlife Protection Squads including anti-smuggling operations of specified locations including river squad have been suggested for deployment to prevent anti-poaching and anti-smuggling activities in the Division. Further, developmental activities like infrastructure development patrolling etc. Under APO Campa (General and Wildlife) Head year wise are also being under taken which promotes wildlife protection activities of the Division to a great extent.

- **Management of trees outside Forests: -**

Trees outside Forest basically belong to two categories of land (a) Government land (b) Private Land. The trees which are located in Government land should be managed scientifically so that they contribute towards integrated and sustainable management of forests as national resources. The removal of timber from RH Plaots is regulated by the relevant provisions of Odisha Forest Act, 1972, Hon'ble Supreme Court directive, State Govt. guidelines and need to be carefully monitored. The Govt. land applied for non-forestry purposes and their present status is furnished in a Tabular Format.

Table 11.5 Trees outside forest area in Govt. Land applied for non-forestry purpose.

Sl No.	Year	Name of the UA applied for tree felling	Khata No./Kissam/ Area	No of trees felled	Remark
1	2010-11	Chief Engineer, DPI & Road, World Bank Project, Odisha	Widening of Road fromBasantia to Bhadrak	1199	UA deposited plantation cost with DM, OFDC Ltd., Jajapur(C) Division as per Plantation Scheme for 10 times plantation. The OFDC Ltd. has planted 31800 nos seedling during 2011-12 and 28,200nos during 2012-13 total 60,000 nos in other road of Bhadrak District out of World Bank fund to compensate loss of felling of trees along Anadpur-Bhadrak-Chandbali wideness project.
			Widening of Road fromIcchapur to Chandbali	1655	
	2013-14		Widening of Road fromIcchapur to Chandbali	1840	
2	2015-16	Executive Engineer, Bhadrak (R&B) Division.	Widening of Road fromJamujhadi to Basudevpur	892	UA deposited plantation cost with DM, OFDC Ltd., Jajapur(C) Division as per Plantation Scheme for 10 times plantation.
3	2015-16	Dy. Chief Engineer (Con) E.Co. Railway, Jajpur-Keonjhar Road.	Bhadrak railway Station to Baitarani River for construction 3rd Railway Line	984	UA deposited plantation cost with DM, OFDC Ltd., Jajapur(C) Division as per Plantation Scheme for 10 times plantation.
4	2017-18	Executive Officer, Bhadrak Municipality	Establishment of Septage Treatment Plant at Balarampur of Amargadia Revenue Village	Action is being taken for joint verification of 1200no of trees	

			Khata No.828/1 Plot No.1979/3293 Kissam- Patit	

N.B:- (i) Permission has been granted as per the decision of Secretary to Govt. of Odisha, Forest &Environment Department for felling of trees for widening purpose from Sl No. 1 to 3.

(ii) As regards to item no.4 application from Executive Officer, Bhadrak Municipality has been received and permission will be granted only after obtaining necessary clearance fromMoEF, GoI, and Forest & Environment Department Govt. of Odisha as per rule.

Since Bhadrak Wildlife Division is having no high Forest except coastal mangroves, effort should be made to access the growing stock of existing plantation, Road Side Plantation, River side Plantation, Canal side, Vail side etc. for their sustainable management and revitalization of rural economy.

- **Forest Consolidation, Survey, demarcation and Boundary pillar posting: -**

The consolidation of forests has been grossly neglected in the past. In fact, no further RF blocks could be notified during the outgoing plan and even in the intervening period. All the pending blocks need to be notified u/s 21 of OFA during this plan period. Utmost priority is to be given to this work and a phased Programme is to be drawn by the DFO and pursued vigorously with the Collector / Forest Settlement Officer (FSO) for final notification of such block(s) as RF for better and intensive forest management. Moreover, some blocks of UDPF are existing without any demarcation. Further other forest areas as per DLC report and borne in the Revenue records especially large areas with good tree growth should also be converted to RF/PFs for better management.As DPFs and PRFs have been notified since long back, these blocks may need fresh demarcation to ascertain their exact location, size and area in present condition. In fact, in many such blocks, the boundary lines are not traceable leading to confusion in the field. These blocks need to be demarcated in consultation with the FSO and assistance should be provided to the FSO to complete his enquiry so that the final notification is facilitated. The DFO should sincerely pursue all the pending proposals and facilitate the notification in a fixed time frame. Besides, new proposals for notification as RFs during the plan period shall also be dealt with promptly.

- **Treatment Plan:-**

(I) Procurement of soft copy of Revenue mouza maps 16" = 1 Mile scale all around the forest block.

(II) Downloading of image map

(III) Rectification of Revenue, Topo and Image Map.

(IV) Drawing at forest Block boundary with respect to Revenue Map

(V) Position of Trisimali, Dosimali, and Forest pillars along boundary of forest block as shown in Revenue map.

(VI) Extraction of Geo-reference co-ordinates, distance, bearing of pillar position.

(VII) Survey Demarcation of the Forest block in field and pillar posting with chain, compass, GPS instruments.

For PRF and VF land schedule shall be taken into the account to ascertain the boundary.

11.5 Working scheme for Bhadrak Wildlife Division for the period 2019-20

The basis of proposals for this working plan is based on guidance issued in National Working Plan Code-2014 and National Forest Policy in force. In absence of any previous working plan the following working circle are suggested in the approved PWPR: -

1. Protection Working Circle-3576.24 Ha.
2. Plantation overlapping working circle
3. JFM overlapping working circle-1179 Ha. for VSS and 4752 Ha. for EDC
4. Wildlife Management and Bio-diversity conservation and development working circle.

