



GOVERNMENT OF ODISHA

**DEPARTMENT OF FOREST, ENVIRONMENT &
CLIMATE CHANGE. BHUBANESWAR**

**REVISED WORKING PLAN OF
BONAI FOREST DIVISION (2021-22 TO 2030-31)**

**Prepared by :-
Sri Sanath Kumar N, IFS,
Divisional Forest Officer – cum-
Working Plan Officer, Bonai Forest Division**



भारत सरकार / Government of India

पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय / Ministry of Environment, Forest and Climate Change

एकीकृत क्षेत्रीय कार्यालय / Integrated Regional Office

ए/3, चंद्रशेखरपुर / A/3, Chandrasekharpur

भुवनेश्वर - 751 023, ओडिशा / Bhubaneswar - 751 023, Odisha



Telephone: 0674 - 2301213, 2302432, 2301248, 2302452, 2302453.

E-mail: roez.bsr-mef@nic.in

No. 8(31)31/2016-FCE

14th December, 2021

To

The Addl. Chief Secretary,
Forest & Environment Department,
Govt. of Odisha,
Bhubaneswar.

Sub: Approval of draft Revised Working Plan of Bonai Forest Division for the period from 2021-22 to 2030-31 - reg.

Ref: The PCCF & HoFF, Odisha letter No.20552/11F (SFM) 14/2019 dated 02.12.2021.

Madam,

The revised draft Working Plan of Bonai Forest Division for the period 2021-22 to 2030-31 submitted by the PCCF, Odisha has been examined and accordingly, the Central Government (MoEF&CC) with the powers vested under Forest (Conservation) Act, 1980, has decided to accord approval of the working plan of Bonai Forest Division for the period 2021-22 to 2030-31, subject to the following General and Specific conditions:

The formal endorsement / approval from the State Govt. may also be obtained.

General Conditions:

1. The orders of Hon'ble Supreme Court of India in the matter of W.P. No. 202/95 Godaverman Therumulkpad Vs Union of India and related Interlocutory applications shall be strictly complied with. Any prescription or operation at variance with the order of Hon'ble Apex Court shall be kept in abeyance till such order is in force or otherwise not modified.
2. Further, in strict compliance with Hon'ble Supreme Court's order dated 22.09.2000, the State Government of Odisha shall ensure that regeneration of forest is commensurate with fellings, if any, to be carried out under the present working plan.
3. Consequently, no felling should be carried out without making allocation of requisite funds for undertaking regeneration operation in order to ensure regeneration to be commensurate with fellings. In case of failure of regeneration or any shortfall in achieving the target of regeneration, further harvesting shall remain suspended till backlog/ shortfall in regeneration is made up and subsequent formal approval from the Eastern Regional Office is to be obtained. **No felling shall be carried out without an approved Annual Timber Operation by the competent authority.**
4. This working plan is approved for the year **2021-22 to 2030-31.**
5. Standing snags/dead or dying trees should not be removed and shall be preserved for wildlife habitat/shelter. In site specific coupes / sections having unduly large no. of such trees needing removal, the State Forest Department may take special permission from Integrated Regional Office, MoEF&CC, Bhubaneswar.

6. Deviation statement along with the prescribed documents shall be reported and got endorsed from the competent authority by the end of the year of operation. Accordingly a summary of the report/certificate shall be submitted along with the Annual Action Taken Report to the IRO, MoEF&CC, Bhubaneswar for information and record.
7. No new road shall be constructed and no fresh forest area shall be broken for widening / reconstruction of existing roads without obtaining prior approval under Forest (Conservation) Act, 1980.
8. Approval of the working plan does not permit to carry out any non-forestry work including construction of building, for which necessary permission under F(C) Act shall be obtained, as may be required.
9. CF (T) shall submit to the CCF (WP) / PCCF the yearly action taken report against the physical & financial targets of felling & regeneration against each working circle of this W.P. by the end of the year of operation.
10. Immediate action may be taken for repairing of old pillars, if any. Prescriptions may be provided for revisiting all pillars every five years for purpose of maintenance and appropriate action be taken depending on condition of boundary pillars. Staff in charge of beat will verify physically the boundary pillars and shall give a certificate annually to the DFO with copy to the CCF, Working Plan confirming that no fresh encroachments have taken place. Vulnerable areas will be verified by the Range Officers.
11. The detail copy of the PF/RF Notification, if any, may be compiled and a copy of each shall be kept with the DFO/Working Plan Officer and CCF, Working Plan for reference.
12. State Forest Department shall initiate the process for the preservation of old available maps.

Specific Conditions:

The prescriptions under the proposed working circles are approved with observations stated above and with specific condition that:

1. Sporadic, wind fallen / uprooted trees, if any, shall also be allowed to be harvested in addition to the approved working scheme prescriptions for the year 2021-22 after its special approval of the list of enumerated trees by the CF (T) / RCCF (T) forwarding a copy to Integrated Regional Office, Bhubaneswar. In case of large scale wind fallen, damaged and epidemic outbreak, special permission for tree felling may be obtained from the Integrated Regional Office of MoEF&CC, Bhubaneswar. The volume extracted out of wind fallen/ uprooted trees shall be deducted out of the total volume of yield as calculated and permission for felling is allowed for balance volume only.
2. A mid-term evaluation of the implementation of working plan prescriptions and its impact on the forests may be done after the end of initial five years for which reasonable number of benchmark / sample plots may be maintained.
3. After recording the GPS and checking the records of each planting site DFO to certify that plantation is not taken up in the existing old plantation sites, without the prescribed action required prior to replanting.
4. Plantation details along with current status (conditions of plantation and survival) may also be included along with GPS surveyed boundary locations shown on a map, so that chances of mismanagement, confusion, encroachment and problem of identification of the site are reduced.
5. The Department should prepare a programme for DGPS survey of forest boundaries and prepare geo-referenced maps with important administrative and management details, if not done earlier.

6. Prescriptions must be provided for demarcation of un-demarcated balance forest area. The area details of un-demarcated forest area, number of pillars and funds required to demarcate it and year wise plan for demarcation so as to complete it at the earliest should be provided.
7. No forest, bearing naturally grown trees shall be clear felled for any purpose what so ever.
8. The prescriptions are to enable necessary co-existence of development with nature, and to ensure implementation strictly adhering to the provisions of Indian Forest Act, 1927, Wildlife (Protection) Act, 1972, Forest (Conservation) Act, 1980, Panchayats (Extension to the Scheduled Areas) Act, 1996 (PESA), Biological Diversity Act, 2002, and Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.
9. Implementation of People Biodiversity Register (PBR) formulation as well as Access of Benefit sharing Regulation has to be implemented and monitored.
10. Listed wetland, defined under the Wetland (Conservation & Management) Rules, 2017 situated in and outside forest to be restored and sustainable managed. Annual target along with riparian restoration will be done strictly in accordance under the provision of aforesaid Rules.
11. Raising of genetically improved seedlings/clonal propagation needs emphasis for timber productivity enhancement for future. Accordingly, year-wise raising of clonal seedlings will be fixed in proportion in the Division.
12. No permanent structure for Eco-Tourism purpose should be allowed. Ecotourism should be focused with identification of sites, traditions, community practice and future management involving local communities. Benefit accrued from eco-tourism to be plowed back to local communities. Number of visitors shall be fixed as per the carrying capacity study. Safety audit to be carried out in all the eco-tourism sites.

Central Govt. reserves the right to review, modify or withdraw this approval at any time, if any, of the conditions of approval are not implemented or relevant modifications in the Working Plan, if any, is required so as to keep it in conformity with the orders, circulars and guidelines issued by the Central Govt. under Forest (Conservation) Act, 1980 or any other statute and National Forest Policy.

Yours faithfully,

Padma Mahanti

(Padma Mahanti)

Dy. Inspector General of Forests (C)

Copy to:

1. The Addl. Director General of Forests (FC), Ministry of Environment, Forest & Climate Change, Indira Paryavaran Bhawan, Agni Wing, Aliganj, Jorbagh Road, New Delhi-110 003 for kind information.
2. The Principal Chief Conservator of Forests, Forest Department, Govt. of Odisha, Aranya Bhawan, Chandrasekharpur, Bhubaneswar for kind information and necessary action.
3. The Addl. PCCF (P&SM), Forest Department, Govt. of Odisha, Aranya Bhawan, Chandrasekharpur, Bhubaneswar for kind information and necessary action.
4. The Managing Director, Odisha Forest Development Corporation Limited, Bhubaneswar for kind information.
5. Guard File.

Padma Mahanti

Dy. Inspector General of Forests (C)



STATE FOREST HEAD QUARTERS, ODISHA
OFFICE OF THE PRINCIPAL CHIEF CONSERVATOR OF FORESTS,
ARANYA BHAWAN, CHANDRASEKHARPUR, BHUBANESWAR-23

Memo No. 72 /11F (SFM)- 14/2019
Dated, Bhubaneswar the 01/01 January, 2022

To

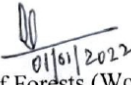
The Divisional Forest Officer,
Bonai Forest Division.

**Sub: - Approval of draft Revised Working Plan of Bonai Forest Division
for the period 2021-22 to 2030-31.**

In inviting a reference to the aforesaid subject, I am to say that Government of India, Ministry of Environment, Forest & Climate Change, Integrated Regional Office, Chandrasekharpur, Bhubaneswar vide their Letter No.8(31)31/2016-FCE dt.14.12.2021 (copy enclosed) have accorded the approval of the Revised Working Plan of Bonai Forest Division for the period from 2021-22 to 2030-31 with certain General and Specific Conditions mentioned therein.

You are, therefore, requested to follow the instructions of Government of India as stipulated in the above order during implementation of the Working Plan in the Division.

Encl:- As above.


01/01/2022
Conservator of Forests (Working Plan)

Contd..P/2

Memo No. 73 Dt. 01.01.2022 //2//

Copy along with a copy of Letter No. 8(31)31/2016-FCE dt.14.12.2021 of Government of India, Ministry of Environment, Forest & Climate Change, Integrated Regional Office, Chandrasekharpur, Bhubaneswar forwarded to the Additional Chief Secretary to Government of Odisha, Forest & Environment Department, Bhubaneswar for information and necessary action.


01/01/2022
Conservator of Forests (Working Plan)

Memo No. 74 dt. 01.01.2022

Copy along with a copy of letter No 88(31)31/2016-FCE dt.14.12.2021 of Government of India, Ministry of Environment, Forest & Climate Change, Integrated Regional Office, Chandrasekharpur, Bhubaneswar forwarded to the Managing Director, Odisha Forest Development Corporation Ltd., Kharvelanagar Nagar, Bhubaneswar for information and necessary action.


01/01/2022
Conservator of Forests (Working Plan)

Memo No. 75 dt. 01.01.2022

Copy along with a copy of Letter No. 8(31)31/2016-FCE dt.14.12.2021 of Government of India, Ministry of Environment, Forest & Climate Change, Integrated Regional Office, Chandrasekharpur, Bhubaneswar forwarded to the Regional Chief Conservator of Forests, Rourkela Circle for information and necessary action with reference to the Memo No.9529 dt.15.11.2021 of Divisional Forest Officer, Bonai Forest Division.

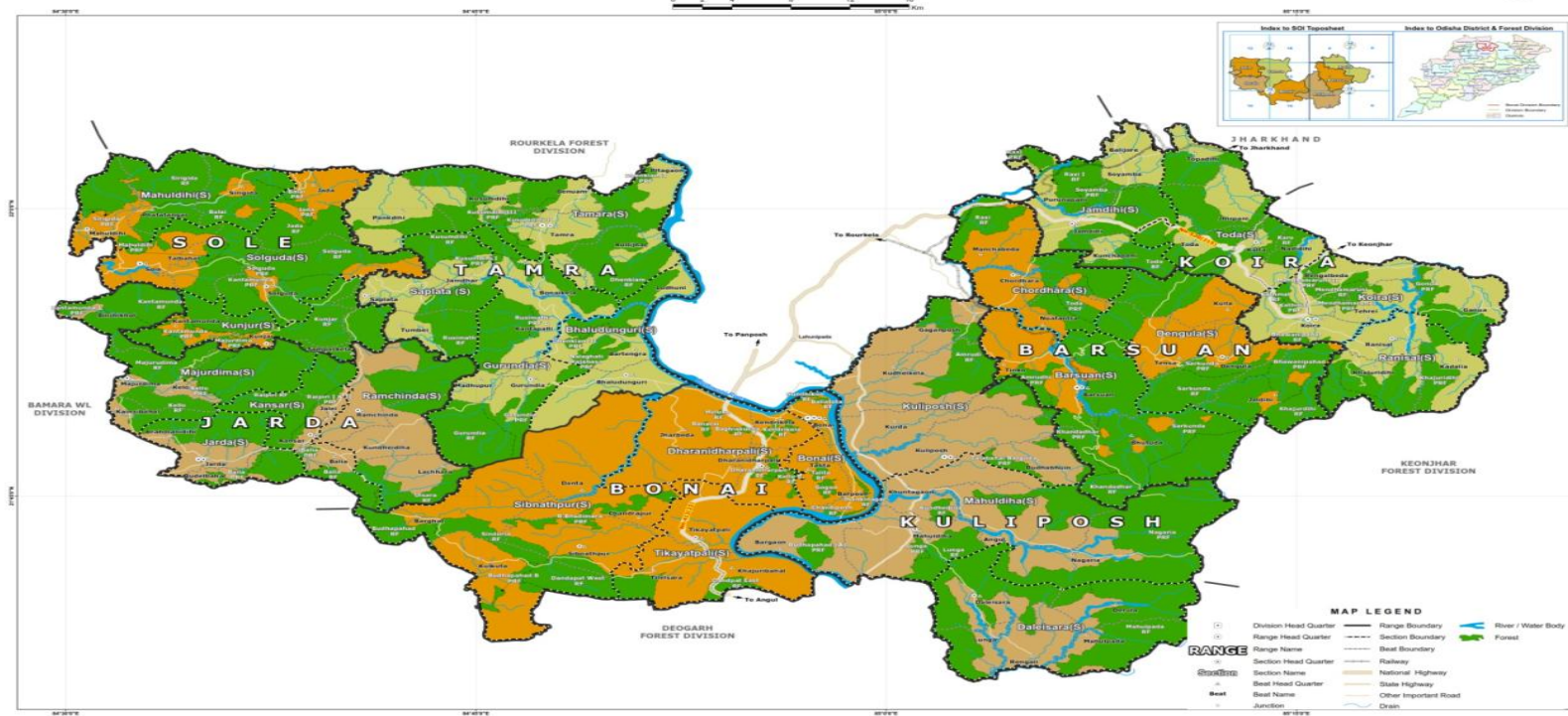

01/01/2022
Conservator of Forests (Working Plan)

Memo No. 76 dt. 01.01.2022

Copy along with a copy of Letter No. 8(31)31/2016-FCE dt.14.12.2021 of Government of India, Ministry of Environment, Forest & Climate Change, Integrated Regional Office, Chandrasekharpur, Bhubaneswar forwarded to the PCCF(PP&A)/Additional Principal Chief Conservator of Forests (P&SM)/Chief Executive Officer (CAMPAA)/ O/o the PCCF, Odisha for information and necessary action.


01/01/2022
Conservator of Forests (Working Plan)

BONAI FOREST DIVISION



ADMINISTRATIVE SETUP

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Prepared by:



Spatial Planning & Analysis Research Center Pvt. Ltd. (SPARC), G/11, Chintika Industrial Estate, Chintika, Bhubaneswar - 751 024, Odisha

Phone: 0674 - 662001, Fax: 0674 - 662004, E-mail: info@sparc.co.in

ଶିଶିର କୁମାର ରଥ
SISIR KUMAR RATHO



ପ୍ରଧାନ ମୁଖ୍ୟ ବନ ସଂରକ୍ଷକ
ଓ ବନବାହିନୀ ମୁଖ୍ୟ, ଓଡ଼ିଶା
PRINCIPAL CHIEF CONSERVATOR OF FORESTS
& HEAD OF FOREST FORCE, ODISHA

FOREWORD

The Revised Working Plan of Bonai Forest Division has been approved vide Letter No.8 (31) 31/2016-FCE dt.14.12.2021 of the Government of India Ministry of Environment, Forest & Climate Change, Integrated Regional Office, Bhubaneswar. This Working Plan of Bonai Forest Division is the 5th Working Plan of the series, however, 1st plan after re-organization of the Division in the year 2003.

This is the first working plan solely dedicated to the forests of the current Bonai Forest Division, excluding the forests transferred to Rourkela Forest Division after the 2003 reorganization. The SWOT Analysis has been meticulously conducted in order to prepare the Plan with realistic prescriptions for achieving the desired outcome. Eight Working Circles, both exclusive & overlapping, are prescribed in this Working Plan covering a total area 137282.602 Ha. In the current Plan, it is prescribed for protection of ecologically sensitive areas, perennial stream catchment areas, and steep precipitant slopes with high altitude. In order to plan Joint Forest Management activities in the Division, a new Working Circle has been introduced to the Plan. Special focus has been placed on increasing bamboo forest cover, managing human-wildlife conflicts, ensuring the long-term use of NTFP, etc.

Sri Sanath Kumar N, IFS, Divisional Forest Officer & WPO, Bonai Forest Division under the guidance of Dr. Arun Kumar Mishra, RCCF, Rourkela has carried out an excellent job revising the Working Plan to meet the challenging circumstances linked to modern Forest Management. I congratulate both the Forest Officer and that hope this plan will serve as a technical and scientific document to achieve its stated objectives.

(Sisir Kumar Ratho, IFS)

AUTHOR'S PREFACE

Bonai Forest Division in the present form got constituted on 1.10.2003, after reorganization of Odisha Forest Department. However management of forests of this division has historical importance. Prior to the year 1911, forests of Bonai State were not subjected to any systematic form of management. However, with the visit of Agency, some sort of regulatory control in the working of the forests was introduced. The management of forests in a systematic direction began with the preparation of first Working Plan in the year 1935 for the period from 1935-36 to 1952-53 by Sri J.N. Ghosh. Bonai Forest Division got constituted with effect from 1.1.1948. Consequently second, third and fourth working plans for the division got written by Sri. S. N. Das, Sri. G. G. Das & Sri Suresh Pant, IFS respectively.

The present Plan for the period 2021-22 to 2030-31 is the fifth working plan in the series, however first plan after reorganization in the year 2003. This Plan has been prepared by following provisions of National Working Plan Code-2014. Benefits of modern technologies and satellite imagery interpretation got utilized effectively in the plan preparation. The ORSAC, Odisha and NRSA, Hyderabad have played vital roles in providing the required database for preparation of this plan with the use of Remote Sensing (RS) and Geographical Information System (GIS) tools. With their extensive help only, preparation this plan got possible within a small time spell.

I extend my heartfelt thanks to my predecessor, Sri Sudhanshu Sekhar Khora, IFS, who had drafted the PWPR and started preparation of the plan.

I extend my heartfelt thanks to Sri Lingaraj Otta, IFS, the then Regional Chief Conservator of Forests, Rourkela, who gave proper shape to the approved PWPR.

I extend my sincere and heartfelt thanks to Dr. Sandeep Tripathy, IFS and Sri Sisir Ratho, IFS, for their valuable inspiration and guidance in capacity of Principal Chief Conservator of Forests & Head of Forest Force (PCCF & HoFF), in preparing the plan. I am also thankful to Sri. A.K. Jaiswal, IFS, for his valuable inputs in preparation of this plan, during his tenure as Conservator of Forests, Working Plan, Bhubaneswar.

I am thankful to Sri Bhanja Kishore Swain, IFS & Dr. Arun Kumar Mishra, and IFS for their valuable guidance in capacity of R.C.C.F, Rourkela, in bringing the plan to its final shape. I am also thankful to Sri. P.K. Sahoo, Conservator of Forests, Working Plan Bhubaneswar for his valuable guidance in finalizing the plan.

My sincere thanks also go to Assistant Conservators of Forests, Sri Johana Oram, ACF (E&CC), Sri M.K. Nath ACF(Affn. FF & Com.) and Sri Yasobanta Karali, ACF (Admn.PP & Ecotourism) for their assistance in preparing the plan. I am also thankful to all Range Officers and other filed staff of Bonai Forest Division for their contributions in preparing the plan.

I am thankful to Sri Sitaram Pradhan, Dy. C.F. (Rtd.) and Sri Chandra Sekhar Acharya, Senior Clerk (Rtd.) in providing their valuable time and contribution while preparing this working plan.

I am thankful for all ministerial staff and Data managers of Bonai Forest Division for their valuable support in preparing the plan. In this regard I am especially thankful to Sri Pravat Ranjan Sutar, Sri Sushant Kumar Patra, Sri Deepak Kumar Sahu, Sri Santosh Kumar Gantayat for their fast and accurate data entry work. I am also thankful to Sri Manoranjan Giri, GIS expert and Sri Shanti Bhushan Sahoo, Biodiversity expert for their valuable contributions in preparing this plan.

I hope this plan will guide in sustainable management of Forests & Wildlife resources of Bonai Forest Division in future, and in mitigating the present day challenges in the field of environmental conservation. At the end, once again I extend my heartfelt thanks and appreciation to all for their cooperation.

(Sanath Kumar N, IFS)
Divisional Forest Officer-cum-
Working Plan Officer, Bonai Division.

Executive Summary along with the constraints faced during writing of the plan

1. THE TRACT DEALT WITH:

Bonai Forest Division, with its Head Quarters at Bonai, coming under Bonaigarh subdivision of Sundargarh District is bounded on the North by Jharkhand State and Rourkela Forest Division, on the East by Keonjhar Forest Division and Deogarh Forest Division, on the West & South by Bamra Forest Division and Deogarh Forest Division. The total geographical area of Bonai Forest Division is 2934.21 Sq. Km and the Forest Cover of Bonai Forest Division is 2032.77 sq. Km., which is 69.27% of geographical area. For administrative and management point of view Bonai Forest Division has been divided into 7 Forest Ranges, 25 Forest Sections and 95 Forest Beats. River Brahmani divides this Division into almost two equal parts i.e., East Bonai and West Bonai. Most of the terrain covered under East Bonai is of hilly and undulating type. Compared to East Bonai, West Bonai is more rugged and has got predominance of quartzite rocks. Important rock types in the division are represented by Mica-Schists, Phyllites and Quartzites. The stratigraphy of the area is represented by Older Metamorphic Quartzite, Mica Schist and Quartzite, Iron Ore Formation, intrusive, recent to sub recent formation, & economic minerals. Soils of East Bonai got derived from the rocks of iron ore series and are mostly red ferruginous soils. Due to predominance of Quartzites and Quartz-Schists types of rocks in the hill ranges, West Bonai is covered with adequate depth of soil and in such places; good stands of Sal are found. Climatic conditions are marked by Summer from March to June, rain from July to September, Post Monsoon in October and November and Winter from December to February.

2: MAINTENANCE/INCREASE IN THE EXTENT OF FOREST AND TREE COVER

There are 45 RF (Reserved Forests) Blocks (1,02,894.567 ha.), 41 PRF (Proposed Reserved Forests) Blocks (34,105.896 ha.), 25 nos of DPF (Demarcated Protected Forests) Blocks (5849.793), 32 nos of VFs (Village Forests) (166.790 ha.) & 29 nos of PFs (Protected Forests) (575.654 ha.) are there in the present working plan. Also there is 61.731 ha of unclassed forests also there in the division. The calculated area as per previous working plan is 1,49,392.834 ha. However, during reorganization

15,136.866 ha of forest area got merged with Rourkela Division and the net area is 1,34,255.968 ha. Apart from this area 5 PRF blocks, 25 DPFs, 32 village forests, and 29 Nos of Protected Forests got added in the present working plan. The total calculated area as per the revised working plan is 1,41,334.418ha. But an area of 4051.816 ha.of forest land diverted under FC Act, 1980 and FRA,2006 has got deducted from the total area and thus, the forest area under management in the revised Working Plan is 137282.602 ha. DLC lands under Bonai Division come to an extent of 25,269.129 ha.

The total length of external boundaries of 59 RF blocks as maintained in the expiring Working Plan is 1,403.015 Kms. While analyzing the change in forest cover during the year 2015 to 2017 for the whole of Bonai Forest Division, it is seen that there has been decrease of 379.99 ha of Very Dense Forest and the forest cover of the Division has also decreased 649.49 ha in the category of Moderately Dense Forest. But the forest cover has increased to the extent of 213.42 ha in the category of Open Forest. Some portions of the forests of Koira and Barsuan Range of Bonai Division are enriched with Iron and Manganese ores. The present mining activities in forest lands are regulated by following provisions under Forest (Conservation) Act'1980 and Environmental (Protection) Act'1986. Presently 11,698.0197 Ha of land under the division jurisdiction is being covered by mining leases, out of which 9,784.767 Ha is forest land.

Illegal collection of Timber and firewood, encroachment of forest areas, grazing of domestic cattle in forest, forest fire, insects, weeds and climbers, drought, flood, cyclone, shifting cultivation. (Podu Cultivation), and mining activities are various identified threats to forests. The entire area of the division comes with in the Northern Tropical Moist Deciduous Zone. The main types of forest embracing the major parts of the Division are the Moist Peninsular Sal, the Dry Peninsular Sal and the Dry Mixed Deciduous Forest. Trees outside forests (TOF) are located on the lands other than forests, including agricultural lands, built-up areas such as settlements and infrastructure, and bare lands.

3. MAINTENANCE, CONSERVATION AND ENHANCEMENT OF BIODIVERSITY

From the vegetation survey and forest inventory , important trees and other species found in the Division are *Shorea robusta*, *Terminalia tomentosa*, *Terminalia bellerica*, *Bombaxma labarium*, *Eujenia jambolana*, *Ougeinia dalbergiodes*, *Anogeissus*

latifolia, *Pterocarpus marsupium*, *Terminalia chebula*, *Tectona grandis*, *Tamarindus indica*, *Spondius pinnata*, *Madhuca latifolia*, *Syzygium cumini*, *Albizia chinensis*, *Smilax crophylla*, *Diospyros melanoxylon*, *Lagerstromea ariflora*, *Bauhinia variegata*, *Aegle marmelos*, etc. The prevailing vegetation is of mixed type with Sal as the principal species.

A total of 232 species of plants have got recorded during the recently conducted biodiversity study, which includes 37 species of climbers, 41 species of shrubs, 39 species of herbs and 13 species of grasses. The faunal diversity of Bonai Forest Division consist of 31 species of dragonflies, 25 species of damselflies, 136 species of butterflies, 31 species of fishes, 18 species of amphibians, 21 species of snakes, 17 species of lizards, 1 species of turtle, 173 species of birds and 39 species of mammals. 106 number of sacred groves covering an area of 22.23 ha have got identified in the division.

Odisha Biodiversity Board is authorised to implement the legal provisions of Biological Diversity Act 2002 in the state and works in this regard are under progress. The dynamic PBRs shall be completed at GP, Block, Urban Local bodies and District level with the technical guidance of Odisha Biodiversity Board and Technical Support Group (TSGs) by the BMCs coming under Bonai Division within a period of 5 years and the same shall be enriched every year.

Out of 136 species of butterflies recorded from the division area, 13 species are legally protected by Wildlife Protection Act, 1972. Fish fauna of the Brahmani River is relatively less threatened by human activities. Major threats affecting amphibian and reptile diversity are habitat loss and forest degradation. Fair diversity of fugivorous and insectivorous birds is the characteristic of the avifaunal diversity of the division. Chances of decline in population of various floral species, especially medicinal plant species cannot be neglected because of varying level of biotic pressure in the form of forest area fragmentation, fuelwood collection, agricultural expansion, collection of non-timber forest products, grazing of livestock, shifting cultivation and climate change.

Even though, not much attempts have been done towards the identification of genetic resources in the division, in-situ conservation of wildlife is being practiced in the division by protecting and maintaining the habitat requirements for a wide variety of flora and fauna. Degraded ecosystem and anthropogenic pressure, high chances of wildlife crimes, Human-wildlife conflict, and issues related to Wildlife rescue and

rehabilitation are various constraints in the field of wildlife conservation in the division. Scarcity of Water during summers, insufficient areas under meadows etc are some limiting factors identified in the wildlife habitat. Engagement of Protection squads to assist the field staff, strict enforcement of various acts and rules, strengthening of camping network in forest areas, habitat management activities, regular monitoring of wildlife, ensuring people's participation in wildlife conservation, and checking negative interactions at Human-Wildlife interface are various measures being ensured in the division to protect and manage wildlife and its habitat.

4. MAINTENANCE AND ENHANCEMENT OF FOREST HEALTH AND VITALITY

Regeneration status of various species in different blocks of Bonai Forest Division has assessed and furnished in the plan. During the period of dry weather i.e. March to middle of June majority of forest areas under this Division are prone to Forest Fire. In order to check forest fire , fire vulnerability map and plan for reclamation of forest fire is being prepared in advance, fire lines are being traced and maintained timely in forest areas prone to fire, necessary number of fire fighting equipments required are being procured and supplied to staff in advance, Fire fighting squads are being engaged to assist the staff in fire fighting activities, additional vehicles are being hired for improving the mobility of staff in the field during fire season, proper awareness measures are being ensured and proper attention is being paid to participate people in fire fighting activities. This Division is not free from the ravages of natural calamities like floods, droughts and storms. Grazing in forest areas by large herds of cattle, buffalos, goats, and sheeps being kept by villagers is an important threat in the field of forest protection , in the division. Lopping while collecting NTFPs, areas affected by weeds, incidences attack of insects, pests and diseases are important areas to be given attention with respect to forest health and vitality. Population growth in the adjoining villages to forest areas cause proportionate increase in the use of forest resources and this in turn causes depletion of forest resources. Poverty and lack of alternate employment opportunities among the forest dependent community add on this fuel to this depletion. Major portion of the forests of East Bonai are rich with minerals of economic significance. Though, mining activities got streamlined under the enactment of Forest Conservation Act, 1980 presently, careless mining operations

happened in the past caused a lot of irreparable damage to forests. Mining operations are, by their nature, potential sources of Air pollution, Water pollution and Noise pollution also.

5. CONSERVATION AND MAINTENANCE OF SOIL AND WATER RESOURCES

Large scale soil erosion is not visible in Bonai Division due to relatively thick forest cover barring degraded forest areas and areas where mining operations are undertaken. The Khandadhar RF block, which has been ecologically sensitive, needs to be managed from watershed point of view. However, some identified degraded forest areas in the Division are prone to soil erosion. Soil and Moisture Conservation Measures taken up in different ranges of the division for the last working plan period has provided in Para 5.1. of the plan. The River Brahmani is the major river running through the territory of this Division. It has many tributaries in the forms of hill streams all along its eastern and western bank within the Division. The drainage of greater part of western Bonai is towards the river Brahmani. Apart from the Brahmani, other important river is Karo which runs a very short distance through the Bonai Division. Rivers, streams & water logged areas are the natural inland wetlands present in the division area.. Reservoirs, Tanks and Ponds are types of manmade wetlands present in the division. Wetlands as defined under the wetland rules, 2017 situated outside the forest, which acts as aquifers within the division area has listed in Para 5.3.6. Ground water Status in fringe villages adjoining to forest area , and status of aquifers along with hydrology map have also provided in the plan.

6. MAINTENANCE AND ENHANCEMENT OF FOREST RESOURCE PRODUCTIVITY

The growing stock of wood of Bonai Forest Division has been estimated during the inventory of Forest Resources by laying 0.1 ha area of sample plot in Random Stratified Sampling method. Geo co-ordinates of 1033 Nos sample points were supplied to NRSC through ORSAC. Girth and height of tree species above 30 cm gbh have been recorded species wise. In Forest Blocks of East Bonai specially in Toda RF, Karo RF, Sarkunda RF, Lunga RF, Katmal RF and in few pockets in Nagaria PRF, Sarkunda PRF, Sal Species in Site Quality II noticed in previous Plan period has moved to Site Quality II/III. Similarly the Sal species in Site Quality III has moved to Site Quality III/IV. In Forest Blocks of West Bonai Sal Site Quality III noticed in previous Plan period in Kunjar RF,

Majurdima RF, Kantamunda RF and Raipiri RF, now conforms to Sal site quality IV and the site quality IV noticed in previous Plan period in most of the Forest Blocks of West Bonai has moved to Sal site quality V. Bamboos are mostly confined to the forests of West Bonai. In East Bonai availability of bamboos is very poor except in Mahulpada RF and Lunga RF. The growing stock of bamboos in bamboo bearing areas have been assessed and found to be 54703 SU. For Mean Annual Increment, the first year of this working plan will be taken as the base year and the Mean Annual Increment of principal species will be calculated by estimating the volume of the species at regular intervals. Details of permanent Sample Plots selected for the purpose has been furnished in Appendix-IV. In order to produce quality seedlings for plantations, there are 10 permanent nurseries in the division. Seedlings produced & plantations taken up within Working Plan area in the Division for the last working plan period has provided in Para 6.4 of the plan. Details of biomass for carbon stock assessment has provided in para 6.5 of the plan.

7. OPTIMIZATION OF FOREST RESOURCE UTILIZATION

During the last working plan period 1,72,965 number of trees got marked from various coupes of the division and out of which 1,59,282 number of trees got felled through OFDC Ltd. Total outturn of timber is calculated as 80963.44 cum and total outturn of firewood has calculated as 21766.5 stacks. Production of Bamboo during last working plan period has calculated as 29667.29 IB in SU and 283659 CB in numbers. The method and agencies of harvesting of some of the important NTFP items has furnished in para 7.4 of the plan. During the plan period, the Odisha Forest Development Corporation Ltd has supplied timbers to the local people at a concessional rate for their domestic use. The demand of Timber has been assessed from the socio economic survey and from the OFDC, Ltd. The recorded supply of timber has also been assessed from the OFDC Ltd and from the working of tenant timbers in the Division. The collection and trade of MFP items have been transferred to the control of Gram Panchayats with effect from 31.03.2000 as indicated vide Item 7.4 above. The removal of fodder from forest has been assessed basing on socio economic data and provided in para 7.8. Valuation of forest products in the form of royalty realized during the last plan period has provided in para 7.9.

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

There are 299 number of Vana Samrakhyan Samities (VSS) formed within the division and they have assigned with 2350 ha. of forest area adjoining to their villages for protection and management. In 214 numbers of VSS, Micro plans have been prepared through participatory rural appraisal (PRA) under various schemes. Treatment of degraded forest areas to improve the quality of forests through Artificial regeneration, Assisted Natural Regeneration, and Soil and Moisture Conservation activities have taken up in most of these VSS assigned forests through schemes like OFSDP, FDA and AJY. Activities aiming Livelihood Improvement of local forest dependent community have also taken up during the last plan period. Provision of sufficient labour days to local community has also ensured through various works executed in VSS areas. A study conducted in 2013 on traditional indigenous knowledge indicates about 71 species of edible fruits and 30 other unidentified edible fruits, 35 species of leafy vegetables, 31 species of mushrooms, 19 species of tubers, and at least 12 species of seeds used for production of edible oil consumed by this primitive tribal group. During this survey 85 species of plants of medicinal importance were recorded from the Paudibhunya habitat and frequently used by the community. In total, 106 Nos. of Sacred Groves in 77 number Villages, covering an area of 22.2368 ha have got identified from the division area and the list provided in Para 8. 5.1. of the plan. Presently Khandadhar Day tourism site and Khandadhar Nature Camp are two ecotourism initiatives in the division. Community managed sustainable ecotourism activities are being promoted here. More than 98% of the human population of Bonai division is characterized by rural population. Prevalent social customs relevant to forests has detailed in Para 8.7.1. Status of compliance of Forest Rights Act has furnished in Para 8.8 of the plan. The livelihood support of people in and around the forests largely depends on NTFP products.

9. ADEQUACY OF POLICY, LEGAL AND INSTITUTIONAL FRAME WORK

Management Planning with respect to forests and wildlife of the division provide for sustainable management of forests and its biodiversity as enshrined in the National Forest Policy encompassing the ecological (environmental), economic (production) and social (including cultural) dimensions. The last approved working plan for the Division is for the period 1997-98 to 2016-17 prepared by Sri Suresh Pant, IFS. Works undertaken in the Division were according to the prescriptions made in this plan. A compiled report on various offences booked during the last Working Plan period in the Division is tabulated in para 9.3.1. Permanent research plots are not present in the Division for conduct of any research studies. However some research works published during the last Working Plan period by other institutions/individuals have provided in para 9.4. of the plan. The sanctioned and present strength of executive establishment and office establishment of the Division as on 31.03.2021 has furnished in para. 9.5. Total Capital Value of Forests of the division has assessed as Rs.214052.20 crores, which includes capital value of Rs.46613.20 crores and imputed value of environmental services as Rs.167439 crores. Monitoring and evaluation parameters have been provided in the Control Forms to monitor the implementation of different prescriptions of all Working Circles. Details of Forestry/Environmental awareness and education programmes conducted for students in the last plan period has provided in Para 9.9 of the Plan. Adequate staffs as per sanctioned strength are not in position as there has been long gap in recruitment.

10. FIVE YEAR PLANS:

A summary of works taken up during the last five year plan along with activities taken up under preceding Five year plan has provided here.

11. PAST SYSTEM OF MANAGEMENT:

Working plan written by Sri Babu J.N. Ghosh for the period 1935-36 to 1952-53 was the first working plan and was of preliminary nature and simple as to its prescription, which consisted of the High Forest Working Circle, The Dandapat Working Circle, the Coppice Working Circle & the Bamboo working circle. The under lying principle of the exploitation was revenue generation, and exploitation was carried out

as per the prescription of the plan and no over exploitation had taken place. Revised working plan for the duration of 1953-54 to 1972-73 was prepared by S.N.Das, in which six working circles were constituted- Conversion working circle, Selection working circle, Selection coppice working circle, Coppice working circle, Bamboo Working Circle & Protection Working Circle. The revised working plan for the duration of 1973-74 to 1992-93 was prepared by Sri G.G. Das, IFS. This plan was further extended up to 1995-96 vide Govt. letter No.24786/F&E dated 26.11.93. It has been further extended up to 30.06.98 vide No.18-F C-W P-OS-Bonai dt.13.12.97 of the C.C.F (Central), Bhubaneswar. The Sal Conservation Working Circle, the Selection Working Circle, the Coppice Working Circle, the Plantation Working Circle, the Bamboo Working Circle, and the Protection Working Circle were various working circles in the plan. The expired Revised Working Plan prepared by Sri Suresh Pant, IFS, Working Plan Officer, Sambalpur came into force with effect from 1997-98 and was valid up to 2016-17. In this plan, the PRF areas (already notified u/s-4 of O.F. Act'1972) of 43 blocks out of 46 Blocks have been included for the first time for its systematic management along with the R.F. areas. An area of 1,15,455.452 ha from 59 blocks of RFs and 33,937.382 ha from 43 blocks of PRFs got included in the plan. The working plan was proposed to be managed under Selection Working Circle (1,20,295.172 Ha.), Protection Working Circle (8,426.860 Ha.), Rehabilitation-cum-Plantation Working Circle (20, 670.802 Ha.), Bamboo (overlapping) Working Circle (70,190.802 Ha.), Wild life (overlapping) Working Circle (1,48,156.952 Ha.), N.T.F.P (overlapping) Working Circle (1,48,156.952 Ha.) and Misc. (overlapping) Working Circle (3,809.992 Ha.). The 5th Working Plan of this Division had to be prepared with effect from 2017-18. But due to delay in preparation of the Working Plan, from 2017-18 to 2020-21, forests & wildlife of this division got managed as per the annual Working Schemes with due approval of the Eastern Regional Office of the MoEF & Climate Change (Govt. of India), Chandra Sekharpur, Bhubaneswar.

12. STATISTICS OF GROWTH AND YIELD

In the absence of any statistical data in the Division regarding the growth and yield of various species, published literature for growth statistics for Sal and other species have referred and used for assessing statistics of growth and yield. The Forest

Survey of India has developed local volume equation for different forest species both principal and secondary species taking forests of Phulbani, Sambalpur and Koraput districts as per their sampling for Odisha state. These equations have used for assessing the volume and yield of growing stock of forests of the division. Five number of quality classes recognized has detailed in para 12. 1. 4 of the plan. Sample plot size got fixed as prescribed under Annexure II of the Working Plan Code- 2014. An outline of the methodology adopted for assessment of the growing stock and yield has detailed in Para 12.5.1.Crown density data(strata wise) for all the compartments of the division has appended as AppendixII-A. Out of the working plan area 8.3 % of forests are having less than 10% canopy density, 34.47 % forests are having 10-40% canopy density, 35.19% forests are having 40-70 % canopy density and 20.10 % forests are having more than 70% canopy density. Overall sampling intensity for various canopy density classes are estimated to be 0.0632(>70), 0.0767(40-70), 0.0574 (10-40) and 0.0213 (<10). Estimated stand for the entire division has come to be 83,69,915. Estimated stock for the entire division has got assessed to be 1,91,18,699 cub. m. The yield has regulated by area with a percentage check on the removal of exploitable trees as calculated by Smythies' safeguarding formula. Total growing stock of bamboo in the division is estimated to be 54703 SU. Total Carbon Stock within the forest area is estimated to be 12057183 tons. Carbon stock of ToF is estimated to be 508539.41 tons.

13. BASIS OF PROPOSALS:

In consonance with the National Forest Policy 1988, the basic aim of management of forests covered under this plan will be to meet as far as possible the increasing demand of forest produce without disturbing the fragile environmental stability and ecological balance which are so vital for the sustenance of all life forms. General objectives of management have got set by considering dynamics of forest and stands, Forests and Soils, Forest and water, Forest Biodiversity, Climate and Forests, Socio-economic consideration and generation of forest based Employment opportunities and livelihood options, tools for integrated development and public awareness. Required change in management practices has been made and accordingly forest areas have been allotted to different Working Circles; Selection working circle (105,558.787 Ha), Protection Working Circle (7,558.700 ha), Rehabilitation Working

Circle (20,325.275ha), Plantation Working Circle (3,839.840 ha), Bamboo (Overlapping) Working Circle (65,082.505 ha), NTFP (Overlapping) Working Circle (137,282.602 ha), JFM (Overlapping) Working Circle (14,135.968 ha), and Wildlife (Overlapping) Working Circle (137,282.602 ha).

14. SELECTION WORKING CIRCLE:

This Working Circle has been prescribed for sustainable harvesting of exploitable trees with activities to improve forest growth and crop quality. 105558.787 ha of forest areas from 61 forest blocks have been assigned to this working circle. Forests allotted to this working circle fall mainly under moist peninsular and dry peninsular Sal forests. 20 nos of felling series have been constituted in 7 Forest Ranges of this Division. Each felling series has been further divided into 10 numbers of annual coupes. Analysis of crop has done according to the methodology prescribed in National Working Plan Code 2014. Tree Species under different girth class along with percentage of Sal in various forest blocks of Selection Working Circle has provided in Para 2..6.1 of the plan.

The Selection system will be adopted with emphasis on sustainable production and stability of the ecosystem. Sal is the most important species in all the forest blocks of this working circle and is to be treated as principal species. In addition to it, Bija (*Pterocarpus marsupium*), Sisoo (*Dalbergia latifolia*), Gambhar (*Gmelina arborea*), and Champa (*Michelia champaca*), are to be treated as principal species. Exploitable Girth for different Species in different Forest Blocks have provided in Para 2.6.4. .In this Revised Working Plan the felling cycle of 10 years has been prescribed synchronizing the plan period. The yield has been regulated by area with a percentage check on removal of selection trees arrived at by smithies safeguarding formula.

Yield calculated for different Forest Blocks has provided in para 2.6.7. of the plan. Table of felling has provided in para 2.6.8 of the plan. Method of executing felling including marking rules have got detailed in para 2.6.9 of the plan. Subsidiary silvicultural operation shall be taken up in the year following the main felling. Small pockets within the selection working circle which are having poor vegetation or no vegetation are to be restocked by planting of indigenous species on the gaps and tending the existing crops by Assisted Natural Regeneration after completion of coupe working.

15. PROTECTION WORKING CIRCLE :

Protection Working Circle has been prescribed as an independent Working Circle for protection of the ecologically fragile areas, catchment areas of perennial streams and steep precipitant slopes with high altitude following the same management principles as have been followed in the previous plan. Ecologically fragile areas covering entire Khandadhar R.F. Areas under active encroachment for cultivation and habitation purposes, areas subjected to shifting cultivation in the recent past or currently under this practice, and areas which have already been deforested for the purpose of resettlement of the displaced people but yet to be dereserved have got included in this working circle.

A total area of 7558.70 ha from 16 number of forest blocks got included in this working circle. For implementation of prescriptions of the Protection Working Circle, six numbers of Protection Series have been formed. Since areas included in this Working Circle are in immediate need, complete protection measures coupled with improvement of vegetative cover have been prescribed here. For silvicultural treatment of the forest areas, Protection Cycle of 10 years has been prescribed to synchronise with the Plan period. For implementation of protection measures, rehabilitation and other silvicultural measures, the forest areas have been divided in to 10 annual Protection areas in each Protection Series

16. REHABILITATION WORKING CIRCLE:

This Working Circle has been prescribed in this Revised Working Plan for taking up rehabilitation measures to improve the Growing Stock of forest and quality of forest vegetation in degraded forest patches. A total area of 20,325.275 ha. from 41 forest blocks got included in this working circle. A total of 20325.275 Ha. area is to be rehabilitated within the plan period.

To implement the prescription of the Rehabilitation Working Circle, 16 nos. treatment Series have been constituted. Due to severe biotic interference in the form of illicit felling, over grazing, fire hazards, shifting cultivation, and illegal mining activities Forest blocks under this circle are in various stages of degradation. No exploitation has prescribed in natural vegetated areas except removal of dead, dying, diseased and moribund trees. For rehabilitation of degraded forest areas allotted to this Working

Circle, Rehabilitation Cycle of 10 years is prescribed to synchronize with the Plan period. Each Rehabilitation series has been divided into 10 nos of annual rehabilitation coupes to be worked out during the Plan period.

Demarcation of Rehabilitation Coupe, Preparation of Treatment Map, Preparation of Cost Estimate, and execution of rehabilitation measures according to the need of the area have prescribed. Various areas included under this working circle are in different stages of degradation and require different type of site specific treatments. The total area has distinguished to Type-A, B , C & D according to the type of treatments required. Different operations required to be done in each type have also detailed in the chapter. Control of grazing and fire protection have prescribed as associated regulations.

17. PLANTATION WORKING CIRCLE:

Working Circle has been prescribed for restocking the forest vegetation by taking artificial regeneration in suitable barren, bushy, weed affected and blank areas along with tending operations in the existing plantations. This Working Circle covers 18 RFs with an extent of 2480.025 ha., 12 PRFs with an extent of 617.371 ha. and 29 nos of PFs with an extent of 575.654 ha. and 32 Nos. of Village Forests with an extent of 166.790 ha. Pure block plantation through artificial regeneration will be done in the available blanks of minimum 4.0 ha.

To implement prescriptions of the Working Circle, 3 (three) numbers of Planting series have been constituted. Each Planting Series has been divided in to 10 annual coupes to cover the area of the series in the Plan period. Broad guidelines for execution of plantation operations have prescribed in the plan. Also method of execution of plantation through various steps including nursery raising have also got prescribed. Since plantation activity is a time bound work and largely dependent on monsoon and weather, time schedule has also been prescribed. Old plantations have got allotted to different tending series in order to carry out tending operations.

18. BAMBOO (OVERLAPPING) WORKING CIRCLE:

This is an overlapping Working Circle which has been prescribed for production and sustainable harvesting of Bamboos in the division area through suitable silvicultural measures. The bamboo bearing areas of the Selection Working Circle and Rehabilitation Working Circle have been brought under this Bamboo (OL) Working Circle. Bamboos are mostly confined to the forests of west Bonai where the soil is not very fertile and climatic conditions are rather hot and dry. The availability of bamboo is very poor in many places it is practically absent in the forests of East Bonai where good soil cover and moist climate supports luxuriant Sal forests. For implementation of the prescriptions of Bamboo Working Circle, 9 nos of cutting series have been constituted. The silvicultural system adopted for working of bamboos will be Culms Selection-cum-Clump Improvement.

The cutting cycle of four years (A, B, C, D) has prescribed. Yield will be regulated entirely by area. Bamboo Coupe will be opened for working from October to June. Various steps for execution of Bamboo Cutting have been detailed in the plan. Three types of treatment have been prescribed. Cutting rules for Bamboos have also been detailed. Rules applicable to various treatment types also been detailed. Simultaneous silvicultural operations have also been prescribed. Treatment to be followed in case of gregarious flowering of bamboos has also been detailed in the plan.

19. NTFP (OVERLAPPING) WORKING CIRCLE:

This Working Circle has prescribed for sustainable management of Non-Timber Forest Produce in the Division and overlaps with all forest areas of Bonai Forest Division. Most of the the NTFPs are harvested annually and the harvesting area spread over through out the forests of Bonai Division. Hence, no collection series has been formed. No Silvicultural System is prescribed except the collection of NTFPs on sustainable basis without hampering the future yield and regenerating the NTFPs & MFPs species. There is need to ascertain the impact of collection / extraction / utilization practices on sustainability of these forests vis-à-vis the role of NTFPs in the village economy.

Since NTFPs are being collected annually and the collection area covers all the forest Blocks of the Division, no collection cycle is prescribed. The Divisional Forest Officer should assess the yield in consultation with the field staff, primary collectors and traders. Collection of NTFP items to be regulated as per guidelines of Govt. time to time. Important NTFP species of Bonai Forest Division and Calendar of Collection have also been detailed in the plan.

20. JOINT FOREST MANAGEMENT (JFM) WORKING CIRCLE:

This (Overlapping) Working Circle has been prescribed to execute joint forest management activities with the aim of protection of forests from human dependence on one hand and to improve socio economic status of the forest dependent community on the other hand as envisaged in National Forest Policy, 1988. The JFM (overlapping) Working Circle is being constituted in this Plan for the first time.. As on 31.3.2020, there are 299 Nos. of VSS / JFMCs formed in the jurisdiction of Bonai Forest Division, as per Joint Forest Management resolutions issued by Govt. of Odisha. The area allotted to these VSSs comes to 13,649.518 ha. This area along with 166.790 ha. of Village Forest areas comes to 14,135.968 ha., which has been included in JFM working circle. As per the JFM Resolution of the State, micro plans need to be prepared for each VSS, in which activities to be taken up in the VSS areas shall be planned and recorded. List of forest areas outside the working plan area (revenue forests) which comes within the assigned forests to JFMCs have also been listed in the plan.

21. WILDLIFE (OVERLAPPING) WORKING CIRCLE:

This working circle has been constituted for protection and management of the existing wildlife, improvement of their habitat and conserving biodiversity. For highlighting the importance of wildlife and to improve the wildlife population in this Division, constitution of this working circle has been done and this Wildlife (Overlapping Working) Circle will overlap with the entire Working Plan area of the Division i.e., 1,37,282.602 ha. Present status and distribution of Wildlife has been described in the plan. Key issues and challenges identified are habitat degradation due to Biotic pressure on wildlife resources viz. illicit felling, poaching, illegal collection of NTFP, encroachment etc., increasing demand of wildlife and its products in the illegal market and the

resultant threat of illegal wildlife trade, increasing incidences of Human-Wildlife conflict, habitat destruction out of increased developmental activities, inadequate focus on habitat improvement, and lack of awareness among general public.