- **General objectives of the working plan:-**

i. Sustainable management of Forests and its biodiversity as enshrined in the National Forest Policy.

ii. To encompass the ecological (environmental), economic (production) and social (including cultural) dimensions.

iii. To ensure conservation of forests and reducing forest degradation.

iv. To maintain and enhance of ecosystem services including ecotourism.

v. To increase forest productivity, establishment of regeneration, improve forest health in progressive manner.

vi. To increase the growing stocks and carbon sequestration potential.

vii. Sustainable yield of forest produce, prevention of soil erosion and stabilization of the terrain.

viii. Manage Coastal Mangrove and Casuarina plantation as effective Shelter Belt.

ix. Forest Fringe management with special thrust.

x. Improvement and regulation of hydrological regime.

xi. People's involvement in planning and management of forests fulfilling socio-economic and livelihood needs of the people.

xii. To improve wildlife Habitat, population and reduce man-animal conflict.

xiii. Adoption of modern technology for better management.

xiv. Management of TOF with villagers' participation.

- **Protection Working Circle:-**

  The mangrove forest area along the coast of Bay of Bengal, the area with crocodile concentration, the nesting place of Olive Ridley Turtle are to be brought under protection working circle.

There is no dedicated staff for protection/management of the wild fauna, the intervention at present is limited to patrolling the area during turtle migration season. Olive ridley sea turtles arrive in the small islands like Babubali island, Wheeler island, Coconut island etc. and the sea coast in 2nd half of October every year. They mate in shallow waters and wait for right weather and proper beach to lay their eggs. Mass nesting takes place between February to April. The eggs hatch approximately 50 days after the nesting and the hatchlings go back to the sea during the month of April/May.

During this period, patrolling are organized by the Division with help of hired trawlers to prevent unauthorised entry of fishing vessels. Indian Coast Guard also carries out its own patrolling and at times joint patrolling is carried out. Illegal fishing vessels when apprehended are prosecuted under Wildlife (Protection) Act, 1972. Onshore and offshore camps are established to monitor turtle mortality, movement of illegal fishing vessels and organizing movement into the sanctuary area. These camps are mostly manned by daily waged workers from the local community. Movement pattern of turtle congregation is monitored in the water during the course of patrolling. The beach is monitored and suitable sites for nesting are cleared of debris. At the time of mass nesting, census of nesting turtles are carried out scientifically and the number is estimated. Steps are taken to prevent damage of eggs by dogs, wild animals like jackals and wild boars. At the time of hatching, steps are taken to prevent mortality by seagulls, crows etc. and if required the hatchlings are helped manually to enter into the sea. During the time of nesting and hatching, lights on the seaward side are switched off by DRDO authorities.

The sanctuary remains unattended from June to October every year and hardly any conservation efforts are carried out.

The following proposals are suggested during the year 2019-20 under Elephant Depredation Activities in boarder areas adjoining to Hadagarh Sanctuary of Keonjhar Wildlife Division and Portion of this Division. The Elephant herd usually visit the area of cultivation of mango, jack fruit and pine apple during ripening period and also at the time of harvesting of seasonal paddy and maize crops of the locality.

Table no. 11.6 ELEPHANT DEPRADATION IN BHADRAK (WL) DIVISION

Sl. No.	Name of the Range	Name of the Section	Loation	Item of work	Quantity	Period
1	2	3	4	5	6	7
1	Bhadrak (WL) Range	Agarpada	Border area adjoining to HadagarhSanctuary of Keonjhar (WL) Division & portion of Bhadrak (WL) Division	Squad	1 no. (10 nos. members	Through out the year
				Vehicle	1 no.	
				POL	3000 ltr.	
				Ancillaries	Spot light-4nos, Torch-8nos, Crackers, Night Vision Binaculars-2 nos., Night Vision Binoculars-2 nos., Camera-2nos., uniforms, Shoes, Temporary shed, installation of solar light, solar fencing,etc	

In absence of High Forest no felling services and cutting sections are prescribed. However keeping in view the objectives stated above the following proposals have been inducted in phase II of ICZMP Project.

Table no. 11.7 Proposal for Bhadrak Wildlife Division under Phase-II of ICZMP

Sl. No.	Name of Project	Location	Item of work	Objective
1	ICZMP Phase-II	Babubali	(i)Procurement of High Speed Boat-1 No. (ii)Procurement of Support Boat-2 Nos.	Required for sea patrolling purpose. Olive Ridley Sea Turtle mass nesting protection and conservation monitoring of Biodiversity conservation
2	-do-	Chandnipal, Karanjmal, Balimunda, Kasia, Mohanpur,	Ant-poaching squad-2 units (20 nos.)	For protection of 2375 Ha. Mangrove plantation created under OFSDP

The area will be rightly protected from all sorts of biotic interference inform of encroachment, illicit felling, grazing, poaching etc., so as to keep it under natures own care and nursing. Further, the existing growing stock and young generation shall be improved upon by taking suitable site specific tending and cleaning operations.

- **Plantation (overlapping) Working Circle:-**

The following plantation programme has been implemented in Bhadrak (WL) Division under different schemes during the year 2018-19.

Table no. 11.8: Plantation Activities of Bhadrak (WL) Division during 2018-19

SL No.	Name of the Division	Name of the Scheme	Target of Plantation		Achievement	Target of Distribution	Achievement
			Target	No. of seedling to be planted		Target	
1	Bhadrak (WL) Division	MGNREGS	50RKM	12500	50 RKM	150000	150000

Further the plantation programme proposed to be executed during 2019-20 different scheme wise is listed below:

Table no. 11.9 Plantation Activities of Bhadrak (WL) Division, during 2019-20

SL No.	Name of the Division	Name of the Scheme	Target of Plantation		Achievement	Target of Distribution	Achievement
			Target	No. of seedling to be planted		Target	
1	Bhadrak (WL) Division	IGC	10000	3800	0	140500	0
2		GMM	3000	3000	0	250000	0
3		MGNREGS	50RKM	12500	-	-	-
4		Kanika Sand Conservation Plan	30 Ha. Casuarina Plantation	75000	-	-	-
5		ICZMP	30 Ha. Mangrove Plantation	48000	-	-	-
6			5 Ha. Casuarina Plantation	7500	-	-	-

Table no. 11.10 Proposed activities to be implemented in Kanika Island

Sl. No.	Nature of Intervention
1	Sand dune stabilization by creating density plantation of casuarinas over 30 Hectares
2	Protection from biotic interference a. Procurement of 1 motor boat a. Two rowing boats with fibre coating b. Construction and maintenance of landing facilities c. Procurement one Vehicle (Scorpio)
3	Management of creeks and channels a. Opening of Creek Mouth b. Extension of Channels
4	Assisted Natural Regeneration
5	Monitoring of Shoreline Change a. Baseline survey & mapping b. Annual satellite image processing and data analysis

6	Biodiversity assessment
7	Annual hydrographical Survey alongwith facilities for ground truthing.
8.	Stay out facilities/infrastructure creation for technical staff & support staff for field level study on biodiversity assessment, hydrographical survey & shoreline changes, arrangement of boarding, logistics & related charges.

- **ECO-TOURISM ACTIVITY**

  In addition to the above for eco-tourism point of views the following interventions are suggested:-

  (a) Since the Kanika island is located opposite to DPCL, day time tourism with provision for one speed boat and two numbers of support boats for smooth journey of the tourists should be made available.

  (b) Land development with provision for sitting places, lawn, garden with provision of water facility.

  (c) Infrastructure development for staffs and provision of adequate no. of staffs for smooth management of all the items of eco-tourism activities in the island.

  (d) Provision for interpretation center and earmarked day picnic spot in the island.

  (e) Watch tower provision for sightseeing.

  (f) Provision for solar light installation.

  (g) Provision for inspection path to be delineated properly for smooth movement of the tourist.

- **Treatment of old SFP Plantations: -**

The SFP Plantation area of this Division comprises of a total area of 1641.00 ha., out of which 1638.56 ha. is Govt. land and 2.44 Ha. is private land. In view of very low survival percentage such plantation areas need to be identified and demarcated in the field with the help of revenue staff. After proper identification and demarcation such areas should be declared as VF as per Village Forest Rule, 1985, JFM resolution and its subsequent amendments. Such VF plots are to be coloured in village sheet. Cadastral map (to be proposed during working plan preparation). Small stone cairns of half meter height are to be erected and coal tarring of trees standing on the boundary are to be made at the time of demarcation. Plantation areas shall be indicated fixing sign boards at strategic points. The matured crop of old SFP Plantation should not be allowed to be harvested without obtaining prior approval of MOEF Govt. of India and F&E Department. Govt. of Odisha as the District is devoid of any good vegetal cover since last super cyclone which ravaged coastal Odisha including Bhadrak District.

The old SFP Plantation areas devoid of any vegetation after demarcation of VF should be restocked with Block Plantation @ Rs.1600/- plants per Ha. and Gap Plantation should be adopted depending on field position and crop/plantation composition as per existing Govt. norm.

The plantation areas shall be strictly protected from grazing and fire suitable areas if any available adjacent to these plantations may be developed into fodder plantation and even encourage stall feeding those by diverting the grazing pressure from the plantation area. The people in the adjoining areas of plantation should be formally or informally associated in the plantation works and they should be asked to prevent their cattle entering the plantation area by setting up future awareness campaigns. Wherever necessary involvement of people should be assured for protection of the plantations in a participatory made.

- **JFM (over-lapping) working circle:-**

It comprises of 44 VSS and 20 EDC. The VSS and EDC of this Division one now in a dormant stage and not functional at all. They should be sensitised as per JFM Guideline for proper protection of flora and fauna and execution of developmental works including entry point activities as per micro plan. Regular meetings, capacity building, exposure visits to successful area etc. should be practised at frequent intervals for better result.Further, the VSS and EDC have not yet been registered by the Competent Authority under Society Registration Act 1860

- **Wildlife Management and Biodiversity conservation and development working circle:-**

This basically includes buffer area of Gahiramatha sanctuary, Bhitarakanika national park, movement area of crocodiles in Baitarani and Mantei river, nesting areas of Olive Ridley Turtles and also includes such other areas of specific importance. The wet lands need to be surveyed, protected and developed.

- **Management of trees outside Forests:-**

Trees outside Forest basically belong to two categories of land (a) Government land (b) Private Land. The trees which are located in Government land should be managed scientifically so that they contribute towards integrated and sustainable management of forests as national resources. The removal of timber from RH Plots is regulated by the relevant provisions of Odisha Forest Act, 1972, Hon'ble Supreme Court directive, State Govt. guidelines

and need to be carefully monitored. The Govt. land applied for non-forestry purposes and their present status is furnished in a Tabular Format.

Table no 11.11: Indicating trees outside forest area in Govt. Land applied for non-forestry purpose.

Sl No.	Year	Name of the User Agency applied for tree felling.	Khata No. / Kissam/ Area	No. of trees felled/ to be felled	Remarks
1	2018-19	Executive Engineer, Bhadrak (R&B) Division.	Widening of road from Motto to Choaudhury Ghat.	1341	User Agency deposited plantation cost with Divisional, Manager, OFDC, Ltd, Jajpur Division as per plantation scheme for 10 times plantation.
2	2019-20	Executive Engineer (Con.), S.E. Railway, Kharagpur	Widening of railway line from Ranital to Bhadrak	312	User Agency deposited plantation cost with Divisional, Manager, OFDC, Ltd, Jajpur Division as per plantation scheme for 10 times plantation.
3.	2019-20	G.M (Tech.) &P.D NHAI,	Rehabilitation and up gradation of Six laning of NH-5 (new-NH-16)	4979	User Agency has requested to deposit plantation cost with Divisional, Manager, OFDC, Ltd, JajpurDivision as per plantation scheme for two times plantation.
4.	2019-20	Executive Engineer, Bhadrak (R&B) Division.	Widening of road from Jamujhadi to Dhamara.	408	User Agency has requested to deposit plantation cost with Divisional, Manager, OFDC, Ltd, Jajpur(C) Division as per plantation scheme.

- **Forest Consolidation, Survey, demarcation and Boundary pillar posting: -**

The consolidation of forests has been grossly neglected in the past. In fact, no further RF blocks could be notified during the outgoing plan and even in the intervening period.