Provision of sufficient number of protection squads to assist the staff in protection activities, improving the protection network of the division by increasing the number of camping locations and by improving the facilities in the existing camping locations, proper maintenance of boundary lines , protected area coverage(legal) to suitable areas, ensure proper amenities and working conditions to the staff, ensure proper co-ordination with other line departments like Roads, Railways etc., proper monitoring of protection activities through registers, reports and modern tools, inter division co-ordination to check offences in the boundary areas, preparation of crime dossiers, sharing of information between the divisions at landscape level, mitigating man-wildlife conflict, proper watch on habitual offenders, ensuring proper participation of local people through proper eco development activities, special strategies to meet Monsoon and Fire season, proper communication strategy by good network of wireless stations and mobile stations etc are various strategies prescribed.

In accordance with the above said strategies, various measures have proposed to take up in the division to protect and manage wildlife and its habitat. Engagement of Protection Squad, Improving the network of camping locations, Field patrolling to cover all vulnerable areas, Division Level mobile squad, Strengthening of communication network , Boundary Maintenance , Protected Area Coverage, Annual maintenance of Roads, Provision of vehicles to improve the mobility of protection staff, Intelligence gathering network , Insurance coverage for Protection Staff, Strengthening of Staff amenities, Co-ordination with neighbouring divisions, Co-ordination with line departments, Capacity Building of staff, Use of modern tools / software/imageries, and Protection from Grazing are important measures prescribed under protection and enforcement activities. Effective measures to mitigate effect of forest fire on wildlife management also got incorporated. In order to ensure proper wildlife monitoring in the division, various measures such as establishment of wildlife monitoring cell, maintaining daily patrolling logs/registers at beat level, population estimation programmes at division level, recording data from PIPs, camera trapping, monitoring of Birds,

vegetation Survey, use of GIS/GPS tools, procurement of necessary equipment for wildlife monitoring and wildlife health monitoring measures have suggested.

In order to ensure proper habitat management, measures for improving food availability, measures for improving water availability , measures for Improving the cover, and measures for improving wilderness have suggested. Also prescriptions have given to maintain special habitats like snags, snag recruits, large old trees, trees with fluting boles and buttresses, lianas and tangled climbers.

Prescriptions for protection of wetlands, mitigation of Human-Wildlife Conflict and Protection of Wildlife Corridors, and measures for wildlife rescue and rehabilitation have also been suggested. Community managed sustainable ecotourism in potential areas have also been prescribed. Public awareness measures, eco development activities, research, monitoring and training have also become part of wildlife management in the plan. Implementation of site specific wildlife conservation plans and regional wildlife management plan have also been suggested to ensure mitigation of pressure on wildlife habitats because of developmental activities.

22. GENERAL FINANCIAL FORECAST OF THE PLAN:

General Financial forecast of the plan has prepared, yearwise. Expected Revenue and Expected Expenditure has correlated. Possible sources of funds have also been listed in the plan.

23. MISCELLANEOUS REGULATIONS:

Petty felling and extractions, rights and concessions and its regulations, and maintenance of boundaries and annual inspection programmes have got detailed under miscellaneous regulations.

24. REGULATION OF MINING ACTIVITIES:

Presently there are 76 No of mining leases under the jurisdiction of Bonai Forest Division. Out of these, 5 No. of leases lie in non-forest land only and the rest 71 leases are having both forest and non-forest land. These mining leases consists of parts of 5 nos. of Reserved Forest Blocks covering an area of 2575.417 .ha., 10 nos of PRF Forest Blocks covering an area of 2512.085 ha. , revenue Forests over 1728.873 ha. and DLC

land over 2968.392 ha. Though mining operations are important to contribute towards catering raw minerals to various industries, its negative effects on forest and hence wildlife habitat need to be checked properly through various measures. Presently these activities are being strictly monitored as per provisions of various Acts and rules in this regard. Compensatory levies need to be levied from concerned user agencies and proper rehabilitation measures need to be ensured.

25. SCIENCE AND RESEARCH:

References have been made to all research articles used in the preparation of the plan. Research gaps and needs with respect to availability of data and information required for writing the plan have also been specified. Prescriptions emphasise on creation and maintenance of preservation plots, sample plots, regeneration plots and other research and experimental plots.

26. SUMMARY OF PRESCRIPTIONS:

A summary of prescription under the plan has been provided in Chapter 14 of Part-2 of the plan.

27. TREES OUTSIDE FORESTS:

Importance of protection and development of ToF & present Scenario of ToF in Bonai Forest Division have been detailed in the plan. Plantations outside recorded Forest areas and avenue Plantations have been listed. Details of distribution of seedlings to public done during the last working plan period have also been provided. Growing Stock & Carbon Stock of ToF have been estimated and provided. Issues and Challenges in management of ToF, and various measures to improve ToF have also been discussed in detail.

28. MANAGEMENT OF WATER RESOURCES:

Present status of water resources in Bonai Forest Division, various issues and challenges in management of these water resources, need of integrated water resource management and activities to be implemented to manage these resources sustainably have been detailed in the plan.

29. CLIMATE AND REDD+:

REDD+ Reducing Emission from Deforestation and Degradation, along with conservation of forests has been recognized as a very innovative way to tackle climate change. To implement specific REDD+ action in the Bonai Forest Division measures such as addressing drivers of deforestation and degradation, conservation and enhancement of Forest Carbon Stocks, Sustainable Management of Forests etc. have suggested and various activities in these lines have also been prescribed.

30. CONSTRAINTS FACED DURING WRITING OF THE PLAN:

The plan was developed in complete conformity with the National Working Plan Code-2014. Because the details required for Part 1 of the plan were in new dimensions, and most of this information was not easily available, gathering the necessary data was a major challenge. Previous working plans of the division were for 20 years, while the current plan is for 10 years. Formulating a plan for the entire Working plan area, which were managed as per 20 year cycle, to synchronise with 10 years was a laborious and time-consuming task. There was no specific working plan officer in charge of developing the plan. As a Divisional Forest Officer, I wrote the plan while giving division management. As a result, time was a major barrier in completing the project.

I. Introduction

Prior to the year 1911, forests of Bonai State were not subjected to any systematic form of management. However, with the visit of Agency, some sort of regulatory control in the working of the forests was introduced. However the management of forests in a systematic direction began with the preparation of first Working Plan in the year 1935 for the period from 1935-36 to 1952-53 by Sri J.N. Ghosh. This Plan was of preliminary nature and simple as to its prescriptions. During this plan period, Bonai Forest Division got constituted with effect from 1.1.1948. The second and third working plans for the division were got prepared by Sri S. N. Das and Sri G.G. Das for the periods 1953-54 to 1972-73 and 1973-74 to 1992-93 respectively. New features of the second plan were the introduction of conversion to uniform system and selection coppice system and formation of bamboo working circle and protection working circle with detail prescriptions therein. Compartment histories were also compiled for the first time in this plan.

In the third plan, improvements made were diversion of forest areas unsuitable for conversion to uniform system to selection system, reconstitution of selection felling series into smaller units for proper distribution of work and demarcation of coupes taking topographical features into account. Besides these, reflection of encroached areas and village ring lines in management maps, reconciliation of boundary lines and formation of new plantation working circle were other striking features of this plan.

In the fourth Working Plan of Bonai Division prepared by Sri Suresh Pant, IFS for the period from 1997-98 to 2016-17, Sal Conversion Working Circle and Coppice Working Circle have been replaced with Selection Working Circle and Rehabilitation-cum- Plantation Working Circle with felling cycle of 20 years. A protection working circle also got constituted in the plan with the aim of protection of ecologically fragile areas in the division. Also working circles for management of

Bamboo Forests, Wildlife, NTFPs, and regulation of miscellaneous activities got constituted in this plan as overlapping working circles.

In the year 2004, The Ministry of Environment and Forests (MoEF), Govt. of India adopted a uniform code, the National Working Plan Code – 2004 for preparation of Working Plans for the management of forest under the prescriptions of a Working Plan to standardize the procedure. The Govt. of India MoEF & CC has further brought a uniform code with effect from 1.4. 2014 called National Working Plan Code, 2014 in place of National Working Plan Code, 2004 for management of forests and bio-diversity in India. The present Working Plan has been prepared as per guidelines laid down in National Working Plan Code, 2014.

Sri Lingaraj Otta, IFS, the then Regional Chief Conservator of Forests Rourkela Circle prepared the Preliminary Working Plan Report (PWPR) for the expiring working plan, and it got approved vide Memo No. 23296 dated 8.12.2016 of Principal Chief Conservator of Forests, Odisha. As per the approved PWPR, it was suggested to divide the entire division area into Selection Working Circle, Rehabilitation Working Circle, Protection Working Circle and Plantation Working Circle. Apart from this Bamboo (OL) working circle, NTFP (OL) working circle, Wildlife (OL) working circle, JFM(OL) working circle, and Mining(OL) working circle were also suggested. Also it was decided to expand the working plan area compared to the last working plan by adding Demarcated protected Forests(DPF), Village Forests (VFs), & Protected Forests(PF).

Revision works for the current plan which is fifth in the sequence was commenced in the year 2017. In order to save time and to reduce the expenditure of field exercise, it was decided at the State level to approach ORSAC and NRSC to provide sample points for necessary field data collection. The NRSC through the ORSAC provided sample points on stratified random sampling method. In this method, the sample variance has been reduced by dividing the population into number of homogeneous vegetation strata and then inventory sample points have been selected randomly using stratification with the advantage of forest type classified map and forest crown density map available from remote sensing. Inventory design was based on a stratified random sampling design. A pre inventory was first carried out to assess the

variability within and across strata. Sampling intensity, inventory, point allocation at the compartment/block level and allowable sampling error and approaches to optimize the inventory effort for the project was technically deliberated and approved by Project Execution Committee and Project Management Committee.

The filed inventory was carried out by staff of Bonai Forest Division. Sample points provided by ORSAC/NRSC have been approached through navigation, and necessary details in prescribed forms got collected. From the uploaded data, NRSC has assessed various data needed for the preparation of the working plan. This data after necessary correction has been used in preparing the present plan. From 2017-18 onwards various activities in the division are being carried out as per working schemes approved by MoEF & CC, Govt. of India, since the preparation of working plan of the Division was under progress. Hence, the present plan is for the period from 2021-22 to 2030-31.

Changes made in the present plan compared to the expiring plan are as discussed below.

- i. During reorganization of forest divisions in Odisha in 2003, some portion of Bonai Forest Division got merged with Rourkela Forest Division, and these areas got excluded from this plan, compared to the last plan.
- ii. Demarcated Protected Forests (DPFs), Protected Forests (PF), & Village Forests have also been incorporated in the plan and brought under scientific management.
- iii. Hence, the total area to be managed under this plan is 142592.700 ha. as per Govt. notification. However the computed Working Plan area is 141334.418 ha which includes 45 Reserved Forests, 41 Proposed Reserved Forests, 25 Demarcated Protected Forests, 32 Village Forests and 29 no. of Protected Forests. After deducting the diverted Forest areas of 4051.816 ha. diverted under FC Act, 1980 and FRA, 2006, the net area under management comes to 1,37,282.602 ha.
- iv. Management Maps, Stock Maps and Working Plan Maps have been prepared on the latest topographical maps of metric scales.

- v. Various Chapters in the plan have revised as per the National Working Plan Code-2014 issued by MoEF & CC, Govt. of India.
- vi. “Rehabilitation cum Plantation Working Circle” in the previous plan got revised to two working circles- “Rehabilitation Working Circle” and “Plantation working Circle” to achieve specific objectives related to rehabilitation of degraded areas and plantation activities, according to the present conditions of the forest.
- vii. One new working circle “JFM Working Circle” has got introduced in the plan for planning Joint Forest Management activities in the division.
- viii. Misc. (Overlapping) Working Circle of the previous Working Plan has not constituted in the present Working Plan, instead activities mentioned therein have detailed under Misc. Regulation.

The Vision, goals and objectives of management, SWOT analysis for prescriptions of strategies for achieving the goals and objectives, expected outcome and abstract of plan prescriptions are as detailed below.

a. **The vision:** The vision statement of this working plan is “Conserving the total Biodiversity of forests of Bonai Forest Division landscape through protection and sustainable management of resources with a special focus on the ecological and socio-economic security for the present and future generations”.

b. **Goals and objectives of management:** Goals and objectives formulated for this working plan is as shown in the table- I (b)

Table- I(b) Goals and objectives formulated for this working plan	
Goals	Objectives
(i) Ensuring biodiversity conservation and development	i. To protect and manage forests & wildlife resources with a view to conserve and enrich bio-diversity. ii. To conserve genetic resources and maintain their sustainable use. iii. To assess the biodiversity of forest periodically and improve the Important Value Index of species. iv. To ensure enforcement of various acts and rules existing to conserve biodiversity v. To prevent the further degradation of environment by restricting felling of trees and giving more emphasis on preservation of flora and fauna of these forests.
(ii) Enhancing the viability of natural forest ecosystems	i. To conserve and improve the existing vegetative-cover for soil and water conservation with a view to ensure ecological and environmental stability. ii. To conserve water sources, enhance water conservation capacity of forest ecosystem and assist in regulating the flow of water in its catchment. iii. To construct water harvesting structures, check dams, plug gullies and protect river banks, nala banks on either side.

(i) Ensuring sustainable management of forest resources	(i) To assess the existing growing stock of the forests of Bonai Forest Division. (ii) To utilize forest resources scientifically by following apt silvicultural principles. (iii) To restock forest areas through proper rehabilitation measures.
(iv) Enhancing production capacity of forests of Bonai Forest Division.	i. To improve the condition, composition and productivity of the existing forests by further enriching the standing crop through scientific management. ii. To increase productivity of forests ecosystem and maintain the vitality. iii. To rehabilitate the depleted forest through artificial regeneration and tending of the existing vegetation iv. To reduce soil erosion, enhance fertility of Soil and ensure the stability of forest ecosystem.
v. Ensuring socio-economic development of forest dependent community	i. To endeavor to meet the requirements of people for agricultural small timbers, firewood, bamboos and other forest produces. ii. To promote development of sustainable and non-destructive livelihood opportunities for local communities iii. To promote Joint Forest Management involving Vana Samrakhyana Samiti for sustainable management of forests. Ensure sustainable production of Non-Timber Forest Products and thus enhance livelihood opportunities of the communities dependent on forests iv. To meet needs and requirements related to forest produce of local people and local communities living in and around forest areas.

	v. To enhance their livelihood, ensure usufruct benefit sharing and protect their traditional knowledge and traditional/cultural practices. vi. To generate employment for local people by involving them in various forestry operations including collection of various Non Timber Forest Produce (NTFP) inducing a sense of belonging for the forest in them.
vi. Creating mass awareness regarding importance of conservation of nature and natural resources	(i) To educate people regarding the importance of conservation of nature and natural resources through proper measures. (ii) To ensure capacity building of local forest dependent community towards conservation of nature and natural resources.
vii. Improving the organizational set up and staff amenities	i. To introduce modern tools for scientific management of the forests. ii. To take up the infrastructure development for integrated development of the Division. iii. To develop human resources in protection & management of forests and wildlife.
viii. Mitigating Climate change	i. To reduce emissions from deforestation and forest degradation ii. To enhance Carbon Sequestration in forest by following most desirable level of biomass production and find ways for adoption with change in climate.

c. SWOT ANALYSIS:

Strengths, Weakness, Opportunities and Threats identified for prescription of strategies for achieving goals and objectives are as listed below.

(i) Strengths: Various strengths of the division have listed as follows.

- i. Availability of vast stretch of forests with luxuriant and varied biodiversity.
- ii. The River Brahmani and tributaries to support the existence of flora and fauna in the region.
- iii. Potentiality of the areas under the division in production forestry in terms of timber and NTFPs
- iv. Availability of local level institutions for planning and executing joint forest management activities.
- v. Ameliorative potential of areas to provide recreation facilities to people.
- vi. Huge potential of area to work as an excellent field for research studies in Forestry and Wildlife.
- vii. Prospect of the area to function as a centre for Public awareness on protection of natural resources
- viii. Properly planned administrative set up to protect and manage forests and wildlife in the area.
- ix. Trained manpower to large extent to execute activities prescribed in the plan.
- x. Rich mineral deposit in the division area to support the economy of the nation.
- xi. Scientifically prepared and regularly updated working plans for management of forest areas.

(ii) Weaknesses: Weaknesses identified are listed below.

- i. Increased human interference on forest resources from large number of human settlements adjoining forest areas.
- ii. Huge dependency on forest resources to ensure livelihood of local forest dependent community.
- iii. Degrading wood stock and other NTFPs because of biotic pressure out of human population explosion.
- iv. Fragmented forests lands posing threat to wildlife connectivity.

- v. Lack of sufficient staff strength within the administrative set up.
- vi. Vulnerability of the area to get exploited for mineral extraction.
- vii. Scarcity of water
- viii. Lack of know-how (new technologies and tools for sustainable forest management.)
- ix. Lack of tools for assessment of various interventions and integration to the plan.
- x. Difficulties to enforce various acts and rules.
- xi. Forest land tenure problems.
- xii. Resistance to change.

(iii) Opportunities: Various opportunities identified are as follows.

- i. Updated forest management plan standards
- ii. Biodiversity conservation /protection.
- iii. Production of forest produces (Timber and non-timber forest produce)
- iv. Expansion of forest lands
- v. Forest recreation/ecotourism development.
- vi. Improvement in income from forests through planned income generation activities.
- vii. Improvement in alternate employment opportunities to forest dependent communities.
- viii. Natural disaster prevention
- ix. Capacity building
- x. Environment awareness.
- xi. Research
- xii. Sustainable utilization of natural resources
- xiii. Infrastructure Development for protection and management of forests.
- xiv. Joint Forest Management activities.
- xv. Convergence activities with line departments to promote livelihood of forest dependent community.

(iv) Threats: Identified threats are as follows.

- i. Vulnerability to Forest Fire
- ii. Areas vulnerable to Illegal logging
- iii. Areas vulnerable to Poaching of wildlife
- iv. Areas vulnerable to Encroachment of forest land and resultant forest loss
- v. Chances of Diseases
- vi. Chances of pests'/Insects' attack and resultant biodiversity loss
- vii. Mining activities for extraction of minerals and resultant reduction in forest cover
- viii. Practices of shifting cultivation in division area.
- ix. Land use change
- x. Floods
- xi. Drought
- xii. Climate Change

d) Expected outcome: Scientifically managed forests & sustainably grown and harvested wood, improved protection network with upgraded facilities, restored degraded areas, trained manpower to improve the quality of protection and management of forests, increased tree cover outside the recorded forest areas, enhanced avenue for environmental awareness and responsible society to conserve forests and wildlife, strengthened JFM system , increased participation of people in protection and management of forests and wildlife, sustainably managed Non Timber Forest Produces, improved forest quality, improved soil water regime, increased tree cover and hence carbon stock, decreased emissions and advanced technological measures to conserve natural resources are expected outcomes of the plan.

e) **Abstract of the plan prescription:**

Abstract of plan prescriptions has tabulated in the table –I (e)

Table –I(e): Abstract of the plan prescriptions			
Chapter No.	Para No. /Sub-Para No.	Prescribed activity	Remarks
A	B	C	D
Part-II Chapter 2	2.6.9.1	Demarcation of annual coupes	Demarcation of annual coupes to be done during the preceding year of the year due for felling in winter season by a Forest Officer not below the rank of trained Forester and checked by Range Officer and Assistant Conservator of Forest.
Part-II Chapter 2	2.6.9.2	Marking	Marking shall be done after demarcation of the coupe in the year preceding the year in which coupe is due for working.
Part-II Chapter 2	2.6.9.4	Execution of felling	Felling should be done through OFDC Ltd. The execution of all coupe works shall be done within the period starting from 1 st October to 30 th June.
Part-II Chapter 2	2.6.10	Subsidiary Silvicultural Operation	Subsidiary Silvicultural Operations to be done in the year following the main felling.
Part-II Chapter 2	2.6.11	Regeneration	Pockets with poor regeneration to be restocked through ANR using indigenous species. The areas which are infested with invasive weeds like Eupatorium, Lantana spp.etc.need to be identified and after completion of coupe working, these weeds are to be eradicated by uprooting before they get flowered.

Part-II Chapter 2	2.6.11	Other regulations in SWC areas	Protection from lopping, grazing, and forest fire. Climber cutting, Soil& Moisture Conservation, Plantation of indigenous species in areas which are having poor regeneration or no regeneration
Part-II Chapter 3	3.7.3, 3.7.5	Execution of Protection activities in protection working circle	Demarcation of Annual coupes, Preparation of Annual Action Plan, Maintenance of boundaries, Deployment of protection squads.
Part-II Chapter 3	3.7.6	Associated regulations	Improvement of Communication, and fire protection measures to check encroachment of forest area and Podu cultivation, Catchment area treatment measures and measures to improve people participation in forest protection
Part-II Chapter 4	4.6.6.1	Demarcation of rehabilitation coupe	For ensuring timely field operations, the annual rehabilitation areas are to be delineated in the map and demarcated in the field in the year proceeding the year in which it is due for working.
Part-II Chapter 4	4.6.6.2	Preparation of treatment map	An officer not below the rank of Range Officer should inspect and examine area carefully and prepare a treatment map of the same area, which should exhibit measures to be taken up for different patches within the annual rehabilitation area.

Part-II Chapter 4	4.6.6.3	Preparation of Cost Estimate and its approval.	Cost estimate to be prepared by the Range Officer for various suggested rehabilitation measures, and to get it approved by Divisional Forest Officer.
Part-II Chapter 4	4.6.6.3	Rehabilitation operations in Type-A and Type-B areas	Cutting back of all high stumps, Cutting of all climbers and uprooting them wherever possible, singling out of multiple coppice shoots and retaining of most promising one, the 'C' grade thinning in congested patches, under this dead, moribund, diseased, suppressed, dominated and defective dominant trees are to be removed without creating lasting gap in the canopy and planting of two year old seedlings of bamboo along with fruit bearing and NTFP yielding species under ANR Scheme
Part-II Chapter 4	4.6.6.3	Rehabilitation operations in Type-C areas	Suitable soil & conservation measures shall be taken up according to the slope of the area
Part-II Chapter 4	4.6.6.3	Rehabilitation operations in Type 'D' areas	In areas having dense bushy and scrubby type of growth, the cleaning and pruning operations are to be carried out. Wherever required, necessary soil and water conservation measures as prescribed are to be taken up. Necessary administrative and educative measures to be taken up in areas of shifting cultivation.

Part-II Chapter 4	4.6.6.4.	Fencing	Vegetative Fencing, Trench Fencing and Stone wall fencing have suggested for fencing the rehabilitating area. Regeneration of indigenous species through ANR has prescribed in the area for regeneration
Part-II Chapter 4	4.6.6.4.	Associated Regulation and Measures	Control of grazing and fire protection measures have prescribed.
Part-II Chapter 5	5.6.2	Demarcation of Annual Plantation Areas:-	Patches selected for block plantations should have at least 4.0 ha. area. When the selected patches have large area, then they are to be divided into sections of 4.0 ha. each with 3.0m wide section line and 4.0 m wide section path. This covers completely barren, blank, eroded and degraded patches having plain to gentle slope.
Part-II Chapter 5	5.6.3	Site Clearance	The clearance of plantation site is to be done during the month of February.
Part-II Chapter 5	5.6.4	Staking &Pitting:-	For the proper alignment and spacing of rows in the planting site, staking is essential. Staking is to be done at a spacing of 2.5m X 2.5m or 2m X 2m depending upon the degree of degradation. Once staking operation is completed, pitting operation need to be taken up in the spots marked for planting. The pits of size 30cm X 30cm X 30cm are to be dug.

Part-II Chapter 5	5.6.5.	Nursery operations	As per their viability, the seeds for the various species are to be procured well before actual sowing. The work in regards of preparation of nursery beds should commence from the first week of January. As per requirement, temporary nurseries are also to be prepared at the site of plantations. The work for preparing temporary nursery should start from 1 st week of January with the clearance of site, fencing, polythene bag filling and seed dibbling operations one after another. These operations should be completed by the end of February. Seedlings of species which are slow growing or whose seeds are having low viability are to be raised in the permanent nurseries. The planting stock of species which are fast growing and whose seeds are having relatively long viability are to be raised in the temporary nurseries.
Part-II Chapter 5	5.6.5. 4	Plantation & post plantation in 1 st year	Pre-sprouted poly potted stump planting Casualty replacement 1 st soil working, weeding & manuring 2 nd soil working and weeding 3 rd soil working Fire tracing and inspection path
Part-II Chapter 5	5.6.5. 4	Post Plantation Operation in 2 nd Year	Casualty replacement, 1 st weeding, soil working & manuring , 2 nd weeding and soil working

Part-II Chapter 5	5.6.5. 4	Post Plantation Operation in 3 rd and subsequent Years	Soil working and casualty replacement, Pruning and singling
Part-II Chapter 5	5.6.5. 5	Thinning in Existing Plantation:	Most of the plantations raised during the period of last plans are of mixed type. Out of these reasons, it is difficult to prescribe any set schedules of thinning for most of the old plantations. Thinning is to be carried out only if necessary on silviculture grounds.
Part-II Chapter 5	5.6.6	Associated Regulations and Measures:	Plantation journals to be maintained properly.
Part-II Chapter 6	6.6.6.1.	Demarcation of annual coupes	Bamboo coupes shall be demarcated by giving double coal-tar rings at the breast height of all the trees standing on the coupe lines, which are distinctly visible from each other. Similarly single coal tar ring will show the section line.

Part-II Chapter 6	6.6.6.2.	Execution of Bamboo coupes	An Agency will be identified by the State Government as Bamboo is a nationalized forest produce.
Part-II Chapter 6	6.6.6.3.	Preparation of Treatment Maps	A Treatment map will be prepared by the Agency for working on a copy of the management map in 1: 50,000 scale indicating salia and daba bamboo areas respectively. Three treatment types shall be identified. <u>Treatment type 'A'</u> : Areas with healthy and well stocked bamboo clumps consisting of Clump quality - I Where clum height of bamboos is 9 meters and above, Clump quality - II Where culm height of bamboo is between 6 to 9 meters, Clump quality – IIIWhere clum height of bamboos is below 6 meters, <u>Treatment type 'B'</u> : Areas with well stocked but degraded, damaged, congested and / or fire burnt clumps. <u>Treatment Type 'C'</u>: Areas where in bamboo clumps are sparse and scattered. If necessary the treatment Type B & C may be further classified into the above three clump quality classes if good growth is there.

Part-II Chapter 6	6.6.6.2 6.6.6.5	Execution of Bamboo Cutting:	The State Government decides the agency for working of bamboo, as it is a nationalized forest produce. At present the Orissa Forest Development Corporation Ltd. is the agent of Government to work out bamboo coupes through the Raw Material Procurer (RMP) on their behalf. If OFDC surrenders some coupes on un-economic considerations, it will be worked departmentally, because, all the area will be treated as per prescription of Working Plan irrespective of availability of harvestable bamboo. <u>Treatment type - A</u> Commercial felling will be done in those clumps, which have more than the prescribed minimum number of culms in each. Cultural operations shall be carried out in clumps having less than the prescribed minimum number of culms in each. In such clumps commercial fellings will not be done. <u>Treatment type – B:</u>There will be no commercial felling in any clump. Only cultural operations shall be carried out <u>Treatment type – C:</u>Only cultural operations shall be carried out in the existing bamboos clumps

Part-II Chapter 6	6.6.6.7.	Simultaneous Silvicultural Operations	Since productivity of the bamboo forest depends on proper and timely silvicultural operations, it should be ensured to carry out such operations during / or immediately after the year of actual harvest.
Part-II Chapter 6	6.6.6.7.1.	Treatment of Gregariously Flowered Bamboo Clumps:	Bamboo seedlings at a spacement of about 4m x 4m are to be adopted and retained and the rest are to be thinned out. Clearing, soil working and weeding are to be done around the adopted bamboo seedlings up to a radius of 50 cm. To maintain continuity, planting of bamboo rhizomes also to be resorted to especially in big gaps. All the flowered clumps are to be worked out as per the prescriptions of the Working Plan. The area should be closed for grazing. Elaborate fire protection measures are also to be taken.
Part-II Chapter 6	6.6.6.8	Regeneration :	Care should be taken to prevent the bamboo regenerations from grazing and fire. Further, bamboo seedlings and rhizomes are to be planted in Treatment C type areas of Bamboo forests.

Part-II Chapter 6	6.6.9.	Control, Associated Regulations and Measures	Even if commercially viable bamboos are not available, SSO (Simultaneous Silvicultural Operations) should be taken up in the whole of degraded areas. The RMP is to work the entire coupe area delivered to them. The left out (unworked) area should be taken up departmentally. Frequent training programmes to staff to be ensured. Stone packing in boundaries, protection from grazing, fire protection etc.
Part-II Chapter 7	7.6.4	Calculation of yield	The Divisional Forest Officer should assess the yield in consultation with the field staff, primary collectors and traders
Part-II Chapter 7	7.6.5	Method of Collection	For those items of NTFPs which shall be auctioned, it can be done so as per policy of the State Government issued from time to time but state owned Corporations and Co-operatives like OFDC, TDCC, LAMP etc. will be given preference over others. NTFPs items shall be collected from the trees without causing any injury to them.
Part-II Chapter 7	7.6.5	Capacity building training of primary collectors	The primary collectors should be properly guided and trained to collect NTFPs in a non-destructive way
Part-II Chapter 7	7.6.5	Value addition of NTFPs	Value addition to collected NTFPs will increase their earning

Part-II Chapter 7	7.6.5	Establishment of village micro enterprises	Village micro enterprises based on NTFP should be encouraged.
Part-II Chapter 7	7.6.8.1, 7.6.8.2, 7.6.8.3	Protection activities	All the forest blocks should be protected from fire, grazing of cattle and cutting and lopping of trees.
Part-II Chapter 7	7.6.8.4	Marketing of NTFPs	Most of the NTFPs are not collected because of lack of marketing facilities. The marketing aspects of various NTFPs need to be researched and improved.
Part-II Chapter 7	7.6.8.5	Ensure Fair prices of NTFPs	The district administration has to shoulder all responsibility to ensure that price fixation for procurement of NTFPs are done every year in time and regular return on NTFP collection are submitted by the traders and procurers to the Range Officers:
Part-II Chapter 7	7.6.8.6	Control of collection of NTFPs	Collection of NTFPs should not be allowed beyond the carrying capacity and regeneration potential of the forests.
Part-II Chapter 7	7.6.8.7	Regulation of Rights and Concessions	Rights and concessions of local people shall be regulated in accordance with the provisions of relevant acts and rules in this regard.

Part-II Chapter 8	8.7.1	Demarcation of assigned areas to VSS	It helps to resolve tenurial conflict between villages and gives the VSS members a sense of ownership and specific identity which eventually motivates them to protect the forest and helps for the better management.
Part-II Chapter 8	8.7.2 to 8.7.4	Preparation of microplans	The micro plans should be prepared keeping in view the overall prescriptions of the concerned working circles, thorough PRA exercise.
Part-II Chapter 8	8.7.5	Community mobilization towards protection of forest resources	It is important that the motivation level of the people to protect the forests should be sustained for a long period to respond to the protection provided.
Part-II Chapter 8	8.7.6	Engagement of partner-NGOs	In order to help the staff in community mobilization it is suggested to engage p-NGOs.
Part-II Chapter 8	8.7.7	Income Generation activities	Income generating activities (IGA) like sericulture, pisciculture, vermiculture, lakh, and honey collection could be encouraged through VSSs .
Part-II Chapter 8	8.7.8	Rewards /incentives to VSSs	Good JFM practices to be incentivized/rewarded.

Part-II Chapter 8	8.7.9	Capacity Building of Staff & Villagers towards JFM activities	In order to execute activities proposed under JFM it is important to equip the implementing staff and villagers with required skills. It is therefore proposed to conduct capacity building of staff and villagers in this regard.
Part-II Chapter 8	8.8	Control measures	All the areas assigned to the VSS should be marked on the top sheets of 1:50000. The works taken up in these VSS areas should be entered in the compartment histories. The checking of compartment histories should form a part of the office inspections by the Conservator of Forests and the DFO
Part-II Chapter 8	8.9	Regulation of Rights and concessions	Rights and concessions in this Working Circle shall be regulated in accordance with the provisions of the relevant gazette notifications of the respective forest blocks and the Govt. of Orissa policy with regard to JFM.
Part-II Chapter 8	8.9.3	Community Forest Management	Provisions of Forest Rights Act 2006 shall be followed.
Part-II Chapter 8	8.9.4	Fringe Forest Management (Convergence measures)	Proper Joint Forest Management Activities need to be taken up in convergence with other line departments, to check biotic pressure in fringe forests
Part-II Chapter 9	9.8.1. 1	Engagement of Protection Squad	In order to assist staff in protection activities it is proposed to constitute different types of protection squads. Around 250 number protection personnel are proposed to be engaged .

Part-II Chapter 9	9.7.1.2	Improving the network of Camping locations	In order to ensure protection activities in the interior parts of forests, it is proposed to improve the network of camping locations
Part-II Chapter 9	9.7.1.3	Field patrolling covering all vulnerable areas	Field Perambulation by staff with protection squad to detect offences have prescribed
Part-II Chapter 9	9.7.1.4	Constitution of Division Level mobile squad	In order to provide necessary assistance to the field staff and to improve intelligence gathering on field level activities one division level mobile squad is proposed.
Part-II Chapter 9	9.7.1.5	Strengthening of communication network	It is proposed to strengthen the existing VHF network and mobile phone network
Part-II Chapter 9	9.7.1.6	Boundary Maintenance	It is proposed to maintain damaged pillars and to post new pillars in required locations
Part-II Chapter 9	9.7.1.7	Protected Area Coverage	One continuous patch, covering parts of Tamra, Jarda and Sole Range is very good wildlife habitat and devoid of much human interference(around 200 sq.KM) is proposed to be brought under Protected Area Coverage.

Part-II Chapter 9	9.7.1.8	Annual maintenance of Roads	In order to improve the communication, it is proposed to maintain all forest roads annually.
Part-II Chapter 9	9.7.1.9	Provision of sufficient vehicles	In order to ensure the easy mobility of staff it is proposed to provide sufficient vehicles to staff. It is proposed to hire vehicles in absence of Govt. vehicles.
Part-II Chapter 9	9.7.1.10	Improvement of intelligence Gathering network	It is proposed to incentivize/reward informers, who provide valuable information regarding various forest/wildlife offences.
Part-II Chapter 9	9.7.1.11	Insurance coverage to protection staff	It is proposed to ensure life insurance/ health insurance coverage packages for all protection squads working in the division.
Part-II Chapter 9	9.7.1.12	Strengthening of Staff amenities	It is proposed to construct residential buildings and to maintain existing buildings according to necessity. It is also proposed to provide other necessary amenities to staff to carry out effective protection activities in the field.
Part-II Chapter 9	9.7.1.13	Co-ordination with neighboring divisions	It is proposed to conduct co-ordination meetings with neighboring divisions at frequent intervals, to strengthen the protection activities in the border area
Part-II Chapter 9	9.7.1.14	Co-ordination with line departments	It is proposed to have proper co-ordination with energy department and railways for checking accidental deaths of wildlife especially elephants

Part-II Chapter 9	9.7.1.15	Capacity Building of staff	It is proposed to arrange various capacity building training programmes for staff on various topics as required
Part-II Chapter 9	9.7.1.16	Procurement of modern tools / software/imageries	It is proposed to procure sufficient number of modern tools such as GPS PDA, Drones, etc. which can help in protection activities in future.
Part-II Chapter 9	9.7.1.17	Protection from Grazing	Control of grazing in wildlife potential areas have been prescribed to check habitat degradation and to prevent the spread of zoonotic diseases.
Part-II Chapter 9	9.7.2	Preparation fire protection and reclamation plan	To plan out activities to protect forest and wildlife of the division from ill effects of forest fire.
Part-II Chapter 9	9.7.2	Tracing fire lines	To check fire in fire prone areas
Part-II Chapter 9	9.7.2	Engagement of fire protection squad	To assist staff in fire protection activities
Part-II Chapter 9	9.7.2	Procurement of fire fighting equipment	To equip staff to carry out efficient fire protection activities

Part-II Chapter 9	9.7.2	Hiring Fire vehicles	To alter the mobility of staff and fire fighting squad
Part-II Chapter 9	9.7.2	Establishment of temporary fire watch towers	To enable staff in detecting fire points early.
Part-II Chapter 9	9.7.2	Capacity Building training	To equip staff in efficient fire protection activities
Part-II Chapter 9	9.7.2	Awareness of Public	To make aware public regarding the importance of protection of forests and wildlife from forest fire
Part-II Chapter 9	9.7.2	Incentives to VSSs	To motivate staff towards fire protection incentives to VSSs have suggested.
Part-II Chapter 9	9.7.3.0	Establishment of wildlife monitoring cell	In order to compile the regular monitoring data on wildlife, one research scholar with computer facilities have suggested.
Part-II Chapter 9	9.7.3.2	Maintaining daily patrolling logs/registers at beat level	To record details of regular monitoring
Part-II Chapter 9	9.7.3.3	Wildlife Population estimation programmes at division level	It is proposed to conduct population estimation exercises for reptiles, small mammals, and amphibians

Part-II Chapter 9	9.7.3.4	Recording data from PIPs	Pressure impression pads to be maintained to collect the indirect evidences of carnivores. Necessary equipment/ materials for collection of data to be procured.
Part-II Chapter 9	9.7.3.5	Camera trapping	It is proposed to procure necessary number of camera traps for the division, and to plan grid-wise continuous monitoring of carnivores in potential areas.
Part-II Chapter 9	9.7.3.6	Monitoring of Birds	It is proposed to have bird census programmes(for both terrestrial birds and water birds) in the division.
Part-II Chapter 9	9.7.3.7	Vegetation Survey	Preservation plots can be laid, and monitoring at regular interval can be done.
Part-II Chapter 9	9.7.3.8	Use of GIS/GPS tools	Procurement of GOS/GPS tools for wildlife monitoring is proposed
Part-II Chapter 9	9.7.3.9	Procurement of necessary monitoring equipment	Equipment required for wildlife monitoring to be procured.
Part-II Chapter 9	9.7.4.1(a)	Protection of representative forest patches with palatable food of wildlife	To ensure food availability to wildlife
Part-II Chapter 9	9.7.4.1(b)	Development of meadows	To improve healthiness of wildlife habitat, since the meadow cover in the division is very less

Part-II Chapter 9	9.7.4.1(c)	Eradication of invasive species	To promote growth of palatable grass species of herbivores
Part-II Chapter 9	9.7.4.1(d)	Assisting regeneration of Bamboo and other fruit bearing species	To ensure food availability to wildlife
Part-II Chapter 9	9.7.4.1(e)	Maintenance of Saltlicks	To ensure mineral requirement of wildlife.
Part-II Chapter 9	9.7.4.1(f)	Silvicultural measures	Keeping the wildlife aspect in mind, the exploitable diameter of various species has to be kept on higher side and the percentage of removal of exploitable size trees to be properly regulated and safe guarded. Likewise, various subsidiary silvicultural operations like opening of canopy, thinning in congested patches, improvement felling etc. to be prescribed for improving the general availability of food.
Part-II Chapter 9	9.7.4.2(i)	Creation of new water bodies and renovation of existing water bodies	To ensure water availability to wildlife, creation of new water bodies and renovation of existing water bodies have prescribed.

Part-II Chapter 9	9.7.4.2(ii)	Measures to ensure water availability to wildlife during peak summer.	In order to ensure water availability to wildlife during peak summer, it is also proposed to construct water storage structures like small diameter concrete rings nearby roads at regular intervals and to provide water to these structures by using water tankers.
Part-II Chapter 9	9.7.4.2(iii)	Soil & moisture conservation measures	The sites subjected to erosion can be recovered through proper soil and moisture conservation measures.
Part-II Chapter 9	9.7.4.3	Measures for Improving the Cover	To improve the availability of shelter to different animals very selective removal of mature trees without creating a lasting gap in canopy in the areas under selection working circle has to be prescribed. The measures like improving the density of forest and its composition, loose piling up of debris, no felling of trees within radius of 50 meters along nalla, water holes, wallows saltlicks and core habitat of wild animals etc. have also been prescribed for improving the cover for different wild species.
Part-II Chapter 9	9.7.4.4	Measures for Improving Wilderness	Maintaining the vast wilderness available in its natural condition free from biotic interference and disturbances is one of the prime requirements in habitat improvement programme.
Part-II Chapter 9	9.7.4.5	Protection of Special Habitats	Snags, snag recruits, large old trees, Lianas and tangled climbers etc. to be protected.

Part-II Chapter 9	9.7.4.6	Protection of wetlands	Wetlands present in the division area need to be identified and inventoried. Proper studies and awareness measures need to be planned and executed.
Part-II Chapter 9	9.7.5.4	Construction of watch towers	In order to facilitate the staff and elephant trackers in elephant monitoring, watch towers in strategic locations have suggested
Part-II Chapter 9	9.7.5.4	Rectification of sagging of electric lines	To prevent accidental/deliberate electrocution death of elephants this measure havebeen suggested.
Part-II Chapter 9	9.7.5.4	Co-ordination with energy department staff	To prevent accidental/deliberate electrocution death of elephants this measure has been suggested.
Part-II Chapter 9	9.7.5.4	Engagement of elephant trackers and early warning system	Regular monitoring of elephant and providing early warning to people regarding entry of elephants to human habitations being ensured through these measures
Part-II Chapter 9	9.7.5.4	Physical barriers	Solar fencing, Elephant Proof trenches and vegetative barriers have suggested. Barricading to open wells present in agricultural fields adjoining forest areas have also suggested.
Part-II Chapter 9	9.7.5.4	Provision of Solar street lights in conflict areas	To prevent the entry of elephants to villages, this measure has been suggested

Part-II Chapter 9	9.7.5.4	Application of modern tools	Radio collaring, Real time monitoring etc. have suggested
Part-II Chapter 9	9.7.5.4	Compassionate payment & insurance to agricultural fields	To compensate the loss due to wildlife depredation these measures have suggested
Part-II Chapter 9	9.7.6	Constitution of Wildlife rescue team division level	One wildlife rescue team to be developed at division level with trained staff for leading various wildlife rescue operations.
Part-II Chapter 9	9.7.6	Procurement of rescue equipment	Procurement of sufficient quantity of rescue cages and equipment, tranquilization equipment and drugs .
Part-II Chapter 9	9.7.6	Procurement of rescue vans	Procurement of rescue vans/vehicles has been suggested to enable the efficient working rescue teams
Part-II Chapter 9	9.7.6	Capacity building training of staff .	Specialized Training of staff in rescue and rehabilitation of wildlife.
Part-II Chapter 9	9.7.6	Outsourcing of trained & licensed people	Outsourcing of trained licensed persons in rescue and rehabilitation of snakes under the monitoring of forest department staff
Part-II Chapter 9	9.7.7.3	Construction of orientation Centre at Khandadhar for visitors	In order to orient visitors towards rules and regulations one orientation centre at the entrance has suggested

Part-II Chapter 9	9.7.7.3	Construction of interpretation Centre at Khandadhar	To explore nature interpretation facilities for visitors one interpretation centre has been suggested at Khandadhar.
Part-II Chapter 9	9.7.7.3	Maintenance & Upgradation of facilities in Khandadhar nature camp	Maintenance & Upgradation of facilities in Khandadhar nature camp is required to ensure efficient running of Khandadhar nature camp as a community managed sustainable nature tourism package.
Part-II Chapter 9	9.7.7.3	Maintenance & Upgradation of facilities in Tensa nature camp	Maintenance & Upgradation of facilities in Khandadhar nature camp is required to ensure efficient running of Tensa camp as a community managed sustainable nature tourism package.
Part-II Chapter 9	9.7.7.3	New ecotourism facilities at Upper Khandadhar Rukuda, and various waterfall areas in the division.	According to need of provision of alternate employment opportunities to local forest dependent community, ecotourism activities maybe started at Rukuda and Upper Khandadhar.
Part-II Chapter 9	9.7.7.3	Publicity and awareness	Website, Brochures, publications, documentaries, films etc. have been suggested in this regard.

Part-II Chapter 9	9.7.8	Eco development activities	Motivation of VSS members towards protection of forest and wildlife resources have promoted through activities leading to Eco development.
Part-II Chapter 9	9.7.9.1	Research	In collaboration with reputed institutions and NGOs
Part-II Chapter 9	9.7.9.2	Review meetings and Third party evaluation	Review meetings and Third party evaluation has been prescribed as monitoring measures
Part-II Chapter 9	9.7.9.3	Capacity Building trainings for staff	Capacity Building trainings for staff have been suggested to enable staff in dealing with various wildlife matters.
Part –II Chapter 10	11.1.1 to 11.1.4	Petty Felling and extraction of timber	Petty Felling and extraction of timber required for departmental purpose, KL wing demand, research needs etc. have assessed and prescribed.
Part –II Chapter 10	11.1.5	Forest Road improvement	Improvement of existing forest roads and conversion of existing extraction paths
Part –II Chapter 11	12.1 to 12.3	Science & Research	It has prescribed to lay sufficient number of preservation plots, sample plots, and regeneration plots .
Part –II Chapter 14	15.5 to 15.6	Assessment and documentation of ToF	In order to know the present status of ToF in the division, it is suggested.
Part –II Chapter 14	15.7	Inventorying potential areas to develop TOF	Areas with potential to develop Trees outside Forests need to be identified to develop ToF

Part –II Chapter 14	15.8	Awareness programmes	In order to make aware people regarding the importance of raising ToF, awareness programmes need to be planned and executed. Extension programmes through other organizations need to be promoted.
Part –II Chapter 14	15.8	Capacity Building	Building the capacity of general public in raising trees outside forest need to be ensured.
Part –II Chapter 14	15.8	Convergence activities	To raise ToF, co-ordination and co-operation from line departments are essential and hence it has proposed.
Part –II Chapter 14	15.8	Involvement of VSSs	Involvement of VSSs in activities aiming development of ToF need to be ensued
Part –II Chapter 14	15.8	Afforestation in lands identified outside forests.	Raising and distribution of seedlings according to the demand of the public., creation of wind breaks and shelter bets in agricultural lands through VSSs(in convergence with agricultural department), improving the quality existing TOF through proper ANR measures and waste land plantations outside forest areas have suggested.
Part –II Chapter 14	15.8	Monitoring and evaluation	Documentation and application of modern tools such as GIS have proposed under Monitoring and evaluation measures.
Part –II Chapter 14	15.8	Incentives and Rewards	Incentives/Rewards for good works need to be ensured.