All the pending blocks need to be notified u/s 21 of OFA during this plan period. Utmost priority is to be given to this work and a phased programme is to be drawn by the DFO and pursued vigorously with the Collector / Forest Settlement Officer (FSO) for final notification of such block(s) as RF for better and intensive forest management. Moreover, some blocks of UDPF are existing without any demarcation. Further other forest areas as per DLC report and borne in the Revenue records especially large areas with good tree growth should also be converted to RF/PFs for better management.As DPFs and PRFs have been notified since long back, these blocks may need fresh demarcation to ascertain their exact location, size and area in present condition. In fact, in many such blocks, the boundary lines are not traceable leading to confusion in the field. These blocks need to be demarcated in consultation with the FSO and assistance should be provided to the FSO to complete his enquiry so that the final notification is facilitated. The DFO should sincerely pursue all the pending proposals and facilitate the notification in a fixed time frame. Besides, new proposals for notification as RFs during the plan period shall also be dealt with promptly.

Treatment Plan: -

(I) Procurement of soft copy of Revenue mouza maps 16” = 1 Mile scale all around the forest block.

(II) Downloading of image map

(III) Rectification of Revenue, Topo and Image Map.

(IV) Drawing at forest Block boundary with respect to Revenue Map

(V) Position of Trisimali, Dosimali, and Forest pillars along boundary of forest block as shown in Revenue map.

(VI) Extraction of Geo-reference co-ordinates, distance, bearing of pillar position.

(VII) Survey Demarcation of the Forest block in field and pillar posting with chain, compass, GPS instruments.

(VIII) For PRF and VF land schedule shall be taken into the account to ascertain the boundary.

11. 6 Working scheme for Bhadrak Wildlife Division for the period 2020-21

The basis of proposals for this working plan is based on guidance issued in National Working Plan Code-2014 and National Forest Policy in force. In absence of any previous working plan the following working circle are suggested in the approved PWPR:-

(1) Protection Working Circle-3576.24 Ha.

(2) Plantation overlapping working circle

(3) JFM overlapping working circle-1179 Ha. for VSS and 4752 Ha. for EDC

(4) Wildlife Management and Bio-diversity conservation and development working circle.

- **General objectives of the working plan:-**

(a) Sustainable management of Forests and its biodiversity as enshrined in the National Forest Policy.

(b) To encompass the ecological (environmental), economic (production) and social (including cultural) dimensions.

(c) To ensure conservation of forests and reducing forest degradation.

(d) To maintain and enhance of ecosystem services including ecotourism.

(e) To increase forest productivity, establishment of regeneration, improve forest health in progressive manner.

(f) To increase the growing stocks and carbon sequestration potential.

(g) Sustainable yield of forest produce, prevention of soil erosion and stabilization of the terrain.

(h) Manage Coastal Mangrove and Casuarina plantation as effective Shelter Belt.

(i) Forest Fringe management with special thrust.

(j) Improvement and regulation of hydrological regime.

(k) People's involvement in planning and management of forests fulfilling socio-economic and livelihood needs of the people.

(l) To improve wildlife Habitat, population and reduce man-animal conflict.

(m) Adoption of modern technology for better management.

(n) Management of TOF with villagers' participation.

- **Protection Working Circle:-**

The mangrove forest area along the coast of Bay of Bengal, the area with crocodile concentration, the nesting place of Olive Ridley Turtle are to be brought under protection working circle.

There are no dedicated staffs for protection/management of the wild fauna; the intervention at present is limited to patrolling the area during turtle migration season. Olive Ridley sea turtles arrive in the small islands like Babubali Island, Wheeler Island, Coconut Island etc. and the sea coast in 2nd half of October every year. They mate in shallow waters and wait for right weather and proper beach to lay their eggs. Mass nesting takes place between February to April. The eggs hatch approximately 50 days after the nesting and the hatchlings go back to the sea during the month of April/May.

During this period, patrolling is organized by the Division with help of hired trawlers to prevent unauthorized entry of fishing vessels. Indian Coast Guard also carriesout its own patrolling and at times joint patrolling is carried out. Illegal fishing vessels when apprehended are prosecuted under Wildlife (Protection) Act, 1972. Onshore and offshore camps are established to monitor turtle mortality, movement of illegal fishing vessels and organizing movement into the sanctuary area. These camps are mostly manned by daily waged workers from the local community. Movement pattern of turtle congregation is monitored in the water during the course of patrolling. The beach is monitored and suitable sites for nesting are cleared of debris. At the time of mass nesting, census of nesting turtles are carried out scientifically and the number is estimated. Steps are taken to prevent damage of eggs by dogs, wild animals like jackals and wild boars. At the time of hatching, steps are taken to prevent mortality by seagulls, crows etc. and if required the hatchlings are helped manually to enter into the sea. During the time of nesting and hatching, lights on the seaward side are switched off by DRDO authorities. The sanctuary remains unattended from June to October every year and hardly any conservation efforts are carried out.

The following proposals are suggested during the year 2019-20 under Elephant Depredation Activities in boarder areas adjoining to Hradagarh Sanctuary of Keonjhar Wildlife Division and Portion of this Division. The Elephant herd usually visit the area of cultivation of mango, jack fruit and pine apple during ripening

period and also at the time of harvesting of seasonal paddy and maize crops of the locality.

Table no. 11.12 ELEPHANT DEPRADATION IN BHADRAK (WL) DIVISION						
S.N	**Range**	**Section**	**Location**	**Item**	**Quantity**	**Period**
1	Bhadrak (WL) Range	Agarpada	Border area adjoining to Hadagarh Sanctuary of Keonjhar (WL) Division & portion of Bhadrak (WL) Division	Squad	1 no. (10 nos. members	Through out the year
				Vehicle	1 no.	
				POL	3000 ltr.	
				Ancillaries	Spot light-4nos, Torch-8nos, Crackers, Night Vision Binaculars-2 nos., Night Vision Binaculars-2 nos., Camera-2nos., uniforms, Shoes, Temporary shed, installation of solar light, solar fencing,etc	

In absence of High Forest no felling services and cutting sections are prescribed. However keeping in view the objectives stated above the following proposals have been inducted in phase II of ICZMP Project:-

Table no. 11.13 Proposal for Bhadrak Wildlife Division under Phase-II of ICZMP				
Sl. No	Name of Project	Location	Item of work	Objective
1	ICZMP Phase-II	Babubali	(i)Procurement of Support Boat-2 Nos.	Required for sea patrolling purpose. Olive Ridley Sea Turtle mass nesting protection and conservation monitoring

				of Biodiversity conservation
2	-do-	Chandnipal, Karanjmal, Balimunda, Kasia, Mohanpur,	Ant-poaching squad-2 units (20 nos.)	For protection of 2375 Ha. Mangrove plantation created under OFSDP

The area will be rightly protected from all sorts of biotic interference inform encroachment, illicit felling, grazing, poaching etc., so as to keep it under natures own care and nursing.Further, the existing growing stock and young generation shall be improved upon by taking suitable site specific tending and cleaning operations.

- **Plantation (overlapping) Working Circle:-**

The following plantation programme has been implemented in Bhadrak (WL) Division under different schemes during the year 2019-20.

Table 11:14: Plantation Activities of Bhadrak (WL) Division during 2019-20

S.N	Division	Scheme	Target of Plantation		Achievement		Target of Nursery	
			Activities	No. of seedling to be raised	Activities	No. of seedlings planted	Activities	Achievement
1	Bhadrak (WL) Division	NREGS	60 RKM	15000	40 RKM	10000	-	-
2		IGC	3800nos. UTP	3800	3800nos. UTP	3800	140500 distribution	140500
3		GMM	3000nos. UTP	3000	3000nos. UTP	3000	250000 distribution	250000

Further the plantation programme proposed to be executed during 2020-21 different schemes wise is listed below:

Table No 11.15: Plantation Activities of Bhadrak (WL) Division, during 2020-21

SL No.	Division	Scheme	Target of Plantation		Achievement		Target of Nursery	
			Activities	No. of seedling to be raised	Activities	No. of seedlings planted	Activities	Achievement

1	Bhadrak (WL) Division	CAMPA 2019-20	-	-	-	-	150000 (18 m)	15000
2		CAMPA 2020-21	27 ha. AR plantation	47520	-	-	200000 (6 m) distribution	200000
			-	-	-	-	200000 nos. (18m)	-
3		IGC	10000 nos. UTP	10000	-	-	-	-
4		GMM	20 ha. AR Plantation	32000	-	-	-	-
5		OEMF	-	-	-	-	100000 (6m)	-
6		MGNREGS	60 RKM Avenue Plantation	15000	-	-	150000 (6 m)	60000
7		Kanika Island Conservation Plan	7.2 ha. Casuarina Plantation	20000	-	-	-	-

Table no. 11.16 Proposed activities to be implemented in Kanika Island

Sl. No.	Nature of Intervention
1	Sand dune stabilization by creating density plantation of casuarinas over 30 Hectares
2	Protection from biotic interference b. Procurement of 1 motor boat d. Two rowing boats with fibre coating e. Construction and maintenance of landing facilities f. Procurement one Vehicle (Scorpio)
3	Management of creeks and channels c. Opening of Creek Mouth d. Extension of Channels
4	Assisted Natural Regeneration
5	Monitoring of Shoreline Change c. Baseline survey & mapping d. Annual satellite image processing and data analysis
6	Biodiversity assessment

7	Annual hydrographical Survey alongwith facilities for ground truthing.
8.	Stay out facilities/infrastructure creation for technical staff & support staff for field level study on biodiversity assessment, hydrographical survey & shoreline changes, arrangement of boarding, logistics & related charges.

- **ECO-TOURISM ACTIVITY**

In addition to the above for eco-tourism point of views the following interventions are suggested.

i. Since the Kanika island is located opposite to DPCL, day time tourism with provision for one speed boat and two numbers of support boats for smooth journey of the tourists should be made available.

ii. Land development with provision for sitting places, lawn, garden with provision of water facility.

iii. Infrastructure development for staffs and provision of adequate no. of staffs for smooth management of all the items of eco-tourism activities in the island.

iv. Provision for interpretation center and earmarked day picnic spot in the island.

v. Watch tower provision for sightseeing.

vi. Provision for solar light installation.

vii. Provision for inspection path to be delineated properly for smooth movement of the tourist.

- **Treatment of old SFP Plantation:-**

The SFP Plantation area of this Division comprises of a total area of 1641.00 ha., out of which 1638.56 ha. is Govt. land and 2.44 Ha. is private land. In view of very low survival percentage such plantation areas need to be identified and demarcated in the field with the help of revenue staff. After proper identification and demarcation such areas should be declared as VF as per Village Forest Rule, 1985, JFM resolution and its subsequent amendments. Such VF plots are to be coloured in village sheet. Cadastral map (to be proposed during working plan

preparation). Small stone cairns of half meter height are to be erected and coal tarring of trees standing on the boundary are to be made at the time of demarcation. Plantation areas shall be indicated fixing sign boards at strategic points. The matured crop of old SFP Plantation should not be allowed to be harvested without obtaining prior approval of MOEF Govt. of India and F&E Department. Govt. of Odisha as the District is devoid of any good vegetal cover since last super cyclone which ravaged coastal Odisha including Bhadrak District.

The old SFP Plantation areas devoid of any vegetation after demarcation of VF should be restocked with Block Plantation @ Rs.1600/- plants per Ha. and Gap Plantation should be adopted depending on field position and crop/plantation composition as per existing Govt. norm.

The plantation areas shall be strictly protected from grazing and fire suitable areas if any available adjacent to these plantations may be developed into fodderplantation and even encourage stall feeding those by diverting the grazing pressure from the plantation area. The people in the adjoining areas of plantation should be formally or informally associated in the plantation works and they should be asked to prevent their cattle entering the plantation area by setting up future awareness campaigns. Wherever necessary involvement of people should be assured for protection of the plantations in a participatory made.