Part –II Chapter 15	16.1	Maintenance of Boundaries	Year wise programme of maintenance of Boundary line and Pillars in five year cycle.
Part –II Chapter 16	16.2	Inspection programme of Boundary lines	Year wise programme of inspection of Boundary lines in ten year cycle.
Part –II Chapter 16	16.3	Maintenance of Compartments and Sub- compartments	Compartment and Sub-compartments to be maintained.
Part –II Chapter 16	16.4	Cost Norm of expenditure	Norm of expenditure to be incurred during maintenance of Boundary line and Pillars

f) Works prescribed to be executed during the Plan Period (yearwise Physical Target): Yearwise physical target of works prescribed to be executed during the plan period has tabulated in the table I (f)

Table I(f)- Yearwise details of works prescribed during the plan period.													
Chapter No.	Para No. /Sub-Para No.	Prescribed activity	Yearwise Physical target										Total
			2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	
			Phy	Phy	Phy	Phy	Phy	Phy	Phy	Phy	Phy	Phy	
A	B	C	E	F	G	H	I	J	K	L	M	N	O
Part-II Chapter 2	2.6.9.	Demarcation of annual coupes (area of coupes in ha)	9394.780	9735.235	10150.02 1	11896.062	10704.061	11297.831	10713.228	11206.18 4	10379.518	10097.43 2	105574.352
Part-II Chapter 2	2.6.9.2	Marking (area of coupes in ha)	9394.780	9735.235	10150.02 1	11896.062	10704.061	11297.831	10713.228	11206.18 4	10379.518	10097.43 2	105574.352
Part-II Chapter 2	2.6.10	Subsidiary Silvicultural Operation(area in ha)	10097.43 2	9394.780	9735.235	10150.021	11896.062	10704.061	11297.831	10713.22 8	11206.184	10379.51 8	105574.352
Part-II Chapter 2	2.6.11	Regeneration (area in ha)	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	2000.00
Part-II Chapter 2	2.6.11	Creation of Fire lines(KM)	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	3000.00
Part-II Chapter 3	3.7.5.1	Demarcation of annual coupes of Protection Working Circle(in ha)	760.00	717.971	780.00	781.356	790.375	779.665	772.304	771.108	695.936	709.985	7558.700
Part-II Chapter 3	3.7.5.2	Engagement of ProtectionSquad (No. of personnel)	100	100	100	100	100	100	100	100	100	100	1000

Part-II Chapter 3	3.7.5.2	Survey and demarcation of forest block boundaries (KM)	445.190	421.064	434.434	463.791	408.444	445.19	421.064	434.434	463.791	408.444	2172.923
Part-II Chapter 3	3.7.5.2	Procurement of equipments required for protection activities(No. of Field kits including uniform)	175	175	175	175	175	175	175	175	175	175	1750
Part-II Chapter 3	3.7.5.2	Procurement of modern tools required for protection activities (No. of Trap Cameras)	50	50	50	50	50	50	50	50	50	50	500
Part-II Chapter 3	3.7.5.2	Procurement of modern tools required for protection activities (Drone Camera No.)	5	5	5	4	1	1	1	1	1	1	25
Part-II Chapter 3	3.7.5.3, 3.7.6.3	Soil and Moisture Conservation measures(area to be covered in ha)	1564.80	1629.50	1793.20	1680.30	1688.70	1736.00	1591.90	1701.30	1956.40	1902.50	17244.60
Part-II Chapter 3	3.7.5.4	Regeneration of blank patches in Protection Working Circle area(in ha)	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	2000.00
Part-II Chapter 3	3.7.5.5	Forest Road improvement(Length of road in KM)	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	600.00
Part-II Chapter 3	3.7.5.6	Engagement of Fire protection squad in protection working circle (No. of personnel)	100	100	100	100	100	100	100	100	100	100	1000

Part-II Chapter 3	3.7.5.6	Procurement of fire fighting equipment(No. of kits)	50	50	50	50	50	50	50	50	50	50	500
Part-II Chapter 3	3.7.5.6	Publicity and awareness on protection of forests and wildlife(No. of programmes)	50	50	50	50	50	50	50	50	50	50	500
Part-II Chapter 3	3.7.5.7	Strengthening of VHF net work (No. of locations)	20	20	20	20	20	20	20	20	20	20	200
Part-II Chapter 3	3.7.5.7	Procurement of mobile phones to field staff	50	50	50	50	50	50	50	50	50	50	500
Part-II Chapter 3	3.7.5.7	Rewards /incentives to informers(No. of informers)	50	50	50	50	50	50	50	50	50	50	500
Part-II Chapter 4	4.6.6.1	Demarcation of rehabilitation coupe(area in ha)	1564.80	1629.50	1793.20	1680.30	1688.70	1736.00	1591.90	1701.30	1956.40	1902.50	17244.60
Part-II Chapter 4	4.6.6.2	Preparation of treatment map(No. of coupes)	10	10	10	10	10	10	10	10	10	10	100
Part-II Chapter 4	4.6.6.3	Rehabilitation operations in Type-A and Type-B areas (area in ha)	782.40	814.75	896.60	840.15	844.35	868.00	795.95	850.65	978.20	951.25	8622.30
Part-II Chapter 4	4.6.6.3	Rehabilitation operations in Type-C areas(area in ha)	391.20	407.38	448.30	420.08	422.18	434.00	397.98	425.33	489.10	475.63	4311.15
Part-II Chapter 4	4.6.6.3	Rehabilitation operations in Type 'D' areas (area in ha)	391.20	407.38	448.30	420.08	422.18	434.00	397.98	425.33	489.10	475.63	4311.15

Part-II Chapter 4	4.6.6.4.	Fencing (in KM)	50	50	50	50	50	50	50	50	50	50	500
Part-II Chapter 4	4.6.6.4.	Associated Regulation and Measures (area in ha)	1564.800	1629.500	1793.200	1680.300	1688.700	1736.000	1591.900	1701.300	1956.400	1902.500	17244.600
Part-II Chapter 5	5.6.2	Demarcation of Annual Plantation Areas (area in ha)	727.014	779.539	671.250	769.434	755.414	794.025	770.318	808.910	825.516	783.632	7685.052
Part-II Chapter 5	5.6.3	Site Clearance(area in ha)	200.000	200.000	200.000	200.000	200.000	200.000	200.000	200.000	200.000	200.000	2000.000
Part-II Chapter 5	5.6.4	Staking &Pitting (area in ha)	200.000	200.000	200.000	200.000	200.000	200.000	200.000	200.000	200.000	200.000	2000.000
Part-II Chapter 5	5.6.5.	Nursery operations (No. of seedlings to be raised)	352000	352000	352000	352000	352000	352000	352000	352000	352000	352000	3520000
Part-II Chapter 5	5.6.5. 4	Plantation & post plantation in 1 st year (area in ha)	200.000	200.000	200.000	200.000	200.000	200.000	200.000	200.000	200.000	200.000	2000.000
Part-II Chapter 5	5.6.5. 4	Post Plantation Operation in 2 nd Year(area in ha)		200.000	200.000	200.000	200.000	200.000	200.000	200.000	200.000	200.000	1800.000
Part-II Chapter 5	5.6.5. 4	Post Plantation Operation in 3 rd and subsequent Years(area in ha)			200.000	200.000	200.000	200.000	200.000	200.000	200.000	200.000	1600.000
Part-II Chapter 5	5.6.5. 5	Thinning in Existing Plantation(area in ha)	400.000	400.000	400.000	400.000	400.000	400.000	400.000	400.000	400.000	400.000	4000.000

Part-II Chapter 5	5.6.6	Associated Regulations and Measures(area in ha)	695.30	714.58	640.42	695.10	681.80	709.10	740.08	774.20	773.77	687.80	7112.15
Part-II Chapter 6	6.6.6.1.	Demarcation of annual Bamboo coupes(area in ha)	15700.98 8	15977.54 4	15502.64 4	17901.329	15700.988	15977.544	15502.644	17901.32 9	15700.988	15977.54 4	161843.542
Part-II Chapter 6	6.6.6.3.	Preparation of Treatment Maps(No. of coupes)	9	9	9	9	9	9	9	9	9	9	90
Part-II Chapter 6	6.6.6.7.	Simultaneous Silvicultural Operations(area in ha)	15700.98 8	15977.54 4	15502.64 4	17901.329	15700.988	15977.544	15502.644	17901.32 9	15700.988	15977.54 4	161843.542
Part-II Chapter 6	6.6.6.8	Regeneration (area in ha)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	1000.00
Part-II Chapter 6	6.6.9	Control, Associated Regulations and Measures(area in ha)	15700.98 8	15977.54 4	15502.64 4	17901.329	15700.988	15977.544	15502.644	17901.32 9	15700.988	15977.54 4	161843.542
Part-II Chapter 7	7.6.5	Capacity building training of primary collectors(No. of trainings)	25	25	25	25	25	25	25	25	25	25	250
Part-II Chapter 7	7.6.5	Value addition of NTFPs through VSSs/SHGs, as income generation activity (No. of VSSs to be covered)	30	30	30	30	30	30	30	30	30	30	300
Part-II Chapter 7	7.6.5	Establishment of village micro enterprises(No. of VSSs to be covered)	30	30	30	30	30	30	30	30	30	30	300
Part-II Chapter 7	7.6.8.4	Marketing of NTFPs(No.VSSs to be covered)	30	30	30	30	30	30	30	30	30	30	300

Part-II Chapter 8	8.7.1	Demarcation of assigned areas to VSS(area in ha)	2365.00	2365.00	2365.00	2365.00	2365.00	2365.00	2365.00	2365.00	2365.00	2365.00	23650.00
Part-II Chapter 8	8.7.2 to 8.7.4	Preparation of microplans(No. of VSSs)	40	40	40	40	40	40	40	40	40	39	399
Part-II Chapter 8	8.7.5 8.7.10	Formation of new VSSs/reconstitution of existing VSS	10	10	10	10	10	10	10	10	10	10	100
Part-II Chapter 8	8.7.6	Engagement of partner-NGOs(No. of VSSs)	50	50	50	50	50	50	50	50	50	49	499
Part-II Chapter 8	8.7.7	Income Generation activities (in Lakhs)	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	49.00	499.00
Part-II Chapter 8	8.7.8	Rewards /incentives to VSSs (in Lakhs)	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	50.00
Part-II Chapter 8	8.7.9	Capacity Building of Staff & Villagers towards JFM activities(No. of trainings)	200	200	200	200	200	200	200	200	200	200	2000
Part-II Chapter 8	8.8	Control measures- Supply of fuel efficient chullas(No. of villages	50	50	50	50	50	50	50	50	50	50	500

Part-II Chapter 9	9.7.1. 1	Engagement of Protection Squad(No. of protection personnel	180	180	180	180	180	180	180	180	180	180	1800
Part-II Chapter 9	9.7.1.2	Improving the network of Camping locations(No. of campsheds to be constructed)	4	3	3	3	2	2	2	2	2	2	25
Part-II Chapter 9	9.7.1.4	Constitution of Division Level mobile squad(No. of squad members)	15	15	15	15	15	15	15	15	15	15	150
Part-II Chapter 9	9.7.1.5	Strengthening of communication network(Up gradation of existing VHF stations)	3	3	2	1	1	1	1	1	1	1	15
Part-II Chapter 9	9.7.1.5	Strengthening of communication network(Procurement of existing in Lakhs)	10.00	5.00	5.00	3.00	2.00	0.00	0.00	0.00	0.00	0.00	25.00
Part-II Chapter 9	9.7.1.6	Boundary Maintenance (KM)	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	500.00
Part-II Chapter 9	9.7.1.8	Annual maintenance of Roads (KM)	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	500.00
Part-II Chapter 9	9.7.1.9	Provision of sufficient vehicles(No. of 4-wheeler vehicles o be procured)	5	5	3	3	3	2	1	1	1	1	25

Part-II Chapter 9	9.7.1.9	Provision of sufficient vehicles(No. of 2-wheeler vehicles to be procured)	8	6	5	4	4	4	4	4	4	4	47
Part-II Chapter 9	9.7.1.10	Improvement of intelligence Gathering network(No of informers to be paid)	200	200	200	200	200	200	200	200	200	200	2000
Part-II Chapter 9	9.7.1.11	Insurance coverage to protection squad (No. of protection squad)	250	250	250	250	250	250	250	250	250	250	2500
Part-II Chapter 9	9.7.1.12	Strengthening of Staff amenities(Construction of ACF quarter)	2	1	2	1	2	1	2	1	2	1	15
Part-II Chapter 9	9.7.1.12	Strengthening of Staff amenities(Construction of RO quarter)	2	0	0	0	0	0	0	0	0	0	2
Part-II Chapter 9	9.7.1.12	Strengthening of Staff amenities(Construction of DFO Quarter)	0	1	0	0	0	0	0	0	0	0	1
Part-II Chapter 9	9.7.1.12	Strengthening of Staff amenities(Construction of Forester Quarter)	5	5	5	5	0	0	0	0	0	0	20
Part-II Chapter 9	9.7.1.12	Strengthening of Staff amenities(Construction of FG Quarter)	10	10	10	10	9	0	0	0	0	0	49

Part-II Chapter 9	9.7.1.13	Co-ordination with neighbouring divisions(No. of meetings)	25	25	25	25	25	25	25	25	25	25	250
Part-II Chapter 9	9.7.1.14	Co-ordination with line departments(No. of co-ordination meetings)	20	20	20	20	20	20	20	20	20	20	200
Part-II Chapter 9	9.7.1.15	Capacity Building of staff (No. of capacity building programmes)	25	25	25	25	25	25	25	25	25	25	250
Part-II Chapter 9	9.7.1.16	Procurement of modern tools / software/imageries (No. kits)	25	25	25	25	25	25	25	25	25	25	250
Part-II Chapter 9	9.7.2	Preparation fire protection and reclamation plan	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	80.00
Part-II Chapter 9	9.7.2	Tracing fire lines (km)	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	20000.00
Part-II Chapter 9	9.7.2	Engagement of fire protection squad	400.00	400.00	400.00	400.00	400.00	400.00	400.00	400.00	400.00	400.00	4000.00
Part-II Chapter 9	9.7.2	Procurement of fire fighting equipment(No. of kits)	40	40	30	30	30	30	20	20	20	20	280
Part-II Chapter 9	9.7.2	Hiring Fire vehicles	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	250.00

Part-II Chapter 9	9.7.2	Establishment of temporary fire watch towers(No. of camps)	50	50	50	50	50	50	50	50	50	50	500
Part-II Chapter 9	9.7.2	Capacity Building training(No. of trainings)	30	30	30	30	30	30	30	30	30	30	300
Part-II Chapter 9	9.7.2	Awareness of Public(NO. of programmes)	50	50	50	50	50	50	50	50	50	50	500
Part-II Chapter 9	9.7.2	Incentives to VSSs(No. of VSSs)	20	20	20	20	20	20	20	20	20	20	200
Part-II Chapter 9	9.7.3.1	Establishment of wildlife monitoring cell	1	0	0	0	0	0	0	0	0	0	1
Part-II Chapter 9	9.7.3.2	Maintaining daily patrolling logs/registers at beat level(No. of logs)	100	100	100	100	100	100	100	100	100	100	1000
Part-II Chapter 9	9.7.3.3	Wildlife Population estimation programmes at division level(No. of Census Programmes)	2	2	2	2	2	2	2	2	2	2	20

Part-II Chapter 9	9.7.3.4	Recording data from PIPs(Procurement of equipment- no. of kits)	25	25	25	25	25	25	25	25	25	25	250
Part-II Chapter 9	9.7.3.5	Camera trapping(procurement of camera traps)	100.00	50.00	50.00	50.00	50.00	50.00	0.00	0.00	0.00	0.00	350.00
Part-II Chapter 9	9.7.3.6	Monitoring of Birds(No. of Census Programmes)	1	1	1	1	1	1	1	1	1	1	10
Part-II Chapter 9	9.7.3.7	Vegetation Survey	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	50.00
Part-II Chapter 9	9.7.3.9	Procurement of necessary monitoring equipment(No. of kits)	30	30	30	30	30	30	30	30	30	30	300
Part-II Chapter 9	9.7.4.1	Protection of representative forest patches with palatable food of wildlife(extent of area in ha.)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	1000.00
Part-II Chapter 9	9.7.4.1	Development of meadows(No.)	30	30	30	30	20	20	20	20	20	20	240
Part-II Chapter 9	9.7.4.1	Eradication of invasive species(Ha)	300.00	300.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	2600.00

Part-II Chapter 9	9.7.4.1	Assisting regeneration of Bamboo and other fruit bearing species(area in ha)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	1000.00
Part-II Chapter 9	9.7.4.1	Maintenanace of Saltlicks	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	250.00
Part-II Chapter 9	9.7.4.2	Creation of new water bodies (No.)	3	3	3	3	3	3	3	3	3	3	30
Part-II Chapter 9	9.7.4.2	Renovation of existing water bodies(no.)	15	15	15	15	15	15	15	15	15	15	150
Part-II Chapter 9	9.7.4.2	Measures to ensure water availability to wildlife during peak summer.(No. of locations)	200	200	200	200	200	200	200	200	200	200	2000
Part-II Chapter 9	9.7.4.2	Soil & moisture conservation measures(in ha)	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	10000.00
Part-II Chapter 9	9.7.4.3	Measures for Improving the Cover(area in ha to be treated)	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	10000.00

Part-II Chapter 9	9.7.4.4	Measures for Improving Wilderness(area in ha to be treated)	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	10000.00
Part-II Chapter 9	9.7.4.5	Maintaining of Special Habitats	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	10000.00
Part-II Chapter 9	9.7.4.6	Protection of wetlands(No. of wetlands)	5	5	5	5	5	5	5	5	5	5	100
Part-II Chapter 9	9.7.5.4	Construction of watch towers(No.)	2	2	1	1	1	1	1	1	1	1	12
Part-II Chapter 9	9.7.5.4	Rectification of sagging of electric lines (No. Joint patrolling with electric department)	100	100	100	100	100	100	100	100	100	100	1000
Part-II Chapter 9	9.7.5.4	Co-ordination with energy department staff(No. of meetings	25	25	25	25	25	25	25	25	25	25	250
Part-II Chapter 9	9.7.5.4	Engagement of elephant trackers and early warning system	50	50	50	50	50	50	50	50	50	50	500

Part-II Chapter 9	9.7.5.4	Physical barriers EPT(KM)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	1000.00
Part-II Chapter 9	9.7.5.4	Provision of Solar street lights in conflict areas(No. of solar light posts)	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	5000.00
Part-II Chapter 9	9.7.5.4	Procurement of modern tools(No. of kits)	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	100.00
Part-II Chapter 9	9.7.5.4	Compassionate payment & insurance to agricultural fields (No. of victims)	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	10000.00
Part-II Chapter 9	9.7.6	Constitution of Wildlife rescue team division level(No. of team)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	10.00
Part-II Chapter 9	9.7.6	Procurement of rescue equipment(set of required equipment)	5.00	3.00	3.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	20.00
Part-II Chapter 9	9.7.6	Procurement of rescue vans	1	1	0	0	0	0	0	0	0	0	2

Part-II Chapter 9	9.7.6	Capacity building training of staff (No. of trainings).	5	5	5	5	5	5	5	5	5	5	50
Part-II Chapter 9	9.7.7.3	Construction of orientation Centre at Khandadhar for visitors(No)	1	0	0	0	0	0	0	0	0	0	1
Part-II Chapter 9	9.7.7.3	Construction of interpretation Centre at Khandadhar (No)	1	0	0	0	0	0	0	0	0	0	1
Part-II Chapter 9	9.7.7.3	Maintenance & Upgradation of facilities in Khandadhar nature camp	As per requirement	As per requirement	As per requirement	As per requirement	As per requirement	As per requirement	As per requirement	As per requirement	As per requirement	As per requirement	
Part-II Chapter 9	9.7.7.3	Maintenance & Upgradation of facilities in Tensa nature camp	As per requirement	As per requirement	As per requirement	As per requirement	As per requirement	As per requirement	As per requirement	As per requirement	As per requirement	As per requirement	
Part-II Chapter 9	9.7.7.3	New ecotourism facilities at Upper Khandadhar, Rukuda, and various waterfall areas in the division. (No. of projects)	1	1	1	1	1	1	0	0	0	0	6
Part-II Chapter 9	9.7.7.3	Publicity and awareness(No. of publicity measures)	25	25	25	25	25	25	25	25	25	25	250

Part-II Chapter 9	9.7.8	Eco development activities(No. of VSS)	100	100	100	100	100	100	100	100	100	100	1000
Part-II Chapter 9	9.7.9.1	Research (No. of studies to take up)	3	3	3	3	3	3	3	3	3	3	30
Part-II Chapter 9	9.7.9.2	Third party evaluation	1	1	1	1	1	1	1	1	1	1	10
Part-II Chapter 9	9.7.9.3	Capacity Building trainings for staff(No. of trainings)	50	50	50	50	50	50	50	50	50	50	500
Part –II Chapter 11	11.1 to 11.3	Science & Research(No. of study plots to be laid)	2	2	2	2	2	2	2	2	2	2	20
		Research works (No. of projects)	3	3	3	3	3	3	3	3	3	3	30

Part –II Chapter 12	13.1 to 13.3	Science & Research(No. of study plots to be laid)	2	2	2	2	2	2	2	2	2	2	20
		Research works (No. of projects)	3	3	3	3	3	3	3	3	3	3	30
Part –II Chapter 15	15.5.1	Assessment and documentation of ToF(No. of ranges to be covered)	1	1	1	1	1	1	1	0	0	0	7
Part –II Chapter 15	15.5.2	Inventorying potential areas to develop TOF (No. of ranges to be covered)	1	1	1	1	1	1	1	0	0	0	7
Part –II Chapter 15	15.5.3 & 15.5.7	Awareness programmes	50	50	50	50	50	50	50	50	50	50	500
Part –II Chapter 15	15.5.4	Capacity Building(No. of training programmes)	50	50	50	50	50	50	50	50	50	50	500
Part –II Chapter 15	15.5.6	Support to VSSs(No. of VSS)	100	100	100	100	100	100	100	100	100	100	1000

Part –II Chapter 15	15.5.7	Afforestation in lands identified outside forests(ha)	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	2500.00
Part –II Chapter 15	15.5.8	Monitoring and evaluation(No. of evaluation)	1	1	1	1	1	1	1	1	1	1	10
Part –II Chapter 15	15.5.9	Incentives and Rewards(No. of individuals /organizations)	25	25	25	25	25	25	25	25	25	25	250

II. GLOSSARY OF TERMS

III. LIST OF FLORA

(Indicating RET and unique species)

28.2 Glossary of Oriya, English & Latin name:-

A - TREE.

List of trees				
Sl. No.	Oriya Name	Classifications	Botanical Name	Family
1	Amba	Large tree	<i>Mangifera indica</i>	Anacardiaceae
2	Ambada	Medium tree	<i>Spondias mangifera</i>	-do-
3	Achhu	Small tree	<i>Morinda tintoria</i>	Rubiaceae
4	Ankula	-do-	<i>Alangium salvifolium</i>	Alangiaceae
5	Amla	-do-	<i>Emblica officinalis</i>	Euphorbiaceae
6	Arjuna	Large tree	<i>Terminalia arjuna</i>	combretaceae
7	Asan / Sahaja	-do-	<i>Terminalia tomentosa</i>	-do-
8	Aswastha	-do-	<i>Ficus religiosa</i>	Moraceae
9	Ata / Ramphal	Small tree	<i>Annona reticulata</i>	Anonaceae
10	Agasti	-do-	<i>Sesbania grandiflora</i>	Papilionaceae
11	Ambthi	-do-	<i>Bauhinia malabarica</i>	Caesalpiniaceae
12	Baula	Medium tree	<i>Mimusops elengi</i>	Sapotaceae
13	Bija / Piasal	Large tree	<i>Pterocarpus marsupium</i>	Fabaceae
14	Badhial/Sitaphal	Small tree	<i>Annona squamosa</i>	Anonaceae
15	Bandhan	Medium tree	<i>Ougenia oojeinensis</i>	Fabaceae
16	Bara	Large tree	<i>Ficus benghalensis</i>	Moraceae
17	Babul	Small tree	<i>Acacia nilotica</i>	Mimosaceae
18	Bahada	Large tree	<i>Terminalia belerica</i>	Combretaceae
19	Barabakulia	-do-	<i>Dalbergia paniculata</i>	Fabaceae
20	Buro	Small tree	<i>Zizyphus mauritiana</i>	Rhamnaceae
21	Barun	Medium tree	<i>Crataeva religiosa</i>	Capparidaceae
22	Bela	Small tree	<i>Aegle marmelos</i>	Rutaceae
23	Bhalia	Medium tree	<i>Semicarpus anacardium</i>	Anacardiaceae

24	Bheru	Small tree	<i>Chloroxylon swietenia</i>	Meliaceae
25	Batra	-do-	<i>Melia composita</i>	-do-
26	Bhersunga	Small tree	<i>Murraya koenigi</i>	Rutaceae
27	Badam (Deshi)	Large tree	<i>Terminalia catappa</i>	Combretaceae
28	Chadeigudi	Medium tree	<i>Vitex peduncularis</i>	Verbenaceae
29	Chakundi	Large tree	<i>Cassia siamea</i>	Ceasalpinaceae
30	Char	Small tree	<i>Buchanania lanzan</i>	Anacardiaceae
31	Chauli	-do-	<i>Elaeodendron glaucum</i>	Celastraceae
32	Chatian	Large tree	<i>Alstonia scholaris</i>	Apocynaceae
33	Choari	Medium tree	<i>Bauhinia retusa</i>	Caesalpinaceae
34	Champa	Large tree	<i>Michelia champaca</i>	Magnoliaceae
35	Chaladhua	Small tree	<i>Erythrina suberosa</i>	Papilionaceae
36	Damkurudu	-do-	<i>Gardenia latifolia</i>	Rubiaceae
37	Dhaman	Large tree	<i>Grewia tiliifolia</i>	Tiliaceae
38	Dhaura	-do-	<i>Anogeissus latifolia</i>	Combretaceae
39	Dimri	Small tree	<i>Ficus glomerata</i>	Moraceae
40	Eucalyptus	Large tree	<i>Eucalyptus species</i>	Myrtaceae
41	Gamhari	Medium tree	<i>Gmelina arborea</i>	Verbenaceae
42	Ghanta	Small tree	<i>Zizyphus xylopyra</i>	Rhamnaceae
43	Ghodalanja	Large tree	<i>Albizzia stipulata</i>	Mimosaceae
44	Genduli	-do-	<i>Sterculia urens</i>	Sterculiaceae
45	Gohira	-do-	<i>Acacia leucophloea</i>	Mimosaceae
46	Giringa	-do-	<i>Pterospermum heyneanum</i>	Sterculiaceae
47	Gua	Small tree	<i>Areca catechu</i>	Palmaceae
48	Harida	Large tree	<i>Terminalia chebula</i>	Combretaceae
49	Hinjal	Medium tree	<i>Barringtonia acutangula</i>	Lecythidaceae
50	Haldu (kurum)	Large tree	<i>Adina cordifolia</i>	Rubiaceae

51	Jamu	-do-	<i>Syzigium cumini</i>	Myrtaceae
52	Jari	-do-	<i>Ficus retusa</i>	Moraceae
53	Kadamba	Large tree	<i>Anthocephalus cadamba</i>	Rutaceae
54	Kaitha	-do-	<i>Feronia elephantum</i>	Rutaceae
55	Kamalagundi	Small tree	<i>Mallotus philipinensis</i>	Euphorbiaceae
56	Karada	-do-	<i>Cleistanthus collinus</i>	Euphorbiaceae
57	Karanj	Medium tree	<i>Pongamia pinnata</i>	Fabaceae
58	Kasi	Large tree	<i>Bridelia retusa</i>	Euphorbiaceae
59	Kendu	-do-	<i>Diospyros melanoxylon</i>	Ebenaceae
60	Khair	Small tree	<i>Acacia catechu</i>	Mimosaceae
61	Khajuri	Medium tre	<i>Phoenix sylvastris</i>	Palmaceae
62	Kochila	Large tree	<i>Strychnos nuxvomica</i>	Longaniaceae
63	Kangada	-do-	<i>Xylia xylocarpa</i>	Mimosaceae
64	Kodala	-do-	<i>Sterculia villosa</i>	Sterculiaceae
65	Kumbhi	Medium tree	<i>Careya arborea</i>	Lecythidaceae
66	Kusum	Large tree	<i>Scheichera oleosa</i>	Sapindaceae
67	Lankavalia	Small tree	<i>Anacardium occidentale</i>	Anacardiaceae
68	Lodha	Large tree	<i>Symplocus racemosa</i>	Symplocaceae
69	Mahanimba	-do-	<i>Ailanthus excelsa</i>	Simarubaceae
70	Mahula	-do-	<i>Madhuca indica</i>	Sapotaceae
71	Mankada kendu	-do-	<i>Diospyros embryopteris</i>	Ebenaceae
72	Mai	-do-	<i>Lannea coromandelica</i>	Anacardiaceae
73	Mundi	-do-	<i>Mitragyna parvifolia</i>	Rubiaceae
74	Neem	-do-	<i>Azadirachta indica</i>	Meliaceae
75	Nadia	-do-	<i>Cocos nucifera</i>	Palmaceae
76	Nageswar	-do-	<i>Messua ferrea</i>	Guttiferaceae
77	Paldhua	Small tree	<i>Erythrina indica</i>	Fabaceae
78	Palas	Small tree	<i>Butea monosperma</i>	-do-
79	Panasa	Medium tree	<i>Artocarpus intigrifolia</i>	Moraceae
80	Panigamhar	-do-	<i>Trewia nudiflora</i>	Euphorbiaceae
81	Patuli	-do-	<i>Lagerstroemia speciosa</i>	Lythraceae

82	Phasi	Large tree	<i>Anogeissus acuminata</i>	Combretaceae
83	Rai	-do-	<i>Dillenia pentagyna</i>	Dilleniaceae
84	Rajmohi	-do-	<i>Bursera serrata</i>	Burseraceae
85	Ritha	Medium tree	<i>Sapindus emerginatus</i>	Sapindaceae
86	Rohini	Large tree	<i>Soymida febrifuga</i>	Meliaceae
87	Sal	Large tree	<i>Shorea robusta</i>	Dipterocarpaceae
88	Salai	-do-	<i>Boswellia serrata</i>	Burseraceae
89	Salapa	-do-	<i>Caryota urens</i>	Palmaceae
90	Saguan	-do-	<i>Tectona grandis</i>	Verbenaceae
91	Semal	-do-	<i>Bombax ceiba</i>	Bombacaceae
92	Sidha	-do-	<i>Lagerstroemia parviflora</i>	Lythraceae
93	Siris	-do-	<i>Albizzia lebbek</i>	Mimosaceae
94	Sisoo	-do-	<i>Dalbergia latifolia</i>	Fabaceae
95	Sunari	Small tree	<i>Cassia fistula</i>	Caesalpinaceae
96	Sajana	-do-	<i>Moringa oleifera</i>	Moringaceae
97	Sahada	Small tree	<i>Streblus asper</i>	Moraceae
98	Simakayan	-do-	<i>Pithecolobium dulce</i>	Mimosaceae
99	Tala	Large tree	<i>Borassus flabellifer</i>	Palmaceae
100	Tentuli	-do-	<i>Tamarindus indica</i>	Caesalpinaceae
101	Tangini	Small tree	<i>Xylia dolabriformis</i>	Mimosaceae
102	Telko	-do-	<i>Randia uliginosa</i>	Rubiaceae

B - SHRUBS

List of shrubs			
Sl. No	Oriya Name	Botanical Name	Family
1	Arakha	<i>Calotropis procera</i>	<i>Asclepidaceae</i>
2	Amari	<i>Ipomea fistulosa</i>	<i>Convolvulaceae</i>
3	Aswagandha	<i>Withania somnifera</i>	<i>Solanaceae</i>
4	Baincha	<i>Flocourtia sepiaria</i>	<i>Flocourtiaceae</i>
5	Baramasi	<i>Agave american</i>	<i>Amaryllidaceae</i>

6	Basanga	<i>Adhatoda vasica</i>	<i>Acanthaceae</i>
7	Bhanga	<i>Cannabis sativa</i>	<i>Cannabinaceae</i>
8	Gila	<i>Caesalpinia decapetala</i>	<i>Ceasalpiniaceae</i>
9	Girili	<i>Indigofera pulchella</i>	<i>Fabaceae</i>
10	Karabir	<i>Nerium indicum</i>	<i>Apocynaceae</i>
11	Kanteikoli	<i>Ziziphus oenoplia</i>	<i>Rhamnaceae</i>
12	Ghurudu	<i>Gardenia gumifera</i>	<i>Rubiaceae</i>
13	Mamuri	<i>Antidesma diandrum</i>	<i>Euphorbiaceae</i>
14	Nagairi	<i>Lantana camara</i>	<i>Verbenaceae</i>
15	Ranidantakathi	<i>Flemingia chappar</i>	<i>Fabaceae</i>
16	Siju	<i>Euphorbia nivulia</i>	<i>Euphorbiaceae</i>
17	Telkoruan	<i>Ixora parviflora</i>	<i>Rubiaceae</i>
18	Jajangi	<i>Phyllanthus collinus</i>	<i>Euphorbiaceae</i>

C- HERBS

List of Herbs			
Sl. No.	Oriya Name	Botanical Name	Family
1	Ankaranti	<i>Solanum xanthocarpum</i>	<i>Solanaceae</i>
2	Anantamula	<i>Hemidesmus indicus</i>	<i>Asclepidaceae</i>
3	Ada (Ambakasi)	<i>Curcuma amada</i>	<i>Zingiberaceae</i>
4	Apamaranga	<i>Achyranthes aspera</i>	<i>Amarantaceae</i>
5	Baghanakhi	<i>Martynia diandra</i>	<i>Pedaliaceae</i>
6	Bhuinimba	<i>Andrographis paniculata</i>	<i>Acanthaceae</i>
7	Bhurngaraj	<i>Wedelia calendulacea</i>	<i>Campositae</i>
8	Chitaparu	<i>Plumbago zeylanica</i>	<i>Plumbaginaceae</i>
9	Dudura	<i>Datura stramonium</i>	<i>Solanaceae</i>
10	Ganjei	<i>Cannabis sativa</i>	<i>Cannabinaceae</i>
11	Ghikuari	<i>Aloe vera</i>	<i>Liliaceae</i>
12	Haladi	<i>Curcuma longa</i>	<i>Zingiberaceae</i>
13	Hatisundha	<i>Heliotropicum indicum</i>	<i>Boraginaceae</i>
14	Patalagaruda	<i>Rauwolfia serpentina</i>	<i>Apocynaceae</i>

15	Palua	<i>Curcuma aromatica</i>	<i>Zingiberaceae</i>
16	Salaparni	<i>Desmodium gangeticum</i>	<i>Fabaceae</i>
17	Saptapheni	<i>Opuntia dillenii</i>	<i>Cactaceae</i>
18	Tulasi (dhala)	<i>Ocimum basilicum</i>	<i>Labiatae</i>
19	Tulasi (kala)	<i>Ocimum sanctum</i>	-do-
20	Nagapheni	<i>Opuntia vulgaris</i>	<i>Cactaceae</i>

D– GRASSES

List of Grasses			
Sl. No.	Oriya Name	Botanical Name	Family
1	Baunsa (salia)	<i>Dendrocalamus strictus</i>	<i>Gramineae</i>
2	-do- (daba)	<i>Bambusa arundinacea</i>	<i>Gramineae</i>
3	-do- (dungi)	<i>Cephalostachyum pergracile</i>	<i>Poaceae</i>
4	Babuli	<i>Pollinidium angustifolium</i>	<i>Gramineae</i>
5	Bena	<i>Vitiveria zizanoides</i>	-do-
6	Broom	<i>Thysalolaena maxima</i>	-do-
7	Duba	<i>Cynodon dactylon</i>	-do-
8	Kasatandi	<i>Saccharum spontaneum</i>	-do-
9	Sabai	<i>Pollinidium angustifolium</i>	-do-
10	Sinkula	<i>Hetropogon contortus</i>	-do-

E – CLIMBERS

List of Climber			
Sl. No.	Oriya Name	Botanical Name	Family
1	Atundi	<i>Combretum decandrum</i>	<i>Combretaceae</i>
2	Ambalata	<i>Bauhinia racemosa</i>	<i>Caesalpiniaceae</i>
3	Asadhua	<i>Capparis zeylanica</i>	<i>Caparidaceae</i>
4	Anantamuli	<i>Hemidesmus indicus</i>	<i>Asclepiadaceae</i>
5	Arsi / Gila	<i>Entada scandens</i>	<i>Mimosaceae</i>
6	Baidank	<i>Mucuna pruriens</i>	<i>Fabaceae</i>
7	Banamali	<i>Jasminum arborescens</i>	<i>Oleaceae</i>
8	Beta	<i>Calamus tenuis</i>	<i>Palmaceae</i>
9	Dantari	<i>Acacia pennata</i>	<i>Mimosaceae</i>
10	Desialu	<i>Dioscorea alata</i>	<i>Dioscoreaceae</i>
11	Dhudhiali	<i>Cryptolepis buchanani</i>	<i>Euphorbiaceae</i>
12	Gudmari	<i>Gymnema sylvestre</i>	<i>Asclepiadaceae</i>
13	Gulichhi	<i>Tinospora cordifolia</i>	<i>Menispermaceae</i>
14	Kaincha	<i>Abrus precatorius</i>	<i>Fabaceae</i>
15	Kalama	<i>Ipomea aquatica</i>	<i>Convolvulaceae</i>
16	Karaba	<i>Dioscorea pentaphylla</i>	<i>Dioscoreaceae</i>
17	Kankada	<i>Momordica dioica</i>	<i>Cucurbitaceae</i>
18	Lata palas	<i>Butea superba</i>	<i>Fabaceae</i>
19	Malati	<i>Aganosma caryophyllata</i>	<i>Apocynaceae</i>
20	Mardalai	<i>Milletia auriculata</i>	<i>Fabaceae</i>
21	Muturi	<i>Smilax macrophylla</i>	<i>Liliaceae</i>
22	Modanga	<i>Loranthus longiflorus</i>	<i>Loranthaceae</i>
23	Satabari	<i>Asparagus racemosus</i>	<i>Liliaceae</i>
24	Siali	<i>Bauhinia vahlii</i>	<i>Caesalpiniaceae</i>
25	Hadabhanga	<i>Cissus quadrangularis</i>	<i>Ampelidaceae</i>

IV. LIST OF FAUNA

28.3 Glossary of Oriya, English & Latin name :-

A – Mammals

List of animals					
Sl. No.	Oriya Name	English Name	Latin Name	Family	Schedule No.
1	Bajra kapta	Pangolin	<i>Manis crassicaudata</i>	<i>Manidae</i>	I
2	Badudi	Bat	<i>Rouseltute schenaulti</i>	<i>Pteropodidae</i>	V
3	Banabiradi	Wild cat	<i>Felis chaus affinis</i>	<i>Felidae</i>	I
4	Barah	Wild boar	<i>Sus crefa cristatus</i>	<i>Suidae</i>	III
5	Bilua	Jackal	<i>Canis latranus</i>	<i>Canidae</i>	V
6	Bhalu	Black bear	<i>Selenarctos tibetana</i>	<i>Ursidae</i>	II
7	Chital	Spotted deer	<i>Axis axis</i>	<i>Cervidae</i>	III
8	Chemani	House bat	<i>Cynopterus sphinx</i>	<i>Pteropodidae</i>	V
9	Gundichimusa	Squirrel	<i>Funambulus penanti</i>	<i>Sciuridae</i>	V
10	Gurandi	Mouse deer	<i>Trangulus meinna</i>	<i>Tragulidae</i>	I
11	Hati	Elephant	<i>Elephas maximus</i>	<i>Elephantidae</i>	I
12	Heta	Hyena	<i>Hyaena striata</i>	<i>Hyaenidae</i>	I
13	Jinka	Porcupine	<i>Hystrix leucura</i>	<i>Hystriidae</i>	IV
14	Kalarapatriya	Leopard	<i>Panthera pardus fusca</i>	<i>Felidae</i>	I
15	Katasa	Big wild cat	<i>Paradoxurus hermaphrodit</i>	<i>Felidae</i>	II
16	Khurant	Musk deer	<i>Moschila menina</i>	<i>Tragulidae</i>	I
17	Kokisiali	Fox	<i>Vulpes bengalensis</i>	<i>Canidae</i>	II
18	Kutura	Barking deer	<i>Cerrulus muntjac</i>	<i>Cervidae</i>	III
19	Mankada (hanu)	Black-faced monkey	<i>Semnopithecus entellus</i>	<i>Cercopithecidae</i>	II
20	-do- (pati)	Red-faced monkey	<i>Macaca mulatta</i>	<i>Cercopithecidae</i>	II

21	Musa	Mouse	<i>Rattus rattus</i>	<i>Muridae</i>	V
22	-do- (nepali)	Flying squirrel	<i>Petauristaphili pinensis</i>	<i>Muridae</i>	V
23	Nilgai	Blue bull	<i>Boselaphus tragocamelus</i>	<i>Bovidae</i>	III
24	Neula	Mongoose	<i>Herpestes bengalensis</i>	<i>Viverridae</i>	IV
25	Odha	Otter	<i>Lutra lutra</i>	<i>Mustelidae</i>	III
26	Samber	Deer	<i>Cervulus unicolor</i>	<i>Cervidae</i>	I
27	Saliapatini	Civet	<i>Vivericula indica</i>	<i>Viverridae</i>	II
28	Thekua	Hare	<i>Lepus ruficaudatus</i>	<i>Leporidae</i>	III

B– BIRDS

List of birds					
Sl. No.	Oriya Name	English Name	Latin Name	Family	ScheduleNo.
1	Bani	Common myna	<i>Acridotheres tristis</i>	<i>Sturnidae</i>	IV
2	Baya chadhei	Weaver bird	<i>Ploccus phillipinus</i>	<i>Ploceidae</i>	IV
3	Bajapakhi	Hawk	<i>Astur badius</i>	<i>Accipitridae</i>	I
4	Banakukuda	Jungle fowl	<i>Gallus gallus</i>	<i>Phadianidae</i>	IV
5	Baja	Falcon	<i>Ergetta garzette</i>	<i>Accipitridae</i>	I
6	Bhadabhadalia	Blue jay bird	<i>Coracas bengalensis</i>	<i>Muscicapidae</i>	I
7	Bahadakhai	Grey hornbill	<i>Tikos birostris</i>	<i>Bucerotidae</i>	I
8	Bhrungaraj	Black bee	<i>Dissomurus paradisens</i>	<i>Dicruridae</i>	IV
9	Gunduri	Bastard gull	<i>Turnix buscitotor</i>	<i>Turnicidae</i>	IV
10	Chatak	Swiftly	<i>Micropus affinis</i>	<i>Apodidae</i>	IV
11	Chila	Kite	<i>Mylvus migrans</i>		IV
12	Dahuka	Water hen	<i>Metopidius indicus</i>	<i>Jacanidae</i>	IV
13	Gendalia	Grey crane	<i>Anastromis oseitens</i>	<i>Ciconidae</i>	IV
14	Gharchatia	Sparrow	<i>Passer domesticus</i>	<i>Ploceidae</i>	IV

15	Ghukalika	Raven myna	<i>Acridathares ginginianus</i>	<i>Sturnidae</i>	IV
16	Haldibasant	Golden oriole	<i>Oriolus xanthernus</i>	<i>Orididae</i>	IV
17	Hansa	Gander	<i>Anas poacierhancha</i>	<i>Podicipedidae</i>	IV
18	Koeli	Cuckoo	<i>Cuculus caronus</i>	<i>Cuculidae</i>	IV
19	Kajalapati	King crow	<i>Dicrurus maococerus</i>	<i>Dicruridae</i>	IV
20	Kau	Crow	<i>Corvus splendens</i>	<i>Corvidae</i>	V
21	Kochilakhai	Hornbill	<i>Anthroceceros coromatus</i>	<i>Bucerotidae</i>	I
22	Kumbhatua	Red crow	<i>Centropus sinensis</i>	<i>Cuculidae</i>	IV
23	Mayura	Peacock	<i>Pavo cristatus</i>	<i>Phadianidae</i>	I
24	Macharanka	King-fisher	<i>Caryle rudis</i>	<i>Alcedinidae</i>	IV
25	Panikua	Little cormorant	<i>Phalacrocorax nigar</i>	<i>Anatidae</i>	IV
26	Pecha	Owl	<i>Athena brama</i>	<i>Strigidae</i>	IV
27	Para	Pigeon	<i>Columba livia</i>	<i>Columbidae</i>	IV
28	Sua	Parrot	<i>Pistacula kramerii</i>	<i>Sturnidae</i>	IV
29	Saguna	King vulture	<i>Sacrogyps calvus</i>	<i>Muscicapidae</i>	IV
30	Sankachila	Brahmin kite	<i>Haliastur Indus</i>	<i>Muscicapidae</i>	I
31	Kapota	Dove	<i>Streptopellchin opensis</i>	<i>Columbidae</i>	IV
32	Bulbul	Persian / Nightingale	<i>Pyenonotus luteohes</i>	<i>Pycnonotidae</i>	IV
33	Baga (kanti)	Pond heron	<i>Ardeola grayii</i>	<i>Ardeidae</i>	IV
34	Baga (rani)	Cattle egret	<i>Bubulcus ibis coromandus</i>	<i>Ardeidae</i>	IV
35	Baga (rati)	Night heron	<i>Nycticorax nydticorax</i>	<i>Ardeidae</i>	IV
36	Kathahana	Ceylon hoopoe	<i>Upupa ceylonensis</i>	<i>Upupidae</i>	IV

C – SNAKES

List of snakes					
Sl.No.	Oriya Name	English Name	Latin Name	Family	Scheduled No
1	Ahiraj	King cobra	<i>Naja hannah</i>	<i>Elapidae</i>	II
2	Ajarah	Indian python	<i>Python molurus</i>	<i>Boidae</i>	I
3	Chiti	Painted krait	<i>Bungarus coeruleus</i>	<i>Elapidae</i>	IV
4	Dhamana	Rat snake	<i>Ptyas mucosus</i>	<i>Colubridae</i>	II
5	Boda	Russell's viper	<i>Vipera russelli</i>	<i>Viperidae</i>	II
6	Dhulia naga	Sand viper	<i>Echis carinatus</i>	-do-	IV
7	Domundia	John's sandboda	<i>Eryx conicus</i>	<i>Boidae</i>	IV
8	Gokhar	Cobra	<i>Naja naja</i>	<i>Elapidae</i>	II
9	Kananoli	Grass snake	<i>Ahetulla species</i>	<i>Colubridae</i>	IV
10	Laudankia	Arboreal adder	<i>Dryophis nasutus</i>	<i>Elapidae</i>	IV
11	Dhanda	Water snake	<i>Natrix piscator</i>	<i>Colubridae</i>	IV
12	Rana	Banded krait	<i>Bungarus fasciatus</i>	<i>Elapidae</i>	II
13	Tampa	Monocellate cobra	<i>Naja naja kuothia</i>	-do-	II
14	Telia	Blind snake	<i>Typhlops braminus</i>	<i>Typhlopidae</i>	IV

D – LIZARDS

List of lizards					
Sl. No.	Oriya Name	English Name	Latin Name	Family	Scheduled No.
1	Bahurupi	Indian chamleon	<i>Chameleon zeylanicus</i>	<i>Chmaeleonidae</i>	IV
2	Champeineoli	Mabuya	<i>Mabuya bibro</i>	<i>Sciencidae</i>	IV
3	Endua	Garden lizard	<i>Calotes versicolor</i>	<i>Agamidae</i>	IV
4	Godhi	Guana	<i>Varanus monitar</i>	<i>Varanidae</i>	I
5	Jhitipiti	Lizard	<i>Hemidactylus flaviviridis</i>	<i>Gekkonidae</i>	IV

E – TURTLES

List of Turtles					
Sl. No.	Oriya Name	English Name	Latin Name	Family	Scheduled No.
1	Pathuria kaincha	Land tortoise	<i>Testudo elongute</i>	<i>Trionychidae</i>	IV
2	Pani kaincha	Water turtle	<i>Lissemys punctau granosa</i>	<i>Emydidae</i>	IV

F – FISHES

List of fishes				
Sl. No.	Oriya Name	English Name	Latin Name	Family
1	Balia	Trout / Wallago	<i>Wallago attu</i>	<i>Siluridae</i>
2	Baligarada	Sandeel	<i>Glossogobius giziris</i>	<i>Gobidae</i>
3	Bhakur	Carp	<i>Catla catla</i>	<i>Cyprinidae</i>
4	Chenga	Gilt head	<i>Ophiocephalus gachus</i>	<i>Channidae</i>
5	Chitala	Flat fish	<i>Notopterus chitala</i>	<i>Notopteridae</i>
6	Dandikiri	Grig	<i>Esomus dandrica</i>	<i>Cyprinidae</i>
7	Gadisa	Gudgeon	<i>Ophiocephalus punctatus</i>	<i>Channidae</i>
8	Jalanga	Ground fish	<i>Panga sius</i>	<i>Pangasidae</i>
9	Jahlla	Floating fish	<i>Chela argentea</i>	<i>Cyprinidae</i>
10	Kantia	Nail fish	<i>Mystus cavastris</i>	<i>Bagridae</i>
11	Karandi	Minnow	<i>Barbus ambasis</i>	<i>Cyprinidae</i>
12	Magura	Cat fish	<i>Clarius batrachus</i>	<i>Clariidae</i>
13	Mirkali	Mrigal	<i>Cirrhana mrigal</i>	<i>Cyprinidae</i>
14	Neuli	Small sand fish	<i>Gobiopterus ohund</i>	<i>Gobidae</i>
15	Pohala	Water fish	<i>Cirrhinus reba</i>	<i>Cyprinidae</i>
16	Pabata	Callichrous	<i>Callichrous bimaculatus</i>	<i>Siluridae</i>
17	Phalli	Flounder	<i>Notopterus notopterus</i>	<i>Notopteridae</i>
18	Rohi	Breeding fish	<i>Labeo rohita</i>	<i>Cyprinidae</i>
19	Serana	Minnows	<i>Barbus serana</i>	<i>Cyprinidae</i>
20	Seula	Big gudgeon	<i>Ophiocephalus striatus</i>	<i>Channidae</i>
21	Singi	Scorpion fish	<i>Hetero pneustes fossilis</i>	<i>Pneustidae</i>
22	Todi	Eel	<i>Mastocembelus armatus</i>	<i>Cembelidae</i>
23	Chungudi	Shrimp / Prawn	<i>Palaemon malcolmsonii</i>	

G- List of Lichens

Name of Lichen	Family
<i>Anisomeridium terminatum</i>	Monoblastaceae
<i>Anthracothecium pustuliferum</i>	Pyrenulaceae
<i>Bacidia millegrana</i>	Ramalinaceae
<i>Bacidia psorina</i>	Ramalinaceae
<i>Bacidia submedialis</i>	Ramalinaceae
<i>Brigantiaea leucoxantha</i>	Brigantiaceae
<i>Buellia hemispherica</i>	Buelliaceae
<i>Buellia tinctoria</i>	Buelliaceae
<i>Caloplaca cinnabarina</i>	Teloschistaceae
<i>Caloplaca cupulifera</i>	Teloschistaceae
<i>Caloplaca malaensis</i>	Teloschistaceae
<i>Caloplaca orissensis</i>	Teloschistaceae
<i>Caloplaca pollinii</i>	Teloschistaceae
<i>Caloplaca subpoliotera</i>	Teloschistaceae
<i>Cryptothecia phlyctidiformis</i>	Arthoniaceae
<i>Chrysothrix candelaris</i>	Chrysothricaceae
<i>Dirinaria aegialita</i>	Physciaceae
<i>Lecanora perplexa</i>	Lecanoraceae
<i>Lecanora pulicaris</i>	Lecanoraceae
<i>Lecanora rugosella</i>	Lecanoraceae
<i>Lecanora subimmersa</i>	Lecanoraceae
<i>Lecanora tropica</i>	Lecanoraceae
<i>Lecidea sp.</i>	Lecidiaceae
<i>Leptogium austro-americanum</i>	Parmeliaceae
<i>Opegrapha sp.</i>	Opegraphaceae
<i>Parmelia awasthii</i>	Parmeliaceae
<i>Parmelia mesotropa</i>	Parmeliaceae
<i>Parmeliella papillata</i>	Parmeliaceae
<i>Pertusaria albescens</i>	Pertusariaceae
<i>Pertusaria cinchonae</i>	Pertusariaceae
<i>Pertusaria leioplacella</i>	Pertusariaceae
<i>Pertusaria pertusa</i>	Pertusariaceae
<i>Pertusaria quassiae</i>	Pertusariaceae
<i>Pertusaria concinna</i>	Pertusariaceae
<i>Phaeographina limbata</i>	Graphidaceae
<i>Phaeographina pudica var platyloma</i>	Graphidaceae
<i>Phaeographina caesiopruinosa.</i>	Graphidaceae
<i>Physcia cylindrophora</i>	Physciaceae
<i>Pleurotrema filisporum</i>	Physciaceae
<i>Porina tetracerae</i>	Porinaceae
<i>Pyrenula brunnea</i>	Pyrenulaceae
<i>Pyrenula kurzii</i>	Pyrenulaceae
<i>Pyrenula macularis</i>	Pyrenulaceae
<i>Ramalina leiodea</i>	Ramalinaceae

H- List of Algae

Algae	Family
<i>Achnanthes lanceolata</i>	Achnanthaceae
<i>Aphanothece pallida</i>	Aphanothecaceae
<i>Arthrospira santanna</i>	Phormidiaceae
<i>Calothrix braunii</i>	Rivulariaceae
<i>Calothrix clavatooides</i>	Rivulariaceae
<i>Calothrix gardneri</i>	Rivulariaceae
<i>Calothrix javanica</i>	Rivulariaceae
<i>Calothrix marchica</i>	Rivulariaceae
<i>Chlorella vulgaris</i>	Chlorellaceae
<i>Chroococcus turgidus</i>	Chroococcaceae
<i>Cocconeis striata</i>	Cocconeidaceae
<i>Gloeocapsopsis crepidium</i>	Chroococcaceae
<i>Gloeotrichia ghosei</i>	Gloeotrichiaceae
<i>Gloeotrichia indica</i>	Gloeotrichiaceae
<i>Gloeotrichia longicauda</i>	Gloeotrichiaceae
<i>Gloeotrichia raciborskii</i>	Nostocaceae
<i>Halamphora veneta</i>	Catenulaceae
<i>Leptolyngbya terebrans</i>	Leptolyngbyaceae
<i>Limnothrix guttulata</i>	Pseudanabaenaceae
<i>Limnothrix planctonica</i>	Pseudanabaenaceae
<i>Lyngbya majuscula</i>	Oscillatoriaceae
<i>Navicula exilis</i>	Naviculaceae
<i>Navicula fluens</i>	Naviculaceae
<i>Navicula microspora</i>	Naviculaceae
<i>Navicula protracta</i>	Naviculaceae
<i>Nitzschia vasnii</i>	Hydrodictyaceae
<i>Oscillatoria jenensis</i>	Oscillatoriaceae
<i>Oscillatoria princeps</i>	Oscillatoriaceae
<i>Phormidium boryanum</i>	Oscillatoriaceae
<i>Phormidium breve</i>	Oscillatoriaceae
<i>Phormidium irrigum</i>	Oscillatoriaceae
<i>Pseudanabaena limnetica</i>	Pseudanabaenaceae
<i>Rivularia sp.</i>	Rivulariaceae
<i>Spirulina major</i>	Spirulinaceae
<i>Surirella minuta</i>	Surirellaceae