- **JFM (over-lapping) working circle:-**

  It comprises of 44 VSS and 20 EDC. The VSS and EDC of this Division one now in a dormant stage and not functional at all. They should be sensitised as per JFM Guideline for proper protection of flora and fauna and execution of developmental works including entry point activities as per micro plan. Regular meetings, capacity building, exposure visits to successful area etc. should be practised at frequent intervals for better result.

  Further, the VSS and EDC have not yet been registered by the Competent Authority under Society Registration Act 1860.

- **Wildlife Management and Biodiversity conservation and development working circle:-**

This basically includes buffer area of Gahiramatha sanctuary, Bhitarakanika national park, movement area of crocodiles in Baitarani and Mantei river, nesting areas of Olive Ridley Turtles and also includes such other areas of specific importance. The wet lands need to be surveyed, protected and developed.

- **Management of trees outside Forests:-**

Trees outside Forest basically belong to two categories of land (a) Government land (b) Private Land. The trees which are located in Government land should be managed scientifically so that they contribute towards integrated and sustainable management of forests as national resources. The removal of timber from RH Plaots is regulated by the relevant provisions of Odisha Forest Act, 1972, Hon'ble Supreme Court directive, State Govt. guidelines and need to be carefully monitored. The Govt. land applied for non-forestry purposes and their present status is furnished in a Tabular Format.

Table no 11.17: indicating trees outside forest area in Govt. Land applied for non-forestry purpose

Sl No.	Year	Name of the User Agency applied for tree felling.	Khata No. / Kissam/ Area	No. of trees felled/ to be felled	Remarks
1	2019-20	Executive Engineer (Con.), S.E. Railway, Kharagpur	Widening of railway line from Ranital to Bhadrak	208	User Agency deposited plantation cost with Divisional, Manager, OFDC, Ltd, Jajpur (C) Division as per plantation scheme for 2 times plantation.

- **Forest Consolidation, Survey, demarcation and Boundary pillar posting:-**

The consolidation of forests has been grossly neglected in the past. In fact, no further RF blocks could be notified during the outgoing plan and even in the intervening period. All the pending blocks need to be notified u/s 21 of OFA during this plan period. Utmost priority is to be given to this work and a phased programme is to be drawn by the DFO and pursued vigorously with the Collector/ Forest Settlement Officer (FSO) for final notification of such block(s) as RF for better and intensive forest management. Moreover, some blocks of UDPF are existing without any demarcation. Further other forest areas as per DLC report and borne in the Revenue records especially large areas with good tree growth should also be converted to RF/PFs for better management. As DPFs and PRFs have been notified since long back, these blocks may need fresh demarcation to ascertain their exact location, size and area in present condition. In fact, in many such blocks, the boundary lines are not traceable leading to confusion in the field. These blocks need to be demarcated in consultation with the FSO and assistance should be provided

to the FSO to complete his enquiry so that the final notification is facilitated. The DFO should sincerely pursue all the pending proposals and facilitate the notification in a fixed time frame. Besides, new proposals for notification as RFs during the plan period shall also be dealt with promptly.

- **Treatment Plan:-**

(I) Procurement of soft copy of Revenue mouza maps 16" = 1 Mile scale all around the forest block.

(II) Downloading of image map

(III) Rectification of Revenue, Topo and Image Map.

(IV) Drawing at forest Block boundary with respect to Revenue Map

(V) Position of Trisimali, Dosimali, and Forest pillars along boundary of forest block as shown in Revenue map.

(VI) Extraction of Geo-reference co-ordinates, distance, bearing of pillar position.

(VII) Survey Demarcation of the Forest block in field and pillar posting with chain, compass, GPS instruments.

(VIII) For PRF and VF land schedule shall be taken into the account to ascertain the boundary.

CHAPTER-12

STATISTICS OF GROWTH AND YIELD

12.1 No such statistics has been prepared in the Division regarding growth and yield of any species as there is no high forests. As a result of which, it is not possible to calculate the Mean Annual Increment (MAI). However, a modest attempt will be made to assess the growing stock of different plantations of the Division to create a benchmark for future revision.

12.2. Statistics of forest carbon Stock:

Carbon is an element commonly found on earth in various forms. It is an essential element of all forms of life. The bodies of living organisms contain a substantial portion of carbon. Carbon is also found in large quantities in non-living things like oil, nature gas, coal, rocks and air. Globally carbon is held in a variety of different stocks as oceans, fossil fuel deposits, terrestrial system and the atmosphere. In the terrestrial system, carbon is stores in rocks, sediments, swamps, wetlands, forests, forest soil, grassland and agricultural. About two thirds of global terrestrial carbon is contained in forests and forest soil. In addition, there are some non-natural human-created carbon stocks as wood products and waste dumps.

The exchange of carbon among its various forms from the atmosphere, oceans and land is called the carbon cycle. The most significant from of carbon exchange is by the plant. Plants draw in carbon dioxide (CO_2) from the atmosphere through the process of photosynthesis and turn it into biomass (wood, leaves, fruits etc). A part of the CO2taken in by plants is returned to the atmosphere through respiration. Thus, the carbon cycle is renewed and continues interminably.

The delicate balance maintained by nature is being overturned by anthropogenic factors. The extraction of fossil fuels from the earth and many other human induced activities are overloading the atmosphere with carbon dioxide and other greenhouse gases thereby raising serous issues including the very survival of the human race.

Excessive quantities of greenhouse gases disturb the balance of transfer of heat though the atmosphere, normally solar radiation absorbed by space heats the earth while infrared radiation lost to space cools the earth. The presence of excessive anthropogenic greenhouse gas emission (mostly carbon dioxide from fossil fuel burning) in the atmosphere reduces the Earth's ability to cool to outer space through infrared radiation. The result is a heightening of

the greenhouse effect, a nature process by which gases as CO2 absorb and reflect long-wage radiation retaining much of that heat in the Earth's atmosphere and consequently warming the planet.

Human induced disturbance to the carbon cycle have been both direct and indirect. Direct effects include the addition of new carbon to the active global carbon cycle through the combustion of fossil fuels and land use change leading to modification of the vegetation structure and distribution. Indirect human impacts on the carbon cycle include changes in other major global biogeochemical cycle, alternation of the atmosphere composition through the additions of pollutants as CO2 and changes in the biodiversity of landscape and species. Currently about three-quarters of the direct human induced disturbances to the global carbon cycle are due to fossil-fuel combustion. Emission currently exceed 6 GT C/year(gigatons of carbon per year) and are still increasing.

Carbon and forest Eco-System

Forests play an important role in mitigation and adaptation of climate change; Forests sequester and store more carbon than any other terrestrial ecosystem and are an important natural 'brake' on climate change. Carbon sequestration by forest has attracted much interest as a mitigation approach, as it has been considered a relatively inexpensive means of addressing climate regimes. The large geographical area, varied topography, long coastline and the possession of the oceanic island have endowed it with a diversity of natural biomass from desert to alpine meadows, from tropical rain forests to temperate pine forests, from mangroves to coral reefs and from marshland to high altitude lakes.

Research it still in progress to understand the effect of climate change on life forms and ecosystem. It has been suggested that the increased proportion of carbon dioxide in the atmosphere increase fertilization effect and enhances growth in plants. In t6hat case warming and an increase in atmosphere CO2 should productivity and increase the sink potential of vegetation (assuming nutrient supply is adequate and enough inoisture is available). A study on the effects of CO2 fertilization on vegetation and soil in temperate forest ecosystem suggests that plant C increase in response to excess atmospheric CO2 (Downing et al., 1992).

Gregor draws the conclusion that climate change might have positive effects on some of the factors of the forest ecosystem but the overall effect of global warming on the forests does not seem to be positive in terms of an increase in the absorption of carbon. Greenhouse effect result in air pollution, damage to forests, drier and warmer summers, frequent droughts and

heat periods as well as frequent extreme wind storm events which would offset any possible effect resulting from longer vegetation periods (Gregor, 1992).

The main carbon pools in tropical forest ecosystems are living biomass of trees and under story vegetation and the dead mass of litter, woody debris and soil organic matter. The carbon stored in the aboveground living biomass of trees is typically the largest pool land the most directly impacted by deforestation and degradation.

While living trees are growing, they continued to store carbon and therefore acted as carbon sinks. Consequently, mature forests are huge storehouses of carbon. The young trees which grow faster rates also work as carbon sinks. The bigger (and older); the trees, the higher is their ability to cycle and sequester carbon (Morris Bishop, 1998). Though, it is important to consider the annual rate which is as more critical factor (Harmon et al., 1990). In India, a more effective management practice is selective felling of those trees which have already attained a matured age and no more work as sink. On felling such trees, younger trees are planted which sequester more carbon.

Forest that plays a potentially significant role in climate change adaptation, maintenance of ecosystem services and provision of livelihood options, are increasingly threatened by deforestation, fragmentation, climate change is likely to be on forest to provide soil and water protection; habitat for species and other ecosystem services. The potential negative impacts of climate change on dry forests are of particular concern since dry forest soil are more of particular concern since dry forest soil are more susceptible to wind and water erosion. According to the Millennium Ecosystem Assessment, dry land occupies 41% of the earth's land area and home to more than 2 billion people. Intensive human intervention as fire, grazing, agriculture, firewood collection, has adversely transformed many forests.

12.2.1 Methodology for the assessment of Forest Carbon

The 'Good Practices Guidance (GPG) developed by Intergovernmental Panel on Climate Change (IPCC) is universally accepted source book for concepts, definitions, various pools, methods, defaults values, various required equations etc. for preparing account of forest carbon stocks (FCS). Since the subject has been developing in last two decades, many new concepts and methods have emerged but still many challenges remain. The GPG uses the term "Categories" to refer specific sources of emission/ removals of greenhouse gases. As per the IPCC GPG 2003, the categories are: Forest land, Cropland, Grassland, Wetlands, Settlements and other land,

each land-use category is further subdivided. The following sub-categories are considered for the sector:

Forest land remaining Forest Land: An increase in the carbon stocks of Forest Land remaining Forest Land would me4an improvement in canopy density and growing stock of forest. A decrease in the carbon stock of Forest Land remaining Forest Land is generally considered as degradation of forest resources.

Land Converted to Forest land: Any non-forest and converted to Forest land would generally be considered as afforestation.

According to GPG, the calculation of GHG inventories require information on extent of area (in case of LULUCF) of an emission/ removal category termed as 'Activity date' and emission or removal of GHG per unit of area (removal of CO2 per ha. of added forest area) termed as 'Emission factors. The main aim is to estimate their factors for the reporting unit. Once these are estimated, the emission or removal, can be ascertained using the change in carbon stocks.

The different approaches are given in the GPG to present the activity data (the change in area of different land categories). **Approach 1** identifies the total area for each land category; it only provides "net" area. **Approach 2** identifies the land conversion between categories by tracking and provides tabular information about land-use conversion. **Approach 3** involves, in addition, the spatial tracking of land-use conversion.

Table No.12.1.: There IPCC tiers and date requirements

Tier	Data needs/ examples of appropriate biomass data
Tier 1	IPCC default factors: Default MAI (for degradation) and/ or forest biomass stock (for deforestation) values for broad continental forest types, Default values given for all vegetation-based pools.
Tier 2	Country specific data for key factors: MAI and/ or forest biomass values from existing forest inventories and/ or ecological studies. Default values provided for all non-tree pools. Newly-collected forest biomass data is required.
Tier 3	Detailed national inventory of key C stocks, repeated measurements of key stocks through time or modeling: Repeated measurement of trees from permanent plots and/ or calibrated process models. Can use default data other pools stratified by in-county regions and forest type, or estimated from process module.

The total carbon which is stocked in the forests is divided into several pools and the emission factors are derived from assessments of the changes in carbon stocks in these carbon pools. These factors are developed using estimated which are used at different levels: global, natural and sub-national and based on the level the 'Tier levels' (Table 12.1) are defined which are independent of the approach being followed.