I- List of Fungi

Botanical Name	Family	Edibility
<i>Agaricus campestris</i>	Agaricaceae	Edible
<i>Agaricus trisulpharatus</i>	Agaricaceae	Non-edible
<i>Aleuria aurantia</i>	Pyronemataceae	Non-edible
<i>Amanita australis</i>	Amanitaceae	Edible
<i>Amanita caesarea</i>	Amanitaceae	Edible
<i>Amanita loosii</i>	Amanitaceae	Edible
<i>Amanita ovalispora</i>	Amanitaceae	Non-edible
<i>Amanita vaginata</i>	Amanitaceae	Non-edible
<i>Auricularia auricular-judae</i>	Auriculariaceae	Edible
<i>Bisporella citrina</i>	Helotiaceae	Non edible
<i>Bjerkandera adusta</i>	Meruliaceae	Non edible
<i>Clavaria amoena</i>	Clavariaceae	Non edible
<i>Clavaria vermicularis</i>	Clavariaceae	Non-Edible
<i>Clavulinopsis aurantiocinnabarina</i>	Clavariaceae	--
<i>Coltricia cinnamomea</i>	Hymenochaetaceae	Non edible
<i>Coniophora puteana</i>	Coniophoraceae	Non edible
<i>Conocybe apala</i>	Bolbitiaceae	Non edible
<i>Coprinus disseminates</i>	Agaricaceae	Non-edible
<i>Cyathus striatus</i>	Nidulariaceae	Non-edible
<i>Dacryopinax spathularia</i>	Dacrymycetaceae	Non-Edible
<i>Daldinia concentrica</i>	Hypoxylaceae	Non-edible
<i>Entoloma sinuatum</i>	Entolomataceae	Non-edible
<i>Fomitopsis pinicola</i>	Fomitopsidaceae	Non-edible
<i>Ganoderma australe</i>	Ganodermataceae	Non-edible
<i>Ganoderma lucidum</i>	Ganodermataceae	Medicine
<i>Ganoderma tsuga</i>	Ganodermataceae	Medicine
<i>Ganoderma tsugae</i>	Ganodermataceae	Edible
<i>Geastrum fimbriatum</i>	Geastraceae	Non edible
<i>Geastrum saccatum</i>	Geastraceae	Edible
<i>Gomphus floccosus</i>	Gomphaceae	Non-edible
<i>Grifolia frondosa</i>	Meripilaceae	Edible
<i>Hirneola auricular</i>	Auriculariaceae	Edible
<i>Hygrocybe aurantiosplendens</i>	Hygrophoraceae	Non edible
<i>Hygrocybe cantharellus</i>	Hygrophoraceae	Non edible
<i>Hygrocybe russocoriaceae</i>	Hygrophoraceae	Non edible
<i>Laccaria fraterna</i>	Hygrophoraceae	Non-edible
<i>Lactarius deliciosus</i>	Russulaceae	Edible
<i>Lactarius resimus</i>	Russulaceae	Edible
<i>Langermannia gigantean</i>	Agaricaceae	Edible
<i>Lentinus fusipes</i>	Polyporaceae	Edible

<i>Lentinus torulosus</i>	Polyporaceae	Edible
<i>Lentinus tubergium</i>	Pleurotaceae	Edible
<i>Lenzites betulina</i>	Polyporaceae	Non-edible
<i>Lepiota clypeolaria</i>	Agaricaceae	Non edible
<i>Lepiota cristata</i>	Agaricaceae	Non-edible
<i>Leucocoprinus brebissonii</i>	Agaricaceae	Non-edible
<i>Leucocoprinus cepestipes</i>	Agaricaceae	Non-edible
<i>Leucocoprinus cretceus</i>	Agaricaceae	Non-edible
<i>Lycoperdon perlatum</i>	Agaricaceae	Edible
<i>Lycoperdon pyriformi</i>	Agaricaceae	Edible
<i>Macrolepiota clelandii</i>	Agaricaceae	Edible
<i>Macrolepiota dolichaula</i>	Agaricaceae	Non-Edible
<i>Macrolepiota procera</i>	Agaricaceae	Non-Edible
<i>Marasmius anomalus</i>	Marasmiaceae	Non edible
<i>Marasmius capillaris</i>	Marasmiaceae	Non-edible
<i>Marasmius elegans</i>	Marasmiaceae	Non edible
<i>Marasmius haematocephalus</i>	Marasmiaceae	Non edible
<i>Marasmius plicatus</i>	Marasmiaceae	Non edible
<i>Marasmius rotula</i>	Marasmiaceae	Non edible
<i>Marasmius siccus</i>	Marasmiaceae	Non edible
<i>Microporus xanthopus</i>	Polyporaceae	Non edible
<i>Mycena acicula</i>	Mycenaceae	Non edible
<i>Mycena adscendens</i>	Mycenaceae	Non edible
<i>Mycena haematopus</i>	Mycenaceae	Non edible
<i>Nigroporous vinosus</i>	Steccherinaceae	Non edible
<i>Parasola conopilus</i>	Psathyrellaceae	Non-edible
<i>Peniophora incarnata</i>	Peniophoraceae	Non-edible
<i>Phellinus gilvus</i>	Hymenochaetaceae	Non-edible
<i>Phellinus igniarius</i>	Hymenochaetaceae	Non-edible
<i>Pisolithus arrhizus</i>	Sclerodermataceae	Non-edible
<i>Pluteus lutescens</i>	Pluteaceae	Non edible
<i>Polyporus sulphureus</i>	Polyporaceae	Non-Edible
<i>Porodaedalea pini</i>	Hymenochaetaceae	Non-edible
<i>Pycnoporus cinnabarinus</i>	Polyporaceae	Medicine
<i>Pycnoporus sanguineus</i>	Polyporaceae	Non-edible
<i>Ramaria stricta</i>	Gomphaceae	Non edible
<i>Russula brevipes</i>	Russulaceae	Edible
<i>Russula cyanoxantha</i>	Russulaceae	Edible
<i>Russula emetica</i>	Russulaceae	Non-edible
<i>Russula nigricans</i>	Russulaceae	Edible
<i>Russula rosea</i>	Russulaceae	Edible
<i>Russula xerampelina</i>	Russulaceae	Edible

<i>Schizophyllum commune</i>	Schizophyllaceae	Edible
<i>Suillus luteus</i>	Sillaceae	Edible
<i>Termitomyces clypeatus</i>	Lyophyllaceae	Edible
<i>Termitomyces eurrhizus</i>	Lyophyllaceae	Edible
<i>Termitomyces heimii</i>	Lyophyllaceae	Edible
<i>Termitomyces medicus</i>	Lyophyllaceae	Edible
<i>Termitomyces microcarpus</i>	Lyophyllaceae	Edible
<i>Trametes elegans</i>	Polyporaceae	Non-edible
<i>Trametes gibbosa</i>	Polyporaceae	-----
<i>Trametes sanguinea</i>	Polyporaceae	Non – edible
<i>Trametes versicolor</i>	Polyporaceae	Non edible
<i>Tricholoma lobayense</i>	Tricholomataceae	Edible
<i>Tuber rufum</i>	Tuberaceae	Edible
<i>Volvariella volvacea</i>	Pluteaceae	Edible
<i>Xylaria cubensis</i>	Xylariaceae	Non edible
<i>Xylaria filiformis</i>	Xylariaceae	Non-edible
<i>Xylaria hypoxylon</i>	Xylariaceae	Non edible
<i>Xylaria longipes</i>	Xylariaceae	Non edible
<i>Xylobolous subpileatus</i>	Stereaceae	Non-edible
<i>Xylobotryum portentosum</i>	Xylobotryaceae	Non-edible

J- List of Bryophytes

Bryophytes	Family
<i>Aneura pinguis</i>	Aneuraceae
<i>Anthoceros angustus</i>	Anthocerotaceae
<i>Anthoceros levis</i>	Anthocerotaceae
<i>Anthoceros punctatus</i>	Anthocerotaceae
<i>Asterella angusta</i>	Aytoniaceae
<i>Asterella blumeana</i>	Aytoniaceae
<i>Asterella khasiana</i>	Aytoniaceae
<i>Asterella wallichiana</i>	Aytoniaceae
<i>Cephalozia connivens</i>	Cephaloziaceae
<i>Conocephalum conicum</i>	Conocephalaceae
<i>Cyathodium cavernarum</i>	Cyathodiaceae
<i>Dumortiera hirsuta</i>	Marchantiaceae
<i>Frullania muscicola</i>	Jubulaceae
<i>Frullania squarrosa</i>	Jubulaceae
<i>Heteroscyphus argutus</i>	Lophocoleaceae
<i>Lejeunea discreta</i>	Lejeuneaceae
<i>Lophocolea bidentata</i>	Lophocoleaceae
<i>Marchantia linearis</i>	Marchantiaceae
<i>Marchantia palmata</i>	Marchantiaceae
<i>Marchantia polymorpha</i>	Marchantiaceae
<i>Metzgeria decipiens</i>	Metzgeriaceae
<i>Metzgeria furcata</i>	Metzgeriaceae
<i>Metzgeria himalayensis</i>	Metzgeriaceae
<i>Notothylas levieri</i>	Notothyladaceae
<i>Pallavicinia lyellii</i>	Pallaviciniaceae
<i>Pellia endiviifolia</i>	Pelliaceae
<i>Pellia epiphylla</i>	Pelliaceae
<i>Phaeoceros laevis</i>	Notothyladaceae
<i>Phaeoceros laevis</i> subsp. <i>carolinianus</i>	Notothyladaceae
<i>Plagiochasma appendiculatum</i>	Aytoniaceae
<i>Plagiochasma rupestre</i>	Aytoniaceae
<i>Plagiochila porelloides</i>	Plagiochilaceae
<i>Plagiomnium rostratum</i>	Aytoniaceae

VOLUME-I

PART-I

**SUMMARY OF FACTS ON WHICH
PROPOSALS ARE MADE**

CHAPTER –1

THE TRACT DEALT WITH

1.1. Name and Situation

Bonai Forest Division comprises of almost entire Bonaigarh Civil Sub-Division of Sundargarh District excluding the portion coming under Banki Forest Range which has been merged with Rourkela Forest Division during re-organisation of Forest Department on 01.10.2003 vide Government in F&E Department Resolution No.1F(A)/100/2003/13228/F&E dt.08.08.2003 and Government Notification dt.23.08.2003. It lies between $21^{\circ}59'$ N and $22^{\circ}07'$ N latitude and $84^{\circ}48'E$ and $85^{\circ}37'E$ longitude. Bonai Forest Division is bounded on the North by Jharkhand State and Rourkela Forest Division. On the East it is bounded by Keonjhar Forest Division and Deogarh Forest Division. On the West & South, it is bounded by Bamra Forest Division and Deogarh Forest Division.

The total geographical area of Bonai Forest Division is 2934.21 Sq. Km and the Forest Cover of Bonai Forest Division is 2032.77 sq. Km., which is 69.27% of geographical area. The Head Quarters of Bonai Forest Division is at Bonaigarh which is encircled by river Brahmani on North and East direction and National Highway 143 on Western direction. Besides, NH-215 starts from Rajamunda of Rourkela Division and passes up to Panikoili of Jajpur District through Koira Range of this Division on East direction.

River Brahmani divides this Division into almost two equal parts i.e., East Bonai and West Bonai. The river enters the Division at its Northern point near Tamra and leaves the Division at Southern point near the RF boundary of Dandpat R.F. (East). The nearest Railway Stations are Barsuan, Bimlagarh, Chandiposh and Rourkela at a distance of 32 Km, 30 Km, 40 Km. and 70 Km. respectively from Bonai. For administrative and management point of view Bonai Forest Division has been divided into 7 Forest Ranges, 25 Forest Sections and 95 Forest Beats. The details of Ranges, Sections, and beats are as depicted in the table 1.1.1. and details of Forest Roads have been given in table 1.1.2. Details of rest houses have been provided in Appendix IX.

Table 1.1.1. Details of Ranges, Sections, and beats of Bonai Forest Division					
No.	Name of the Range	No.	Name of the Section	No.	Name of the Beat
1.	Bonai	1.	Bonai	1	Bonai
				2	Talita
				3	Badposh
		2	Dharanidhar Pali	4	Kendrikela
				5	Dharanidharpali
				6	Jharbeda
		3	Tikayat-pali	7	Tileisara
				8	Khajuribahal
				9	Tikayatpali
		4	S.Bolang	10	Sibnathpur
				11	Kulkuta
				12	Barghat
				13	Danta
				14	Chandrapur
2	Kuliposh	1	Kuliposh	15	Kuliposh
				16	Kudheikela
				17	Khuntgaon
				18	Gagnaposh
				19	Kurda
				20	Budhabhuin
		6	Mahuldiha	21	Mahuldiha
				22	Angul
				23	Badgaon
				24	Nagaria
		7	Daleisara	25	Daleisara
				26	Rengali
				27	Mahulpada
				28	Derula
				29	Lunga

3	Koira	8	Koira	30	Koira
				31	Gonua
				32	Rengalbeda
				33	Tehrai
		9	Toda	34	Toda
				35	Jhirpani
				36	Nadidihi
				37	Topadihi
				38	Kalta
		10	Jamdihi	39	Jamdihi
				40	Purnapani
				41	Balijore
				42	Kunchpani
				43	Soyamba
		11	Ranisal	44	Ranisal
				45	Khajuridihi
				46	Kadalia
4	Barsuan	12	Barsuan	47	Barsuan
				48	Tinko
				49	Bhutuda
		13	Dengula	50	Dengula
				51	Kula
				52	Jaldihi
				53	Tensa
		14	Chordhara	54	Chordhara
				55	Manchabeda
				56	Nuatantra

5	Jarda	15	Jarda	57	Jarda
				58	Badibahal
				59	Brahmanidihi
		16	Majurdima	60	Majurdima
				61	Kaunsibahal
				62	Kelo
				63	Binjikhoh
		17	Kansar	64	Kansar
				65	Balia
				66	Jalai
		18	Ram-chhinda	67	Ramchhinda
				68	Kundheidiha
				69	Lachhada
6	Sole	19	Solguda	70	Sole
				71	Solguda
				72	Jada
				73	Talbahal
		20	Kunjar	74	Kunjar
				75	Kantamunda
				76	Tamparkela
		21	Mahul-dihi	77	Mahuldihi
				78	Phatatangar
				79	Sirigida

7	Tamra	22	Tamra	80	Tamra
				81	Benuam
				82	Pitagaon
				83	Pankdihi
				84	Kuilijhar
				85	Kusumdihi
		23	Gurundia	86	Gurundia
				87	Bonaikela
				88	Kantapali
				89	Madhupur
		24	Bhalu-dunguri	90	Bhaludunguri
				91	Bartengra
				92	Ludhuni
		25	Saplata	93	Saplata
				94	Jamdarh
95	Tumbei				
Source : O/o the Divisional Forest Officer, Bonai Division					

Table 1.1.2. Details of Forest Roads in Bonai Forest Division				
Name of the Division	Name of the Range	Name of the C.D Block	Name of the Forest Road	Total length of Rorest Road (Km)
Bonai	Bonai	Bonai	S.Balang- Kareiput	12
	Bonai	Bonai	Khajuribahal- Gujapal	2
	Koira	Koira	Jamdihi -Kendughati(Part)	6
	Koira	Koira	kalta- Nadidihi	6
	Koira	Koira	Jamdihi-Bihar Boarder	12
	Koira	Koira	Toda-Topadihi	8.4
	Tamra	Gurundia	Saplata-Boneikela	15
	Tamra	Gurundia	Benuam-Pankadihi	16.08
	Tamra	Gurundia	Jhirpani-Pitagaon	6
	Tamra	Gurundia	Boneikela-Koilijhar	18
	Barsuan	Koira	Jamdihi -Kendughati(Part)	4.5
	Kuliposh	Bonai and lahunipara	Jangra-Mahulpada	25
	Kuliposh	Koira	Kendughati -Jamdihi (Part)	5.5
	Jarda	Gurundia	Jarda-Kello	20
	Jarda	Gurundia	Kello-Jalei	18.07
	Jarda	Gurundia	Majurdima -Bamra Boarder	1
	Jarda	Gurundia	Kansar-Jalei	11
	Sole	Gurundia	Kello-Kunjar- Solguda-Mahuldihi-Phatatangar to Sirigida	54.5
	Sole	Gurundia	Saplata -Soleguda	14
	Sole	Gurundia	Soleguda - Rankei	12
	Sole	Gurundia	Sirigida- Bankhaman	6
	Sole	Gurundia	Jada - Bankhaman	5
	Sole	Gurundia	Jalei -Saplata	9
G.Total:-				287.05
Source : O/o the Divisional Forest Officer, Bonai Division				

The present Revised Working Plan of Bonai Forest Division will exclusively cover the forest area of Bonai Forest Division, extending over an area of 1,37,282.602 ha, which includes 45 nos. of Reserved Forests, 41 nos. of Proposed Reserved Forests, 25 nos. of Demarcated Protected Forests, 32 nos. of Village Forests and 29 nos. of Protected Forests excluding the forest area of 4051.816 ha. diverted under F.C. Act, 1980 and F.R.A., 2006.

In East Bonai, Toda Block is the largest one and forms almost a compact and contiguous patch of forest along with its adjoining and nearby forest blocks of Karo RF, Rakshi RF, Sarkunda RF & Sarkunda PRF, Khajurdihi RF & Khajurdihi PRF, Bhabanipahar RF & Bhabanipatna PRF, Khandadhar RF & Khandadhar PRF, Amrudi RF & Amrudi PRF and Nagaria PRF.

In the West, Bonai is almost a compact and contiguous patch of forests formed by forest blocks of Sirgida RF, Balai RF, Jada RF, Solguda RF, Kantamunda RF, Kunjar RF, Majurdima RF, Raipiri RF, Kello RF, Sirgida PRF, Mahuldihi PRF-I and Mahuldihi PRF II, Balai PRF, Solguda PRF, Raipiri PRF-I and Raipiri PRF II, Kello PRF, Majurdima PRF, Kantamunda PRF-I and Kantamunda PRF II. The remaining RF and PRF blocks in East Bonai and West Bonai are having scattered patches of forest.

1.2. Configuration of the Ground: The entire working plan area is situated mainly in the isolated hilly tract with an average elevation of about 244 m MSL. River Brahmani flows from North to South direction dividing the Bonai Division into approximately two equal parts as East Bonai and West Bonai. The river receives the tributaries from surrounding hills and passes through a gentle undulating valley. There is a belt of level ground varying in width 5 KM to 15 KM on either side of the river.

Most of the terrain covered under East Bonai is of hilly and undulating type. Several of the hill ranges are having altitudes more than 915 m. and cover forest blocks mainly Toda RF, Karo RF, Sarkunda RF, Sarkunda PRF and Nagaria PRF which bear magnificent Sal forests and are extension of the continuity of the Karampada Mountain

Range of Singhbhum. The principal mountain peaks lying within these ranges are Mankarnacha (1117m) and Badamgarh (1074 m) both of which are located along Bonai-Keonjhar boundary. The other important peaks are Kurmitar (1065 m), Bichakhamari (903 m) and Khandadhar (914m). This extension of Karampada Mountain Range running from north-east direction to south-west direction is endowed with valuable deposits of high grade iron ore. Khandadhar waterfall descends from Rantha plateau (763m-915m) and presents a beautiful scenic view. The average height of this waterfall is about 244m. The slope of the terrain is gentle to moderately steep.

Most of the terrain of West Bonai is hilly and is covered with rich forest growth. But unlike the East Bonai, it is more rugged and has got predominance of quartzite rocks. Besides, there are narrow plain strip of lands along both the banks of Bheden, Kharla and Saplatanallahs. The hill blocks in West Bonai form two distinct but separate masses. One mass consists of Rusimath, Gurundia, Ulsura, Budhapahar and Balia forest blocks, while the other hill mass consists of forest blocks mainly Raipiri, Kelo, Kunjar, Kantamunda, Majurdima, Balai, Solguda and Jada. These two distinct hill masses are separated from each other by Kharla and Saplata valleys. The landscape features in West Bonai are not as conspicuous as it is found in East Bonai. The hills rise in a gradual manner from plain to hilly and the average altitude of hills is about 300m lower than the hills of East Bonai. Principal hill peaks in West Bonai are Baghbindha (808m) in Jada RF, Raipiri (800m) in Raipiri RF, Kunjar in Kunjar RF and Baichabiringa (745m) in Kantamunda R.F block.

Forests of this Division are covered by the following Topo Sheets of the scale 1:50, 000 and 1:25, 000.

1:50, 000 Scale		1:25, 000 Scale		
73B/12	73G/5	73B/12 SE	73C/13 NE	73G/1 SE
73B/16		73B/12 SW	73C/13 NW	73G/1 SW
73C/5		73B/16 SE	73C/13 SE	73G/2 NE
73C/9		73B/16 SW	73C/13 SW	73G/2 NW
73C/10		73C/5 NE	73C/14 NE	73G/2 SW
73C/13		73C/9 NE	73C/14 NW	73G/2 SE
73C/14		73C/9 NW	73F/4 SE	73G/5 NE
73F/4		73C/9 SE	73F/4 SW	73G/5 NW
73G/1		73C/9 SW	73G/1 NE	73G/5 SW
73G/2		73C/10 NE	73G/1 NW	

The corresponding open series Topo sheets Numbers areas given below.

1:50, 000 Scale	
73B/12	F-45 G/12
73B/16	F-45 G/16
73C/5	F-45 M/5
73C/9	F-45 M/9
73C/10	F-45 M/10
73C/13	F-45 M/13
73C/14	F-45 M/14
73F/4	F-45 H/4
73G/1	F-45 N/1
73G/2	F-45 N/2
73G/5	F-45 N/5

1.3.Geology, Rock and Soil

1.3.1.Geology& Rock : Rock formations found in Bonai Sub-Division belong mainly to ore Supergrapy of Pre-cambrianage. Important rock types are represented by Mica-Schists, Phyllites and Quartzites. Two groups of sedimentaries known as Dhanjori group and Kolhan series are recognised and are younger than the Iron Ore series as well as Bonai granites (Singhbhum granite). The stratigraphy of the area is represented by the following geographical sequences.

RECENT to SUB-RECENT			Alluvium and soil
			Laterite Vein Quartz
			Aplitic granite and gneisses
P R E C A M B R I A N	Iron Ore	Dhanjori	Dolomite dykes, Carbonaceous quartzite and phyllite
			Quartzite and Quartz-sericiteSchists
		Group	Quartzite, Phyllite, grit and conglomerate
	Super Group	U N C O N F O R M I T Y	
		Bonai	Quartz reffs, Bonai granite
			Basic and Ultrabasic Intrusive
			Banded haematite jasper with iron ore.
			Purple and brown shale with Manganese ore
		Group	Black Shale, Banded haematite jasper and iron ore
			Basic metavolcanics
		Iron Ore Group	Mica schists, Quartzite and phyllite
		Older Metamorphous	Quartzite.

1.3.1.1. Older Metamorphic Quartzite, Mica Schist and Quartzite:

Quartzite constitutes the oldest rocks of the area and is observed conspicuously on the Singardei Pahar (371 m). It is hard and compact and white to greyish green in colour.

The schistose rock is represented by quarzsericiteschists, termolite-tale-chloite-mescoviteschists and quartzite. The outcrops are noticed at south of Kelo (21° 31':85° 03'), Southest of Dalchua (21° 36':85° 08') and near Kantapali (21° 54':84° 48'). These are associated with basic rocks and volcanics and occur as caught-up patches within aplitic gneisses. The rocks are greyish brown to greenish grey in colour and are medium to fine grained.

1.3.1.2. Iron Ore Formation

(a) Lava flows and tuffs: Outcrops of basic lava flows and tuffs are found to occur in Rehropahar (390 m), Kortokapahar (590 m), Lapachuapahar (538 m), Lagutipahar (630 m), and Kalia Pahar around Bonaigarh. The rock is fine to medium grained and brownish-black to greenish black in colour.

(b) Shales and phyllite: Outcrops of these rocks are noticed on all the hill ranges north of Koira, especially on Chhatrabandha hill ranges. These are generally purple red or brown and greenish-grey in colour and show fine foliation. The scales grade into phyllite as noticed on the hillock (215m) located south of Kola village.

(c) Banded Haematite, Quartzite and Jaspers : Outcrops of these rocks are observed in the hill ranges such as chheliatoka Pahar (1100m), Kumritar Pahar, Khandadhar, Erua Pahar (973m) Samlaibar Pahar (992m) Bichakhansi Pahar (988m) and Dhandrahar Pahar (999m). These rocks occur between two formations of upper and lower shales. The rock is well bedded with alternating bands of haematite, Quartzite of Jasper. In these banded rocks, most of the iron ore occurs in the form of haematite, owing to the hardness these rocks resist weathering and form steep hills. They have a general NNE – SSW trend and steep dips to WNW.

1.3.1.4. Intrusive

(a) Epidiorites: Most of the area to the west of iron ore range is occupied by Epidiorites which constitute the hill ranges. It is also noticed on Kapased Pahar (773m) , the hills around Toda ($21^{\circ} 59' : 85^{\circ} 11'$), Meso Pahar (500m), Bonthali Pahar (793m), Baluhun Pahar (362m) and Bhalugonia Pahar (473m). The rock is usually dark-grey to greyish-black in colour and of varying texture with occasional development of schistosity. On weathering these rocks are having buff, reddish and purple shale like appearance. The hills containing these types of rocks are brick-red in colour.

(b) Granites and Gneisses: Extensive outcrops of granites and gneisses (biotite bearing) are seen in the plain areas east of Zarjui ($21^{\circ} 57' : 84^{\circ} 54'$) and Kumehpani ($21^{\circ} 57' : 84^{\circ} 08'$). These are noticed at about 3 Km north of Bonaigarh in a flat terrain country

mostly covered by alluvium. These rocks are intrusive into the rocks of the Iron Ore Group. The rocks are greyish-White to White in colour and are medium to coarse grained and occasionally gneissose. These are often micaceous. At places rocks show the effects of crushing and are pegmatite. These rocks get easily denuded and form fertile top soil suitable for agriculture purpose.

(c)Dhanjori Group: This group is represented by quartzite, quartz sericite, schist, sericite-chlorite, phyllite, conglomerate, carbonaceous quartzite and phyllite and Dolerite dykes. Members of this group are unconformable overlying over the Iron Ore metasediments and Bonai-granite and occur in 'V' shaped form and are distributed from Barghat ($21^{\circ}00' : 84^{\circ}54'$) to ($21^{\circ}56' : 84^{\circ}47'$).

Quartzite, Phyllite, Grit and Conglomerate form the lowermost horizon of Dhanjori group of rocks. The conglomerate contains small pebbles of biotite-granite, Quartzite and basic rocks. The matrix is usually gritting. The phyllites contain elongated pebbles of biotite granite and show schistosity.

The basic, volcanic and ultrabasic members of Dhanjori sequence are exposed west of Kulijhari ($21^{\circ}59' : 84^{\circ}51'$), Sirgaon ($21^{\circ}59' : 84^{\circ}52'$) and Bargaon ($21^{\circ}53' : 84^{\circ}48'$). Dolorites are scattered throughout the granite area and because of their resistance to weathering stand out as small hillocks which are covered mostly with spheroidal boulders. These rocks are usually dark grey or greenish in colour and are medium to coarse grained and are partly altered to epidiorite. The basic rocks are mainly meta-gabbros and meta-dolorites. The ultrabasic rocks comprise of pyroxenite and peridotites and are at places altered.

1.3.1.5. Recent to Sub recent formation

(a) Eplitic Granite and Gneisses: Scattered outcrops of granite, gneisses and elliptic gneisses are available in this Division and belong to recent to sub-recent formations. Veins of elliptic gneisses are noticed in the granite gneisses. These rocks are fine to medium grained, pale pinkish in colour and show strikes of amphibole and biotite and have spotted appearance.

(b) Laterite: Discontinuous capping of ferruginous laterite overlying the older rock formation of Iron ore group is common in the areas of this Division. These rocks cover the slopes of the hills and are even noticed in the valleys. These rocks occur primarily around Kiringsera ($22^{\circ} 15' 30''$: $84^{\circ} 25'$), Kutora ($22^{\circ} 13' 45''$: $84^{\circ} 28'$) and Telaghara ($22^{\circ} 13' 30''$: $84^{\circ} 25' 15''$). The 4.8 Km long chain of hills east of Chamartola ($27^{\circ} 15'$: $84^{\circ} 22' 30''$) is an extensive laterite cover. Small disconnected patches of laterite are observed around Bonaigarh town. These rocks are mainly derived from granites and are locally used for road constructions. The general strike of the rocks is NNE-SSW to NE-SW. Dips are steep (about 70°) to the north-west in iron ore range while in the shales the dip is shallow (40°).

1.3.1.6. Economic Minerals: The most important minerals of economic significance available in Bonai Division are Iron Ore, Manganese Ore, Building stones and Asbestos. The deposits and occurrence of the economic minerals are stated below:-

(a) Iron Ore:-The most significant Iron Ore deposits are found in the Koira and Barsuan Ranges, viz. Khandadhar, Malongtoli, Dandraha Pahar, Basada, BaliaPahar, Badamgarh Pahar, and Mitukuda. Other minor deposits of iron ore are available in Kalta, Daring-buru and Barsuan.

(b) Manganese Ore: Manganese Ore deposits available in Bonai Division are restricted to the Precambrian rocks and are associated with shale and laterite. The important lateretoid deposits are found in the Koira valley near Datimunda, Podadihi, Malda, Mahulsukha, Sarkunda, Orahuri, Nadidihi, Bhutura, Ranisal, Nuagaon etc. Almost all grades of these ores are available but ores containing less than 45% manganese are more prevalent.

(c) Building stones: The granite gneisses, quartzite, dolerites and epidermitis available in the areas of this Division find their applications as road metals and railway blasts. The granite gneisses are also used as building stones and in the manufacture of concrete.

(d) Asbestos: In the Bonai region, asbestos of tremalite type occurs in the ultrabasic rocks near Rangra of Koira Range. It may be concluded that this Division occupies an important position from geographical formation point of view. Its main importance lies in the availability of large deposits of high grade iron and manganese ores belonging to Bonai group of rocks under iron ore subgroup. Iron ore formations are older than Manganese ore formations. Manganese ore occurs along 60 Kms. belt (NNE-SSW trend) known as Bonai-Keonjhar belt. The extent of this belt is about 500 Sq. Km. The other importance of this Division lies in the availability of intrusive rocks (granite, gneisses, dolorites and epidiorites) which are used as building stones.

1.3.2. Soil: Soils of East Bonai are derived from the rocks of iron ore series and are mostly red ferruginous soils. Manganese ore deposits occurring in highly folded shales of the Iron Ore series have been intensely weathered over the years resulting in the formation of lateritic, reddish ferruginous type of soils. As usual, the soil gradually diminishes along the slope and hill tops are usually covered with thin layer of soil. Accordingly, the quality of the Sal deteriorates and mostly quality IV to V type of Sal is found near the hill tops. Soil derived from mica schists and Quartzites are dry and only support a poor Mixed deciduous forests. Quartzite contains some clay forming ingredient which on washing gets deposited in patches. The granite rocks occurring in the areas of this Division produce some of the best agricultural soil which is distributed over a considerable area of the Brahamani Valley. Due to predominance of Quartzites and Quartz-Schists types of rocks in the hill ranges, West Bonai is covered with adequate depth of soil and in such places good stands of Sal are found. In general, due to poor type of soil, the quality of Sal is much poorer in West Bonai than East Bonai.

1.3.2.1. Red Gravelly Soil: Red Gravelly Soil is a type of soil that develops in a warm, temperate, moist climate under deciduous or mixed forest, having thin organic and organic-mineral layers overlying a yellowish-brown leached layer resting on an alluvial red layer. Red soil is generally derived from crystalline rock. They are usually poor growing soils, low in nutrients and humus and difficult to cultivate because of its low water holding capacity. The main features are light texture, single grained to weakly granular structured surface soil, highly porous with low available water holding

capacity. Lime kankar and free carbonates are absent and soils are non saline. The red colour is due to presence of iron oxides. These soils, do not contain lateritic mass within the control section of the soil profile, are moderately acidic and are generally deficient in Nitrogen, organic matter and Calcium. The clay fraction is rich in Kaolinite type clay mineral with varying proportion of Illite. Phosphate fixation is a problem in these soils due to presence of free Iron and Aluminium Oxides.

1.3.2.2- Alluvium and Soil: mantle or capping of yellow brown soil is observed over the area consisting of shales and granites. The river valleys and their flood plains are covered by alluvium.

Table No.1.3.3.1: Parameters for Nutrient Value Assessment			
CONTENT	LOW	MEDIUM	HIGH
Organic Carbon	Up to 0.50%	0.51 to 0.75%	0.76% and above
Phosphorous(P ₂ O ₅)	0 to 14 kg/ha	14 to 40 kg/ha	More than 40 kg/ha
Potassium(K ₂ O)	up to 118 kg/ha	118 to 280 kg/ha	More than 280 kg/ha

The basis for soil reaction is as shown in Table No. 1.3.4.1.

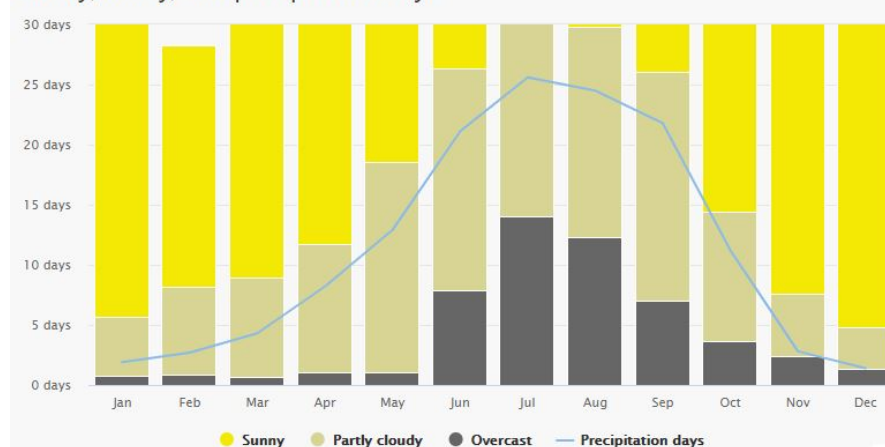
Table No.1.3.4.1: Soil Reaction Criteria	
CLASS	pH VALUE
Strongly Acidic	< 4.5
Moderately Acidic	4.5 to 5.5
Slightly Acidic	5.5 to 6.5
Neutral	6.5 to 7.5
Slightly Alkaline	7.5 to 8.5
Moderately Alkaline	8.5 to 9.5
Strongly Alkaline	> 9.5

1.4. Climatic Parameters

1.4.1 Climate: The average weather condition prevalent in this locality depend on solar radiation (Light, Heat and Temperature), Moisture and Wind. The climatic conditions of this locality for the year is as discussed below table 1.4.1.

Table 1.4.1.-Climatic condition of the locality.			
Sl. No.	Climatic condition	Month	Descriptions
1.	Summer	March to June	- The summer months are very dry and hot desiccating winds blow invariably from 11 AM to 4 PM. - The highest temperature is felt in the month of May-June. - The highest temperature goes up to 44⁰ C. - Occasional showers with thunderstorms are a common feature experienced in this locality.
2.	Rain	July to September	- Uniform precipitation occurs mainly during July and August. But rain starts from 15th June. - Practically there is no rain from December to January. Occasional shower occur during February and March. - It has been observed that unusual heavy precipitation occurs sometime causing floods in the river systems of this Division.
3.	Post Monsoon	October to November	Medium to heavy shower occurs in places, which impart an important role for the vegetation.
4.	Winter	December to February	Practically cold season starts from November and last till the end of February. The continuity of dense vegetation imparts a distinct cold for a longer period.

Cloudy, sunny, and precipitation days



1.4.2 Rain fall - The statement showing the extent of rainfall in different Community Development Blocks have been displayed in the following table 1.4.2.

Table 1.4.2 - C.D. Block-wise rain fall data of Bonai Division from 2009 to 2015 (up to August'2015).															
Year	Month													Total in MM	Total No. of rainy days
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept.	Oct.	Nov.	Dec			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Bonai C.D. Block															
2009	-	-	-	-	65	85	466	437	142	138	5	-	1338	80	
2010	-	-	-	-	41	178	333	360	136	21	7	35	1110.5	64	
2011	-	5	-	74	151	179	310	356	812	79	-	-	1966	98	
2012	33	17	-	8	22	142	267	565	193	104	-	-	1351	81	
2013	-	-	-	19	-	134	429	498	162	180	-	-	1422	76	
2014	-	8	22	8	16	141	466	450	287	37	-	-	1435	61	
2015	18	-	-	32	37	194	324	200	130	-	-	29	964	64	
2016	-	11	-	-	18	76	198	326	209	18	-	-	857	66	
2017	-	-	-	-	71	165	578	105	118	57	1	-	1095	67	
2018	-	-	-	58	128	109	272	335	276	41	-	97	1315	89	
2019	-	52	31	51	19	110	179	353	280	150	-	4	1230	89	
2020	7	39	65	127	58	270	373	656	82	97	1	-	1776	104	

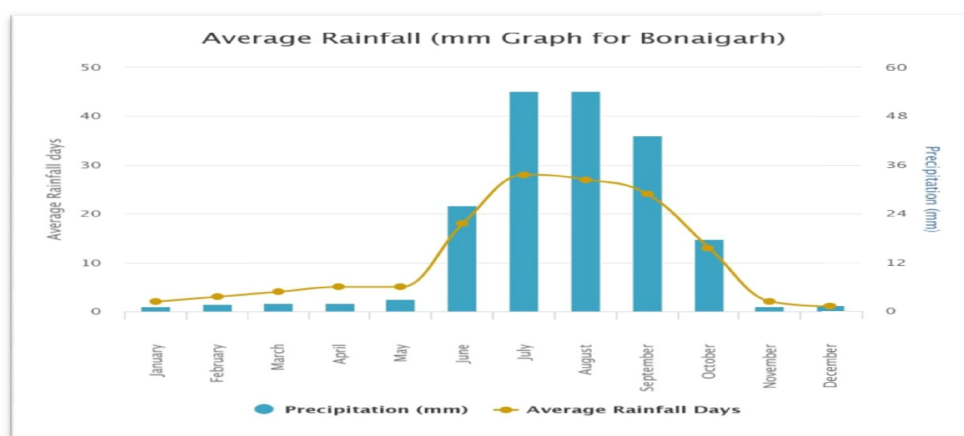
Gurundia C.D. Block															
2008	34	-	-	-	-	405	520	220	271	44	-	-	1493.8	71	
2009	-	-	-	-	66	60	378	442	67	81	14	-	1107.9	70	
2010	0.5	-	14	-	31.4	241	242	194	44	23	2	47	839.1	54	
2011	-	-	-	61	158	121	180	399	684	53	-	-	1656	79	
2012	60	4	-	20	39.0	163	203	672	336	88	15	-	1600	82	
2013	5	7	12	49	16	237	486	384	218	323	-	-	1737	93	
2014	-	18	25	0	47	159	438	420	321	50	-	-	1478	78	
2015	5	16	77	89	76	133	491	475	100	-	-	-	1462	65	
2016	-	13	4	-	64	204	385	291	302	35	-	-	1,99	70	
2017	-	-	-	-	69	288	690	266	183	64	4	-	1562	75	
2018	-	-	-	33	104	136	401	329	260	11	-	114	1389	82	
2019	-	49	88	17	18	229	330	359	311	199	-	-	1598	93	
2020	12	46	87	148	105	391	158	676	116	89	3	-	1833	86	

Lahunipara C.D. Block														
2008	48	4.4	9.4	52.4	67	581.2	402.8	214	288	21	-	-	1688.2	95
2009	-	-	-	21	78.6	72.4	351.2	319.6	110.5	79.5	32	-	1065	79
2010	-	-	-	-	78.9	125.8	304	288.7	107.2	50.3	-	46	1000.5	67
2011	-	12.4	16.1	74.1	152.2	201.6	243.3	454.4	654.4	50.5	-	-	1859	90
2012	27.6	-	-	7.6	22.4	192.6	305.4	725.4	281.2	55	10	-	1627.4	80
2013	12	10.8	0	64.3	94	140	644.4	335.4	243.8	241.2	-	-	1785.9	91
2014	-	5	11.8	28.6	78.80	160.4	565.72	501	236.80	65.8	-	-	1653.88	72
2015	-	-	-	9.3	79.2	221.4	638.5	426.8	36.5	-	-	-	1411.7	61
2016	-	7	-	-	12	58	247	341	445	8	-	-	1118	62
2017	-	-	-	-	94	254	533	163	220	88	-	-	1352	70
2018	-	-	-	86	122	160	366	333	174	14	-	102	1358	73
2019	-	64	36	40	32	131	260	361	200	168	-	-	1291	74
2020	17	47	72	128	85	198	234	630	93	79	-	-	1581	90

Koira C.D. Block														
2009	-	-	-	-	84.3	75.7	317.2	100.8	103	41.3	40	-	762.3	75
2010	-	3	-	-	14	95	134.5	159.5	111.5	18.3	-	25.5	561.3	70
2011	47	11	17	113.5	88	247.6	146.3	335	480	57	-	-	1542.4	88
2012	21	9	-	60	6.2	71	303	386.5	25.2	101	14	1	1224.7	90
2013	3	11	5	70.3	69.3	138	444	288	202	221	-	-	1451.6	98
2014	-	-	-	-	8.55	39.95	420.85	446.3	173	84	-	-	1172.6	66
2015	2	-	-	51	5	347	449	154	113	-	-	16	1134	63
2016	-	27	4	-	70	76	268	383	267	35	-	-	1131	78
2017	-	-	-	-	56	201	546	132	90	107	9	-	1141	65
2018	-	-	1	44	152	106	482	379	334	53	-	113	1665	86
2019	-	85	59	60	69	151	201	316	188	185	-	3	1317	84
2020	37	41	95	131	207	206	115	609	177	54	2	-	1674	98
Source : https://sundergarh.nic.in														

Rainfall pattern and its impact on forests and wildlife – From the above furnished data, it is evident that the rainfall in this tract is irregular. Condition and composition of forests within the division differ with pattern of rainfall in different areas. Bulk of precipitation occurs during rainy season by South West Monsoon. Usually rain starts in

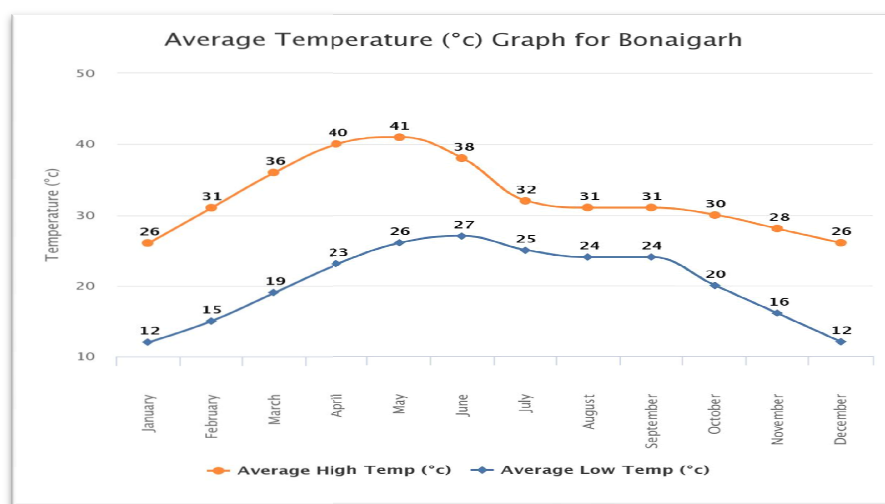
the middle of June and continues upto September. Pre-monsoon showers also occurs in the last week of May or 1st week of June. Post Monsson showers occurs in the month of October and Novemeber. On an average 82 rainy days are getting recoirded in year. Main types of forests embracing the major parts of the digvision are the moist peninsulat Sal, the dry peninsular Sal and dry mixed decicuious forests. Natural regeneration in these forests is affected buy climatic factors a lot, especially availability of rain. Average rain fall is calculated to be 1317.489mm. and most of it is concentrated to Monsoon months only. This erratic rainfall , Prolonged summer , short winter, less moisture retaining capacity of soil , and regular incidences of fires poses some localities of the division to bear poor and dry type of vegetation. Graph showing Average rain fall in the division is as shown below.



1.4.3 Temperature: Monthwise average minimum and maximum temperature for the period from 2005 to 2009 and 2007 to 2011 as obtained from the office of Soil Conservation Department, Bonai is as furnished below table 1.4.3.

Table 1.4.3- Month wise average minimum and maximum temperature				
Month	Average Temperature from 2005 to 2009.		Average Temperature from 2007 to 2011.	
	Maximum	Minimum	Maximum	Minimum
January	27.7	12.2	27.5	12.1
February	30.7	15.0	30.1	14.8
March	35.6	19.3	25.4	19.1

April	40.1	24.1	40.0	24.0
May	41.3	26.7	41.2	26.0
June	36.9	26.3	36.5	26.0
July	31.5	24.6	31.0	24.0
August	31.1	24.5	31.0	24.0
September	32.1	24.3	32.0	24.1
October	32.2	21.4	32.0	21.2
November	30.2	16.2	30.0	15.8
December	27.6	7.5	27.6	5.8



1.4.4 Humidity–

No records/ data relating to humidity have been maintained in this Division.

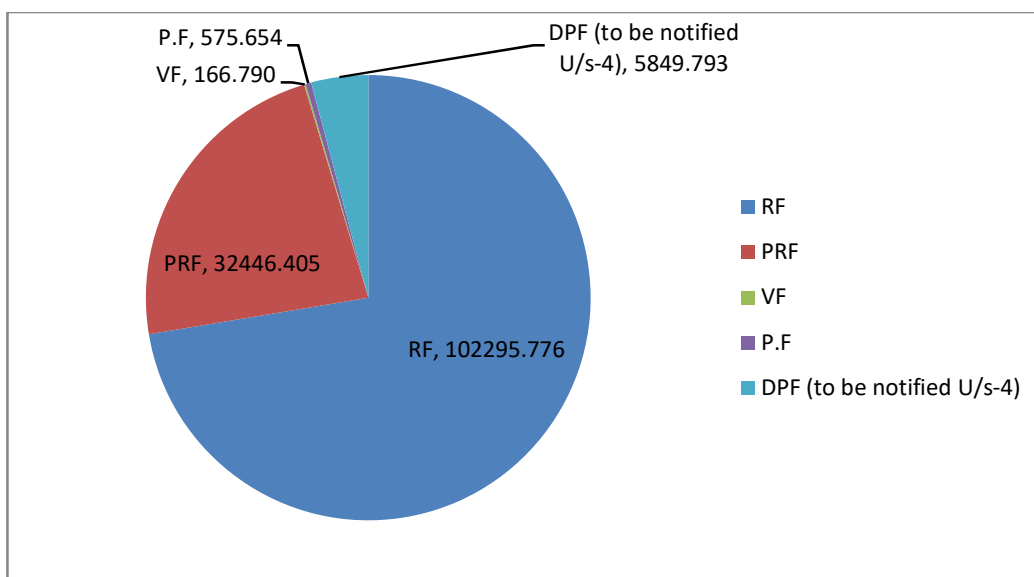
CHAPTER –2

MAINTENANCE/INCREASE IN THE EXTENT OF FOREST AND TREE COVER

2.1. Area of Forests under different legal classes: The Revised Working Plan of Bonai Forest Division prepared by Sri Suresh Pant, IFS for the period from 1997-98 to 2016-17 included 59 RF Blocks (1,16,212.893ha.), 43 PRF Blocks out of 46 nos of PRF, and subsequently 3 nos of PRF Blocks with forest area 189.249 ha. have been notified U/S-4 of OFA, 1972 during the Plan period. Thus, there were in total 49 numbers of PRF Blocks with an extent of 35823.505 ha. and 47 VFs (262.500 ha). During re-organisation of Forest Department on date 01.10.2003, Forest Blocks coming under Banki Forest Range were merged with Rourkela Forest Division. Hence, 14 nos of RF Blocks (13318.326 ha), 8 nos PRF Blocks (1717.609 ha.) and 15 nos of VFs (95.710 ha) have been merged with Rourkela Forest Division. This Revised Working Plan will cover 45 RF Blocks (1,02,894.567 ha.), 41 PRF Blocks (34,105.896 ha.), 25 nos of DPF Blocks (5849.793), 32 nos of VFs (166.790 ha.) & 29 nos of PFs (575.654 ha.).

The details of forest areas included in present Revised Working Plan are given in the following Table 2.1.