In general, moving to higher tiers improves the accuracy of the inventory and reduces uncertainty, but the complexity and resources needed for conducing inventories also increase with higher tiers.

The Tier 1 approach employs the basic method and default emission factors provided in the IPCC Guidelines (Workbook), Tier 1 methodologies usually use activity data that are spatially coarse, such as nationally or globally available estimates of deforestation rates, agricultural production statistic and global land cover maps.

The Tier 2 approach applies emission factors and activity data which are defined by the country. Tier 2 can also apply stock change methodologies based on country-specific data. Country-defined emission factors/ activity data are more appropriates for the climatic regions and land use system in the country.

At Tier 3, higher order methods including models and inventory measurement are repeated over time and supported by high-resolution activity data and disaggregated at sub-nation level. Such systems may use Remote Sensing and GIS tools for tracking land use change over time.

In Forest ecosystem, enormous carbon is stored which is classified in five pools by GPG. The living portion of biomass carbon is classified in two approaches to emission accounting: the inventory approach and the activity-based approach, which are outlined below. Both approaches are supported under IPCC guidance (IPCC, 2003) and are based on the underlying assumption that the flows of GHG to or from the atmosphere are equal to changes in carbon stocks in the biomass and soils.

Table No. 12.2: Different Forest Carbon Pools

Pools		Description
Living Biomass	Above ground biomass (AGB)	All living biomass above the soil including stem, stump, branches, bark, seeds and foliage.

	Below ground biomass (BGB)	All living biomass of live roots. Fine roots of less than 2 mm diameter (country specific) are often excluded because these often cannot be distinguished empirically from soil organic matter or Litter.
Dead Organic Matter	Dead wood	Include all non living woody biomass not contained in the litter, either standing or lying on the ground. Dead wood also includes dead roots and stumps larger than or equal to 10 cm. in diameter or any other diameter used by the country.
Dead Organic Matter	Litter	Includes all non-living biomass with a diameter less than a minimum diameter chosen by the country (for FSI 5 cm.), lying dead, in various states of decomposition above the mineral or organic soil.
Soil	Soil organic matter	Include organic carbon in mineral and organic soil (including pear) to as specific depth chosen by the country (for FSI 30 cm) and applied consistently through the time series.

12.2.2 Data Acquisition for Forest Carbon Accounting

(i) Collating existing forest data

Forest carbon accounting can make use of existing national, regional or global data. Sources will vary between territories, as will the reliability and uncertainty of the source. However, good quality secondary data reduces. However, good quality secondary data reduces both time and cost requirement for accounting.

At a national level, forest inventories, woody biomass assessments, agricultural surveys, land registry information and scientific research can prove useful for land classification and model parameters. Data on temperature, rainfall, soil type and topography should also be sources at smaller scales. In particular, data sources will include national statistical agencies, sectoral experts and universities.

(ii) Using remote sensing

Remote sensing is useful in forest carbon accounting for measurement of total forest area, forest types and canopy cover.

(iii) Data from field sampling

Actual field data is preferable to default data for forest carbon accounting and is required to verify remotely sensed information and generalized data sets. Gathering field measurement for forest carbon accounting requires sampling as completer enumerations are neither practical nor efficient. By definition, sampling infers information about an entire population by observing only a fraction of it. In order to confidently scale up this data to the required geographical level, proper sampling design is vital.

Stratified random sampling is generally used for forest. Carbon inventory as mostly forest areas are heterogeneous. Under stratifies sampling forest area are stratified into homogenous strata and samples are selected from each stratum randomly. This provides precise estimates for different strata and also population. Once sample sites have been selected, established methods of biomass inventory are employed for different pools.

12.2.3 Accounting for Forest Carbon Stocks

(i)Above-Ground Biomass (AGB):

The AGC carbon pools consists of all living vegetation above the soil, inclusive of stems, stumps, bark, seeds and foliage. For accounting purposes, it can be broadly divided into two parts viz, trees and understory. The most comprehensive method to establish the biomass of this carbon pool is destructive sampling, whereby vegetation is harvested, dried to a constant mass and the dry to-wet biomass ration established. Destructive sampling of trees, however, is both expensive and somewhat counter-productive in the context of promoting carbon sequestration. Two further approaches for estimating the biomass density through biomass regression equations. The second converts wood volume estimates to biomass density biomass expansion factors (Brown, 1997).

(ii) Below-Ground Biomass (BGB):

The BGB carbon pool consists of the biomass contained within live roots. As with AGB, although less data exists, regression equation from root biomass data have been formulated which predict root biomass data have been formulated which predict root biomass based on above-ground biomass carbon (Brown, 2002; Cairns et al., 1997)

(iii) Dead Organic Matter (wood):

The DOM wood carbon pools include all non-living woody biomass and includes standing and fallen trees, roots and stumps with diameter over 10 cm.

(iv) Dead Organic Matter (litter):

The Dom litter carbon pool includes all non-living biomass with as size greater than the limit for soil organic matter (SOM), commonly 2 mn, and smaller than that of DOM wood, 10 cm, diameter. This pool comprises biomass in various states of decomposition prior to completer fragmentation and decomposition where it is transformed to SOM.

(v) Soil Organic Matter (SOM):

SOM includes carbon in both mineral and organic soil and is a major reserve of terrestrial carbon (Las et al., 2001). Inorganic forms of carbon are also found in soil; however, forest management hag greater impact on organic carbon and so inorganic carbon impart it largely unaccounted. SOM is influenced through land use and management activities that effect the litter input. In SOM accounting, factors affecting the estimates include the depth of which carbon is accounted, commonly 30 cm. and the time lag until the equilibrium stock is reached after a land use change, commonly 20 years.

12.2.4 Carbon stock data of Bhadrak Wildlife Division:

National Remote Sensing Center, Hyderabad used Remote Sensing technique for measurement of total forest area, forest types and canopy cover and their data is taken into account for calculating the Carbon stock for Bhadrak Wildlife Division.

Table No.12.3

Total Forest area in ha	Carbon stock per unit area in t/ha	Total Carbon stock in t
3577.258	10-16	35772.58 – 57,236.128