Table 2.1. Details of forest area included in the present revised working plan					
Sl. No.	Type of Forest	Forest area before re-organisation (Notified area) in ha.	Forest area merged with Rourkele Forest Division in ha.	Forest area of Bonai Forest Division in present Working Plan as per Govt. Notification in ha.	Computed Area area taken in ha.
1	RF	116212.893	13318.326	102894.567	102295.776
2	PRF	35823.505	1717.609	34105.896	32446.405
3	VF	262.500	95.710	166.790	166.790
4	P.F	575.654		575.654	575.654
5.	DPF (to be notified U/s-4)	7107.292	1226.129 (+) 31.370 (included in PF)	5849.793	5849.793
	Total	159981.844	16389.144	1,43,592.700	141334.418
(-) Forest area diverted under FC Act, 80 & FRA, 2006				4051.816	4051.816
Balance Area				1,39,540.884	1,37,282.602
6.	(+) Unclassed Forests :-			61.731	61.731
G. Total :-				1,39,602.615	1,37,344.333



2.1.1 Reserved Forests (R.F) : The present plan covers 45 number of RF blocks of the division . Details of these RF blocks is given in Table 2.1.1

Table 2.1.1. List of Reserve Forest of Bonai Forest Division				
Sl. No.	Name of the Forest Block	Area in ha. As per Govt. Notification excluding de-reserved area	Area computed by WPO from latest Topo sheet of 1:25,000 scale during last plan (1997-98 to 2016-17) in ha.	Notification No. & Date
1	2	3	4	5
1	Budhapahad RF	1041.278	1071.750	No.13624/CF-12F-179/M/57 dt.27.7.57
2	Dandpat (East) RF	416.997	409.500	-do-
3	Dandpat (West) RF	2338.972	2294.063	-do-
4	Dharanidharpali RF	178.065	178.066	-do-
5	Gogua RF	131.121	131.121	No.34018/12F-M/57 dt.9.11.57
6	Hulku RF	30.756	30.757	-do-
7	Baghiakucha RF	74.463	74.464	-do-

8	Baliatota RF	46.944	46.945	-do-
9	Bonarai RF	66.774	66.775	-do-
10	Chandiposh RF	61.918	61.918	-do-
11	Jankinagar RF	95.912	95.913	-do-
12	Kello-B RF	207.203	207.204	-do-
13	Kendrikela RF	196.276	196.276	-do-
14	Sinduria RF	1144.880	1144.881	No.13624/CF-12F-179/M/57 dt.27.7.57
15	Talita RF	101.983	101.983	No.34018/12F-M/57 dt.9.11.57
16	Sundhikon RF	62.322	62.323	-do-
17	Amrudi RF	2440.416	2408.620	No.13624/CF-12F-179/M/57 dt.27.7.57
18	Lunga RF	5284.176	5242.146	No.13624/CF-12F-179/M/57 dt.27.7.57
19	Kundheibira RF	214.488	260.437	No.85439 dt.22.12.75
20	Mahulpada RF	4734.925	4565.000	No.85305 dt.22.12.75
21	Ulsura RF	1420.477	1400.061	No.13624/CF-12F-179/M/57 dt.27.7.57
22	Balia RF	1499.797	1435.813	No.13624/CF-12F-179/M/57 dt.27.7.57
23	Raipiri RF	6617.563	6614.326	-do-
24	Majurdima RF	3294.617	3339.250	-do-
25	Kello RF	1872.521	2041.978	-do-
26	Kantamunda RF	4410.764	4349.688	-do-
27	Balai RF	3466.693	3416.313	-do-
28	Jada RF	1762.120	1714.500	-do-
29	Sirgida RF	4538.648	4393.563	-do-
30	Kunjar RF	4946.985	4924.687	-do-
31	Solguda RF	2730.068	2730.068	-do-
32	Rushimath RF	6741.533	6712.567	-do-
33	Dhenkiam RF	6553.233	6398.358	-do-
34	Gurundia RF	2531.606	2514.282	-do-
35	Kusumdihi RF	5445.973	5277.124	-do-

36	Toda RF	15722.869	15703.988	No.13624/CF-12F-179/M/57 dt.27.7.57
37	Khajurdihi RF	2125.617	2144.312	-do-
38	Sarkunda RF	1888.870	1934.625	-do-
39	Khandadhar RF	927.559	927.560	-do-
40	Mendhamaruni RF	546.337	512.937	No.34018/12F-M/57 dt.9.11.57
41	Bhabanipahar RF	370.295	370.295	No.13624/CF-12F-179/M/57 dt.27.7.57
42	Kathmal RF	101.173	101.174	No.34018/12F-M/57 dt.9.11.57
43	Rakshi-I RF	1745.884	1796.289	No.13624/CF-12F-179/M/57 dt.27.7.57
44	Rakshi-II RF	1412.788	1472.813	-do-
45	Karo RF	1350.708	1419.063	-do-
Total of Bonai Division:-		102894.567	102295.776	
Source : O/o the Divisional Forest Officer, Bonai Division				

2.1.2 Proposed Reserved Forest (PRF) : In the present plan , 41number of P R.F blocks have been included.Details of P.R.F blocks are given in **table 2.1.2**

Table 2.1.2.-List of PRF (U/s-4) of Bonai Division.				
Sl. No.	Name of the Forest Block	Area in ha. As per Govt. Notification excluding de-reserved area	Area computed by WPO from latest Topo sheet of 1:25,000 scale during last plan (1997-98 to 2016-17)	Notification No. & Date
1	2	3	4	6
1	Bandhabhuin-Bhadimara	564.346	851.125	No.49241 dt.2.7.75
2	Budhapahar (B)	416.835	392.501	No.72281 dt.9.11.73

3	Amurdii PRF	1744.233	1580.500	No.72074 dt.8.11.73
4	Budhapahar (A)	656.819	685.938	No.72281 dt.9.11.73
5	Talbahali- Barhaguda	377.984	347.813	No.49598 dt.3.7.75
6	Lunga PRF	283.286	257.063	No.45872 dt.7.8.74
7	Nagaria PRF	7709.429	9684.811	No.76649 dt.14.11.73
8	Khandadhar PRF	1694.698	1570.375	No.72996 dt.12.11.73
9	Majurdima PRF	160.420	175.437	No.3783 dt.17.1.74
10	Kantamunda-I	474.463	519.250	No.72918 dt.12.11.73
11	Kantamunda-II	129.502	84.938	No.47828 dt.19.7.84
12	Raipiri - I & II	323.269	289.562	No.73602 dt.14.11.73
13	Kelo PRF	62.322	72.375	No.59697 dt.4.8.75
14	Balia - I & II	528.409	414.375	No.38368 dt.22.5.75
15	Mahuldihi - I & II	522.055	544.499	No.722601 dt.9.11.73
16	Sirgida PRF	55.685	73.312	No.73103 dt.13.11.73
17	Solguda PRF	62.614	62.812	No.73615 dt.14.11.73

18	Balai PRF	79.384	88.500	No.72078 dt.8.11.73
19	Jada PRF	105.544	105.544	No.72086 dt.8.11.73
20	Kusumdihi - I	246.118	277.750	No.73598 dt.14.11.77
21	Kusumdihi - II	101.853	76.875	No.72082 dt.8.11.73
22	Kusumdihi - III	396.843	345.251	No.72082 dt.8.11.73
23	Gurundia PRF	1498.280	905.501	No.72283 dt.9.11.77
24	Nalaghati - Rajabasa	607.061	678.625	No.3940 dt.17.1.74
25	Dhenkiam - I PRF	117.159	130.438	No.36045 dt.14.5.75
26	Dhenkiam - II PRF	195.224	137.000	No.3779 dt.17.1.74
27	Rushimath - II	138.178	138.178	No.61890 dt.18.12.99
28	Sarkunda PRF	6434.641	4950.313	No.4033 dt.18.1.74
29	Bhabanipahar PRF	1473.087	1290.313	No.72091 dt.8.11.73
30	Gonua PRF	466.467	352.375	No.3931 dt.17.1.74
31	Khajurdihi PRF	3474.301	3634.313	No.72293 dt.9.11.73
32	Mendamaruni - I	1800.890	472.937	No.38381 dt.22.5.75
33	Mendhamaruni - II	416.479	340.875	No.35941 dt.14.5.75

34	Rakshi PRF	80.938	60.313	No.72297 dt.9.11.73
35	Toda - I PRF	38.446	47.063	No.38376 dt.22.5.75
36	Toda - II PRF	60.704	90.938	No.38376 dt.22.5.75
37	Toda - III PRF	225.820	287.813	No.38376 dt.22.5.75
38	Toda - IV PRF	139.619	186.313	No.38376 dt.22.5.75
39	Toda - V PRF	4.856	4.856	No.38376 dt.22.5.75
40	Kathmal PRF	213.678	213.957	No.73099 dt.13.11.73
41	Soyamba PRF	23.957	23.957	No.62286 dt.22.12.99
Total of Bonai Division:-		34105.896	32446.405	
Source : O/o the Divisional Forest Officer, Bonai Division				

2.1.3 Demarcated Protected Forest (DPF to be notified U/s-4 of OFA'1972) : 25 no of Forest Blocks under the category of DPF to be notified U/s-4 of OFA'1972 have been submitted for approval. But, these areas had not been covered under the expired revised Working Plan for the period from 1997-98 to 2016-17. These forest blocks covering an area of 5849.793 ha. have been included in the present Revised Working Plan for the period from 2021-22 to 2030-31. The details of these forest blocks are given in the Table 2.1.3.

Table 2.1.3. List of Demarcated Protected Forest (DPF) of Bonai Forest Division.					
Sl. No.	Name of Range	DPF	Notification No. & date	Area (in Ha.)	Area (in Acres.)
1	2	3	4	5	6
1	Bonai	Ulundapahar	Memo No.12016/7F (Res)19/81 dt.2.5.1982 of the Addl. Chief Conservator of Forests, Orissa	167.77	414.560
2		Dandpat		619.182	1529.999
3		Dandpat Hill Block		669.77	1655.002
4		Dalki-Rajanbeda		47.102	116.389
5		Padagoth		1010.602	2497.198
6		Bijakuli-Beldihi		658.23	1626.490
7		Barachhapal-Pankihuli		60.582	149.698
8		Bandhabhuin-Dakmunda		283.083	699.498
9	Kuliposh	Singardei		111.323	275.079
10		Kumundi		121.914	301.249
11		Jagati		73.613	181.898
12	Koira	Ranisal		140.38	346.879
13		Kalmang		80.939	200.000
14		Karo		215.702	533.000
15	Barsuan	Raikela		390.53	965.000
16		Toda		240.335	593.868
17		Kaptadihi		30.72	75.909
18		Tinko		141.744	350.249
19	Tamra	Rankei		324.795	802.568
20		Gurundia-Badgaon		79.623	196.748
21		Rushimath-I		120.922	298.798
22		Dhenkiam Part-III		47.861	118.265

1	2	3	4	5	6
23	Jarda	Kunshibahal	Memo No.12016/7F (Res)19/81 dt.2.5.1982 of the Addl. Chief Conservator of Forests, Orissa	33.913	83.799
24		Kello-II		129.988	321.200
25		Kello-III		49.17	121.499
		TOTAL :-		5849.793	14454.838
Source : O/o the Divisional Forest Officer, Bonai Division					

2.1.4 Village Forests (VF) : 32 village Forests are coming under Bonai Division. The VF areas had not been included in the expired Revised Working Plan. These VFs covering an area of 166.790 ha. have been included in the present Revised Working Plan for the period from 2021-22 to 2030-31. The details of VFs are **given in Table 2.1.4.**

Table 2.1.4. List of Village Forests (VF) of Bonai Forest Division.					
Sl. No.	Range	Name of Village	Area in Ha.	Govt. Notification No. & Date	Land schedule of the area in acres.
1	2	3	4	5	6
1	Bonai	Bad-Baurkela	5.422	1715-AFFN (SIDA) 89/91(Pt) -F&E Dt.25.1.1992.	Plot No.373 (7.18), 2601 (2.10), 2348 (1.19) and 2346 (2.93) of Khata No.181
2		Gopinathpur	1.934		Plot No.397 (1.82), 3241 (1.82) and 2924 (1.14) of Khata No.169 and 170
3		Kenaveta	3.439		Plot No.3120(8.50) of Khata No.313
4		Uparbahal	1.092		Plot No.429/1 (2.70) of Khata No.64
5		San Bhalbunguri	5.058		Plot No.272/1 (12.50) of Khata No.43

6		Govindpur	5.058		Plot No.1619 (7.28), 1718 (2.00) and 1720 (3.22) of Khata No.160
7		Dareikela	1.315		Plot No.362 (0.48), 363 (0.77) and 440 (2.00) of Khata No.79 and 82
8		Uparpada	10.117		Plot No.2135 (7.00), 288 (5.50), 2160 (2.20), 4 (3.50), 5(4.30) and 2161 (2.50) of Khata No.178 & 180
9		San Gogua	6.070		Plot No.768/1 (15.00) of Kh. No.154
10		Babu Nuagaon	7.082		Plot No.1622/1 (11.10),1926 (3.55) and 1122/1 (2.85) of Kh. No.157, 159 & 156/63
11		Bandadihi	4.350		Plot No.842 (7.70),844 (1.05) and 804 (2.00) of Kh. No.62 & 64
12		Bad Baurkela	5.058		Plot No.1553/1 (12.50) of Kh. No.184
13		Balitakudar	10.000	AFFN (SIDA) 19/93 - 22017/	Plot No.6/1, 12/1 & 14/1 of Kh. No.71
14		Kasada	8.000	F&E Dt.27.9.1993.	Plot No.1, 19, 22 & 547 of Kh. No.152
15		Bhaldunguri	5.977	1715-AFFN	Plot No.278 (14.77) of Khata No.166
16		Khandapat	4.552	(SIDA) 89/91(Pt) -F&E	Plot No.280 (8.19), 309 (1.36) and 334 (1.70) of Khata No.72
17	Tamra	Mankada Chuan	16.187	Dt.25.1.1992.	Plot No.1 (4.60), 58 (11.50), 31 (9.40), 33 (3.38) and 527/1 (11.12) of Khata No.50
18		Bartengada	4.046		Plot No.259 (2.16), 282 (3.20) and 46 (4.64) of Kh. No.32, 45 & 47

19	Kuliposh	Kadadihi	2.023	1715-AFFN	Plot No.83/1 (5.00) of Kh. No.47
20		Ruguda	5.058	(SIDA) 89/91(Pt) -F&E	Plot No.312 (3.60) and 313 (8.90) of Khata No.210
21		Sihidiha	5.058	Dt.25.1.1992.	Plot No.1850/1 (5.45),1851/1 (3.75) and 1852/1 (3.30) of Kh. No.237
22		Mahuldiha	1.011		Plot No.8 (2.50) of Kh. No.136
23		Ruguda	5.058		Plot No.313 (12.50) of Kh. No.210
24		Tankjoda	0.809		Plot No.448/1 (2.00) of Kh. No.140
25		Madhupur	1.416		Plot No.308 (3.50) of Kh. No.48
26		Belkudar	4.000	AFFN (SIDA)	Plot No.380 (4.00 Ha.) of Kh. No.59
27		Basubahal	3.600	89/91- 29566	Plot No.389 (3.60 Ha.) of Kh. No.69
28		Gadruan	8.000	F&E	
29		Kanujoda	6.000	Dt.9.12.1992.	Plot No.81/31 (6.00 Ha.) of Kh. No.140
30		Ruguda	10.000	AFFN (SIDA) 19/93 - 22017/ F&E	Plot No.384/1386/1, 3410/1, 3410/2, 3485/1, 3485/2 & 3486/1 of Kh. No.210
31		Bichhanapati	4.000	Dt.27.9.1993.	Plot No.944/1 (10.00) of Khata No.48
32		Rangamatia	6.000		Plot No.179/1, 61/1, 62, 63/1, 39/1, 42/1, 43/1 & 44 of Khata No.38 & 39
Total area of Bonai Division:-			166.790	Total 30 Villages (32 Sites)	
Source : O/o the Divisional Forest Officer, Bonai Division					

2.1.5 Protected Forest (PF): There are 29 numbers of Protected Forests covering an area of 575.654 ha. in this Division. These Protected Forests (Declared U/s-33 of OFA'1972) areas had not been included in the expired Working Plan. The PF areas of 575.654 ha. have been included in the present Revised Working Plan. With respect to forest areas diverted as per provisions under Forest Conservation Act, 1980, non-forest lands have got identified for raising CA, and these lands got mutated to Forest Departments and then declared as Protected Forests (PF). The details of PFs have given in Table 2.1.5.

Table 2.1.5. List of Protected Forest (PF) of Bonai Forest Division.						
Sl. No.	Date of Gazette Notification	Name of the declared PF / Date of notification	Name of Village	Name of PS	Name of Tehsil	Area (in ha.)
1	02.09.2002	Kulkutta	Kulkutta	Tikayatpali	Bonai	15.338
2	22.2.2005	Benuam 15.2.2005	Benuam	Banki	Gurundia	21.040
3	14.8.2009	Bhurung 31.7.2009	Bhurung	Bonai	Gurundia	5.000
4	14.8.2009	Nuadihi 31.7.2009	Nuadihi	Tikayatpali	Bonai	16.422
5	20.8.2009	Madhupur 3.8.2009	Madhupur	Gurundia	Gurundia	45.587
6	31.8.2009	Sanjal (B) 18.8.2009	Sanjal	Mahulpada	Lahunipara	16.106
7	31.8.2009	Fuljhar (B) 18.8.2009	Fuljhar	Mahulpada	Lahunipara	16.187
8	31.8.2009	Tamra (A) 18.8.2009	Tamra	Banki	Gurundia	15.621
9	1.09.2009	Fuljhar-A 20.8.2009	Fuljhar	Mahulpada	Lahunipara	5.698
10	1.09.2009	Badjal 20.8.2009	Badjal	Mahulpada	Lahunipara	24.282
11	1.09.2009	San-Nikitimal 20.8.2009	San-Nikitimal	Tikayatpali	Bonai	104.310
12	1.09.2009	Ladapani 20.8.2009	Ladapani	Mahulpada	Lahunipara	9.162

Sl. No.	Date of Gazette Notification	Name of the declared PF / Date of notification	Name of Village	Name of PS	Name of Tehsil	Area (in ha.)
13	1.09.2009	Tamra (B) 20.8.2009	Tamra	Banki	Gurundia	12.750
14	21.8.2010	San-Sibnathpur 13.8.2010	San-Sibnathpur	Bonai	Gurundia	1.335
15	01.9.2009	Sanjal-A 20.8.2009	Sanjal	Mahulpada	Lahunipara	14.941
16	02.9.2010	San-Sibnathpur 24.8.2010	San-Sibnathpur	Bonai	Gurundia	20.570
17	15.11.2010	Nuadihi 3.11.2010	Nuadihi	Tikayatpali	Bonai	9.618
18	25.2.2011	San-Sibnathpur 18.2.2011	San-Sibnathpur	Bonai	Gurundia	17.850
19	22.09.2005	Tamra 22.09.2005	Tamra	Bonai	Gurundia	23.422
20	20.08.2009	Tumbei 20.08.2009	Tumbei	Gurundia	Gurundia	16.798
21	20.04.2015	San-Sibnathpur 20.4.2015	San-Sibnathpur	Bonai	Gurundia	10.800
22	31.07.2009	Madhupur 31.7.2009	Madhupur	Gurundia	Gurundia	59.437

Sl. No	Date of Gazette Notification	Name of the declared PF / Date of notification	Name of Village	Name of PS	Name of Tehsil	Area (in ha.)
23	5.6.2010	Banki	Banki	Lahunipara	Lahunipara	16.390
24		Sadhubahal	Sadhubahal	Mahulpada	Lahunipara	15.783
25		Barhaguda	Barhaguda	Lahunipara	Lahunipara	4.046
26	21.8.2013	Khuntgaon	Khuntgaon	Lahunipara	Lahunipara	11.068
27	26.09.2014	San-Katuridhua 26.9.2014	San-Katuridhua	Gurundia	Gurundia	37.146
28	05.10.2016	Sisudihi 05.10.2016	Sisudihi	Gurundia	Gurundia	7.719
29	13.03.2019	Babu-Nuagaon 13.3.2019	Babu-Nuagaon	Bonai	Bonai	1.228
TOTAL						575.654

2.1.6. Unclassed Forests: Total extent of unclassified forests in the division is 61.731 ha.

,details of which is shown in the following table.2.1.6

Table 2.1.6 Unclassed Forests of Bonai Division

Sl. No.	Name of Range	No. of unclassified forest	Area in ha.
1	Barsuan	14	8.002
2	Bonai	59	8.423
3	Jarda	45	9.824
4	Koira	32	9.979
5	Kuliposh	24	9.093
6	Sole	27	6.550
7	Tamra	40	9.860
	Total :-	241	61.731

No unclassified Forests of this Division have got notified as RF/PF till now.

2.1.7 - Abstract of various categories of forest lands in Bonai Forest Division: Re-organisation of forest Division took place during 2003 with effect from 1-10-2003. However, the total forest area of this Division as on 1.4.1997, area included during 1997-98 to 2019-20, area excluded during that period and net area available as on 11.4.2020 is given below in table 2.1.7.

Table 2.1.7- Forest area statement of Bonai Forest Division (as per legal status) (Notified Area)				
Sl. No.	Type of Forest	Forest area before re-organisation	Forest area merged with Rourkele Forest Division	Forest area of Bonai Forest Division in ha.
1	RF	116212.893	13318.326	102894.567
2	PRF	35823.505	1717.609	34105.896
3	VF	262.500	95.710	166.790
4	P.F	575.654	-	575.654
5.	DPF (to be notified U/s-4)	7107.292	1226.129 (+) 31.370 (included in PF)	5849.793
8.	Unclassed Forests	71.000	9.269	61.731
	Total	1,60,052.844	16,398.413	1,43,654.431
	(-) Forest area diverted under FC Act, 80 & FRA, 2006			4,051.816
	Net Area :-			1,39,602.615
Source : O/o the Divisional Forest Officer, Bonai Division				

2.1.8 - DLC Report of the Division: The D.L.C. report of Bonai Forest Division has prepared during 1997. The DLC lands under Bonai Division comes to 25,269.129 ha. Copy of the report as such is appended as Appendix XV.

2.1.9- Range wise Forest area of previous Working Plan : The details of Range wise Forest area of previous Working Plan is as given below in table 2.1.9 :

Table 2.1.9- Details of Range wise Forest area of previous Working Plan								
Sl. No.	Range	RF (in Ha.)	PRF (in Ha.)	DPF (in Ha.)	Village Forests (in Ha.)	Protected Forests (in Ha.)	Un-classed Forest (in Ha.)	Total Forest (in Ha.)
1	2	3	4	5	6	7	8	9
1	Bonai	6,195.864	981.181	3,516.321	73.995	242.336	8.423	11,018.120
2	Kuliposh	12,294.305	8,012.361	306.850	62.033	133.663	9.093	20,818.305
3	Koira	13,667.893	6,856.256	437.021	-	-	9.979	20,971.149
4	Barsuan	12,903.907	12,451.715	803.329	-	-	8.002	26,166.953
5	Tamra	18,611.825	3,300.716	573.201	30.762	199.655	9.860	22,726.019
6	Jarda	17,062.015	1,548.883	213.071	-	-	9.824	18,833.793
7	Sole	22,158.758	954.784	-	-	-	6.550	23,120.092
G.Total:-		1,02,894.567	34,105.896	5,849.793	166.790	575.654	61.731	1,43,654.431

2.2. Forest area under different Working Circles in the present revised Working Plan:

The expired Revised Working Plan prepared by Sri Suresh Pant, IFS, Working Plan Officer, Sambalpur came into force with effect from 1997-98 and was valid up to 2016-17. At the time of preparation of the Revised Working Plan, the area of R.F. and P.R.F. Blocks have been computed by the W.P.O Sambalpur from latest Topo Sheet of 1:25,000 scale and included in the Revised Working Plan for its management as per details given below in table 2.2.1.

Table 2.2.1				
Category of Forests	Area in ha. as per Government notification	Area computed by WPO from Topo sheet of 1:25,000 scale and included in the Working Plan	Area of Banki Range merged with Rourkela (T) Division and now excluded.	Net area now available for management in ha.
1. RF	1,16,212.893 (59 blocks)	1,15,455.452 (59 blocks)	13,159.676 (14 blocks)	1,02,295.776
2. PRF (u/s-4)	35,310.178 (43 blocks)	33,937.382 (43 blocks)	1,977.190 (7 blocks)	31,960.192 (36 blocks)
Total :-	1,51,523.071	1,49,392.834	15,136.866	1,34,255.968

Apart from this, another 5 PRF blocks (486.213 ha.), 25 DPF (to be notified u/s-4) (5,849.793 ha.) 32 village forests (166.790 ha.), 29 Nos of Protected Forests (575.654 ha.) of notified area has been included in the present revised Working Plan. Thus, the total area is 1,41,334.418 ha. But an area of 4,051.816 ha. (3,981.936 ha. for Mining purpose + 49.648 ha. for other purpose + 20.232 ha. under F.R.A.) has been diverted under F.C. Act 1980 and F.R.A. 2006. The said area of 4051.816 ha. has been deducted from the total area and thus, the forest area under management in the revised Working Plan of this Division is 137282.602 ha. as per details given below in table 2.2.2:-

Table 2.2.2							
Sl. No.	Type of Forests	Area in Ha. (Computed area)	Area diverted in ha.				Net Area in ha.
			Under F.C. Act		FRA, 2006	Total	
			For Mining	Other than Mining			
(a)	RF	1,02,295.776	2,264.119	49.648	12.556	2,326.323	99,969.453
(b)	PRF	32,446.405	1,717.817	0.000	7.676	1,725.493	30,720.912
(c)	DPF	5,849.793	-	-	-	-	5,849.793
(d)	Village Forests	166.790	-	-	-	-	166.790
(e)	PF (u/s-33)	575.654	-	-	-	-	575.654
G. Total :-		1,41,334.418	3,981.936	49.648	20.232	4,051.816	1,37,282.602

Working class wise forest area in each Range in the present Working Plan is as shown in the table 2.2.3.

Table 2.2.3 Forest area under different working circles						
Items	R.F. in Ha.	P.R.F. in Ha.	P.F. in Ha.	Village forests in Ha.	DPF (in ha.)	Total in Ha.
1	2	3	4	5	6	7
1. Selection Working Circle.	90025.964	15532.823	-	-	-	105558.787
2. Protection Working Circle.	3916.155	3642.545	-	-	-	7558.700
3. Rehabilitation Working Circle.	3547.309	10928.173	-	-	5849.793	20325.275
4. Plantation Working Circle.	2480.025	617.371	575.654	166.790	-	3839.840
Total :-	99969.453	30720.912	575.654	166.790	5849.793	137282.602
5. Bamboo (overlapping) Working Circle.	62771.192	2311.313	-	-	-	65082.505
6. Wildlife (overlapping) Working Circle.	99969.453	30720.912	575.654	166.790	5849.793	137282.602
7. NTFP (overlapping) Working Circle.	99969.453	30720.912	575.654	166.790	5849.793	137282.602
8. JFM (overlapping) Working Circle.	9377.378	3851.950	-	166.790	739.850	14135.968

Reason for deviation in actual area worked in Working Circle wise of previous Working Plan and proposed in present Working Plan is given in the following table 2.2.4.

Table 2.2.4.- Reason for deviation in actual area worked in Working Circle wise of previous Working Plan and proposed in present Working Plan

Sl. No.	Working Circle	Area as per previous Working Plan in Ha.	Area as per present Working Plan in Ha.	Difference in area (+) or (-)	Reason of deviation
1	2	3	4	5	6
1	Selection Working Circle	1,08,417.025	1,05,558.787	(-) 2,858.238	The area diverted under FCA and FRA has been deducted as indicated vide Table 1.3.10.1 and thus, there is less area for management
2	Protection Working Circle	7,822.298	7,558.700	(-) 263.598	
3	Rehabilitation Working Circle	18,016.645	20,325.275	(+) 6,148.470	Area increased due to inclusion of DPF, VF and PF areas in the present Working Plan
4	Plantation Working Circle		<u>3,839.840</u> 24,165.115		
	Total:-	1,34,255.968	1,37,282.602	(+) 3,026.634	
5	Bamboo (over lapping) Working Circle	65,092.380	65,082.505	(-) 9.875	Area diverted under FCA & FRA has been deducted as indicated vide Table 1.3.10.1
6	Wild Life (over lapping) Working Circle	1,33,506.708	1,37,282.602	(+) 3,775.894	Area increased due to inclusion of DPF, VF & PF area in the present Plan.
7	NTFP (over lapping) Working Circle	1,33,506.708	1,37,282.602	(+) 3,775.894	
8	Misc. (over lapping) Working Circle	3,809.992	No Working Circle formed in the present Plan		
9	JFM (over lapping) Working Circle	-	14,135.968	(+) 14,135.968	Newly formed in the present Working Plan

2.3. Percentage of Forest with secured boundaries:

2.3.1 Boundary Position

The total length of external boundaries of 59 RF blocks as maintained in the expiring Working Plan is 1,403.015 Kms. out of which, 43.4 Kms. are of natural origin and the rest are artificially demarcated by clearing a strip of 20 to 40 feet wide and by erecting stone cairns and wooden post. At some places masonry pillars are also used for the purpose.

During re-organisation of Forest Division with effect from 1.10.2003, the area of entire Banki Range has merged with Rourkela Division. Accordingly, the net boundary length of both RF and PRF areas of Bonai Division are as below in table 2.3.1.

Table 2.3.1.- Net boundary length of RF & PRFs of Bonai Division				
Category of Forests.	Total No. of boundary pillars.	Total boundary line in Kms.		
		Boundary line except common boundary line.	Common boundary line.	Total in Kms.
1	2	3	4	5
1. RF	8,357	990.968	194.400	1,185.368
2. PRF (u/s-4)	4,953	552.048	226.131	778.179
Total:-	13,310	1,543.016	420.531	1,963.547

The details of RF and PRF-wise total number of boundary pillars, boundary lines with common boundary line has been prepared and furnished below in table 2.3.1.1 & table 2.3.1.2.

Table 2.3.1.1. - List of Reserved Forests (RF) wise length of boundary line and Pillars of Bonai Division.						
Sl. No.	Name of the Forest Block	Area in ha. as per Govt. Notification excluding de-reserved area	No. of Boundary Pillars in Nos.	Length of Boundary Line excluding common boundary line in Kms.	Length of common boundary line in Kms.	Total Boundary length in Kms.
1	2	3	4	5	6	7
1	Budhapahad RF	1041.278	100	15.282	3.500	18.782
2	Dandpat (East) RF	416.997	54	6.761	4.250	11.011
3	Dandpat (West) RF	2338.972	127	18.828	5.750	24.578
4	Dharanidharpali RF	178.065	103	10.263	3.000	13.263
5	Gogua RF	131.121	47	8.511	0.000	8.511
6	Hulku RF	30.756	10	2.311	0.000	2.311
7	Baghiakucha RF	74.463	33	4.640	0.000	4.640
8	Baliatota RF	46.944	24	3.483	0.000	3.483
9	Bonarai RF	66.774	20	3.421	0.000	3.421
10	Chandiposh RF	61.918	28	4.046	0.000	4.046
11	Jankinagar RF	95.912	73	10.890	0.000	10.890
12	Kello-B RF	207.203	97	12.538	3.000	15.538
13	Kendrikela RF	196.276	81	11.997	0.000	11.997
14	Sinduria RF	1144.880	128	17.465	3.000	20.465
15	Talita RF	101.983	27	5.394	0.000	5.394
16	Sundhikon RF	62.322	33	6.173	0.000	6.173
17	Amrudi RF	2440.416	274	32.925	0.000	32.925
18	Lunga RF	5284.176	710	80.669	1.000	81.669
19	Kundheibira RF	214.488	61	8.110	0.000	8.110
20	Mahulpada RF	4734.925	253	41.590	1.000	42.590
21	Ulsura RF	1420.477	250	24.585	4.500	29.085
22	Balia RF	1499.797	201	17.461	8.000	25.461
23	Raipiri RF	6617.563	333	20.978	18.250	39.228
24	Majurdima RF	3294.617	249	23.079	8.500	31.579
25	Kello RF	1872.521	200	15.165	7.000	22.165
26	Kantamunda RF	4410.764	292	23.035	12.500	35.535
27	Balai RF	3466.693	323	18.378	17.000	35.378
28	Jada RF	1762.120	160	8.108	12.000	20.108

29	Sirgida RF	4538.648	395	40.659	7.000	47.659
30	Kunjar RF	4946.985	291	19.331	15.750	35.081
31	Solguda RF	2730.068	250	11.121	14.250	25.371
32	Rushimath RF	6741.533	305	49.676	2.250	51.926
33	Dhenkiam RF	6553.233	502	77.644	2.250	79.894
34	Gurundia RF	2531.606	145	20.010	2.250	22.260
35	Kusumdihi RF	5445.973	343	63.792	6.000	69.792
36	Toda RF	15722.869	735	113.118	13.700	126.818
37	Khajurdihi RF	2125.617	171	25.465	2.500	27.965
38	Sarkunda RF	1888.870	173	18.860	6.700	25.560
39	Khandadhar RF	927.559	74	12.520	0.000	12.520
40	Mendhamaruni RF	546.337	145	15.986	0.000	15.986
41	Bhabanipahar RF	370.295	58	2.776	2.500	5.276
42	Kathmal RF	101.173	37	4.240	0.000	4.240
43	Rakshi-I RF	1745.884	174	25.132	0.000	25.132
44	Rakshi-II RF	1412.788	112	21.397	0.000	21.397
45	Karo RF	1350.708	156	13.155	7.000	20.155
Total of Bonai Division:-		102894.567	8357	990.968	194.400	1185.368
Source : O/o the Divisional Forest Officer, Bonai Division						

Table 2.3.1.2. - List of PRF wise length of boundary line and Pillars of Bonai Division.						
Sl. No.	Name of the Forest Block PRF)	Area in ha. as per Govt. Notification excluding de-reserved area	No. of Boundary Pillars in Nos.	Length of Boundary Line excluding common boundary line in Kms.	Length of common boundary line in Kms.	Total Boundary length in Kms.
1	2	3	4	5	6	7
1	Bandhabhuin-Bhadimara	564.346	265	36.463	1.750	38.213
2	Budhapahar (B)	416.835	128	17.071	4.000	21.071
3	Amurdii PRF	1744.233	238	24.870	9.250	34.120
4	Budhapahar (A)	656.819	76	13.105	0.000	13.105
5	Talbahali-Barhaguda	377.984	114	14.299	0.750	15.049
6	Lunga PRF	283.286	64	5.636	2.500	8.136
7	Nagaria PRF	7709.429	518	63.513	37.000	100.513
8	Khandadhar PRF	1694.698	155	7.171	15.731	22.902
9	Majurdima PRF	160.420	90	8.703	2.500	11.203
10	Kantamunda-I	474.463	165	16.500	8.500	25.000
11	Kantamunda-II	129.502	314	32.523	3.400	35.923
12	Raipiri - I & II	323.269	194	16.617	8.500	25.117
13	Kelo PRF	62.322	105	5.694	4.600	10.294
14	Balia - I & II	528.409	216	25.750	6.500	32.250
15	Mahuldihi - I & II	522.055	146	14.945	4.400	19.345
16	Sirgida PRF	55.685	39	3.492	1.500	4.992
17	Solguda PRF	62.614	32	2.547	1.500	4.047
18	Balai PRF	79.384	48	3.700	0.200	3.900
19	Jada PRF	105.544	63	4.600	0.800	5.400
20	Kusumdihi - I	246.118	83	12.040	1.500	13.540
21	Kusumdihi - II	101.853	116	17.459	0.800	18.259
22	Kusumdihi - III	396.843	120	12.443	7.600	20.043
23	Gurundia PRF	1498.280	216	22.402	6.000	28.402

24	Nalaghati - Rajabasa	607.061	124	18.415	0.000	18.415
25	Dhenkiam - I PRF	117.159	81	5.885	0.100	5.985
26	Dhenkiam - II PRF	195.224	76	8.390	1.500	9.890
27	Rushimath - II	138.178	56	5.086	2.700	7.786
28	Sarkunda PRF	6434.641	115	11.500	53.000	64.500
29	Bhabanipahar PRF	1473.087	31	3.470	13.000	16.470
30	Gonua PRF	466.467	93	13.544	0.000	13.544
31	Khajurdihi PRF	3474.301	285	45.341	9.000	54.341
32	Mendamaruni - I	1800.890	159	16.049	4.500	20.549
33	Mendhamaruni - II	416.479	100	6.383	6.500	12.883
34	Rakshi PRF	80.938	43	6.833	0.000	6.833
35	Toda - I PRF	38.446	19	2.012	0.500	2.512
36	Toda - II PRF	60.704	50	4.004	0.250	4.254
37	Toda - III PRF	225.820	81	12.258	0.000	12.258
38	Toda - IV PRF	139.619	18	0.781	2.500	3.281
39	Toda - V PRF	4.856	4	0.300	0.200	0.500
40	Kathmal PRF	213.678	78	6.654	3.000	9.654
41	Soyamba PRF	23.957	35	3.600	0.100	3.700
Total of Bonai Division:-		34105.896	4953	552.048	226.131	778.179
N.B.:- Common boundary with RF:- 168.131 Kms.						
Common boundary with PRF:- 58.000 Kms.						
Total:- 226.131 Kms.						
Source : O/o the Divisional Forest Officer, Bonai Division						

Status of Boundary Pillars

Present status of boundary pillars of RFs & PRFs have been verified and status of pillars is given in the table 2.3.1.3. The damaged pillars need to be repaired and in case of missing pillars, new pillars need to be posted & numbered accordingly.

Table 2.3.1.3 Status of Boundary Pillars

Sl. No.	Name of the RF	Total numbers of Pillars as notified	Status of Boundary Pillars		
			Good	Damaged	Missing
Reserve Forests (RFs)					
1	Budhapahad RF	100	45	40	15
2	Dandpat (East) RF	54	24	22	8
3	Dandpat (West) RF	127	58	51	18
4	Dharanidharpali RF	103	47	41	15
5	Gogua RF	47	21	19	7
6	Hulku RF	10	5	4	1
7	Baghiakucha RF	33	15	13	5
8	Baliatota RF	24	11	10	3
9	Bonarai RF	20	9	8	3
10	Chandiposh RF	28	13	11	4
11	Jankinagar RF	73	33	29	11
12	Kello-B RF	97	44	39	14
13	Kendrikela RF	81	37	33	11
14	Sinduria RF	128	58	51	19
15	Talita RF	27	12	11	4
16	Sundhikon RF	33	15	13	5
17	Amrudi RF	274	124	110	40

18	Lunga RF	710	322	285	103
19	Kundheibira RF	61	28	24	9
20	Mahulpada RF	253	115	102	36
21	Ulsura RF	250	113	100	37
22	Balia RF	201	91	81	29
23	Raipiri RF	333	151	134	48
24	Majurdimia RF	249	113	100	36
25	Kello A RF	200	91	80	29
26	Kantamunda RF	292	132	117	43
27	Balai RF	323	146	130	47
28	Jada RF	160	73	64	23
29	Sirgida RF	395	179	159	57
30	Kunjar RF	291	132	117	42
31	Solguda RF	250	113	100	37
32	Rushimath RF	305	138	122	45
33	Dhenkiam RF	502	228	202	72
34	Gurundia RF	145	66	58	21
35	Kusumdihi RF	343	156	138	49
36	Toda RF	735	333	295	107
37	Khajurdihi RF	171	78	69	24
38	Sarkunda RF	173	78	69	26
39	Khandadhar RF	74	34	30	10
40	Mendhamaruni RF	145	66	58	21
41	Bhabanipahar RF	58	26	23	9
42	Kathmal RF	37	17	15	5
43	Rakshi-I RF	174	79	70	25
44	Rakshi-II RF	112	51	45	16
45	Karo RF	156	71	63	22
Total :-		8357	3791	3355	1211
Proposed Reserved Forests (PRFs)					
1	Bandhabhuin-Bhadimara	265	120	106	39
2	Budhapahar (B)	128	58	51	19
3	Amurdii PRF	238	108	96	34
4	Budhapahar (A)	76	34	31	11
5	Talbahali-Barhaguda	114	52	46	16
6	Lunga PRF	64	29	26	9
7	Nagaria PRF	518	235	208	75
8	Khandadhar PRF	155	70	62	23
9	Majurdimia PRF	90	41	36	13
10	Kantamunda-I	165	75	66	24
11	Kantamunda-II	314	142	126	46
12	Raipiri - I & II	194	88	78	28
13	Kelo PRF	105	48	42	15
14	Balia - I & II	216	98	87	31
15	Mahuldihi - I & II	146	66	59	21
16	Sirgida PRF	39	18	16	5
17	Solguda PRF	32	15	13	4
18	Balai PRF	48	22	19	7
19	Jada PRF	63	29	25	9
20	Kusumdihi - I	83	38	33	12
21	Kusumdihi - II	116	53	47	16
22	Kusumdihi - III	120	54	48	18
23	Gurundia PRF	216	98	87	31
24	Nalaghati - Rajabasa	124	56	50	18

25	Dhenkiam - I PRF	81	37	33	11
26	Dhenkiam - II PRF	76	34	31	11
27	Rushimath - II	56	25	22	9
28	Sarkunda PRF	115	52	46	17
29	Bhabanipahar PRF	31	14	12	5
30	Gonua PRF	93	42	37	14
31	Khajurdihi PRF	285	129	114	42
32	Mendamaruni - I	159	72	64	23
33	Mendamaruni - II	100	45	40	15
34	Rakshi PRF	43	20	17	6
35	Toda - I PRF	19	9	8	2
36	Toda - II PRF	50	23	20	7
37	Toda - III PRF	81	37	33	11
38	Toda - IV PRF	18	8	7	3
39	Toda - V PRF	4	2	2	0
40	Kathmal PRF	78	35	31	12
41	Soyamba PRF	35	16	14	5
Total of Bonai Division:-		4953	2247	1989	717

Out of total 86 RF and PRF blocks, DGPS Survey in respect of 71 blocks have been completed leaving 15 blocks (1RF+14PRF) covering an area of 14,507.690 Ha. as per details given below in **Table 2.3.1.4.**

Table 2.3.1.4- Details of DGPS survey in Bonai Forest Division						
Category of forest	Total area in Ha. as per Notification.		Survey Completed.		Balance to be taken up.	
	No. of block	Area in Ha.	No. of block	Area in Ha.	No. of block	Area in Ha.
1	2	3	4	5	6	7
1. RF	45	1,02,894.567	44	1,01,132.447	1	1,762.120
2. PRF (u/s-4)	41	34,105.896	27	21,360.326	14	12,745.570
Total:-	81	1,37,000.463	71	1,22,492.773	15	14,507.690

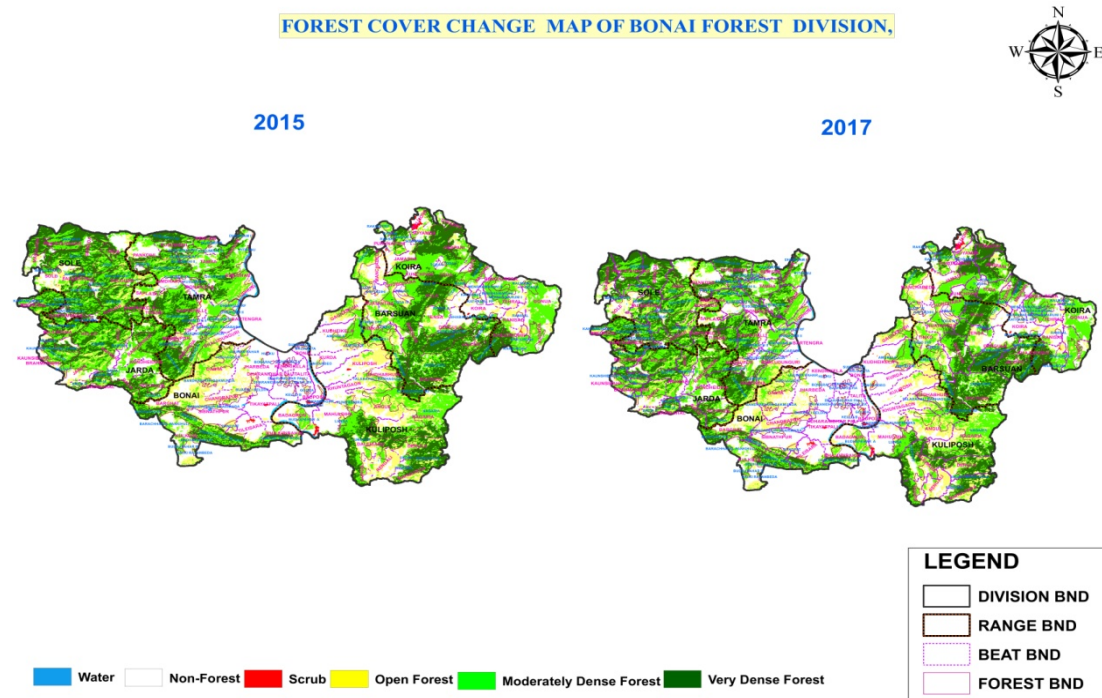
The length of boundary line as reported above may vary to some extent after completion of DGPS Survey of the rest of the RF and PRF blocks.

The length of common boundary of Reserved Forests and PRFs of Bonai Division with Jharkhand state is 18 Km, with Rourkela Division is 52 Km, Bamra Division is 16 Km, Deogarh Division is 56 Km and with Keonjhar Division is 56 Km. Boundary pillars and boundary lines are being maintained regularly basing on availability of funds.

2.4.Land Use, Land Use Change and Forestry (LULCF):

2.4.1: Forest Cover Change: While analyzing the change in forest cover during the year 2015 to 2017 for the whole of Bonai Forest Division, it is seen that there has been decrease of 379.99 ha of Very Dense Forest and the forest cover of the Division has also decreased 649.49 ha in the

category of Moderately Dense Forest. But the forest cover has increased to the extent of 213.42 ha in the category of Open Forest. In the category of Scrub Forest there has been increase of 40.18 ha.



The details of forest cover changes during 2015 to 2017 in Divisional level, and Range level are shown in **Table No.2.4.1.1& Table No. 2.4.1.2.**

Table No.2.4.1.1- Forest Cover change in Bonai Forest Division			
Type of Forest cover	Forest cover in 2015 (in ha)	Forest cover in 2017 (in ha)	Forest cover change between 2015 and 2017
Very dense forest	62708.57	62328.58	-379.99
Modrately dense forest	84968.50	84319.01	-649.49
Open forest	44270.99	44484.41	213.42
Scrub forest	704.96	745.15	40.18
Source : FSI report on Forest cover for 2015 & 2017			

Table No.2.4.1.2- Forest cover change in different Ranges of Bonai Forest Division				
Forest Range	Type of Forest cover	Forest cover in 2015 (in ha)	Forest cover in 2017 (in ha)	Forest cover change between 2015 and 2017
Barsuan	Very dense forest	13287.94	13230.90	-57.04
	Modrately dense forest	12389.05	12210.45	-178.60
	Open forest	5351.47	5154.48	-196.99
	Scrub forest	10.88	11.25	0.36
Bonai	Very dense forest	3086.58	3087.20	0.63
	Modrately dense forest	5638.03	5630.38	-7.65
	Open forest	9610.62	9630.43	19.81
	Scrub forest	246.03	271.08	25.05
Jarda	Very dense forest	9439.63	9416.08	-23.55
	Modrately dense forest	12542.76	12436.48	-106.28
	Open forest	3225.21	3378.35	153.14
	Scrub forest	0.13	0.17	0.05
Koirā	Very dense forest	6879.80	6886.86	7.07
	Modrately dense forest	13691.51	13579.79	-111.72
	Open forest	4384.28	4298.22	-86.07
	Scrub forest	258.60	258.89	0.29
Kuliposh	Very dense forest	7471.45	7311.25	-160.20
	Modrately dense forest	13539.73	13419.82	-119.91
	Open forest	13663.60	13766.77	103.17
	Scrub forest	168.09	184.17	16.07
Sole	Very dense forest	12634.58	12571.16	-63.42
	Modrately dense forest	10607.10	10539.95	-67.15
	Open forest	2756.48	2866.33	109.85
	Scrub forest	0.00	0.00	0.00
Tamra	Very dense forest	9854.60	9825.12	-29.48
	Modrately dense forest	16560.32	16502.13	-58.19
	Open forest	5279.33	5389.83	110.50
	Scrub forest	21.24	19.59	-1.65
Source : FSI report on Forest cover for 2015 & 2017				

2.4.2. Summary of changes occurred during the last plan period:

During the last plan period 6775.103 ha of forest area got diverted for non forestry purposes, for which compensatory afforestation has raised over an area of 5349.875 ha within this division and 2498.473 ha in other division areas. Also individual rights have got settled over 11,469.80 ha of forest lands, there also land use got changed. A total of 28.533 ha of forest land got diverted under provisions of FRA-2006.

Details of Forest area diverted under Forest Right Act, 2006 during the last Working Plan period has furnished in **Appendix-VII(e)**

Details of Forest area diverted under FC Act, 1980 during the last Working Plan period along with NFL/DFL provided for Compensatory Afforestation has furnished in **Appendix -VII(f)**

2.4.3 Mining leases and status of Diversion of Forest Land as per provisions under Forest (Conservation) Act, 1980:-

Some portions of the forests of Koira and Barsuan Range of Bonai Division are enriched with Iron and Manganese ores. The commercial exploitation of these minerals have been undergoing for last 7 to 8 decades. Forest (Conservation) Act'1980 came into force with effect from 25.10.1980. Hence, the present mining activities in forest lands are going on with due approval under Forest (Conservation) Act'1980 and Environmental (Protection) Act'1986. The position of mining leases of Bonai Forest Division with position of broken lands as on 31.3.2030 and its approval under F.C. Act'1980 are given below in table 2.4.3.

Table 2.4.3- Mining leases and and status of Diversion of Forest Land as per provisions under Forest (Conservation) Act’1980(as on 31.3.2020)			
Item	In case of mining with both Forest and non forest areas		In case of mining with non forest areas only.
1	2		3
(No. of Mining Leases	71		5
(b) Area covered under mining leases in Ha.	RF.	2,575.417 Ha.	NF... 84.747 Ha.
	PRF.	2,512.085 Ha.	
	DPF	NIL	
	Rev. F	1728.873 Ha.	
	DLC.	2,968.392 Ha.	
	Total: -	9,784.767 Ha.	
	NF.	1,913.2527 Ha.	
	G.Total:-	11,698.0197 Ha.	
(c) No. of cases where final approval obtained under Forest (Conservation) Act’1980.	34 Cases 6,397.780 Ha.		
(d) No. of cases where stage-I clearance issued and pending for final approval	9 Cases		
(e) Position of broken land as on 30.9.2015.	RF.....	410.137	
	PRF.....	403.688	
	KF.....	295.209	
	DLC.....	738.903	
	Total: -	1847.937	
	NF.....	90.752	
	G.Total:-	1938.689	

The Project wise details of forest areas under different category approved under Forest (Conservation) Act'1980 as on 31.03.2020 is enclosed vide Appendix-VII.

2.5. Threats to the Forest: Major threats to forests and wildlife of the Division can be listed as follows.

1. Illegal collection of Timber and firewood.
2. Encroachment of forest.
3. Grazing of cattle in forest.
4. Forest fire.
5. Insects.
6. Weeds and climber.
7. Drought, Flood and Cyclone.
8. Shifting cultivation. (Podu Cultivation)
9. Mining Activities.

2.5.1. Illegal collection of Timber and Firewood: The threat is caused due to the illegal collection of timber and firewood by the local people for their domestic and commercial use by cutting the young regenerations and established pole crops to collect fire wood. They remove the middle aged trees for timber. Even local people become connived with the timber smugglers. This practice is to be discouraged by making awareness among the villagers and strengthening of Vana Samrakshana Samiti under Joint Forest Management Resolution and by strengthening the protection measures.

2.5.2. Encroachment of Forest: Bonai Division is also having considerable area of forest land under active encroachment and shifting cultivation. A good portion of prime forest land having gentle slope, adjoining to the large settlement areas have been encroached for agricultural and homestead purpose. Some valley portions adjoining to perennial streams have been observed to be under active encroachment in the past. Quite a large portion of few PRF blocks especially in East Bonai was facing burning of forest areas for shifting cultivation. Such areas are either completely devoid of vegetation or sparsely covered with scrubby or bushy type of vegetation. But at present, the practice of

shifting cultivation in East Bonai has been reduced to some extent due to employment of the Tribal peoples in the mining works. All the old and abandoned areas that became degraded due to shifting cultivation are to be restocked on priority basis.

Apart from this, some portions of the RF blocks were also under active encroachment in the past. As per instructions of the PCCF, Odisha vide his Memo No.12000(65)/9F-II(Misc)1/2002 dt.5.6.2002, the position of Pre-80 and Post-80 encroachment areas was jointly verified by the Forest Department with the officials of Revenue Department during 2002-2003 and 2003-2004 and the position of encroachment are given below in table 2.5.2.

Table 2.5.2- Position of encroachment in Bonai Forest Division			
Category of Forests.	No. of encroacher	Area in Ha. under encroachments	Remarks
RF	NIL	NIL	
PRF (u/s-4)	33	18.495	
G.Total:-	33	18.495	

ABSTRACT

1.	Raipiri PRF	:-	12 Cases	=	5.688	Ha.
2.	Balia PRF	:-	9 Cases	=	6.357	Ha.
3.	Kello PRF	:-	5 Cases	=	2.913	Ha.
4.	Majurdima-B PRF	:-	1 Cases	=	0.607	Ha.
5.	Khandadhar PRF	:-	6 Cases	=	2.93	Ha.
Total :-					18.495	Ha.

The encroachment areas of 18.495 ha. has been allotted to Plantation Working Circle for its management in the present working plan. But Plantation in the above areas can be taken up subject to eviction of the Forest Lands from the encroachers.

2.5.3. Grazing of cattle in Forest: Forest blocks of Bonai Forest Division are vulnerable to grazing in view of the domestic animals of nearby habitations. Large herds of cattle, buffalos, goats, and ships are being kept by villagers for their domestic requirements. They let their domestic animals to graze in the forest. Such uncontrolled grazing and browsing in forest area is causing severe damage to forest vegetation. Due to grazing, the natural regeneration and young plantations get adversely affected. The incidences of heavy grazing are more in the forest area adjoining villages.

2.5.4. Forest Fire: Forest fire is a big threat to forest. During the period of dry weather i.e. March to middle of June this Division is prone to fire hazards. It burns the leaves and other debris lying on the forest floor. The forest fire and the destruction caused therein is a regular feature of this Division. Most of the forest fire occurrences in this Division are intentional and manmade. The forest fire destroys the micro organisms of the ground soil and thus reduces the fertility of soil to a great extent. It also destroys trees of lower diameter, poles, saplings, seedlings, grasses and fire prone species. Many a times, the wild fauna and birds are getting destroyed due to forest fire. The forest fire in the vicinity of the village areas occur mainly for collection of Mohua Flower and Kendu leaves.

2.5.5. Insects: Disease like dry rot is a fungal disease causing damage to the heart wood of Sal and other trees. The Sal heart wood borer (*Hoplocerambyx apinocornis*) is found in dead and diseased Sal trees and in unbarked logs. The green healthy trees are rarely attacked by these insects. Leaf defoliators cause damage to leaves of the trees by eating away the chlorophyll pigments in some tree species. *Loranthus* is a parasite causing diseases in different trees. Few Sal trees have noticed to have been affected by this parasite but incident and intensity is neither serious nor wide spread. Many fungi and parasitic plants have been found to affect the forest crop adversely. Different types of fungi attack the forest species. Damages occur due to stem borers, defoliators, skeletonizers and termite attack in the forest and stem borers are found in inferior Quality Sal Forest.

2.5.6. Weeds and Climbers: Forests of Bonai Forest Division are mainly of moist deciduous and dry deciduous types. Most of forest areas are infested with invasive weeds like *Lantana camara*, *Eupatorium species* which are most common. Due to this invasion of weeds the regeneration of tree species in the forest area is getting severely affected. The invasive weed attack is more in the PRF areas which were subjected to practice of shifting cultivation in the past. The growth of planted species is hindered by these invasive weeds in different plantation areas of Bonai Forest Division. In the weed affected forest area the growth of tree species are also affected. Movement of staff inside forest area becomes difficult to carry out different forestry operations due to invasion of weed growth.

2.5.7. Drought, Flood and Cyclone

This Division is not free from the ravages of natural calamities like floods, droughts and storms. Almost every year, the area is affected by cyclonic storms of varying intensity. The area also gets affected regularly by cyclonic storms and drought and floods in the River Brahmani and its tributaries. The area was severely affected by the Cyclone Phailin during October 2013 & Hudhud Cyclone during October 2014, which devastated the Forest growth and plantation of Division and also resulted in large scale uprooting of trees. During the cyclone a sizable number of birds and wild animals died whose numbers could not be assessed. Every year the Brahmani River passing through this Division gets flooded with rain water; as a result of which nearby areas are submerged which damage forest growth on either side of the river.

Drought also occurs in certain parts of the Division in view of scanty rain fall during rainy season. In the peak summer months the water source in the forest dries up and water scarcity is found in hilly area except in some perennial streams. The Koira plateau is subject to extreme heat, and damage to forest vegetation may occur in the period of extreme drought. In view of scarcity of water, the wild animals run to the nearby habitation in search of water and become easy prey for poachers. Frost occurs in Koira Plateau and in Kunjar hills but the duration is limited to few days in the winter season. It is not severe enough to cause any substantial damage to the forest crop.

2.5.8. Shifting Cultivation. (Podu Cultivation) :In the past a good proportion of forest having luxuriant forest growth was damaged and eventually lost, especially in East Bonai by tribals due to their pernicious practice of Shifting cultivation. A good proportion of Reserved Forest area of East Bonai was subjected to shifting cultivation. The distinct features of this practice were the rotation of fields rather than the rotation of crops and slash burning method. Under this practice, patches of forest on hills having moderate slopes used to be cleared by slash and burn method and afterwards without ploughing the ground seeds of pulses, maize, rice etc. used to be sown. After cultivating for two to three years, such cleared patches used to be abandoned by the tribals due to loss of fertility and afterwards they used to switch over to new areas.

Tribes used to return to old cleared patches after a gap of 20 to 30 years for re-cultivation purpose. This practice was confined to portions of hills having moderate slope, flat top of hill and valley portions. Gradually this pernicious practice was abandoned in the Reserved Forest areas. The secondary growth of even aged crop of almost pure Sal in most of the area of East Bonai is probably the consequence of such practice. Though at present such practice does not exist in Reserved Forests of East Bonai, it is being noticed in many PRF blocks viz;-Nagaria PRF, Sarkunda PRF, Khajurdihi PRF, Khandadhar PRF, Mendhamaruni PRF, Bhabanipahar PRF, etc and is causing severe damage to the forest vegetation of Bonai Forest Division adversely. Shifting cultivation was however, not being practiced extensively in West Bonai. To arrest such degradation of forest and ecology, consistent efforts are to be made for creating awareness among the local inhabitants about the importance of forest and its impact on their livelihood. At the same time man power and infrastructure facilities are to be improved to check the biotic interference.

2.5.9. Mining Activities: Forests of Koira and Barsuan Range are having luxuriant Sal crop. Due to presence of Iron ores and Manganese ores, a number of permitted mining activities are going on inside forest area for supply of raw materials to different Steel Plants. This results in damage to forest vegetation and breaking of forest land.

2.6. Distribution of different Forest Types:

Bonai Division is mainly an isolated hilly tract and lies within the tropical zone. It is situated at a fairly good distance from sea and for that reason the vegetation is practically free from its direct influence. The altitude of the area varies from 152m in plains to 903m in Koira plateau. The terrain is rugged and has continuous hill ranges interspersed with small pockets of level lands and valleys. The climate is characterized by hot dry and prolonged summer season with short and mild winter season.

The average rainfall of the area is about 1500 mm. and most of it is concentrated to monsoon months only. The occurrence of frost is rare and is of localized nature. Therefore, the entire area comes within the **Northern Tropical Moist**

Deciduous Zone. But due to the factors like poor moisture retaining capacity of soil, regular incidence of annual fire and low depth of soil on the hills, some of the localities like hill tops and exposed slopes contain a poor and dry type of vegetation. The main types of forest embracing the major parts of the Division are the **Moist Peninsular Sal**, the **Dry Peninsular Sal** and the **Dry Mixed Deciduous Forest**.

Forests of this Division can be classified under the following types and subtypes in the lines of classification adopted by Champion and Seth.

1. Sub- group 3C- North Indian Tropical Moist Deciduous Forests.

Type: 3C/C2- Moist peninsular Sal

Subtype: 3C/C2e (i) Moist peninsular High Level Sal.

3C/C2e (ii) Moist peninsular Low Level Sal.

3C/C2e (iii) Moist peninsular Valleys Sal.

2. Sub- group 5B- Northern Tropical Dry Deciduous Forests.

(i) Type: 5B/C1- Dry Sal Bearing Forests

Subtype: 5B/C1 (e)- Dry peninsular Sal Forests

(ii) 5B/C2- Northern Dry Mixed Deciduous Forests..

(iii) 5/E 9- Dry Bamboo Brake.

3. Sub- group 2B- Northern Tropical semi Evergreen Forests.

Type 2B/C3- Orissa Tropical Semi Evergreen Forests.

4. Terminalia tomentosa Forests 3/1 E.

Tropical semi-evergreen type of forests corresponding to 2 B/C3 is found along the banks of perennial streams in East Bonai and pure patches of Terminalia tomentosa and Anogeissus latifolia are also found in small patches but their extent is very small.

The description of each type and Sub-type and its distribution is given below:-

Moist Peninsular Sal- Type 3C/C2e : This type of Sal Forests occur in the forest blocks of Toda, Karo, Sarkunda, Khajurdihi, Kathmal and Lunga of East Bonai and in the valleys and pockets of forest blocks of Raipiri, Kelo, Kunjar, Majurdima, Jada, Sulguda and Balai of West Bonai. Though, it is at its best in the sheltered valleys having deep sandy loam type of soil with adequate moisture content but it also ascends up to the upper slopes, ridges and flat top of hills provided soil is drained and deep loam. The quality of Sal varies from quality-II to quality-IV depending upon the type, depth and texture of soil and availability of moisture.

High Level Sal – Sub type 3C/C2 e (i) : This sub-type is confined to the upper slopes, ridges and flat tops of hills of the forest blocks of Toda, Lunga and Khajurdihi. These areas are having mostly crystalline and laterite type of rocks. The quality of Sal is usually IV but the crop is somewhat open.

Low Level Sal- Sub type 3C/C2 e (ii): This sub-type is fairly extensive in the lower and middle slopes of hills of all important forest blocks in the Koira plateau viz. Karo, Sarkunda, Toda, Kahjurdihi, Kathmal. It is also prevalent in the moist valleys lying in the southern portions of west Bonai. The underlying rocks are laterite or crystalline and soil is deep loam or alluvium and supports a magnificent crop of Sal, the quality is in general III.

Valley Sal-sub type 3C/C2/e (iii) : This sub-type is confined to the moist valleys of forest blocks of Toda, Sarkunda, Karo and Lunga of East Bonai only. The best Sal forests of this Division are found under this subtype. In some localities, sound Sal trees having height more than 30m are also seen. The growth of Sal is good attaining quality-II in general and even quality-I in few favourable localities. The density varies from 0.6 to 0.8. The stocking of crop is full and Sal constitutes 75 to 90 % of the standing crop.

Dry Peninsular Sal Forests- Subtype 5B/C1 (e) :This sub-type covers the largest area of the Division and is found extensively in all forest blocks of West Bonai and in Rakshi area of East Bonai. Forest under this subtype occurs on shallow soils derived usually from crystalline and metamorphic rocks. These types of soil are having poor moisture retention capacity and are not suitable for the development of moist Sal forests. Forest of this sub-type occupies entire portions of hills excepting the ridges and steep slopes where there is predominance of mixed miscellaneous forests and the moist valleys and level plains where forest type corresponds to moist Sal (low level) forest. Through, the area receives good rainfall which is adequate for the growth of moist sal but the factors like low moisture retention capacity of soil, occurrence of repeated annual fires contributing to more and more drier conditions etc. have caused the establishment of this type of forests. Sal is the dominant species forming 50 to 79% of standing crop. The quality of Sal is poor varying from Quality-IV to Quality-V. The quality of Sal is generally Quality-V over a considerable area, especially on upper slopes and hill summits, where the soil is quite shallow but in the valleys and lower slopes there are extensive areas of Quality-IV. In the areas adjoining to perennial streams where the soil is of good depth and water table is not low, small strips of Quality-III Sal is also available.

Northern Dry Mixed Deciduous Forests 5B/C2: The extent of this type of miscellaneous forest is small and confined to the exposed localities having southern aspect. Terrain under this type is having fairly steep slope with rocky out crops. Here, Sal is either absent or confined to pockets of deeper soil. The crop is open with poor and stunted growth of trees.

Dry Bamboo Breaks 5/E9: Salia Bamboo (*Dendrocalums strictus*) is having its luxuriant growth in the upper slopes of hills of the forest blocks of West Bonai. Patches of these bamboos are also found within the areas of mixed forests where soil is too shallow to allow the growth of tree species. In the RF blocks of Mahulpada, Salia bamboo has come up as pure crop specifically in the areas which were subjected to shifting cultivation in the past. But the quality of bamboo in these areas is not good as culms are thin and short and clumps are small.

Orissa Tropical Semi-evergreen Forests-type 2B/C3: The extent of this type of semi-evergreen forests is limited and confined to small strips adjoining to the perennial streams in East Bonai. This type is post climax to the moist deciduous forests and evergreen species have come up due to favourable conditions.

Terminalia Tomentosa Forests-type 3/E1: In small pockets of deep soil and on clay alluvium patches in the forest blocks of Toda and Sarkunda, almost pure Terminalia tomentosa forests have come up. Sal is not able to come up here due to adverse edaphic factors.

Anogeissus Latifolia Forests: Small and fairly pure patches of Anogeissus latifolia occur within the moist Sal forests in Toda and Karo forest blocks of East Bonai. Their occurrence can be attributed to local edaphic variation. These patches of Anogeissus latifolia usually occurs at hill tops and stand conspicuously as they are surrounded on all sides by pure Sal forests.

2.7. Tree cover outside Forest area: Trees outside forests (TOF) are located on the lands other than forests, including agricultural lands (e.g. agro-forestry systems, farm forestry, industrial plantations, hedgerows, woodlots), built-up areas such as settlements and infrastructure (e.g. street trees, parks and other urban tree systems) and bare lands (e.g. dunes, both abandoned and accomplished mining sites). Due to non availability of remote sensing map plot description, enumeration for areas outside forests have not been taken up during field work for assessment of potential for forestry outside forests as part of sustainable land use management at landscape level within the forest Division. The focus of forestry outside forest area is on production forestry, revitalization of rural economy and expanding economic opportunities through innovations.

2.7.1: Trees outside forests are located on the agricultural lands, institutional premises, road side Avenue Plantation etc. Some people are also involved in tree plantation of commercial species in their unproductive land. Free distribution of seedlings under farm forestry is made to the people/institution of this Division in each year. Seedlings

are supplied to the mine owners in each year on payment of cost to take up plantation in & outside the lease area as well as in abandoned and dump yards. The details of seedling supplied to various mines and industries during the period from 2011-12 to 2019-20 is furnished below in table 2.7.1.

Table 2.7.1- Year wise Seedlings supplied to sponge industries/ Mines owner/ VSS	
Year	No. of seedlings supplied
2011-12	4,10,035
2012-13	3,12,803
2013-14	3,62,275
2014-15	1,23,150
2015-16	1,83,600
2016-17	5,62,200
2017-18	2,67,074
2018-19	1,73,331
2019-20	6,81,860
2020-21	15,63,061

Avenue Plantation on both sides of different roads of this Division have been taken up under different schemes and the position of plantation during last 5 (Five) years is furnished below in table 2.7.2.

Table 2.7.2.- Details of Avenue plantation	
Year	Area covered (in RKM)
2010-11	6 RKM
2011-12	20 RKM
2012-13	40 RKM
2013-14	100 RKM
2014-15	120 RKM
2015-16	80 RKM

2016-17	66 RKM
2017-18	51 RKM
2018-19	25 RKM
2019-20	110 RKM
2020-21	110 RKM
Total:-	728 RKM

Apart from this, plantation in various mode have been taken up in Revenue and other Non-Forest lands over 14845.3 ha.

Suggestion for plantation outside forest areas.

- (a) The VSSs/JFMCs shall be motivated for plantation in and around the village over the non-forest areas.
- (b) Eco-clubs in all schools and colleges shall be motivated to take up tree plantation within their premises.
- (c) There is provision to give award to best Gram Panchayat / Institution as well as individual for outstanding work in tree planting etc. under Prakruti Mitra and Prakruti Bandhu and cash prize of Rs.10,000/- and Rs.5,000/- being given to the awardees respectively. The prize amount may be enhanced to popularize the schemes ultimately better result can be obtained in plantation.
- (d) Plantation on both sides of NH and all the major village roads are to be done in a planned manner.

CHAPTER –3

MAINTENANCE, CONSERVATION AND ENHANCEMENT OF BIODIVERSITY:

3.1. Forest Composition and Distribution:

3.1.1. In order to conduct vegetation survey and to prepare forest inventory of Bonai Forest Division, 900 nos of sample points of 0.1 ha. area have been selected on Stratified Random Sampling and provided by NRSC through ORSAC. While traversing in compartment to approach observational assessment of site quality, tree species composition, its health, density and crop age have been made and recorded in Plot Approach Form. Crop composition has also been recorded over 2 ha. area around the center of sample point at radius of 80 mtr and recorded in Plot Description Form for compartment description. All tree species having girth 30 cms and above have been enumerated in the 0.1 ha. plot and recorded in Plot Enumeration Form. From the vegetation survey and forest inventory, important trees and other species found in the Division are *Shorea robusta*, *Terminalia tomentosa*, *Terminalia bellerica*, *Bombax malabaricum*, *Eugenia jambolana*, *Ougeinia dalbergiodes*, *Anogeissus latifolia*, *Pterocarpus marsupium*, *Terminalia chebula*, *Tectona grandis*, *Tamarindus indica*, *Spondias pinnata*, *Madhuca latifolia*, *Syzygium cumini*, *Albizia chinensis*, *Smilax macrophylla*, *Diospyros melanoxylon*, *Lagerstomea parviflora*, *Bauhinia valie*, *Aegle marmelos*, etc. The average rainfall of the area is about 1500 mm. and most of it is concentrated to monsoon months only. The occurrence of frost is rare and is of localized nature. Therefore, the entire area comes within the Northern Tropical Moist Deciduous Zone. But due to the factors like poor moisture retaining capacity of soil, regular incidence of annual fire and low depth of soil on the hills, some of the localities like hill tops and exposed slopes contain a poor and dry type of vegetation. Main types of forest embracing major parts of the Division are the Moist Peninsular Sal, the Dry Peninsular Sal and the Dry Mixed Deciduous Forest.

3.1.2. Bonai Division is mainly an isolated hilly tract and lies within the tropical zone. It is situated at a fairly good distance from sea and for that reason the vegetation

is practically free from its direct influence. The altitude of the area varies from 152m in plains to 903m in Koirā plateau. The terrain is rugged and has continuous hill ranges interspersed with small pockets of level lands and valleys. The climate is characterized by hot, dry and prolonged summer season with short and mild winter season. The average rainfall of the area is about 1500 mm. and most of it is concentrated to monsoon months only. The occurrence of frost is rare and is of localized nature. Therefore, the entire area comes within the **Northern Tropical Moist Deciduous Zone**. But due to the factors like poor moisture retaining capacity of soil, regular incidence of annual fire and low depth of soil on the hills, some of the localities like hill tops and exposed slopes contain a poor and dry type of vegetation. The main types of forest embracing the major parts of the Division are the **Moist Peninsular Sal**, the **Dry Peninsular Sal** and the **Dry Mixed Deciduous Forest**.

3.1.3. The prevailing vegetation is of mixed type with Sal as the principal species. It occurs as a dominant species both in moist and dry region of this Division and is also economically most important species. At many places, both in plain and hilly terrain, it forms almost pure or nearly pure crop. Though in most of the hills it ascends to the top, it is at its best in the valleys having deep loamy soil. The quality of Sal and its associates varies from All India QII to Q V depending upon type and depth of soil, aspect, moisture content of soil, altitude etc. Forests of Bonai Division are well stocked with trees of varying girth classes except areas maintained under coppice system in the past which had already been degraded to a great extent and are bearing trees predominantly of smaller girth classes. Natural regeneration in most of these areas is satisfactory but the establishment of seedlings is very poor mainly due to occurrence of repeated annual fire and heavy biotic pressure.

3.1.4. Soil in East Bonai is derived mostly from phyllites shales (near Koirā plateau and Toda villages) and from epidiorite and hematite in other areas, whereas in west Bonai soil is primarily derived from parent rocks of quartzite and quartz-schist and is relatively dry and infertile in nature. Due to these factors and probably due to some differences in rainfall, Sal forests of East Bonai and West Bonai are distinctly different from quality composition and forest type point of view. Considerable areas of forests in

East Bonai especially, in the R.F. blocks of Toda, Karo, Sarkunda and Lunga and few pockets in the PRF blocks of Nagaria and Sarkunda contain a very fine quality Sal forests corresponding to that available in Saranda forests of Jharkhand State. Here, the quality II and quality III are found in the valleys and in the lower slopes of hills having rich and well drained soil while quality IV Sal is found towards the top of hills. Drier and poorer type of Sal forests, generally of quality IV, occurs in most of the areas of West Bonai except in some valleys and moist packets of forest blocks of Kunjar, Majurdima, Kantamunda and Raipiri where Sal Forest conforms to quality III.

3.1.5. In the RF blocks of Rakshi, Rushimath, Gurundia and Dhenkiam, the forest crop is much inferior in the northern half in comparison to southern half as trees are not capable of growing to big sizes and unsoundness develops at early age. For a long time, sizable portions of PRF blocks of Nagaria, Sarkunda, Khajurdihi, Toda, Mendhamaruni, Khandadhar etc. of East Bonai have been used in shifting cultivation. This pernicious practice is still continuing and has already caused severe devastation of valuable forests of these areas. All such areas of above PRF blocks which were subjected to shifting cultivation in the distant and recent past are either covered with stunted pole size growth of coppice origin or are heavily infested with weeds and grasses.

3.1.6. Dry Peninsular Sal Forests covers the largest area of the Division and is found extensively in all forest blocks of West Bonai and in Rakshi area of East Bonai. Moist Peninsular Sal Forests occur in the forest blocks of Toda, Karo, Sarkunda, Khajurdihi, Kathmal and Lunga of East Bonai and in the valleys and pockets of forest blocks of Raipiri, Kelo, Kunjar, Majurdima, Jada, Sulguda and Balai of West Bonai. High Level Sal forest are confined to the upper slopes, ridges and flat tops of hills of the forest blocks of Toda, Lunga and Khajurdihi. Low Level Sal present in the lower and middle slopes of hills of all important forest blocks in the Koirā plateau viz. Karo, Sarkunda, Toda, Khajurdihi, and Kathmal. It is also prevalent in the moist valleys lying in the southern portions of west Bonai. Valley Sal forests form the vegetation in moist valleys of forest blocks of Toda, Sarkunda, Karo and Lunga of East Bonai only. The best Sal forests of this Division are found under this subtype Northern Dry Mixed Deciduous

Forests of miscellaneous type is confined to the exposed localities having southern aspect. Odisha Tropical Semi-evergreen Forests-type 2B/C3 is limited and confined to small strips adjoining to the perennial streams in East Bonai. In small pockets of deep soil and on clay alluvium patches in the forest blocks of Toda and Sarkunda, almost pure TerminaliaTomentosa Forests-type 3/E1 are existing.

3.2. Plant Species Diversity:

3.2.1 Plant Species diversity is the variety in number and richness of the species of a region. Species richness is the number of species per unit area & species evenness is the number of individual of the different species. Plant diversity is the product of both species richness & evenness. In the expired Revised Working Plan, comprehensive study of plant species diversity in different forest blocks have not been provided. In the present Revised Working Plan exercise, plant species diversity have been assessed for all the forest blocks of Bonai Division by taking inventory of forest resource in stratified random sampling of 0.1 ha. area and details of which is given in Appendix –II A.

3.2.2.The contribution of individual species to the overall diversity within a community or ecosystem varies to a great extent. The coexistence of organisms that differ widely from each other contributes more to overall diversity than the coexistence of very similar species. Functional diversity is considered to be one of the main factors determining the long term stability of an ecosystem and its ability to recover from major disturbances. Assessment of status of floral and faunal species and their periodic monitoring can be helpful in formulating strategies for conservation, maintenance and enhancement of overall biodiversity through sustainable management land use practices.

3.2.3. Stability of a forest is directly proportional to the biodiversity it harbours. Hence, biodiversity study of forest areas is a necessity, while planning its protection & management. The National Working Plan Code 2014 has also given emphasis on the need of biodiversity survey while preparing the working plan. As per

the new code, detail enumeration is to be carried out on the sample plots over 0.1 ha. Data collected during the enumeration of growing stock such as the number of individual of each species and the DBH of each tree are utilized to derive secondary attributes like basal area (BA, m²/ha), density (D, trees per ha) and frequency (F, number of quadrates which are present in relation to total plots observed). Relative value of BA, D and F will be calculated. The Importance Value Index (IVI) is calculated by adding up Relative Dominance (RBAF), Relative Density (RD) and Relative Frequency (RF). However, in case of shrubs, herbs, saplings and for regeneration, the IVI is calculated on the basis of relative values, i.e. relative frequency and relative density. It is assumed that the dominance of the species increases with an increasing important value and that the species with lowest importance value is the least important one. The maximum IVI value is 300 (100 each for RBA, RD and RF). Basal area and density of the tree species should be converted to ha basis. To estimate the stand structure, all tree species should be grouped under different DBH classes. The total number of individuals belonging to each DBH class should be calculated for each species for each site.

$$D_s = \frac{\text{Total number of individuals of a species}}{\text{Total area of quadrates studied}}$$

$$F_s (\%) = \frac{\text{Number of quadrates in which a species occurs}}{\text{Total area of quadrates studied}} \times 100$$

$$RF_s (\%) = \frac{\text{Density } (D_s) \text{ of a species}}{\text{Total density of all species}} \times 100$$

$$RBAF_s (\%) = \frac{\text{Total basal area of a species}}{\text{Total basal area of all species}} \times 100$$

$$IVI_s = RD_s + RF_s + RBAF_s$$

(where 's' denotes a particular species for which these variables are calculated)

3.2.4. Species diversity is an expression of community structure and is unique to the community. The number of species in a community is referred to as species richness when topography of the compartment is homogeneous. The relative abundance of all species is called evenness. Species diversity includes both species

richness and evenness. A community demonstrates a high species diversity if equally or nearly equally abundant species are present. Communities with a large number of species that are evenly distributed/populated are the most diverse and communities with few species, or if only a few species are abundant, then the species diversity is low. Species diversity indices like Shannon-Wiener Index (H') and Simpson's Index (λ) are calculated separately for trees, shrubs and herbs and their individuals differ in size and are sampled differently. Similarly index (community co-efficient) is calculated for determining the number of species which are shared among the sites to assess the extent of variation in the species composition. The details of plants species diversity in terms of density, frequency, total basal cover, dominance, IVI have been assessed and is given in **Appendix IIB**

3.3. Status of Biodiversity Conservation in Forests:-

A total of 232 species of plants have got recorded during the recently conducted biodiversity study, which includes 37 species of climbers, 41 species of shrubs, 39 species of herbs and 13 species of grasses. Weed infestation has caused major problems for the forest ecosystem in the division. These plants, often exotics species, grow aggressively and cause changes in the habitat. A study in 2015 (Chowdhuryetal 2015) had recorded 3 major weeds from the area i.e. *Parthenium hysterophorus*, *hromolaenaodorata* and *Lantanacamara*. At present, Bonai forest ecosystem is facing threats from the rapid proliferation of *Chromolaenaodorata*. Expansion of weeds and their highly fluctuating biomass pose threats to habitats of fauna and native vegetation. Steps need to be taken to check the ingress of *Chromolaena odorata* into the areas which are still free from it. The role played by native vegetation of the region in maintaining ecological functioning need to be studied and to be incorporated in division management. Regular monitoring of vegetation change, invasive species extension and its effect on native species need to be done. Bonai has a mosaic of habitat that is responsible for a rich avifauna. There is a need to monitor these habitats for long-term protection and conservation of various groups of flora and fauna in the area.

3.3.2. The faunal diversity of Bonai Forest Division consists of 31 species of dragonflies, 25 species of damselflies, 136 species of butterflies, 31 species of fishes, 18 species of amphibians, 21 species of snakes, 17 species of lizards, 1 species of turtle, 173 species of birds and 39 species of mammals. Bonai Forest Division represents a high avifaunal diversity. The high richness of birds in Bonai Forest Division can be attributed to the high habitat heterogeneity of inland, aquatic and terrestrial habitats in the division. This variety of habitat attracts and support variety of bird species. The study area has a fair diversity of fruiting trees and shrubs and is rich in the diversity and abundance of insects, which provide food to the variety of bird species. Although many of the birds of the study area were insectivores, food competition was reduced by the utilization of different habitat types, feeding behavior, and food items. The presence of Brahmani River in the study area creates a reasonable habitat for waterbirds. This addition of waterbirds to the overall numbers favorably contributed to the bird diversification in the area.

3.3.3. Brahmani River and other water bodies in the division area have identified as diverse habitat for a wide variety of indigenous fish species. The fish fauna of the Brahmani River is relatively less threatened by human activities, even though some stretches of the river are affected to a minor degree by pollution by sewage and agricultural activities. The major threats affecting amphibian and reptile diversity are habitat loss and forest degradation.

3.3.4. With the aim of conservation of biodiversity, which the forests of this division harbour, various protection and management activities are being practiced in the division. Reducing the over dependency on forest resources by human is very important. The illicit felling, poaching and other forest offences are being controlled properly through strict patrolling and enforcement activities. Improvement of manpower through engagement of protection squad, strengthening communication facilities and other infrastructural requirements, capacity building of staff etc are some among these measures. Regular monitoring is another important requirement while managing natural resources. Wildlife Censuses (population estimations) and biodiversity studies have been carried out during the last working plan period. Lack of

awareness among local forest dependent community is one of the major challenges in the field of biodiversity conservation. In order to tackle this issue, joint forest management activities in lines of JFM resolutions issued by Government of Odisha are being implemented, through local level institutions, called “Van Sanrakshan Samitis (VSS)”. A lot of awareness programmes are also being conducted in this regard.

3.3.5. Wildlife Habitat management activities to ensure habitat requirements of various wild animals through proper Soil and Moisture Conservation Works, creation of water bodies, development of meadows etc. are another set of activities executing in this regard. In order to check the impact of developmental activities viz. mining on the biodiversity, site specific wildlife conservation plans are getting planned and executed with the necessary approval of Chief Wildlife Warden of Odisha. While planning, extraction of forest resources such as Timber and NTFPs, a conservation oriented approach is being followed. All felling activities are being planned by following strict silvicultural principles in which the chances of permanent gap in the canopy is being discouraged and opportunity for new regeneration is being encouraged. Immediately, after coupe working, subsidiary silvicultural operations are being carried out for maintaining the functionality of the forest without any deviation.

3.3.6. Protection & Management of biodiversity outside the recorded forest area is another challenge. In order to achieve this, provisions of Biological Diversity Act, 2002 are being followed. Attempts are under progress to prepare Biodiversity registers for all Grama Panchayats coming under this division. Sacred groves are characterized by the excellent biodiversity within small area. A study on protection and conservation of Sacred Groves of Bonai Forest Division except Koiria Range has been taken up during 2011-12 by Center for Biodiversity Conservation, Barmunda, Bhubaneswar, funded by Odisha Forestry Sector Development Project (OFSDP). A total 106 Nos of Sacred Groves covering an area of 22.2368 ha. have been identified for the purpose. The details of Range-wise position are furnished in the table 3.3.6.

Table. 3.3.6: Range wise distribution of sacred groves in Bonai Forest Division.			
Sl. No.	Range	No. of Sacred Groves	Area in ha.
1	Bonai	24	4.1873
2	Jarda	14	4.1877
3	Sole	15	3.3057
4	Tamra	20	4.2486
5	Kuliposh	4	0.9386
6	Barsuan	29	5.3684
Total		106	22.2368
Source : O/o the Divisional Forest Officer, Bonai Division			

Total of 306 species of plants that includes 295 species of angiosperms (107 species of trees, 118 species of herbs, 14 species of shrubs, 47 species of climbers and 10 species of orchids) and 11 species of lower plants (4 lichens and 7 bryophytes) were recorded from these sacred groves. Similarly 41 species of fungi were also recorded from these entire groves. The faunal diversity in the sacred groves was represented by 26 species of mammals, 132 species of birds, 22 species of reptiles, 13 species of amphibians, 122 species of butterflies, 26 species of odonates, 27 species of arachnids, 31 species of other invertebrates. In total 14 species of rare, endangered and threatened plants were documented among all the groves as per their regional status.

The study highlights some important observations and recommendations to include sacred groves in policy level conservation planning. It is very important to uphold traditions and beliefs in order to protect and conserve these unique forest patches which represent the rich vegetation of the concerned area. Ecological services rendered by sacred groves needs to be highlighted and people should be aware to realize that the conservation of these groves are crucial for their sustenance.

Protection of the wide variety of flora and fauna identified in these sacred groves is being ensured through proper awareness and joint forest management activities now.

3.3.7. Milestones for People's Biodiversity Register Formulation and Access of Benefit Sharing Regulations:

Odisha Biodiversity Board is authorised 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, districts, 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 the level of local bodies. 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 manufacturers against the commercial collection of bio-resources under Access and Benefit Sharing Agreement (ABS) fees which is 3 to 5% of the ex-factory gross sale of the total value of the bio-resources. 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. The PBRs shall consist of detailed information on local biological resources and its associated traditional knowledge including flora fauna and agricultural diversity of the local areas for monitoring and evaluation.

The dynamic PBRs shall be completed at GP, Block, Urban Local bodies and District level with the technical guidance of Odisha Biodiversity Board and Technical Support Group (TSGs) by the BMCs coming under Bonai Division within a period of 5 years and the same shall be enriched every year after getting new information as and when comes from the traditional knowledge holders, users and other stakeholders related to uses of biological resources; both for livelihood and commercial.

3.4. Status of Species prone to over exploitation: Based on the biodiversity studies conducted in the year 2017 (by Sr. Kishore Kumar Mandal, Hon. Wildlife Warden, Mayurbhanj and Dr. Truptirekha Kar, researcher), sensitive species towards human activities in Bonai division, can be discussed as follows.

(a) Out of 136 species of butterflies recorded from the division area, 13 species are legally protected by Wildlife Protection Act, 1972, i.e. *Atrophaneura hector*, *Chliaria othona* are protected under the Schedule - I, and *Euchrysops cnejus*, *Lampides boeticus*, *Rapala varuna*, *Spindasis lohita*, *Tanaecia lepidea*, *Hypolimnys misippus*, protected under the Schedule - II, and *Hyarotis adrastus*, *Euthalia lubentina*, *Appias libythea*, *Baoris farri*, *Euploeacore* under the Schedule IV. Presence of these scheduled species in the study area design at the area is rich in butterfly diversity and there is a crucial necessity to acclimatize conservation policies. Butterflies are very sensitive insects. A little change in environmental condition and habitat alteration can influence their distribution and abundance (Wynter-Blyth, 1957). Therefore, habitat fragmentation, vegetation loss, grazing pressure, human settlement or any other damaging activities are mainly responsible for loss of diversity of both butterflies and plants in the division area and must be regulated.

(b) Bonai Forest Division can be considered as a refuge for conservation of some indigenous species of the Odisha state. Fish fauna of the Brahmani River is relatively less threatened by human activities, even though some stretches of the river area affected to a minor degree by pollution by sewage and agricultural activities. There is an urgent need to focus attention for conservation and management of threatened fish species present in these rivers for saving from further endangerment.

(c) Major threats affecting amphibian and reptile diversity are habitat loss and forest degradation. As ectotherms, their daily activity and fitness directly depend on environmental conditions, and drastic shifts in environmental conditions caused by habitat modification could alter significantly their reproduction and survival performance. Contrary to large mammals, bats, and birds, the low agility of amphibians and reptiles will constrain their movements to other sites after habitat modification.

(d) Fair diversity of fugivorous and insectivorous birds is the characteristic of the avifaunal diversity of the division. The study area has a fair diversity of fruiting trees and shrubs and is rich in the diversity and abundance of insects, which provide food to the variety of bird species. Seasonal and perennial fruit bearing trees and plants such as *Ficus benghalensis*, *Ficus religiosa*, *Zizyphus* sp. etc. are common in this place. Utilization of forest areas for other land uses will increase the food competition and it may cause these bird species prone to population decline. Bird community composition within and between forest habitats is largely depended on the physical structure of the vegetation, the kinds of distribution of foraging substrate and the availability and abundances of insect resources, all of which are influenced by the species composition of the plant community. Maximum activities in the division area are found in the opening and the edge of the forest or near human habitation. Since birds prefer edge forest, which provided them with mixed habitats and the suitable perching points to capture the aerial prey and open areas to feed along, conservation efforts to be promoted to protect these patches.

(e) Tiger (*Panthera tigris*), which was reported from different areas of Bonai Forest Division until one and half decade ago, is now apparently absent here (Mishra 2000). Wild dog, Gaur, Sambar Deer, and Nilgai are some speices for which sufficient evidences are not there from the division area presently. Encounter rate of Spotted Deer (*Axis axis*) and Four Horned antelope (*Tetracerus quadricornis*) have reportedly shrunk locally over the last three decades.

(f) Over exploitation of major timber yielding species has not noticed, as its felling and conversion is being controlled by various Acts and rules. However, chances decline in population of various floral species, especially medicinal plant species cannot be neglected because of varying level of biotic pressure in the form of forest area fragmentation, fuelwood collection, agricultural expansion, collection of non-timber forest products, grazing of livestock, shifting cultivation and climate change.

3.5. Conservation of Genetic Resources:

3.5.1. Long-term conservation of forest genetic resources (FGR) is a corner stone of sustainable forest management. Through conservation and proper forest management, it is possible to maintain the evolutionary processes of species and the diversity of their genepools for use now and in the future. Traditionally, forest conservation has often been understood as a steady-state process, whose goal is to preserve natural forests in their original state. Forests, however, are dynamic systems. Human activities have modified forests and their biodiversity for millennia.

3.5.2. Among the different components of biodiversity, genetic diversity is the building block of the evolutionary process. Conservation of FGR, therefore, should accommodate evolutionary concepts to ensure continuous adaptation under changing environments. Several global and regional threats to forest ecosystems are contributing to profound changes in the patterns of distribution of tree genetic diversity. Global climate change is modifying the prevailing environmental conditions to which forests have adapted. Forest fragmentation, introduction of invasive species and atmospheric pollution also are having adverse effects on forests. Changes in land use will have a greater impact on the genetic resources of forests, and hence special attention need to be given to identify such resources and to conserve.

3.5.3 Eventhough, not much attempts have been done towards the identification of genetic resources in the division, in-situ conservation of wildlife is being practiced in the division by conserving and maintaining the habitat requirements for a wide variety of flora and fauna. Conservation of FGR is a multiphase process. Existing forest resources and the genetic diversity they contain provide a basis for conservation measures. The selection of priority species is one of the most important phases of the conservation process because future activities shall be based on priorities set in the planning phase. As soon as priority setting has been completed, genetic diversity must be assessed and located for subsequent conservation activities. The selection of conservation measures depends on how the objectives of a conservation programme are defined. These measures then provide a framework to implement practical conservation work. In co-

ordination with Silvicultural research wing of Odisha forest department or other reputed research institutions, attempts can be made in this line.

3.6. Fauna and their Habitats: Bonai Forest Division is rich in faunal diversity due to its unique biogeographical location, diversified climatic conditions and enormous eco-diversity. Recent biodiversity studies in the division area reveals that the faunal wealth of the forests of the division includes 31 species of dragonflies, 25 species of damselflies, 136 species of butterflies, 31 species of fishes, 18 species of amphibians, 21 species of snakes, 17 species of lizards, 1 species of turtle, 173 species of birds and 39 species of mammals.

3.6.1. Odonates and Butterflies:

3.6.1.1. 56 species including 31 species of dragon flies (Suborder: Anisoptera) belonging to 3 families and 25 species of damselflies (Sub order: Zygoptera) belonging to 5 families were recorded from the division. In case of Anisoptera, 31 species were recorded belonging to three families namely Gomphidae Aeshnidae and Libellulidae. In case of Zygoptera, 25 species were recorded belonging to five families namely: Calopterygidae, Chlorocyphidae, Coenagrionidae, Lestidae, and Platycnemididae. The highest diversity of odonates were recorded belonging to the family Libellulidae (46%), followed by Coenagrionidae (30%), Aeshnidae (5%), Platycnemididae (5%), Gomphidae (4%), Calopterygidae (4%), Chlorocyphidae (4%), Lestidae (2%). Among the dragonflies (Anisoptera) *Orthetrum Sabina*, *Rhyothemis variegata*, *Crocothemis servili* were the most common species, whereas among the damselflies *Ischnura senegalensis* and *Ceragrion coromandelianum* were common species.

3.6.1.2 A total of 136 species of butterflies belonging to five families were recorded in the study area. The most dominant family is Lycaenidae with 41 species (30.15%), followed by Nymphalidae (29.41%, 40 species), Hesperidae (19.11%, 26 species), Pieridae (12.5%, 17 species), Papilionidae (8.82%, 12 species). The dominance of Lycaenid and Nymphalid butterflies in the area might be due to the availability of host plants and nectaring plants, as the habitat association of butterflies can be directly related to the

availability of larvalhost plants, vegetation cover of herbs, shrubs and trees for nectarine.

List of damselflies, dragon flies and butterflies has furnished in Appendix XX.

3.6.2. Fishes: The Brahmani is the major river running through the territory of Bonai Forest Division. It has many tributaries in the form of hill streams all along its western and eastern bank within the Forest Division. Studies reveal the presence of 31 species of fishes belonging to 11 families in these water bodies. Cyprinidae has highest diversity with 16 species followed by Bagridae (3species), Mastacembelidae, Anabantidae, Channidae (2 species each); and Notopteridae, Cobitidae, Claridae, Belonidae, Synbranchidae and Balitoridae (one species each). Most of the fishes (27) that are recorded in the study area are Least Concern as per the Conservation Status according to IUCN (2014); while only 2 species recorded as Data Deficient (DD). Inventory of fishes of Bonai division has furnished in Appendix XX.

3.6.3: Herpetofauna

3.6.3.1 Amphibians : Eighteen species belonging 5 families of amphibians were recorded in total in Bonai Forest Division. Out of 18 species, 7 species belongs to Dicroglossidae family, followed by Microhylidae with 4 species, from Bufonidae with 3 species, from Racophoridae with 3 species and a single species from Ranidae. List of Ambhibians is attached in Appendix XX.

3.6.3.2. Reptiles : Reptiles were represented by 39 species from 13 families. In the study area, 21 species of snakes, 17 species of Lizards, and one species of Turtles were recorded. Highest eleven species were from family Colubridae, 5 species from families Gekkonidae and Scincidae, 4 species from family Elapidae, 3 species from Agamidae and Viperidae, 2 species from family Boidae, and 1 species from families Trionychidae, Chamaeleonidae, Varanidae and Typhlopidae. List of Reptiles is attached in Appendix XX.

3.6.4. Avifauna:

3.6.4.1 A total of 173 species of birds belonging to 54 families have got recorded from the division area. Studies reveals that Cuculidae family (9species) dominated the avian in this area, followed by Anatidae, Turdinae, Sylviinae (8speciaseach), Columbidae (7 species), Motacillidae (6 species), Strigidae, Muscicapinae, Sturnidae, Dicruridae (5 species each), Ardeidae, Phasianidae, Psittacidae, Caprimulgidae, Picidae, Alaudidae, Pycnonotidae, Timaliinae (4 species each), Falconidae, Turnicidae, Rallidae, Meropidae, Hirundinidae, Irenidae, Laniidae, Nectariniidae (3 species each), Jacanidae, Charadriidae, Scolopacidae, Apodidae, Aedinidae, Bucerotidae, Capitonidae, Monarchinae, Paridae, Dicaeidae, Estrildidae, Passerinae, and Oriolidae (2 species each) . Moreover, 13 families- Podicipedidae, Phalacrocoracidae, Threskiornithidae, Tytonidae, Coraciidae, Upupidae, Pittidae, Rhipidurinae, Sittidae, Zosteropidae, Ploceinae, and Artamidae-werepoorlyrepresented in the study area with a single species each (Fig.6.2). Among the avifauna of Bonai Forest Division, 141 (82%) are found to be residents, 32(18%) are found to be migrant including 23 (13%) wintervisitor, 6 (3%) summer visitor, and 3(2%) are passage visitors. .Further more analysis of avian abundance revealed that 82 (47.4%) species were common, 55 (31.8%) species were uncommon, 29(16.8%) were rare and 7 (4.05%) were occasional. Among the recorded species, 2 species were “globallythreatened” birds according to the International Union for Conservation of Nature (IUCN) Global Red List. All the remaining are in the Least Concern category.

3.6.4.2. The richness of birds in Bonai Forest Division can be attributed to the high habitat heterogeneity of both inland aquatic and terrestrial habitats here. The area lies in an important ecological zone of southern portion of Chotanagpur Plateau falling in the biogeographic zone of Deccan Peninsula having high Sal forests association in the region. The forest in this region is covered with variety of different habitats to which Sal are predominant. Therefore, a variety of habitats and environments of this sanctuary attract and support variety of bird species.

3.6.4.3 The area has a fair diversity of fruiting trees and shrubs and is rich in the diversity and abundance of insects, which provide food to the variety of bird species. Seasonal and perennial fruit bearing trees and plants such as *Ficus benghalensis*, *Ficus religiosa*, *Zizyphus* sp. etc. are common in this place. Maximum bird activities are found to be in the opening and the edge of the forest or near human habitation. Most of the species in the area were either insectivores or omnivores feeding largely on the ground in the open areas. Birds preferred the edge forest, which provided them with mixed habitats and the suitable perching points to capture the aerial prey and open areas to feed along.

3.6.4.4. The Brahmani River creates a reasonable habitat for water birds. This addition of water birds to the over all numbers favorably contributed to the bird diversification in the area. Migratory water birds such as Red-crested Pochard, Northern Pintail were found to be using the sweater bodies for foraging. Some resident water birds like Cormorants, Egrets and Herons inhabit in the river and waterbodies. These birds generally feed upon planktons, fishes, amphibians and invertebrates from reservoir. Birds such as Small Blue Kingfisher *Alcedo atthis*, White-breasted Kingfisher *Halcyon smyrnensis*, Small Bee-eater *Merops orientalis*, Common Swallow *Hirundo rustica*, Red-rumped Shallow *Hirundo daurica*, Paddyfield Pipit *Anthus rufus* and Wagtail species were generally present in all the habitats.

Inventory of birds of Bonai Division is attached as Appendix XX.

3.6.5. Mammals: Mammals are extremely important for functioning and well balancing of ecosystems. They share responsibility for pollinating plants and dispersing seeds; they are both predator and prey and can have immense effects on the structure and composition of vegetation, plant productivity and nutrient cycling. Many of the mammalian species are experiencing greater population declines than any of the other vertebrate groups. Mammals are widely distributed among diversified habitats in Bonai Forest Division, Odisha, India. Various factors associated with these habitat types have distinct impact on the occurrence and distribution of mammalian species in the region. Studies reveal the presence of 39 species of mammals, as listed in Appendix XX.

3.7. Threats and Challenges to Wildlife: In the past, before starting scientific planning of forest management, over the years there has been rapid shrinkage of forest resources and hence the wilderness. Even after starting of scientific management of forest resources, special attention to wildlife conservation has initiated only during last working plan period. Unabatted poaching of wild animals, pernicious practices of shifting cultivation and Akhand Shikar, intentional setting of fire, diversion of forest land for agriculture and settlement purpose, encroachments, overgrazing by domestic livestock, over exploitation through commercial forestry operations, collection of NTFP in unscientific manner, mining activities, illicit felling etc. have been the adverse factors responsible for the destruction of wildlife and shrinkage of wilderness in this division. An analysis of key issues and gaps identified in management of wildlife in the division is as detailed below.

3.7.1. Degraded ecosystem and anthropogenic pressure: Various forms of biotic pressure on forests leading to habitat degradation/fragmentation in the division is as discussed below.

- (i) **Illicit felling:** This division area is inhabited by a good number of tribal forest dependent communities, who depend on forests for collection of fuel wood etc. Further timber smugglers in connection with the local inhabitants try to operate timber smuggling from forest areas. Because of proper protection activities, these offences are negligible presently, however illicit felling is one of the identified reason for wildlife habitat degradation in the past.
- (ii) **Poaching:** Being close to Sambalpur, Rourkela and Deogarh districts, many forest areas under the division are prone to be approachable from these districts too. Poaching of elephants, leopard, spotted deer, barking deer, wild boar, and many other wildlife species have got reported from this division area in the past. Poaching by electrocution, traps, snares, etc. are common mode of operation by offenders.

- (iii) **Encroachment:** There are age-old forest land encroachment cases in the division unsettled till now. A few portions of prime forest land having gentle slopes and adjoining large settlement areas have been encroached for agriculture and home-stead purposes. Even deep inside, few RF and PRF blocks in some valley portions adjacent to perennial streams are under active encroachment. Many of forest blocks in the Division lack proper boundary demarcation and boundary pillar posts. This situation causes vulnerability of these areas for further encroachment.
- (iv) **Shifting cultivation:-**In some areas of Bonai Forest Division, shifting cultivation is in practice now also. Forest areas are being damaged due to slash and burn cultivation. People clear the forest, cultivate it for a year or two and then abandon the area in search of new areas as the fertility goes down. Though this form of cultivation is not very profitable, the tribal people continue with it as it is a part of their tradition. In spite of several incentives offered by the Government, shifting cultivation has not altered significantly.
- (v) **Demand of forest land for developmental activities:** There is a high demand of forest land in this division for various developmental activities like construction of road and railways lines, mining activities etc. There are 65 mining leases in the Division out of which 22 are operational. Bonai Forest Division is rich in minerals like iron ore and manganese particularly in Koira and Barsuan Ranges. The most significant Iron Ore deposits are available at Khandadhar, Malongtoli, Dandrah Pahar, Basuda, Baliapahar, Badamgampahar, Mitukuda and Rakno in Bonai Range and Kalta, Dariflgburu and Barsuan in Koira Range. The Koira valley is significant deposits of Manganese Ore especially near having Datimunda, Podadihi, Malda, Mohulsukha, Sarkunda, Orahuri, Nadidihi, Bhutuda, Ranisal and Nuagaon. Mining activities pose threat to wildlife habitat in the division area.

- (vi) **Forest fire:** The forest fire and the destruction caused therein is a regular feature of this Division. Most of the forest fires occurring in this Division are intentional and man made. The forest fire destroys the humus and micro organisms of the ground soil and thus reduces the fertility of soil to a great extent. It also destroys trees of lower diameter, grasses and fire tender species. Many a times the wild fauna and birds get destroyed due to forest fire. Forest fire not only affects the forest vegetation adversely but also causes destruction of wild habitat.

- (vii) **Unregulated Grazing by domestic livestock:** Grazing of livestock in the forest blocks has been occurring in all the ranges and affecting regeneration of the vegetation.

- (viii) **Unregulated collection of NTFP:** Since forest areas under this division are being used by local inhabitants for illegal collection of NTFPs such as Kendu leaves, Sal seeds, Mahua flowers etc., there is huge human interference to wildlife habitat

- (ix) **Illegal entry points:** Most of the forest patches are not contiguous, however scattered, and hence there are a lot of illegal entry points to wildlife habitat. Checking these entry points through proper measures by establishing chain gates, camp sheds etc. is very important.

3.7.2. Wildlife Crime : Poaching and illegal wildlife trade is wildlife crimes noticed in the area in the past. Wildlife cases booked in the division (other than natural deaths) for the last 10 years are as shown in the following table 3.7.2.

Table 3.7.2 – Details of Wildlife offences in Bonai Division		
Year	No. of cases booked under Wildlife Protection Act	Nature of offence
2010-11	4 No.	Poaching of 2 No. of wild boars, and 2 No. of elephants
2011-12	5 No.	Poaching of 2 No. of barking deers, 1 No. of elephant and 2 No. of wild boar
2012-13	1 No.	Poaching of 1 No. of barking deer
2013-14	4 No.	Poaching of one porcupine and one spotted deer. Two barking deer death by street dog attack.
2014-15	5 No.	Accidental death of one barking deer, Poaching of one wild boar and one barking deer, and death of two barking deer by street dog attack.
2015-16	2 No.	Poaching of one elephant and death of barking deer by dog attack
2016-17	2 No.	Poaching of one wild boar and road accidental death of one bear
2017-18	1 No.	Poaching of a spotted deer
2018-19	3 No.	Poaching of one giant squirrel and poaching of two wild boars
2019-20	2 No.	Poaching of two wild boars
2020-21	2 No.	Poaching of a Wild Boar & 4 Nos. of Indian Gaint squirrel.
Source : O/o the Divisional Forest Officer, Bonai Division		

Issues while dealing with wildlife crime is as detailed below.

- (a) Lack of expertise among the field staff:** Many field staff is not skilled to deal with booking and follow up of wildlife offences because of lack of sufficient knowledge in this regard.

(b) Low rate of conviction: Lack of proper detection and preparation of prosecution report leads to low rate of conviction in wildlife cases. This reduces the impact of the activities of the protection staff who take lot of effort to detect wildlife offense cases.

3.7.3. Human-wildlife conflict : Negative interaction between human and wildlife at the interface is another threat in the field of wildlife conservation in the Division, as discussed below.

- (i) Wildlife accidents:** Accidental deaths of wildlife due to sagging of electric lines is one threat, Further railways and national highways pass through the forest areas also pose threat in this regard.
- (ii) Human-elephant conflict:** The forest Division harbours more than 65 Asian elephants. These elephants do not have permanent abode in this division and usually elephants come down to forest fringe villages from Bamra and Keonjhar Division and also from Jharkhand forests during harvesting season to damage the crop as well as the houses of people. In the process, casualties of both humans and elephants take place. Elephant depredation is predominant in Bonai Range, where elephants migrate from Deogarh area raid the agriculture/ horticultural crop, damage houses in the forest fringe villages. Human-elephant conflict is also getting recorded from Tamra and Jarda ranges. Koira/Barsuan ranges which share Jharkhand and Keonjhar boundaries, a human-elephant conflict is acute during migration of elephants. A railway line also passes in these ranges which connects Rourkela with Barsuan cutting across the elephant corridor. Elephant also migrate from Jharkhand to Sarkunda RF and create problems in Koira Range. Illegal electrical hooking from the electric supply of the Railway of the local area of Topadi is a major problem for Koira Range wherein elephants may come in contact with the electric conductors.

(iii) **Human- sloth bear conflict:** Man-sloth bear conflict is also another important aspect which needs to be addressed. Due to movements of sloth bear to revenue forests adjoining human habitations, conflict is reportedly high. Injuries to human beings are also substantial leading to negative attitude towards the sloth bears.

(iv) **Human-wild boar conflict:** Conflict with wild boar is also very high particularly in crop fields near the forest areas. Wild pigs, in large groups enter into crop field and cause extensive damage.

3.7.4. Issues related to Wildlife rescue and rehabilitation: Wildlife rescue and rehabilitation is another area where proper care to be given. Details of rescue and rehabilitation of Wildlife in the Division is furnished below in table 3.7.4.

Table 3.7.4- Details of Rescue & Rehabilitation of wildlife in Bonai Forest Division.

Sl. No	Name	Scientific Name	Details of Rescue		Details of Release	
			Date	Place	Date	Place
1	Barking Deer	<i>Muntiacus muntjac</i>	25.04.2020	Madhpur	25.04.2020	Lunga RF
2	Barking Deer	<i>Muntiacus muntjac</i>	18.06.2020	Baldihi	20.06.2020	Lunga RF
3	Banded Kukri	<i>Oligodon arnensis</i>	19.6.2020	Bonai town	19.06.2020	Sundhikan RF
4	Barred Wolf snake	<i>Lycodon striatus</i>	22.6.2020	Bonai town	22.06.2020	Sundhikan RF
5	Rat Snake	<i>Ptyas mucosus</i>	25.06.2020	Bonai town	25.06.2020	Sundhikan RF
6	Banded Kukri	<i>Oligodon arnensis</i>	25.06.2020	Narendra Village	25.06.2020	Sundhikan RF
7	Rat Snake	<i>Ptyas mucosus</i>	05.07.2020	Bonai town	05.07.2020	Sundhikan RF
8	Banded Krait	<i>Bungarus fasciatus</i>	10.07.2020	Jamkei Village	10.07.2020	Balitota RF
9	Banded Krait	<i>Bungarus fasciatus</i>	11.07.2020	Bonai town	11.07.2020	Singhadihi DPF
10	Checkered keelback	<i>Fowlea piscator</i>	13.07.2020	Banaigarh	13.07.2020	Sundhikon RF
11	Barred Wolf snake	<i>Lycodon striatus</i>	13.07.2020	Narendra Village	13.07.2020	Sundhikon RF
12	Spectaled Cobra	<i>Naja Naja</i>	13.07.2020	Banjhikusum Village	13.07.2020	Gugua RF
13	Common Krait	<i>Bungarus caeruleus</i>	17.07.2020	Turmura Village	17.07.2020	Nanarai RF
14	Spectaled Cobra	<i>Naja Naja</i>	25.07.2020	Nagadihi Village	25.07.2020	Kello RF
15	Spectaled Cobra	<i>Naja Naja</i>	30.07.2020	Jaganathpur, Bonai	30.07.2020	Sundhikan RF
16	Rat Snake	<i>Ptyas mucosus</i>	31.07.2020	Bonai town	31.07.2020	Kello RF

17	Rat Snake	<i>Ptyas mucosus</i>	31.07.2020	Bonai town	31.07.2020	Kello RF
18	Russell Kukri	<i>Oligodon taeniolatus</i>	03.08.2020	Bonai town	03.08.2020	Sundhikan RF
19	Rat Snake	<i>Ptyas mucosus</i>	07.08.2020	Barhamusa Village	07.08.2020	DD Pali RF
20	Common Krait	<i>Bungarus caeruleus</i>	11.08.2020	Jakeikala Village	11.08.2020	Talita RF
21	Common Wolf snake	<i>Lycodon aulicu</i>	11.08.2020	Jakeikala Village	11.08.2020	Talita RF
22	Common Wolf snake	<i>Lycodon aulicu</i>	11.08.2021	Bonai town	11.08.2021	Sundhikon RF
23	Checkered keelback	<i>Fowlea piscator</i>	17.08.2020	Bonai town	17.08.2020	Sundhikon RF
24	Common Bronze Back	<i>Dendrelaphis tristis</i>	18.08.2020	Jaganathpur, Bonai	18.08.2020	Baliatota RF
25	Sand Boa	<i>Eryx conicus</i>	22.08.2020	Bonai town	22.08.2020	Sundhikon RF
26	Sand Boa	<i>Eryx conicus</i>	25.08.2020	Bonai town	25.08.2020	Sundhikon RF
27	Russell Kukri	<i>Oligodon taeniolatus</i>	01.09.2020	Brahmani Gaon	01.09.2020	Singhadihi DPF
28	Banded Kukri	<i>Oligodon arnensis</i>	05.09.2020	Bonai town	05.09.2020	Singhadihi DPF
29	Common Krait	<i>Bungarus caeruleus</i>	08.09.2020	Jarda	08.09.2020	Raipiri RF
30	Indian Chameleon	<i>Chamaeleo zeylanicus</i>	17.09.2020	Gurundia Village	17.09.2020	Rushimath RF
31	Rat Snake	<i>Ptyas mucosus</i>	17.09.2020.	Jibka Village	17.09.2020.	Borhagoth DPF
32	Spectaled Cobra	<i>Naja Naja</i>	26.09.2020	Upalbahal Village	26.09.2020	Baliatota RF
33	Common Wolf snake	<i>Lycodon aulicu</i>	02.10.2020	Jakeikela Village	02.10.2020	Baliatota RF
34	Common Krait	<i>Bungarus caeruleus</i>	21.10.2020	Tamara RO	21.10.2020	Gurundia RF

The following issues have noticed in the division in this regard.

(a) Lack of trained veterinarians: At present there is no dedicated veterinarian to attend wildlife related issues. The service is being provided by veterinary department through their field officers.

(b) Lack of expertise in wildlife management: Wildlife management is a specialized subject. It not only requires adequate knowledge but also skill in field. The field staff functionaries particularly the frontline staff to be provided training in wildlife rescue and rehabilitation.

3.7.5. Lack of public support: Because of lack of awareness among the general public regarding the importance of conservation of wildlife habitat, public support is lacking in ensuring proper protection to wildlife.

3.7.6. Insufficient resources: Lack of adequate human resources and infrastructure as detailed below also poses difficulty in achieving necessary targets on protection of wildlife resources.

- i. **Staff strength:** Considering the issues to be dealt in the division, staff strength is not sufficient.
- ii. **Insurance:** The daily wages staff engaged in wildlife depredation prevention activities are prone to attack directly by wildlife and during the operation. They are not covered under insurance though they are likely to be injured/killed during any untoward incident.
- iii. **Inadequate training:** Forest field functionaries are not regularly being trained to be equipped with the latest knowledge in wildlife management.
- iv. **Lack of adequate infrastructure:** The infrastructure in terms of vehicles, staff quarters and office equipment are not very sufficient to ensure effective protection activities. Better wildlife management demands higher level of investment in infrastructure for better mobility and office management. This needs to be looked into while planning wildlife management activities.
- v. **Insufficient funds:** Wildlife management requires adequate investment for habitat improvement like conservation, meadow development, creation of water bodies and providing protection mechanism which needs to be substantially increased to bring about perceptible change in wildlife conservation. Since no detailed planning towards management of forest

resources has done till now in the division, allotment funds towards these works were insufficient to effect this

3.7.7. Other limiting factors : Other limiting factors are as described below.

- i. **Scarcity of Water during summers:** Bonai Division is in a dry zone and water availability, particularly in summer is very poor. Water becomes the most important limiting factor during summer.
- ii. **Insufficient areas under meadows:** The Division does not have extensive grasslands. The available grass species are not very nutritive and some of them are unpalatable.

3.8. Protection and Management of Fauna: In the background of issues and challenges explained above, various measures for protection and management of wildlife and its habitat in the division are being taken up. Different measures along with their effects are as explained below.

- (i) **Engagement of Protection squads:** In order to assist the staff in protection activities various types of protection squads are being engaged. Antipoaching squads, antidepredation squads and elephant trackers are various types of squads being engaged in this regard. Because of assistance of these squads, Protection activities are being executed properly in the field because of effective field patrolling and crime detection. Also, anti-depredation activities and elephant monitoring activities are being properly monitored by using these squads, which in turn reduce human-wildlife negative interactions.
- (ii) **Strict implementation of provisions of various Acts and rules:** Offences related to wildlife in the division area got detected and followed up in

provisions with various acts and rules, mainly Wildlife (Protection) Act, 1972 and rules formed their under.

- (iii) **Strengthening of camping network:** From available funds, new watch towers and campsheds have been constructed during the last plan period, which strengthened the protection network of the division by providing camping facilities to staff and protection squad in offence sensitive areas.
- (iv) **Habitat management works:** Many waterbodies have been digged in needed locations during the last plan period. Also many existed water boides got renovated. Apart from this, various SMC works have also been taken up in different forest blocks of the divison. An effort for meadow development, salt lick maintenance etc. have also done in identified areas. All theses efforts aimed to improve habitat requiements needed for various wildlife available here.
- (v) **Wildlife Monitoring:** During the last plan period efforts were there to conduct population estimation of elephants, tiger and its co-predators, and waterfowls. Results of these wildlife census activities could use effectively in managing wildlife in the division.
- (vi) **People's Participation in wildlife protection:** Efforts were there to promote awareness among public to conserve wildlife and its habitat. Awareness progammes have conducted in VSSs, schools, colleges etc. in this regard. Also many important days related to environmental conservation, viz. World environmental day, Earth Day, Wildlife Week, World Forestry Day etc.were observed with public participation.
- (vii) **Checking negative interaction at the Human-wildlife interface :**Provision of physical barriers such as Elephant Proof Trenches, Solar Fencing etc. have ensured in areas highly affected by Human-elephant conflict. Attempts were there to ensure early warning regarding movement of wildlife to human

habitations, anti-depredation, etc. by using various squads. Various awareness measures have also been taken to sensitize people in dealing with human-wildlife conflict situations. Timely payment of compensation to victims of Wildlife attack/depredation was another progressive step followed during the last plan period. All these measures helped to check human-wildlife conflict to some extent.

CHAPTER - 4

MAINTENANCE AND ENHANCEMENT OF FOREST HEALTH AND VITALITY

4.1. Status of Regeneration:

4.1.1. Young plants of tree species up to 10 cm diameter are taken into consideration for assessment of regeneration status of a particular species as prescribed in the Manual of National Forest Inventory of India. Data collected from the square plot of 3 x 3 m for saplings (2 cm to 10 cm collar diameter) and the square plot of 1 x 1 m for seedlings (less than 2 cm collar diameter) are generally used to assess the regeneration status of species in the management unit (compartment) and Forest Block. Based on the photosociological data from plot enumeration, the regeneration status of the treespecies may be assessed in the following catagories:

- a. Good generation, if seedlings are more in numbers than the saplings and likewise saplings are more that of adults.
- b. Fair generation, if seedlings are more in numbers than the saplings but the saplings are equal or less than that of adults.
- c. Poor generation, of a species survives in only sapling stage, but not as seedlings (though sapling may be less, more or equal to adults).
- d. No generation, if a species is absent both in sapling stage, but present as adult.
- e. New regeneration, if a species has no adults but only sapling and/or seedlings.

4.1.2 In case above classifications are absent or insufficient to indicate regeneration status, the lower catagories of regeneration such as established, un-established (whippy and sub-whippy), recruits, etc are assessed by giving value to each category and calculating total regenerative percentage. The numeric value given to established seedling, woody, whippy and recruit enumerated in the sample plots are 5, 4, 2 and 0.5

respectively. The score from “201 to 250 and above” is considered as “excellent”, “151 to 200” is considered as “good”, “101 to 150” is considered as “moderate”, “51 to 100” is considered as “fair” and “0 to 51” as “deficient” with respect to regeneration. Regeneration status of various species in different blocks of Bonai Forest Division has furnished in **Appendix IIC**.

4.2. Area affected by Forest Fire:

4.2.1. During the period of dry weather i.e. March to middle of June majority of forest areas under this Division are prone to Forest Fire. It burns the leaves and other debris lying on the forest floor. The forest fire and the destruction caused therein is a regular feature of this Division. Most of the forest fire occurrences in this Division are intentional and manmade. The forest fire destroys the micro organism of the ground soil and thus reduces the fertility of soil to a great extent. It also destroys trees of lower diameter, poles, saplings, seedling, grasses and fire prone species. Destruction in wild fauna and their habitat is another identified effect of forest fire. The forest fire in the vicinity of the village areas occurs mainly for collection of Mohua Flower and Kendu leaves.

4.2.2. There is a need to carry out fire frequency and burnt area mapping for fire vulnerability on one hand and operational fire monitoring in real time for effective response on the other hand. Real time monitoring of forest fires is being carried out by FSI using MODIS (Moderate-resolution Imaging Spectro-radiometer) Sensor fire alerts on board by two of the satellites - Terra and Aqua. The processed signals on forest hot-spots are being transmitted from Forest Survey of India to State Forest Department on regular basis during fire season. Hence, real time monitoring of forest fire is a process now in operation to curtail fire severity and sensitize State Forest Department at operational level to prevent normal fires in getting converted into Wild Fires. The online feed back on forest fires which are a part of this system could help to estimate the actual loss of forest strata as well as the loss caused to top-soil.

4.2.3. Following measures are being taken in the Division to control forest fire.

(a) Fire vulnerability map and plan for reclamation of forest fire is being prepared in advance, and preparedness of the staff in fire fighting activities is being ensured through proper motivation & training sessions.

(b) Fire lines are being traced and maintained timely in forest areas prone to fire.

(c) Necessary number of fire fighting equipments required are being procured and supplied to staff in advance.

(d) Fire fighting squads are being engaged to assist the staff in fire fighting activities.

(e) Additional vehicles are being hired for improving the mobility of staff in the field during fire season.

(f) Proper awareness measures are being conducted in villages to make aware the people regarding the importance of protection of forest resources from forest fire.

(g) Proper attention is being paid to participate people in fire fighting activities, through VSSs and other local level institutions. Incentives to VSSs are being provided for motivating people to protect the assigned forest area from fires.

4.2.4. Details of extent of area affected by forest fire from 1997-98 to 2020-21 is as shown in the following table 4.2.4.

Table 4.2.4.- Areas affected by forest fire from 1997-98 to 2020-21			
Year	Area affected by fire (in ha.)	Year	Area affected by fire (in ha.)
1997-98	1,027.58 Ha.	2009-10	406.00 Ha.
1998-99	6,210.44 Ha.	2010-11	495.50 Ha.
1999-20	2,900.39 Ha.	2011-12	145.20 Ha.
2000-01	4,454.55 Ha.	2012-13	44.00 Ha.
2001-02	7,627.33 Ha.	2013-14	168.85 Ha.

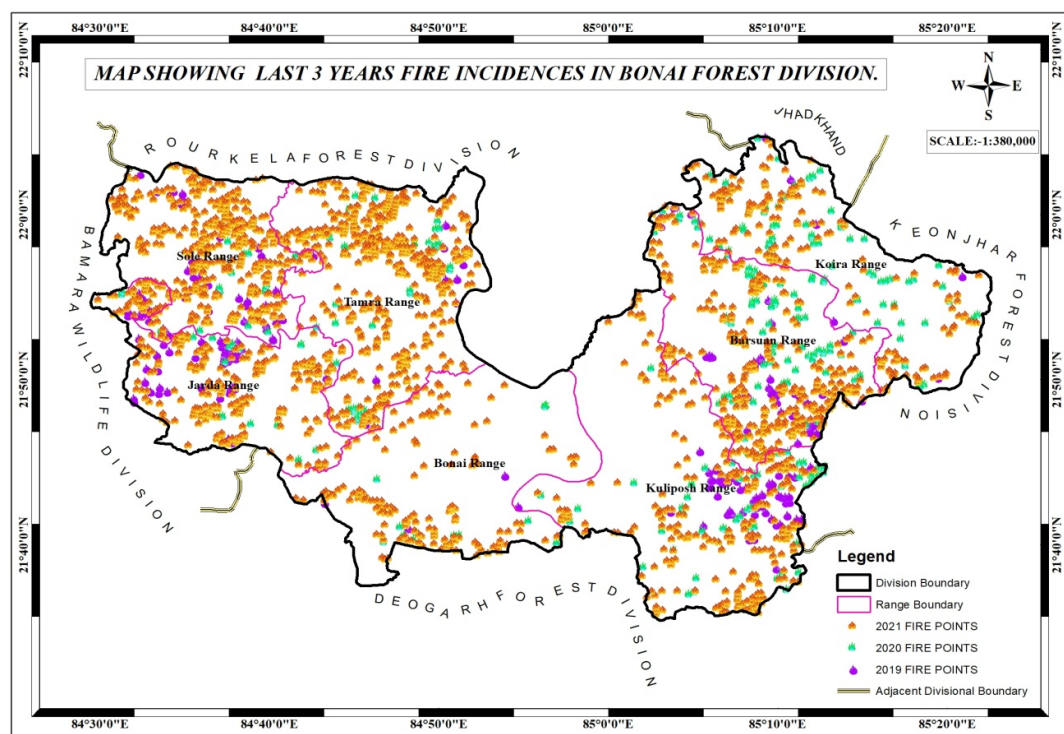
2002-03	7,531.37 Ha.	2014-15	180.00 Ha.
2003-04	4,558.76 Ha.	2015-16	91.50 Ha.
2004-05	1,004.00 Ha.	2016-17	45.16 Ha.
2005-06	205.00 Ha.	2017-18	940.595 Ha.
2006-07	204.00 Ha.	2018-19	826.79 Ha.
2007-08	75.00 Ha.	2019-20	59.04 Ha.
2008-09	447.00 Ha.	2020-21	122.54 Ha.

4.2.5 Satellite Data on forest Fire in the division from 2001 onwards is depicted in the following table 4.2.5

Table 4.2.5.- Fire Incidences Report From 2001 to 2021

Year	No. of Fire incidences reported by Satellite							
	Bonai	Barsuan	Jarda	Koira	Kuliposh	Sole	Tamra	Total
2001	-	-	1	-	4	2	1	8
2002	-	2	-	-	-	-	1	3
2003	-	14	3	-	19	2	10	48
2004	-	5	-	4	11	7	1	28
2005	-	6	4	2	18	-	7	37
2006	-	5	-	-	4	-	3	12
2007	-	10	1	2	11	1	-	25
2008	3	6	4	1	7	1	1	23
2009	7	11	4	-	15	4	4	45
2010	4	16	6	7	9	1	14	57
2011	5	14	12	13	11	9	13	77
2012	9	72	31	33	126	15	22	308
2013	80	168	138	131	149	175	226	1,067
2014	125	320	203	125	441	349	218	1,781
2015	73	140	81	47	141	114	210	806
2016	88	354	271	296	322	287	214	1,832
2017	117	325	103	202	208	202	274	1,431
2018	175	283	208	373	322	326	368	2,055
2019	6	50	57	7	55	38	7	220
2020	13	75	18	66	60	15	44	291
2021	162	319	255	163	278	357	431	1,965

Map showing Fire incidences of last 3 years in Bonai Division.



4.3. Areas damaged by Natural Calamities:

4.3.1. Flood, Drought, Storms and Frost:

4.3.1.1 This Division is not free from the ravages of natural calamities like floods, droughts and storms. Almost every year, the area is affected by cyclonic storms of varying intensity. The area also gets affected regularly by drought and floods in the River Brahmani and its tributaries. The area was severely affected by the Cyclone “Phailin” during October 2013 & “Hudhud Cyclone” during October 2014, which resulted in large scale uprooting of trees in the division area. During the cyclone a sizable destruction has happened with respect to wild animals and their habitat, which could not be assessed. Every year the Brahmani River pass through this Division gets flooded during rainy season; as a result of which nearby areas are getting submerged which affect forest resources adversely on either side of the river.

4.3.1.2 Droughts also occur in certain parts of the Division, on account of scanty rain fall during rainy season. In the peak summer months, the water source in the forest dries up and water scarcity is found in hilly areas except some perennial streams. The Koira plateau is being subjected to extreme heat during summer and because of the resultant drought damage to forest vegetation may occur. In view of scarcity of water the wild animals disperse to the nearby habitation in search of water and become easy prey for the poachers. Frost occurs in Koira Plateau and in Kunjar hills but the duration is limited to few days in the winter season. It is not severe enough to cause any substantial damage to the forest crop.

4.3.1.3 Preparedness of the staff to face these extreme situations in the field is being ensured through proper capacity building trainings. Proper co-ordination with district administration is being ensured for Disaster Management. Protection and Maintenance of wildlife habitat is being ensured through proper measures, during these situations. Post-calamity activities are also being carried out to restore the degraded areas out of these calamities. However, more scientifically planned activities are required to be implemented to prepare the field staff in facing these extreme situations, assessment of damages and restoration works.

4.4. Areas protected from Grazing:

4.4.1 Forest blocks of Bonai Forest Division are vulnerable to grazing in view of the domestic animals of nearby habitations. Large herds of cattle, buffalos, goats, and sheep are being kept by the villagers for their domestic requirements. They let their domestic animals to graze in the forest. Such uncontrolled grazing and browsing in forest area cause severe damage to forest vegetation. This also increases the vulnerability of the area towards soil erosion. Due to grazing the natural regenerations get adversely affected. Incidences of heavy grazing are more in the forest areas adjoining human habitations.

4.4.2 In Barusuan Range Toda RF, Toda PRF, Roxy-II PRF, Amrudi RF&PRF, Sarkunda RF & PRF, Khajurdihi RF, Bhabanipahar PRF are vulnerable areas identified in this regard. In Bonai Range Talita RF, Sundhikon RF, Gogua RF, Kendrikela RF, DD Pali RF, Hulku RF, West Dandapat RF, Budapahad RF are vulnerable areas. Lunga RF, Amrudi RF & PRF are identified areas affected by uncontrolled grazing by livestock in Kuliposh Range. In Tamra Range Kusumdihi RF, Rusimath RF, Dhenkiam RF, and Gurundia RF are areas vulnerable in this regard.

4.4.3 Sincere efforts need to be taken to regulate grazing in accordance with the carrying capacity of the forest and local people need to be motivated to adopt stall feeding and rotational grazing. Further, Prophylactic immunization of cattle should be ensured in coordination with veterinary officials to prevent contamination of disease from the cattle to the wild animals. The status of grazing in different forest blocks of Bonai Forest Division is shown in the Compartment History. Proper Joint Forest Management (JFM) activities also needed to be implemented through VSS, in convergence with line departments.

4.5. Lopping Practices: It is found that, the forest dwellers while collecting NTFP generally lop trees for inducing the growth of trees and hence, the NTFP also. As a result, NTFP yielding trees are getting damaged and subsequently getting died. Further, the people while allowing their animals to graze in the forest, lop trees to feed the domestic animals population. Such practices are detrimental to the forest growth, which damages the regeneration of seedlings, saplings, pole crops and even trees species. Forest dependent community to be given proper awareness regarding sustainable collection of NTFPs according to the carrying capacity of the forest through proper training programmes, Further, alternative measures for cattle food can be planned through proper convergence activities with line departments. For effecting these, VSSs need to be activated in lopping vulnerable areas towards this direction.

4.6. Areas infested by Invasive Weed Species in Forest:

4.6.1. Majority of forest areas under Bonai Forest Division are moist deciduous and dry deciduous. Most of these forest areas are infested with invasive weeds like *Lantana camara*, *Eupatorium spp* etc. Due to this invasion of weeds the regeneration of tree

species in the forest area is severely affected. Infestation of invasive weeds is more in the PRF areas which were subjected to practice of shifting cultivation in the past. Endemic vegetation is getting suppressed by the fast and luxurious growth of these invasive weeds. Also the growth of seedlings being planted in various plantations is also getting affected out of this weed growth. Invasion of these weeds by suppressing the natural endemic vegetation reduces the habitat quality for various wildlives also.

4.6.2. Regular removal of these weeds at interval of 2 to 3 years in such patches is required for healthiness of forest. Removal of invasive weeds should be taken up by uprooting whole plant before flowering stage occurs. Uprooting of invasive weeds should be taken up during rainy season so that the weeds are getting uprooted completely. The status of invasive weeds in the forest of Bonai Forest Division has been assessed and shown in the Compartment History.

4.7. Incidences of Pest and Diseases: The disease like “dry rot” is a fungal disease causing damage to the heart wood of Sal and other trees. The Sal heart wood borer (*Hoplocerambyx apinocornis*) is found in dead and diseased Sal trees and in unbarked logs. The green healthy trees are rarely attacked by these insects. Leaf defoliators damage leaves of the trees by eating away the chlorophyll pigments in some tree species. Loranthus is a parasite causing diseases in different trees. Few Sal trees noticed to have been affected by this parasite but not in a wide spread manner. Many fungi and parasitic plants have been found to affect the forest crop adversely. Different types of fungi attack forest species. Damages occur due to stem borers, defoliators, skeletonizers and termite attack in the forest and stem borers are found to be in inferior Quality Sal Forest.

4.8. Forest Degradation and its Drivers:

4.8.1 Forest degradation can be assessed by comparing the status of forest cover in consecutive years. Conversion of Very Dense Forest to Dense Forest, Dense Forests to Moderately Dense Forests and Moderately Dense Forests to Open Forests are examples for deterioration of quality & quantity of forest cover and hence, forest degradation. Main drivers for forest degradation in Bonai Forest Division area are identified as forest

fire, biotic pressure from forest dependent community in various forms viz. illegal felling of forest trees, fuel wood collection, use of forest land for domestic livestock grazing, and encroachment in forest areas for habitations and agriculture. Further high demand of forest land for developmental activities and mining are other drivers for forest degradation in the division.

4.8.2. Population growth in the adjoining villages to forest areas cause proportionate increase in the use of forest resources and this in turn, causes depletion of forest resources. Poverty and lack of alternate employment opportunities among the forest dependent community add on this fuel to this depletion. Identified areas sensitive to illicit felling in the division are Kusumdihi RF, Gurundia RF, Dhenkiam RF, Chordhara.

4.8.3. Major portion of forests of East Bonai are rich in minerals of economic significance. Out of these, Iron and Manganese are most important. The most significant Iron ore deposits are available at Khandadhar, Barsuan, Toda, Malangtoli, Basada, Baliapahar, Badamgarhpahar, Kalta under Koira and Barsuan Range. The Koira valley portion is having significant deposits of Manganese ore especially near Podadihi, Khajurdihi, Patbeda, Malda, Mahulsukha, Sarkunda, Orahuri, Nadidihi, Bhutuda, Ranisal and Nuagaon. The commercial exploitation of these minerals has been undergoing for last 7-8 decades. These mining operations have contributed significantly towards the industrial development by catering the requirement of Iron and Steel industrial. Though, mining activities got streamlined under the enactment of Forest Conservation Act, 1980 presently, careless mining operations happened in the past caused a lot of irreparable damage to forests. There are 73 No. of mining leases in this Division at present, out of which 68 leases contain forest areas.

4.9. Pollution Control and Protection of Environment:

4.9.1. Urbanization and Industrialization out of the mining of mineral resources from the division area has identified as main reasons for environmental pollution here. Mining operations are, by their nature, potential sources of environmental impacts. Air pollution, Water pollution and Noise pollution are the main types of pollution caused out of the above said developmental activities. Mining causes serious pollution of

surface and groundwater. Transferring minerals from deep below the surface to the surface promotes oxidation reactions. Oxidation of iron salts and of sulfur-containing materials in the presence of water leads to highly acidic solutions. Toxic substances are brought to the surface where they contaminate water and other toxic substances are used to extract valuable elements from ore. Organic pollutants result from human activity at the mine site.

4.9.2. The main sources of emissions during both the construction and operation phases of mines include the products of combustion such as nitrous oxide, carbon dioxide, carbon monoxide, and sulfur dioxide and fugitive dust from the operation of equipment. The main sources of combustion-related emissions during both the construction and operation phases are related to diesel generators, fuel-oil boilers, and from on-site road traffic. Fugitive dust emissions can occur during land clearing, ground excavation, and from equipment traffic on site. Potential sources of fugitive dust during operation include ore loading and unloading, ore crushing, stockpile erosion, and dust from conveyor systems around the site. Fugitive dust emissions are proportional to the disturbed land area and the level of activity and vary substantially from day to day with varying meteorological conditions. Mortality, injury and disease, and physiological and psychological stress are the major effects of industrial air pollution on wildlife. Water around mines is contaminated by waste oil, and biological waste from sewage. More toxic organic compounds are also present

4.9.3. Common mining and mineral processing activities that contribute to noise pollution include overburden removal, drilling and blasting, excavating, crushing, loading and unloading, vehicular traffic, and the use of generators. Air pollution and Noise pollution getting created out of mining vehicles is another threat to environment in the mining belt of Bonai Forest Division.

4.9.4. While approving mining projects, Site Specific Wildlife Conservation Plans are being prepared, in which necessary measures are being prescribed to negate above said pollutions in the area, to safeguard forests and wildlife. Further, while according environmental clearance and forest clearance, the above said issues are being

considered and necessary measures are being stipulated to be carried out by the user agency. Accordingly various measures like increasing trees cover in the surrounding areas, Safety Zone Plantations, Assessment of pollution level with the help of pollution control board, Research works on the impact of mining on wildlife habitat, creation of water bodies for wildlife in areas which are away from the pollution sphere, etc. are being carried out to negate the effect of the above said environmental pollution effects.

CHAPTER-5

CONSERVATION AND MAINTENANCE OF SOIL AND WATER RESOURCES

5.1. Area treated under Soil and Water Conservation Measures.

5.1.1 .In Bonai Forest Division, the annual rain fall is limited from 1400 mm to 1600 mm annually and precipitation period is hardly four months. The rain water flows as surface run off, forming gullies, streams, and nallas and drains rain fall water to river Brahmani. About 69.82% of the total geographical area of this Division is covered by forests constitutes forest area and a good proportion of this forest area is covered with adequate vegetative growth. Large scale soil erosion is not visible in Bonai Division due to relatively thick forest cover barring degraded forest areas and areas where mining operations are undertaken above all, the Khandadhar RF block, which has been ecologically sensitive, needs to be managed from watershed point of view.

5.1.2. However, identified degraded forest areas in the Division are prone to soil erosion. Soil erosion results in poor water retaining capacity of the forest areas. As a result surface run off takes place. In order to conserve Soil and moisture in these areas, various measures are being practiced. Contour trenches, Loose boulder structures, and check Dams have constructed in various degraded forest lands of the division by utilizing funds from various schemes. Further a considerable number of water bodies have dug in various parts of the division to address the issue of scarcity of water to wildlife during the peak summer times. Details of soil and moisture conservation activities taken up during the plan period are furnished below in Table No.5.1.1. Details of water bodies created in the division during the last plan period is furnished separately in Table No.5.1.2.

Table No.5.1.1 Soil and Moisture Conservation Measures taken up in different Ranges during 2011-12 to 2020-21							
Name of Range	Year	Name of the Forest Block	SMC work taken up				Area treated in ha.
			LBCD (in Nos)	Percolation Pit (in Nos)	Graded Earthen Bund MTR	Staggered trench (in Nos)	
Barsuan	2011-12	Sarkunda RF	47	-	-	-	-
Barsuan	2011-12	Toda RF	16	-	-	-	-
Barsuan	2012-13	Toda RF	68	-	-	-	-
Barsuan	2013-14	Toda RF	33	-	-	-	-
Barsuan	2013-14	Sarkunda RF	32	-	-	-	-
Barsuan	2015-16	Toda RF	75	-	-	-	-
Barsuan	2016-17	Kundheidiha RF	18	180	-	-	-
Barsuan	2016-17	Toda RF	68		-	-	-
Barsuan	2017-18	Amrudhi RF (Part)	156	-	-	5625	1000
Barsuan	2017-18	Toda RF	1983	-	3000	-	1360
Barsuan	2019-20	Tinko DPF		-		-	28.3488
Barsuan	2019-20	Amrudhi PRF	78	-	6000	-	200
Barsuan	2019-20		233	-	5500	-	
Barsuan	2019-20	Khandadhar RF	13	-	-	-	200
Barsuan	2020-21	Amrudhi RF	66	-	-	-	-
Bonai	2015-16	West-Dandpat RF	61	-	-	-	-

Bonai	2015-16	East-Dandpat	21	-	-	-	-
Bonai	2017-18	Kello RF	106	35	-	3465	207.203
Bonai	2017-18	Gogua RF	29	90	-	2800	131.121
Bonai	2019-20	East-Dandpat RF	42	1310	1000	800	83.3994
Bonai	2019-20	Dharnidhar Pali RF	8	100	1070	1300	35.613
Bonai	2020-21	East Dandpat RF		-	-	2200	35
Bonai	2020-21	Sinduria RF	24	-	-	6000	100
Jarda	2015-16	Ulsura RF		-	-	-	-
Jarda	2016-17	Raipiri RF		-	1000	-	-
Jarda	2020-21	Ulsura RF		-	-	10000	213.319
Koira	2014-15	Ganua PRF	5	-	-	-	-
Koira	2016-17	Mendhamaruni PRF-I		-	1000	-	-
Koira	2016-17	Toda PRF-II		180	-	-	25
Koira	2016-17	Khajuridihi PRF		109	-	9308	105
Koira	2017-18	Khajuridihi RF	160	140	2000	8616	2154
Koira	2017-18	Khajuridihi PRF	180	-	-	8000	2000
Koira	2017-18	Toda RF (Part)	150	75	-	6424	1606
Koira	2017-18	Rakshi I	16	60	-	1200	300.1
Koira	2017-18	Karo DPF	40	-	-	863	215.702
Koira	2017-18	Karo RF	4	-	-	5403	1350.708

Koira	2017-18	Kathmal RF		145	-		213.678
Koira	2017-18	Mendhamaruni PRF	80	-	-	2185	546.337
Koira	2017-18	Mendhamaruni I	120	-	-	7204	1800.89
Koira	2017-18	Mendhamaruni II	40	-	-	1666	416.479
Koira	2017-18	Gonua	100	30	0	1866	466.467
Koira	2017-18	Bhabanipahar	72	30	2320	1440	360
Koira	2018-19	Toda RF		-			
Koira	2019-20	Toda RF		-	1105.326		800
Koira	2019-20	Khajuridihi PRF		-	6986.62		255.851
Koira	2019-20	Mendhamaruni RF		-	1972.39		109.2674
Koira	2019-20	Mendhamaruni -II PRF		-	2097.68		83.2958
Kuliposh	2015-16	Kundheibira RF		-		16669	
Kuliposh	2017-18	SINGARDEI	22	25	3153	440	111.323
Kuliposh	2017-18	TALABAHALI BARHAGUDA	246	20	-	1512	377.984
Kuliposh	2017-18	Khandadhar PRF	321	-	-		567.5
Kuliposh	2017-18	AMRUDI PRF	1100	-	-	8250	1744.233
Kuliposh	2017-18	AMRUDI RF	2625	-	-	11766	1440.416
Kuliposh	2018-19	Amrudhi RF	180	2100			90.265

Kuliposh	2018-19	Khandadhar PRF	17	-			
Kuliposh	2019-20	Lunga RF	21	-	7877.5	2139	400
Kuliposh	2019-20	Kundheibira RF		-	4000		42.8976
Kuliposh	2019-20	Singardei DPF		-	2360		111.323
Kuliposh	2019-20	Amrudhi PRF		-	5250		500
Kuliposh	2019-20	Nagaria PRF	24	-	1400		962.02
Kuliposh	2019-20	Khandadhar PRF		-	-	-	-
Kuliposh	2020-21	Khandadhar PRF	205.1 28	-	-	-	-
Tamra	2015-16	Nalghati- rajabasa PRF	28	-	-	-	-
Tamra	2016-17	Rushimath RF	-	-	1000	-	-
Tamra	2018-19	Nalghati- rajabasa PRF	138	1020	-	-	89
Tamra	2018-19	Gurundia RF	13	-	-	-	-
Tamra	2018-19	Nalghati- rajabasa PRF		-	-	-	-
Tamra	2019-20	Rushimath RF	7	-	-	-	-
Tamra	2020-21	Dhenkiam RF		-	-	-	-
Source : O/o the Divisional Forest Officer, Bonai Division							

Table No.5.1.2 List of Water Bodies created in Bonai Forest Division		
Year	Locations	No. of waterbody
2007-08	Karo RF	1 No.
2008-09	Kusumdihi and Kunjar RF	2 Nos.
2011-12	Balai, Dandpat, Rushimath and Raipiri RFs.	4 Nos.
2012-13	Rushimath, Raipiri, Kunjar, Majurdima, Gurundia	6 Nos.
2013-14	Kusumdihi, Kello, East-Dandpat, Rushimath, Gurundia, Dhenkiam, Sirigida, Lunga, Lachhada,	12 Nos.
2014-15	Lunga PRF, Nagaria, Amrudi PRF, Kundheibira, Amrudi RF, Lachhada, Kantamunda, Solguda, Balai, Kunjar, Sinduria, Dohichur, Budhapahar, Sisoojharan, Talbahal PRF, Khandadhar PRF, Lunga RF, Gurundia PRF, Rushimath, Kusumdihi, Dhenkiam, Kello, Majurdima, Raipiri and Budhapahar RFs.	38 Nos.
2015-16	-	-
2016-17	Jhinknali near Lunga RF, Balia RF & Toda RF	3 Nos.
2017-18	Budhapahar RF, Balia RF, Raipiri RF, Karo DPF, Khandadhar PRF, Toda RF (2 Nos.) & Khajurdihi PRF	8 Nos.
2018-19	-	-
2019-20	Balia RF, Raipiri RF (2 Nos.), Karo DPF, Dhenkiam RF & Lunga RF	6 Nos.
2020-21	Sirigida RF (2 Nos.), Talbahali-Barhaguda PRF, Lunga RF (2 Nos.), Raipiri RF, Kello RF, Danta KF, Dhenkiam RF & Nagaria PRF	10 Nos.
Total:-		90 Nos.
Source : O/o the Divisional Forest Officer, Bonai Division		

5.2. Duration of Water Flow in the selected Seasonal Streams.

5.2.1. 'The River Brahmani' is the major river running through the territory of this Division. It flows from north to south direction and passes through the centre of the Division. It originates at Panposh from the confluence of two small rivers mainly- the Koel and the Sankh. After a course due south through the Panposh Sub-Division for about 22 Kms., it enters the Bonai Forest Division near Tamra and after a course of about 61 kms within the Division flows away into the Deogarh District. It has many tributaries in the forms of hill streams all along its eastern and western bank within the Division. The most important among these hill streams is the Kuradhi nallah which originates from Toda block near tensa and from there, after a course due north-west, joins the river Brahmani at Barghat. Other smaller hill stream tributaries of the river Brahmani in East Bonai are Sarkunda nallah, the Amrudhi nallah. the Rangan nallah and Karapani nallah. All these nallahs are perennial in nature.

5.2.2. The drainage of greater part of western Bonai is towards the river Brahmani. Along the west bank, the river Brahmani receives only few streams which are not perennial in nature. Among these Katangmura nallah and Rukara nallah are worth mentioning. Katangmura nallah is formed by joining of Saplata nallah- flowing through the Kunjar and Sulguda blocks and kendujhar nallah-flowing through Rushimath and Gurundia block. It passes through Dhenkiam blocks and then joins the Brahmani river. Rukara nallah flows through Balia, Dandpat and Ulsura blocks and joins the Brahmani near Jibka. There are quite a few small non-perennial nallahs which flow through Dandapat, Sinduria and Ulsura blocks and fall directly into the Brahmani river. Kola and Korapani nallahs are also perennial and join the Brahmani river near Barkote and Jangla respectively. Kalo nallah originates from Mahulpada block while Korapani originates from Pauri area. Amrudhi nallah and Khandadhar nallah are other two important nallahs which originate from southern portions of Amrudhi block and Khandadhar block respectively. Both of these nallahs join together and fall into the Brahmani river near poigaon.

5.2.3. Apart from the Brahmani, other important river is Karo which runs a very short distance through the Bonai Division. It originates from the North-West portion of Sarkunda block near Dengula and flows in northern direction and forms the north-eastern boundary of Karo block. Beyond Karo block it enters into Bihar State and Joins the river Koel.

5.2.4. Quite an appreciable area of west-Bonai drains westwards to the Bheden river. The main feeders of the Bheden river are the Bheden nallah flowing through Balai and Kantamunda blocks, the Purpota nallah flowing through Majurdima, Raipiri and Kelo blocks, Kharli nallah and purpota nallah are perennial in nature.

5.3. Wetlands.

5.3.1. Wetlands are defined as areas of land that are either temporarily or permanently covered by water exhibit enormous diversity according to their genesis, geographical location, water regime and chemistry. Wetlands are one of the most productive ecosystems and play crucial role in hydrological cycle. Utility wise, wetlands directly and indirectly support millions of people in providing services such as storm and flood control, clean water supply, food, fiber and raw materials, scenic beauty, educational and recreational benefits

5.3.2. Rivers, streams & water logged areas are the natural inland wetlands present in the division area. Reservoirs, Tanks and Ponds are types of man made wetlands present in the division. The Brahmani river running through the territory of this Division, over around 60 KM, is the important wetland in the division. Tributaries of this river viz. Kuradhi nallah, Sarkunda nallah, the Amrudhi nallah, are also functioning as wetlands in the division. Along the west bank, the river Brahmani receives some non-perennial streams viz. Katangmura nallah and Rukara nallah. Katangmura nallah is formed by joining of Saplata nallah- flowing through the Kunjar and Sulguda blocks and Kendujhar nallah-flowing through Rushimath and Gurundia block. It passes through Dhenkiam blocks and then joins the Brahmani river. Rukara nallah flows through Balia, Dandapat and Ulsura blocks and joins the Brahmani near Jibka. There are quite a few small non-perennial nallahs which flow through Dandapat, Sinduria and Ulsura blocks and fall directly into the Brahmani River.

5.3.4. Kola and Korapani nallahs, Amrudhi nallah and Khandadhar nallah are other important streams which functions as wetlands. Apart from the Brahmani, other important river is Karo which runs a very short distance through the Bonai Division. Majority of portions under west-Bonai drains westwards to the Bheden river. The main feeders of the Bheden River are the Bheden nallah flowing through Balai and Kantamunda blocks, the Purpota nallah flowing through Majurdima, Raipiri and Kelo blocks, Kharli nallah and Purpota nallah. Above said rivers and its tributaries form the network of wetlands in the division which serves as source of provisioning, regulating, cultural and supporting services in the division area. These wetlands form unique ecosystems, maintain essential ecological processes and life support systems inspire human culture and education, and provide support biodiversity in the area.

5.3.5. Wetland conservation and management rules 2017 defines “wetland” as an ecosystem saturated with water either seasonally or permanently. They include mangroves, marshes, rivers lakes, deltas, flood plains, flooded forests, rice fields, coral reefs, marine areas(not deeper than 6m) at low tide, human made wetlands, waste water treatment ponds and reservoirs. The Ministry of Environment, Forest and Climate Change (MoEF&CC) has notified Wetlands (Conservation and Management) Rules, 2017 (hereinafter Wetlands Rules) under the provisions of the Environment (Protection) Act, 1986 as regulatory framework for conservation and management of wetlands in India. These guidelines have been drafted to support the State Governments / Union Territory (UT) Administrations in the implementation of the Rules by providing guidance on:

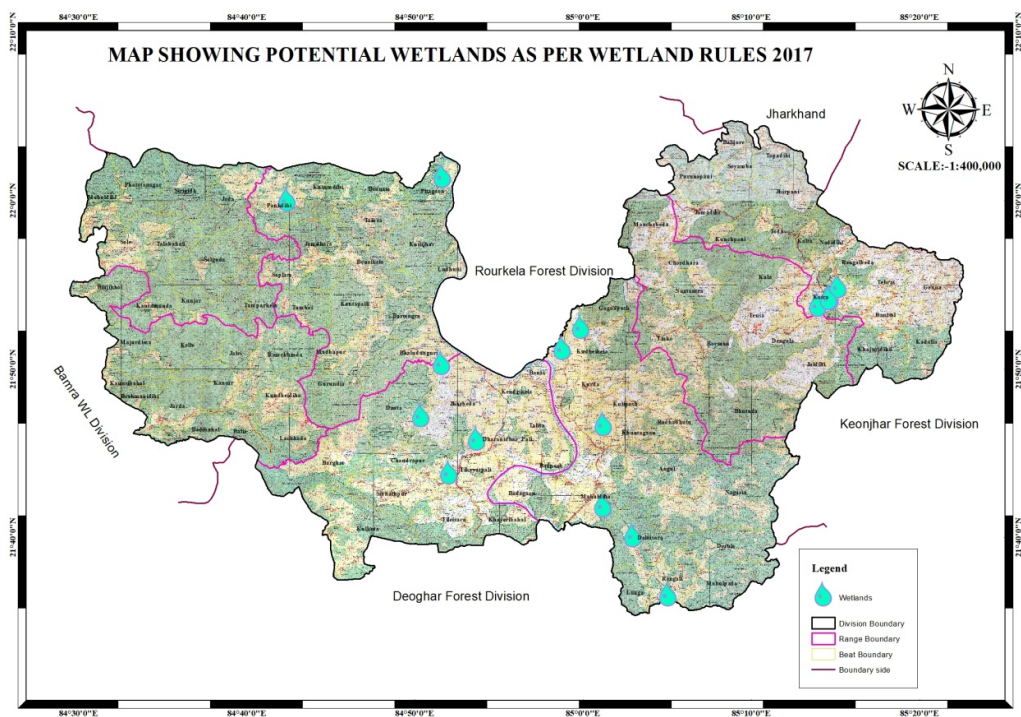
- i. Preparing a list of wetlands in the State / UT
- ii. Identifying wetlands for notification under Wetlands (Conservation and Management) Rules, 2017
- iii. Delineating wetlands, wetlands complexes and zone of influence
- iv. Preparation of Brief Document
- v. Determining ‘wise use’ and ecological character
- vi. Developing a list of activities to be regulated and permitted
- vii. Developing an Integrated Management Plan
- viii. Constitution and operational matters of the Wetlands Authorities
- ix. Overlapping provisions.

In the ambit of definitions of wetlands as per the above said rules, good number of wetlands are available in Bonai Forest Division, both inside and outside the forest area. Catchments of Brahmini river, Perennial streams of Sarkunda, Khandadhar Fall, Phuljhar waterbody, wetland along Lahunipada road, Rukuda Dam, Tuniapali pond, Basudihi pond, Mendhamaruni marshy areas, etc. are examples.

5.3.6. Wetlands as defined under the wetland rules, 2017 situated outside the forest, which acts as aquifers is as listed below in table 5.3.6.

Sl No.	Range	Section	Beat	Name of Waterbody	GPS Location	Area (in Acre.)
1	Kuliposh	Kuliposh	Kuliposh	Kuliposh Kata	N21 46 47 E85 01 12	2.47
2	Kuliposh	Kuliposh	Kudheikela	San Basubahal Kata	N21 52 33 E84 59 52	2.47
3	Kuliposh	Kuliposh	Kudheikela	Ulsurei Pond	N21 51 16 E84 58 45	2.47
4	Kuliposh	Mahuldiha	Mahuldiha	Shihidia Kata (Nalghati)	N21 41 57 E85 01 10	4.94
5	Kuliposh	Daleisara	Daleisara	Daleisara Pond	N21 40 10.7 E85 02 58.3	4.94
6	Kuliposh	Daleisara	Rengali	Rengali Pond	N21.610876 E85.08383	3.706575
7	Koira	Koira	Koira	Kadodiha Village	N21 53 51.0 E85 13 57.6	1.1119725
8	Koira	Koira	Koira	Kasira Village	N21 54 56.5 E85 15 10.5	1.186104
9	Koira	Koira	Koira	Koira Village	N21 54 13.7 E85 14 42.1	2.026261
10	Koira	Koira	Koira	Koira Village	N21 54 15.5 E85 14 37.0	1.0625515
11	Bonai	S. Bolang	Chandarpur	Basudihi Kata	N21°43'45.89" E84°51'31.09"	6.48
12	Bonai	S. Bolang	Chandarpur	Tuniapali Kata	N21 43 53.29 E84 52 01.60	42.89
13	Bonai	Dharanidharpali	Jharbeda	Rukuda Dam	N21 47 18.2 E84 50 20.06	42254.96
14	Bonai	Dharanidharpali	Dharanidharpali	Bad-kata (Gopinathpur)	N21 45 53.46 E84 53 38.92	2.50
15	Tamra	Tamra	Pitagaon	Pitagaon Pond	N22 01 31 E84 51 37	1.334367
16	Tamra	Tamra	Pankadihi	Pankadihi Pond	N22 00 06 E84 42 23	1.5567615
17	Tamra	Bhaludunguri	Bartengla	Bartengla	N21 50 24 E84 51 34	1.73

Map showing these wetlands is given below:



5.3.7. Notification for restoring and rejuvenation of aquifers, in accordance with Wetland conservation and management rules 2017 need to be taken up in the division. Finalization of list as per guidelines need to be done in accordance with MoEF & State Guidelines within one year. Deleneation of wetlands, preparation of brief document, determining 'wise use' and 'ecological character', listing out regulated and prohibited activities & development of integrated development plan shall to be completed within three years.

5.4. Water level in the wells in the vicinity (upto 5 km) of Forest area.

5.4.1. Forest plays a major role in conservation of ground water. Due to degradation of forest the ground water table goes down in the forest area as well as in the fringe villages in the vicinity of the forest. Hence, measurement of the ground water level can be effectively used in monitoring the extent of degradation or improvement in forest cover. To monitor the ground water level periodically, measurement of ground water level below the ground level wells in the fringe villages are taken up in the month of January, April, August and November in different years. For periodical monitoring in 10

years the rise or fall of ground water level can be assessed. At the time of preparation of the Revised Working Plan, measurement of ground water in wells in fringe villages have compiled from the microplans of VSSs of the division and the is given in the table 5.4.1.

Table No.5.4.1 Ground water Status in fringe villages adjoining to forest area				
Sl No.	Name of the fringe village	Adjoining Forest Block	Ground water level in wells (in ft)	
			Before monsoon (May)	After monsoon (October)
1	Tikraposh	Beldihi- Bijakuli D.P.F	5	15
2	Karaiput	Karaiput K.F	1	10
3	Arjun Jhari	Talbahali-Barhaguda P.R.F. & Arjun Jhari K.F.	1	7
4	Jadibahal	Jadibahal KF	3	12
5	Benuam	Benuam K.F	0	22
6	Kuilijhar	Kuilijhar K.F	0	22
7	Ghusuriposh	Kadampur K.F	9	20
8	Makarchuan	Makarchuan K.F	0	25
9	Kadampur	Kadampur K.F	0	20
10	Nalghati	Nalghati K.F	5	20
11	Sisoodihi- Chadharia	Sisoodihi K.F	0	23
12	Bartengeda	Bartengeda K.F	5	15
13	Girijatola	Jamudharh K.F.	0	10
14	Tamra	Tamra K.F.	1	8
15	Chirabeda	Chirabeda K.F	0	18
16	Jagada	Jagada K.F.	0	25
17	Jagannathprasad	Jagannathprasad K.F.	0	20
18	Matalgarh	Matalgarh K.F.	5	15
19	Bhaludarth	Bhaludarth K.F.	0	20
20	Keshboga	Kusumdihi PRF-II & Keosboga KF	5	15
21	Jhirpani	Jhirpani K.F.	0	20
22	Jhakajharan	Jhakajharan K.F.	20	30
23	Soldega	Soldega K.F.	0	22
24	Behedamal (San-Burda)	Balia PRF	0	5
25	Budelbahal & Niktimal	Balia PRF	0	12
26	Badibahal	Badibahal KF	0	13

27	Brahmandihi	Brahmandihi KF	0	21
28	San- Balia	Balia PRF-1	0	12
29	Majurdima	Kello RF/DPF	0	11
30	San-Ramchhinda	Ramchhinda K.F	0	15
31	Janda	Raipiri RF	0	13
32	Kahachuan	Kello R.F.	0	20
33	Ghumaduar	Kello R.F.	0	5
34	Madalia	Rushimath R.F.	0	14
35	Kindro	Ulsura R.F.	0	17
36	Ramchhinda	Rushimath R.F.	0	15
37	Lachhada	Ulsura R.F.	0	13
38	San-Burda	Raipiri RF	0	7
39	Jhaliadihi	Jhaliadihi K.F	0	25
40	Dhengurpani	Kantamunda R.F.	0	8
41	Nuapali	Kantamunda R.F. & K.F.	1	8
42	Asurkhol	Balai R.F.	0	13
43	Badkudar	Balai R.F.	1	15
44	Fatatangar	Balai R.F.	1	8
45	Pipilakani	Kantamunda R.F.	1	4
45	Kantamunda	Kantamunda R.F.	1	3
47	Bad- Kunjar	Kunjar R.F.	0	9
48	Raikela	Raikela K.F.	0	8
49	Rajabasa	Sarkunda P.R.F.	1	10
50	Lasi	Sarkunda P.R.F.	0.5	3
Source : O/o the Divisional Forest Officer, Bonai Division				

5.4.2.Major parts of the Division is characterized by Precambrian consolidated formations. Due to rugged nature of the terrain, most parts of the Division show deeper water level condition during post monsoon period due to the prevailing topographic conditions and water table gradient, which facilitates flow of ground water through nala, streams and river as base flow. To arrest the rapid decline of water table artificial recharge techniques and rain water harvesting methods need to be adopted. The most feasible artificial recharge and rain water harvesting structures are percolation tanks, nallah/contour bunding, small check dams/weirs, gully plugging, etc.

5.5. Status of aquifers: Aquifers are underground layer of water bearing permeable rock, rock fractures or unconsolidated materials. They indicate the source of water level in a particular landscapes and play significant role in ecological systems.

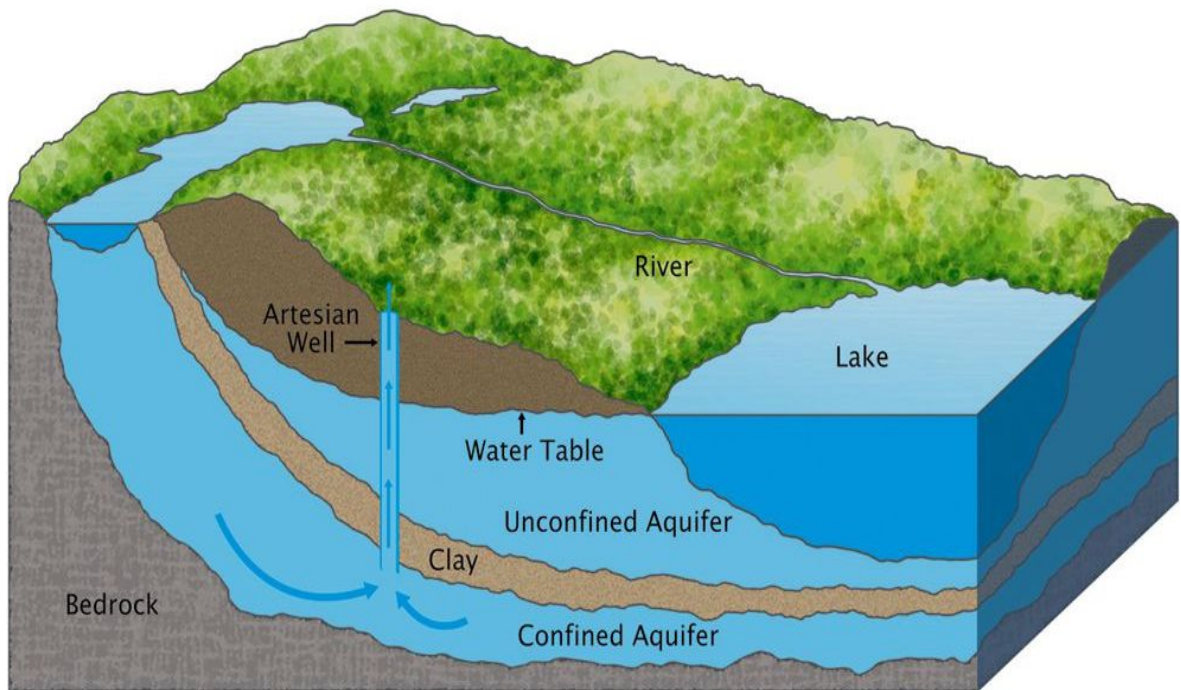


Figure: Illustration of an Aquifer (Source:nationalgeographic.org)

The hydrogeological conditions vary from place to place depending upon the aquifer characteristics of the litho units, sources of groundwater recharge and the structural setting of the area. The hydrogeological units of the area are broadly categorized into three groups namely:

- A. Consolidated formations.
- B. Semi Consolidated formations
- C. Unconsolidated formations

Except for small strips along major drainage courses, almost the entire division is occupied by the consolidated formations comprising of Precambrian meta-sediments of Gangpur series and Iron ore series and also granite gneiss, metasediments like

amphibolite, epidiorite etc. Ground water is stored mainly in the secondary porosity resulting from weathering and fracturing of the rocks. The aquifer materials are highly heterogeneous in character showing both vertical and lateral variations. The weathered residuum form the main repository of ground water, in which ground water occurs under water table condition and circulates through deeper fractures and fissures. Ground water occurs under confined to semi-confined condition in the deeper fractured zones. The water yielding capacity of fractured rocks largely depends on the extent (depth and degree) of fracturing, openness and size of fractures and extent of their interconnections to the near surface weathered zone. Usually two to four water bearing fracture zones occur down to a depth of 100 m bgl.

The semi consolidated formation is constituted of sand stone, shales, conglomerates, grits etc belonging to Talcher, Barakar and Kamthis of lower Gondwana . The Barakar formation is very well developed and often constitute potential aquifer in the area. The coarse grained gritty sandstone on weathering give rise to porous sandy materials. Large diameter open wells and medium deep tube wells are feasible in this formation. The depth of the open wells ranges from 7.25m to 18.42m and the premonsoon depth to water level varies from 6.65m to 15.99m below ground level.

Laterites and alluvium of Sub-recent to recent age constitute the unconsolidated formations. Laterites occurring as capping over older formations are highly porous in nature and form good aquifers to be tapped through dug wells. The alluvial deposits of recent origin occur as thin discontinuous patches along the prominent drainage channels. The alluvium strips constitute the most potential aquifers due to their high degree of porosity and permeability but are only limited in their occurrence. Ground water in these formations occurs under unconfined to semi-confined condition. These mainly consist of silt, sand with gravel & pebble, which form potential shallow aquifers tapped through dug wells. The yield of the open wells is generally 5-6 lps though higher yield of 10 lps is not uncommon.

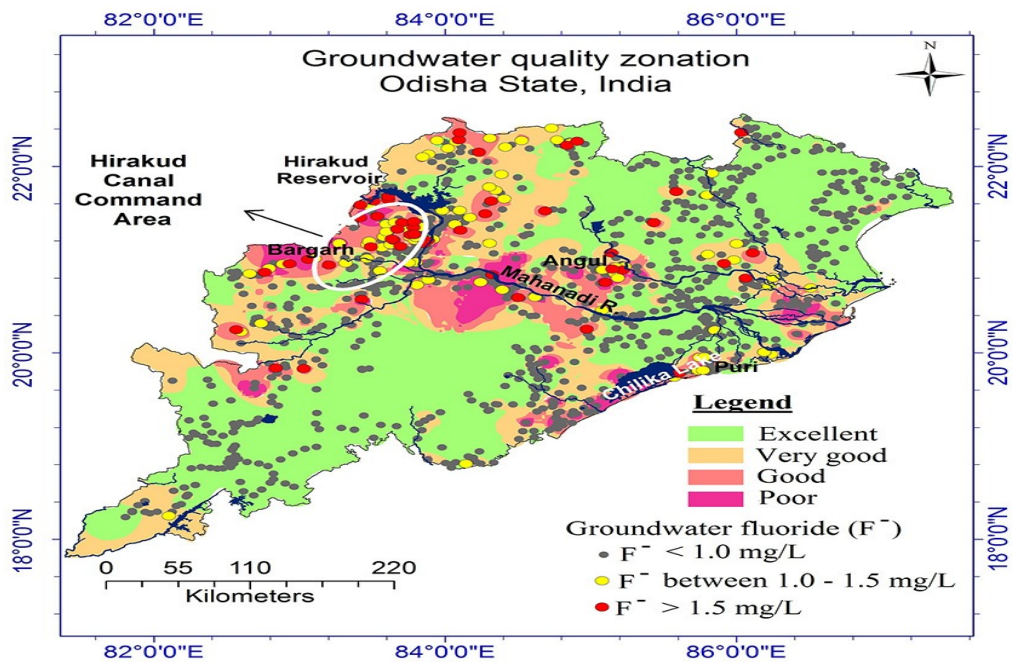
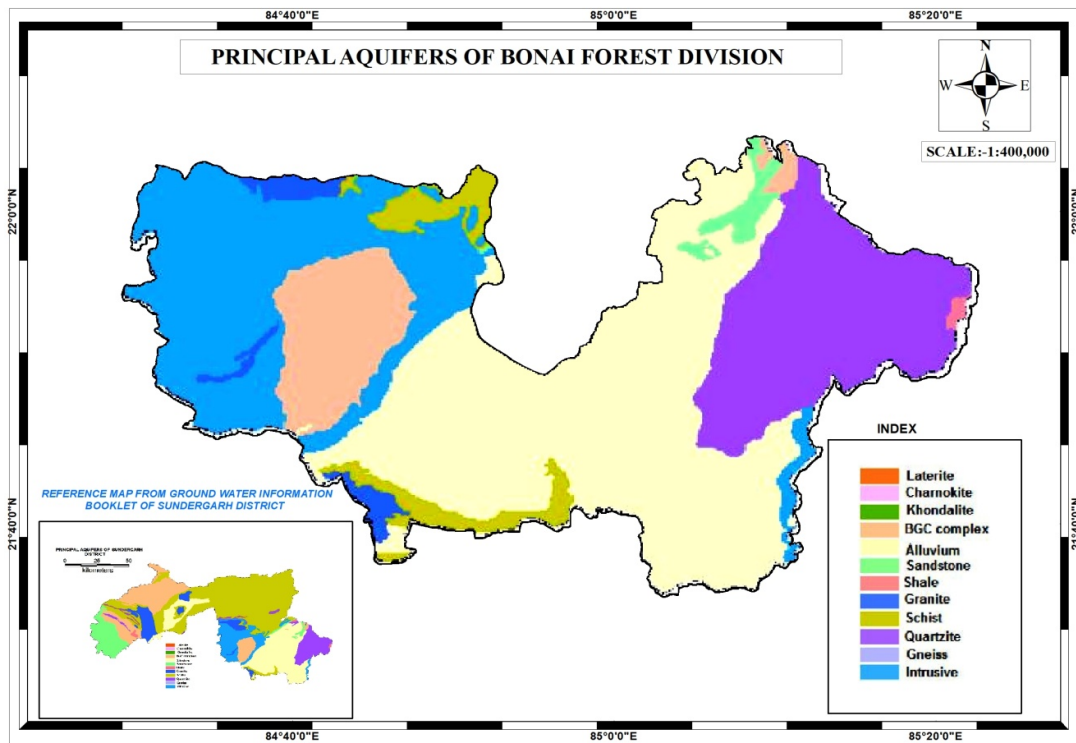


Figure: Groundwater quality of Odisha (Source: Sahu et al., 2021)

Principal aquifers on Bonai Forest Division have depicted in the following map.



Pollution is commonly regarded as the result of industrial revolution. Environmental quality of the area deteriorates as a result of the increasing industrial activity. In order to find out the current status of the pollution of the area, it is very much essential to identify the various sources of pollution. Based on the available data, the ground water from deeper aquifers are suitable for drinking purposes as almost all the constituents are well within the permissible limit. The quality of ground water for irrigation use is also good.

Pollution, Anthropogenic activities including mining are threats to the quality of aquifers in Bonai Forest Division. Here aquifers might be unconfined, semi-confined and confined types and found mainly in rock pore space, rock fracture and cracks.

Aquifers can be recharged through return flow, stagnant water bodies (Ponds, Tanks etc), irrigation, water-filled small pits and conservation of rain water. Scientific approaches like field monitoring, resistivity image profiling; groundwater modeling, dewatering systems etc are needed before and after monsoon in the mining areas of Bonai Forest Division.

CHAPTER –6

MAINTENANCE AND ENHANCEMENT OF FOREST RESOURCE PRODUCTIVITY

6.1. Growing Stock of Wood

6.1.1. The Growing stock of forest has gradually started degrading since beginning of Nineteenth century till the end the century due to shifting cultivation locally known as Podu cultivation. In addition to indiscriminate girdling and burning of trees by tribal people for shifting cultivation, railway sleeper operations started in the last part of nineteenth century with the permission of the then ruler of Bonai State. The first scientific management was started under Babu J. N. Ghosh Plan (1931-32 to 1950-51). In S. N. Das's Plan (1953-54 to 1972-73) and in G.G. Das's Plan (1973-74 to 1992-93), Sal conversion Working Circle was introduced. But due to non availability of matured Sal crop, clear felling of matured crop was not taken up. In the last Working Plan of Sri Suresh Pant, IFS, (1997-98 to 2016-17) Sal conversion Working Circle got abandoned and introduced Selection Working Circle. The Growing Stock of forest improved after the imposition of moratorium on green tree felling in 1990 till 2005 when it was lifted. To check the degradation of Growing stock Rehabilitation Working Circle was introduced in place of Coppice Working Circle. The main thrust has focussed in regeneration, cleaning and soil and moisture conservation to improve the growing stock of degraded forest. As a result percentage of very dense forest in the division has got decreased and moderately dense forest and open forest cover have got increased.

6.1.2. The growing stock of wood of Bonai Forest Division has been estimated during the inventory of Forest Resources by laying 0.1 ha area of sample plot in Random Stratified Sampling method. Geo co-ordinates of 1033 nos sample points were supplied to NRSC through ORSAC. Girth and height of tree species above 30 cm gbh have been recorded species wise. At the time of forest resource inventory observational assessment of site quality, tree species composition, density of forest crop have been made and recorded in Form-I (Plot Approach Form) while approaching the Sample Plot.

Before taking up enumeration at sample plot, altitude, aspect, slope, soil and water resources, crop composition, regeneration status, injury to crop, fire incidence, grazing incidence, presence of weeds, presence of grasses, occurrence of bamboo, plantation status, distance from water source, drivers of degradation, etc. have been assessed over 2.0 ha, area around the centre of sample point and recorded in Form-II (Plot Description Form). Enumeration data have been compiled and forest block wise growing stock of wood has been estimated which is furnished in **Appendix II A**.

6.1.3. In Forest Blocks of East Bonai specially in Toda RF, Karo RF, Sarkunda RF, Lunga RF, Katmal RF and in few pockets in Nagaria PRF, Sarkunda PRF Sal Species in Site Quality II noticed in previous Plan period has moved to Site Quality II/III. Similarly the Sal species in Site Quality III has moved to Site Quality III/IV. The lower slopes of hills containing Sal species of Site Quality IV in previous Plan period now contains lesser nos of Sal Quality IV and more nos of Sal Quality V.

6.1.4. In Forest Blocks of West Bonai Sal Site Quality III noticed in previous Plan period in Kunjar RF, MAjurdima RF, Kantamunda RF and Raipiri RF, now conforms to Sal site quality IV and the site quality IV noticed in previous Plan period in most of the Forest Blocks of West Bonai has moved to Sal site quality V.

6.2. Growing Stock of Bamboo: The Growing Stock of bamboo indicating the number of clumps and clump size in respect of base year has not been assessed in the past and in the expired Plan. Bamboos are mostly confined to the forests of West Bonai. In East Bonai, availability of bamboo is very poor except in Mahlpada RF and Lunga RF. In Sal forests, presence of bamboo clumps is scanty. The growing stock of bamboos in bamboo bearing areas have been assessed basing on the enumeration of bamboo clumps in sample plots and furnished in **Appendix II A**.

6.3. Increment in volume of identified Timber species: The Mean Annual Increment of identified timber species have not been calculated in the past in Bonai Forest Division. During this plan 0.1ha. sample plots have been laid in different strata of forest with geo co-ordinates. Permanent Sample Plots (PSP) have been selected with geo-coordinates out of the sample plots. So, this year will be the base year and the Mean Annual Increment principal species will be calculated by estimating the volume of the species after interval of one year, two years, four years or as per availability of funds and man power.

Details of permanent Sample Plots selected for the purpose has been furnished in **Appendix-IV**.

6.4. Efforts towards enhancement of Forest productivity through quality plantation activities

6.4.1. Production of Quality seedlings: Rapid establishment of seedlings in forest regeneration or afforestation sites after planting is a prerequisite for a successful plantation. Seedling survival after outplanting can be improved by using high-quality seedling material. Seedling quality consists of several features, such as genetic source, morphological properties, nutritional status, stress resistance, and vitality of the seedlings. Field performance of the seedlings is a complex process, which can be affected by many nursery and silvicultural practices. Nursery cultural practices strongly affect the seedling quality that is generally at the highest level during the growth period at the nursery. Afterwards, when the seedlings are transported from the nursery to the planting site (including seedling storage, handling, shipping, and planting practices), quality of the seedlings can only remain the same or decline. For ensuring a successful regeneration, it is important to produce seedlings that retain their high quality until planting and to establish them quickly in the forest regeneration site.

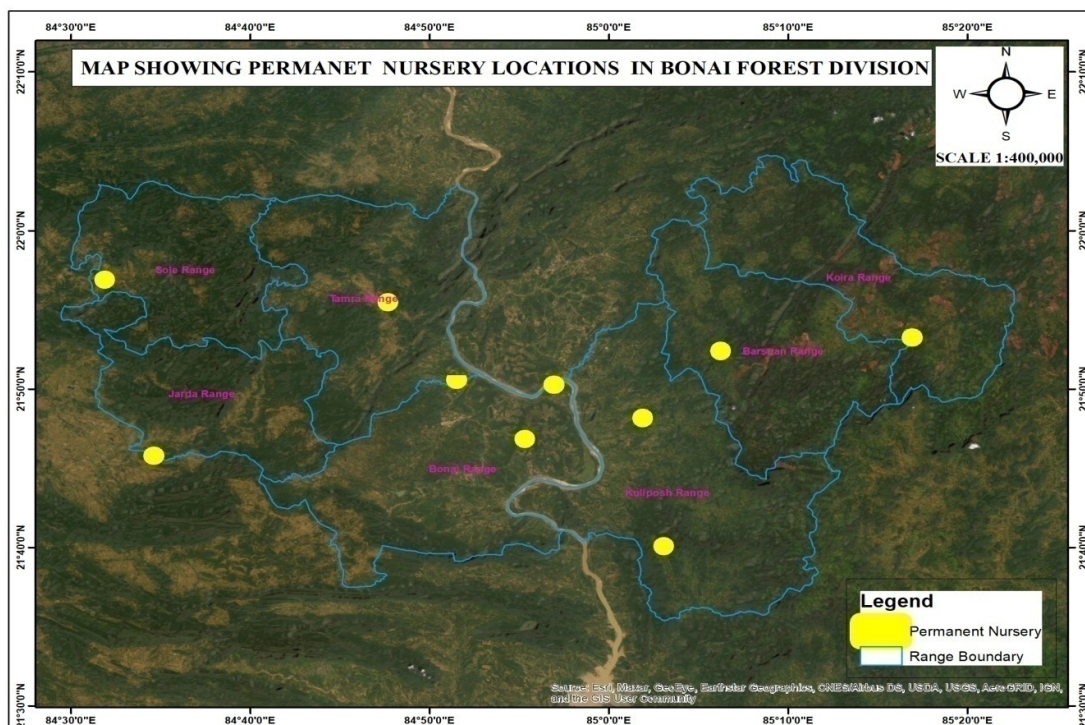
Both 6month old seedlings and 18 month old seedlings are being used in the division for raising plantations. Seedling collection is being done from plus trees (being identified on the basis of phenotypical character), grading of seeds to filter out unhealthier seedlings for establishing, and dibbling in poly bag. In order to avoid root coiling root trainers are also being used. Polythene bags of 9x5x400 size are being used. Ploypot mixture soil, sand and CDM in the ratio 2:1:1 is being filled in the polypot. Soil

mixture preparation includes pulverization and straining. After seed grading and treatment, mother beds are being created for majority of seedlings. Established seedlings from mother beds used to be shifted to poly pots. Watering, sorting, weeding, grading and resetting are being ensured. In case of production of 18 month old seedlings, seedlings shall be shifted to bigger poly bags after 6-8months.

Details of permanent nurseries in the division are as shown in the following table 6.4.1.1.

Sl. No.	Range	Name of Nursery	Location	Area	Production capacity of seedlings
1	Barsuan	Barsuan P. Nursery	Barsuan	0.4 ha.	2,50,000
2	Bonai	Brahmani P. Nursery	Sunkhikon RF	3.25 ha.	4,50,000
3	Bonai	Dharanidharpali P. Nursery	Dharanidharpali RF	1 ha.	3,50,000
4	Jarda	Badibahal P. Nursery	Badibahal	1 ha.	3,00,000
5	Koira	Teherai P. Nursery	Teherai Rev. Forest (KF)	0.5 ha.	2,00,000
6	Kuliposh	Godruan P. Nursery	Godruan	1.2 ha.	5,00,000
7	Kuliposh	Daleisara P. Nursery	Daleisara	1 ha.	5,00,000
8	Sole	Thakurpali P. Nursery	Thakurpali	3 ha.	8,00,000
9	Tamra	Baneikela P. Nursery	Baneikela	0.25 ha.	1,00,000
10	Tamra	Dhatkiposh P. Nursery	Dhatkiposh	0.72 ha.	2,50,000

Map showing locations of permanent Nurseries of Bonai Division is given below:



Details of seedlings produced in the division from 2011-12 onwards is as mentioned in the following table 6.4.1.2.

Table 6.4.1.2. Year wise Seedlings Produced in the division from 2011-12 onwards	
Year	No of Seedlings Produced in the division
2011-12	4,10,035.00
2012-13	3,12,803.00
2013-14	3,62,275.00
2014-15	1,23,150.00
2015-16	1,83,600.00
2016-17	5,62,200.00
2017-18	2,67,074.00
2018-19	1,73,331.00
2019-20	6,81,860.00
2020-21	15,63,061.00

6.4.2. Plantation activities : During the last plan period, Plantations have taken up within and outside the Rehabilitation –cum-Plantation Working Circle. Further, plantations of different species have been taken up under different schemes like 13th FC grant, MGNREGS, CAMPA, FDA, OFSDP etc. Quality plantations shall be taken up in available forest areas during this plan period.

Plantations in all the rehabilitation series have not been taken up in each year as per working Plan prescriptions. But, plantations have been taken up in most of the RF and PRF areas of the rehabilitation series each year under different schemes basing on allotment of funds. However, the details of plantation and other activities taken up during the period from 1997-98 to 2020-21 are furnished below in table 6.4.2.

Table 6.4.2- Plantation taken up within Working Plan area in Bonai Forest Division from 1997-98 to 2020-21		
Sl. No	Year	Area in Ha. Where plantation activities taken up within Working Plan area
1	1997-1998	-
2	1998-1999	-
3	1999-2000	26.720
4	2000-01	-
5	2001-02	35.000
6	2002-03	50.000

7	2003-04	-
8	2004-05	361.730
9	2005-06	15.000
10	2006-07	8.171
11	2007-08	242.500
12	2008-09	475.150
13	2009-10	140.120
14	2010-11	670.634
15	2011-12	153.667
16	2012-13	295.000
17	2013-14	-
18	2014-15	376.975
19	2015-16	2237.963
20	2016-17	973.666
21	2017-18	1251.935
22	2018-19	1198.820
23	2019-20	2003.319
24	2020-21	1037.000
	G.Total:-	11553.370
Source : O/o the Divisional Forest Officer, Bonai Division		

Details of plantations taken up during the last working plan period is furnished in **Appendix XVI**.

The year-wise achievement of plantation activities have been furnished below. Due to non-availability of funds the target could not be achieved fully. There was a requirement of 6,199.16 Ha. of forest land for compensatory afforestation, Addl. compensatory afforestation and Plantation over 1.5 times the Safety Zone area in lieu of diversion of forest land in favour of SAIL, Rourkela and hence, areas were identified in SWC and RWC coupes to meet the requirement.

Year	Area planted (in ha.)
2001-02	70.000
2002-03	50.000
2003-04	-
2004-05	65.000
2005-06	129.500
2010-11	49.528
2011-12	61.367
2012-13	216.025
2013-14	1.400

2014-15	232.020
2015-16	55.123
2016-17	509.391
2017-18	37.224
2018-19	282.843
2019-20	217.820
2020-21	599.547
Total:-	2576.788
Source : O/o the Divisional Forest Officer, Bonai Division	

Plantations based on areas allotted in each year in the working plan has not been taken up during that year due to non availability of funds. However, plantation over 11553.370 Ha.out of 19772.105 Ha.have been taken up under compensatory afforestation under CAMPA, OFSDP, MGNREGA and FC Grant.

6.5. Carbon Stock.

6.5.1. Forest Carbon sequestration is recognized as cost effective and efficient option to address the issues of climate change globally. The Reducing Emission from Deforestation and Forest Degradation (REDD+) mechanism has been objectively functioning in this line. The carbon sequestration refers to the capture or removal of carbon dioxide (CO₂) from the atmosphere and stores it in tree biomass. Since carbon sequestration addresses the issue of climate change, it has a global concern under the reward policy of Reducing Emission from Deforestation and Forest Degradation (REDD+) mechanism. In fact, the live and dead trees store 60 % of the carbon in forest ecosystems. Studies reveals that the avoided deforestation and forest degradation could globally generate worth of 1 - 4 billion t CO₂ potential. Moreover, it could be doubled through afforestation, reforestation and sustainable forest management practices. In addition, the forests endow with natural insurance against many threats specifically drought, flood, and vector-borne diseases. Climate Change can increase these risks, but keeping forests intact or expanding forest cover can contribute to mitigate and adapt against these risks. From 1750 to 2011, CO₂ emissions from fossil fuel combustion and cement production have released 365 (335 to 395) Gt C to the atmosphere, while deforestation and other land use change are estimated to have

released 180 (100 to 260) Gt C. This results in cumulative anthropogenic emissions of 545 (460 to 630) Gt C (IPCC 2013). In contrast, forest conservation, sustainable forest management, and forest enhancement can reduce the CO₂ emission and that would be rewarded under REDD+ mechanism.

6.5.2. Global carbon is held in a variety of different stocks. Natural stocks include oceans, fossil fuel deposits, the terrestrial system and the atmosphere. In the terrestrial system carbon is sequestered in rocks and sediments, in swamps, wetlands and forests, and in the soils of forests, grasslands and agriculture. Forests offer some potential to be managed as a sink, that is, to promote net carbon sequestration. Terrestrially, carbon is stored in vegetation and in the soil. Plants store carbon for as long as they live, in terms of live biomass. Once they die, the biomass becomes a part of the food chain and eventually enters the soil as soil carbon. If the biomass is incinerated, the carbon is reemitted into the atmosphere and is free to move in the carbon cycle. The role of forests in carbon sequestration is probably best understood and appears to offer the greatest near-term potential for human management as a sink. Unlike many plants and most crops, which have short lives or release much of their carbon at the end of each season, forest biomass accumulates carbon over decades and centuries. Furthermore, carbon accumulation potential in forests is large enough that forests offer the possibility of sequestering significant amounts of additional carbon in relatively short periods – decades. Fortuitously, forests managed for timber, wildlife or recreation sequesters carbon as a by-product. Forests may also be managed strictly to sequester carbon. Such a focus on biomass accumulation could provide a somewhat reduced amount of other forest ecosystem services such as biodiversity. However, if forests managed for carbon sequestration are allowed to mature and remain unharvested, one of the long-term effects may be enhanced biodiversity. There are four components of carbon storage in a forest ecosystem. These are trees, plants growing on the forest floor (under-storey material), detritus such as leaf litter and other decaying matter on the forest floor, and forest soils. According to the India State of Forest Report, 2017 total carbon stock in forests of India in 2017 is 7082 million tonnes. It has also reported that the annual increase in carbon stock is 19 million tonnes.

6.5.3. The Carbon content of a tree is approximately the half of dry weight of the tree. The National Working Plan Code-2014 emphasizes to calculate the Carbon stock of forest by laying grid based sample plot of 0.1ha. In the Sample Plots trees species are enumerated above 30cm. girth at breast height (GBH) in the main sample plot and shrubs, regenerations, herbs, and grasses are enumerated on the square plots of 1m x 1m, 3m x 3m laid at 30mtr distance of 30 mtr. from the centre of the main plot of 0.1ha. on North-East, South-East, South-West and North-West direction at 45 degree, 135 degree, 225 degree and 315 degree respectively. Further square plots of 5m x 5m on North-East and South-West direction are laid over the square plots of 1m x 1m and 3m x 3m for estimation of dry wood biomass from dead woods, branches, twigs, humous etc. It has also been provided to lay 1mtr x 1mtr. Square plots on North-East and South-West corner of main plot and to dig one cubic ft soil from both the plots, mix those and collect 200grams of soil to estimate the carbon content of soil.

6.5.4. From the enumeration data of trees above 30cm girth, the volume of individual species is calculated from the volume table for the species. The bole mass of the species can be calculated by multiplying the specific gravity of that species with the volume of the species. Similarly the biomass of species below 30cm girth can be calculated from the square plots of 1m x 1m and 3m x 3m in all four directions laid at 30mtr distance from the centre of the main sample plot. The total bole mass of all species above 30 cm girth are calculated. The Above Ground Biomass (AGB) of the species of 30 cm girth and above are found out by multiplying the total bole mass of the species with the Biomass Expansion factor (BEF) of that species. From the data of AGB, the Below Ground Biomass (BGB) i.e. bio mass of roots of the species can be calculated by multiplying a default value with the Above Ground Biomass (AGB). The Dead Wood Biomass can be calculated by weighing the dry fallen wood, branches, twigs and humous. The total Bio mass of 0.1ha. area is calculated by summing up the Above Ground Biomass (AGB), Below Ground Biomass (BGB) and Dead Wood Biomass (DWB).

6.5.5. The carbon stock of total Biomass is calculated by multiplying a constant factor with the value of total Biomass. The soil Carbon stock can be calculated by analyzing the Carbon content of 200gms of soil collected from pits of 30cm x 30cm x 30cm on South-

East and North-West corners of main plot. The Soil Carbon stock is added to the Carbon stock derived from the total Bio mass (AGB+BGB+DWB).

6.5.6. In this manner the Carbon stock of 0.1ha. area has calculated and Carbon stock per ha has estimated. The Carbon stock of a Forest Block can be calculated by taking the average Carbon stock of the sample plots of that Forest Block and then multiplying the average Carbon stock of 1ha. area with the area of that Forest Block.

6.5.7. The Carbon stock of a Forest Range can be estimated by adding the carbon stock of all the forest blocks under the jurisdiction of the Range as because the forest blocks may be coming under different forest types. Similarly the Carbon stock of a Forest Division can be estimated by adding Carbon stocks of all the Forest blocks under the jurisdiction of the Division. The estimation of carbon stock of a Forest Division should be as accurate as possible and it should be transparent. As per guidelines of Intergovernmental Panel on Climate Change (IPCC) there should be mechanism for measurement, reporting and verification of Carbon stock at national and sub-national level. For this propose permanent sample plots (PSP) are to be laid in the Division in different strata of forest.

6.5.8. Efforts should be made to estimate the Carbon stock of Forest Division, Forest Ranges, Forest Sections, and Forest Beats. The incharge of Division, Range, Section, and Beat are to be well acquainted with the carbon stock under their jurisdictions. Decrease of carbon stock will indicate the degradation of forest and the reasons of drivers of forest degradations are to be found out.

6.5.9. The estimation of Carbon stock of different compartment, forest blocks, and whole of Bonai Forest Division has been dealt in **Chapter XII of Part.I**

6.6. Carbon Sequestration and Mitigation.

Forests are linked to climate change in three ways:-

- (i) They are source of green house gas (GHG) emissions.
- (ii) They offer mitigation opportunity to stabilize GHG concentrations.
- (iii) They are impacted by climate change.

Impacts of climate change on forest eco system are getting manifested as species range shifts, changing bio diversity, physiological changes in plant live cycles, forest growth pattern of species changing boundaries of eco systems and other biotic and abiotic responses / stresses. There are evidences of increase in frequency and severity of forest fire changing water regins and expanding forest insect's infestation. Long observational studies are necessary to identify the key changes for which grid based sample point enumeration has been designed.

The IPCC 3rd asseesment report (AR-3) issued in the year 2001, noted that emission from deforestation and forest degradation in developing countries have a large impact on global carbon cycle. The IPCC 4 th assessment report (AR-4) issued in the year 2007, reported that 80% of carbon dioxide was being emitted by combustion of fossil fuel and 20% of carbon dioxide was being emitted due to deforestation and forest degradation.

Growing trees absorb carbon dioxide (CO₂) from the atmosphere and store the carbon on their trunks with so efficiently that half of the dry weight of a tree is carbon (C). This carbon remains locked up in the form of wood and wood products. The more the growth of the tree, the more is the store of the carbon in its trunk. This absorption of carbon dioxide from the atmosphere and storage of carbon on the trunk of the tree is carbon sequestration.

At the time of Forest Resource / Carbon Inventory, sample plots of 0.1 ha. have been laid in different strata of forest. During inventory of trees of 30 cm and above in GBH have been enumerated, shrubs, herbs, climbers, grasses, bamboos, and dead wood mass have been measured. Out of the total 1033 nos of sample plots provided by ORSAC 100 nos of sample plots of 0.1 ha. have been laid in the forests of Bonai Forest Division in different strata of forests. The carbon stock of the permanent sample plots have been estimated by the methods of multiplying the biomass expansion factor (BEF) to the bole mass. The AGB, BGB, and DWB have been estimated and the carbon stock have been assessed by multiplying the constant factor of 0.47 to the total biomass.

The permanent sample plots (PSP) will be visited after 1 year or 2 year or 4 year and the carbon stock of the permanent sample plots will be estimated as per the methodology described in the previous paras. If the carbon stock of the sample plots will increase then it can be ascertained that carbon have been sequestered. The amount of carbon sequestration can be found out from the following equation.

$$\Delta C = \underline{Ct_2 - Ct_1}$$

$$t_2 - t_1$$

Where ΔC = Amount of carbon sequestration, Ct_1 = Carbon stock of the current year, Ct_2 = Carbon stock after the time period 't'.

When the value of ΔC is positive carbon have been sequestered and forest growths have improved but when ΔC is negative the forest growths have degraded.

Carbon sequestration can be enhanced in the forest by adopting suitable silvicultural practices, like regeneration cleaning, climber cutting, eradicating weeds, and by improving the soil health and fertility, by taking up Soil and moisture conservation in the degraded forest, by checking the biotic interference on the forest making awareness among the members of the VSS and safeguarding the forest from illicit felling.

The carbon stock in 130 nos of Forest blocks in Bonai Forest Divison has furnished in Appendix XIV, which may be taken as permanent sample plots for comparison in future.

CHAPTER- 7

OPTIMIZATION OF FOREST RESOURCE UTILIZATION

7.1. Recorded removal of Timber : The timber and fire wood have been harvested from the timber coupes of Selection Working Circle during the expired plan period by the Odisha Forest Development Corporation, Ltd. The details of Timber working from 1997-98 to 2020-21 are given in **Chapter No. 11.4**. The Selection Coupes were not worked out from 1997-98 to 2004-05 in view of moratorium on tree felling. The year wise Timber Coupe working from 2005-06 to 2020-21 is given below in **Table No. 7.1.1**.

Table No.7.1.1: Year wise Timber Coupe Working from 2005-06 to 2020-21								
Year	Total no of the Coupes	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remark
						Timber in Cums.	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
2005-06	20	5348.009	18237	8942	8478	3639.8900	1347	
2006-07	20	5444.911	19213	8616	8303	2914.8271	950	
2007-08	20	5833.327	19927	10528	10317	5085.1322	1508	
2008-09	20	6204.854	23201	10673	10215	4981.4410	607	
2009-10	20	5228.178	18973	9407	8062	4763.3711	816	
2010-11	20	5607.929	20143	7472	6484	3666.1922	563.5	

2011-12	20	5741.624	19658	9087	8150	4652.3021	1042	
2012-13	20	5982.597	20581	9143	8839	5171.9542	1785	
2013-14	20	5411.130	19126	9106	9106	4594.4131	1669	
2014-15	20	5401.378	17968	12515	12515	6470.1220	2070	
2015-16	20	5529.338	17128	12256	12256	7325.3321	2030	
2016-17	20	5605.066	18726	10750	10750	6706.5880	1226	
2017-18	20	5224.019	18960	15098	15098	6178.9404	1401	
2018-19	20	5419.894	20192	13807	11444	5191.7819	1516	
2019-20	20	5348.697	18378	14064	12085	5419.2786	1467	
2020-21	20	5007.974	16913	11501	7180	4201.8770	1769	
Source : O/o the Divisional Forest Officer, Bonai Division								

Further, the salvaged and seized materials have also been delivered to OFDC Ltd. The Range wise timber and fire wood salvaged and seized in different Ranges and delivered to the Odisha Forest Development Corporation, Ltd is given in **Table No.- 7.1.2**. The main objective of the management of the forest is that the mean annual increment is harvested. In no case the harvest should exceed the quantity of mean annual increment and there should not be any decrease in the growing stock. While prescribing removal from the timber coupe the timber removed by illicit felling should be taken into account and safeguard have been provided for future yield coupe in accordance with Smithy's Safeguarding Formulas. Yield is regulated by area in the timber coupes.

Table No.7.1.2							
Timber and Firewood salvaged Departmentally and delivered to OFDC Ltd in Bonai Forest Division up to 2020-21							
Year	Material salvaged.			Material Delivered to OFDC Ltd			Remarks
	Timber in Cums	Pole in No.	Firewood in Stacks 12'X3'X3'	Timber in Cums	Pole in No.	Firewood in Stacks 12'X3'X3'	
2005-06	349.1975	-	70.5	349.1975	-	70.5	
2006-07	478.3345	-	297.5	478.3345	-	297.5	
2007-08	270.9676	-	301	270.9676	-	301	
2008-09	309.6922	-	409	309.6922	-	409	
2009-10	175.3226	-	277	175.3226	-	277	
2010-11	329.2321	-	167.5	329.2321	-	167.5	
2011-12	354.628	-	121.5	354.628	-	121.5	
2012-13	372.6033	-	140	372.6033	-	140	
2013-14	328.9950	-	123	328.9950	-	123	
2014-15	705.9789	-	377.5	705.9789	-	377.5	
2015-16	588.5227	-	262.6	588.5227	-	262.6	
2016-17	890.9065	-	137	890.9065	-	137	
2017-18	544.1385	-	1	542.1266	-	1	
2018-19	217.9821	-	12	196.2016	-	12	
2019-20	92.2327	-	5	92.2327	-	5	
2020-21	468.6944	-	52	147.0333	-	12	

7.2. Recorded removal of Fuel Wood: The recorded removal of fire wood from 2005-06 to 2020-21 has been shown in **Table No7.1.1**. Besides the local people of fringe villages have also removed fire wood for their domestic consumption and for commercial sale also to earn their livelihood. This un-recorded removal of firewood has been assessed through socio economic survey conducted in the fringe villages.

7.3. Recorded removal of Bamboo : Bamboos have been harvested from the bamboo coupes of Bamboo (Over Lapping) Working Circle by the Orissa Forest Development Corporation, Ltd during the expired plan period. The details are given in **Chapter No.11.4**. The year wise production in Sale Units is given in **Table No.7.3.1**. Further bamboos have also been illicitly removed by the local people for thatching and fencing. Green bamboo of first year and second year have also been removed illegally by the Bamboo Artisans collecting bamboo from the forest. The year-wise details of bamboo coupes due for working area of each coupe, production of industrial and commercial bamboos are furnished below in Table No.7.3.1.

Table No.7.3.1- Abstract of year-wise production				
Year	No. of coupes due for working	No. of coupes worked	Production	
			I.B. In SU	C.B. in Nos.
1	2	3	4	5
1997-98	10	8	10302.53	83844
1998-99	10	8	2962.22	58830
1999-2k	10	7	2709.04	92768
2000-01	10	No Working		
2001-02	10			
2002-03	10			
2003-04	9	5	948.79	12345
2004-05	9	5	2155.15	8739
2005-06	9	5	3470.53	3000
2006-07	9	4	2975.75	5328
2007-08	9	4	630.37	2465
2008-09	9	4	791.45	2115
2009-10	9	4	952.05	1215
2010-11	9	4	1356.45	1500
2011-12	9	4	249.75	1110
2012-13	9	1	-	3800
2013-14	9	1	163.21	5000
2014-15	9	1	-	1600
2015-16	9	No working	-	-
2017-18	9	No working	-	-
2018-19	9	No working	-	-
2019-20	9	No working	-	-
2020-21	9	No working	-	-
Total:-			29667.29	283659
Source : O/o the Divisional Forest Officer, Bonai Division				

N.B.:- From 2003-04, one coupe named Champajharan felling series of Banki Range merged with Rourkela (T) Division during re-organisation.

7.4. Recorded Removal of locally important NTFPs including MFPs.

The method and agencies of harvesting of some of the important NTFP items are furnished below.

(i) Kendu Leaf:-	The K.L. trade is regulated under the provisions of The Odisha KL (Control of Trade) Act'1961 and under operation by K.L. wing of Odisha Forest Department.
(ii) Sal Seed:-	It is a specified forest produce vide Notification No.34308/FFAH dt.9.12.82 and is regulated under The Odisha Forest Produce (Control of Trade) Act'1981. The OFDC Ltd. was appointed as Agent for collection and trade of Sal seed up to 2005 crop.
(iii) Tasar cocoons:-	Lease settled with M/s. ST & SCS Ltd, BBSR a Govt. of Odisha undertaking.
(iv) Sialifibre:-	Lease settled with Rourkela (KL) Division.
(v) Siali leaves:-	Settled with Sri P.K. Agarwal, Bisra along with TDCC Ltd for 3 years from 1996-97 to 1998-99 vide F&E Department No.21794/FFAH dt.25.9.96. Again, the lease settled with Sri Amit Kumar Singh, Bisra for 3 years from 1999-2000 to 2001-02.
(vi) Mohua seed and Char seed:-	Settled with Sri SawarmalGododia, Rajgangpur for 3 years from 1999-2000 to 2001-02.
(vii) Lodh and Medha bark:-	Settled with Sri SawarmalGododia, Rajgangpur for 3 years from 1999-2000 to 2001-02.

Apart from this, lease of 32 MFP items in this Division were settled with M/s- Utkal Forest Products Ltd, Sambalpur vide G.O. No.28403/FFAH dt.6.12.89 for 10 years from 1989-90 to 1998-99. Subsequently, the order was cancelled vide No.10046/FFAH dt.5.5.90 and 29 MFP items out of 32 items were settled with the said company for 10 years from 1990-91 to 1999-2000 vide No.23632/FFAH dt.26.9.90. Out of this collection of 10 MFP items were surrendered by the company during 1995 and 18 items were worked out by the company.

The lease of Lac, Tamarind, Myrobalans and Kantabadhuni were settled with TDCC Ltd during 1997-98. During 1998-99 other item i.e. Gum, Honey, Hill broom, Baidanka, Jute seed, Nageswar, Baghnakhi, Ananta seed, Marda seed, Polanga seed, Kamalagundi, Lodobaguli, Katkal and Makhna seed were settled with TDCC Ltd. But during 1999-2000, TDCC Ltd. had surrendered these extra items and worked only on Lac, Tamarind, Myrobalans and Siali leaves in this Division.

However, as per Govt. Policy, in total, 60 items were treated as MFP items in stead of NTFP items and their collection and disposal was transferred to Gram Panchayats with effect from 31.3.2000. Subsequently, another 9 items were also transferred to the control of G.P. during 2000 and 2006 as detailed below.

No.5503/FFAH dt.31.3.2000	-	60	items
No.13285/FFAH dt.23.8.2000	-	7	items
No.15325/FFAH dt.21.9.2000	-	1	item (Baibirang seed)
No.3695/FFAH dt.2.3.2006	-	1	item (Sal seed)
Total	-	69	Items

The NTFP items like Gum, Sal resin, Sal leaves, Khaira and Catechu, Barks of trees (Sunari, Iodh, Medha, Phenphena, Arjunetc), Roots of Patalagaruda, Tassar cocoons, Sandal wood and Canes are now under the control of Forest Department.

There is ban on collection of Sal leaves and Resin in this Division as its collection will affect the regeneration of Sal forests. Collection of any bark has also been prohibited from Silvicultural point of view. Availability of Khaira, Patalagaruda, Sandal wood and cane are very less for its commercial exploitation. The item like Tassar cocoon is only worked out through SEREFED (ST&SCS Ltd previously), Bhubaneswar.

There is no control over the management of the 69 MFP items as the Gram Panchayats are not reporting details of traders engaged in collection and transportation each year as well as the monthly return on collection of the items entrusted with them. Regular monitoring is required in this matter.

The NTFP survey was carried out in all Ranges of this Division during 2011-12 and 2012-13 under 13th F.C. Grant and the result of out-turn of NTFP both tree and shrub species based with its value are furnished below.

Range	Category of NTFP	Total collection found from sample survey.			Total value in Lakhs.		
		Consumption in Qtls.	Sale in Qtls.	Total quantity in Qtls.	Value based on consumption.	Value as per sale.	Total value.
1	2	3	4	5	6	7	8
Bonai	Tree based	572.200	3,180.530	3,752.730	7.780	55.869	63.649
Kuliposh	- do -	3,676.895	4,435.300	8,112.195	71.630	78.941	150.571
Barsuan	- do -	1,231.000	3,837.000	5,068.000	17.640	97.098	114.738
Koira	- do -	190.000	453.000	643.000	2.087	5.190	7.277
Tamra	- do -	154.200	676.485	830.685	2.980	11.510	14.490
Jarda	- do -	1,124.420	6,431.564	7,555.984	19.902	113.830	133.732
Sole	- do -	442.000	2,459.500	2,901.500	6.033	41.595	47.628
Total:-		7,390.715	21,473.379	28,864.094	128.052	404.033	532.085
Bonai	Shrub based	5.50	30.70	36.20	0.101	0.588	0.689
Kuliposh	- do -	988.70	431.60	1,420.30	4.943	2.158	7.101
Barsuan	- do -	-	5,000.00	5,000.000	-	5.110	5.110
Koira	- do -	47.00	100.00	147.00	0.630	1.250	1.880
Tamra	- do -	28.08	37.62	65.70	0.480	0.626	1.106
Jarda	- do -	77.01	141.75	218.76	0.962	1.770	2.732
Sole	- do -	0.25	0.25	0.50	0.007	0.008	0.015
Total:-		1,146.540	5,741.920	6,888.460	7.123	11.510	18.633

7.5. Demand and Supply of Timber and Important Non-Timber Forest Produce : During the 1st plan period, OFDC Ltd has supplied timber to local people as per the demand in the field. The data on recorded removal of timber from the division has already provided in table 7.1.1. Recorded removal of firewood from the division has also shown in the table 7.1.1. The demand and supply of non-timber forest produce has not been assessed in the out going plan. During the plan period the Odisha Forest Development Corporation Ltd has supplied timbers to the local people at a concessional rate for their domestic use. The demand of Timber has been assessed from the socio economic survey and from the OFDC, Ltd. The recorded supply of timber has also been assessed from the OFDC, Ltd and from the working of tenant timbers in the Division. There is no record of supply of non timber forest produce. The demand and supply of NTFPs have been assessed from the socio economic survey conducted over 108 nos of VSS in the Division. Social economic survey report has appended as Appendix IID.

7.6. Import and Export of wood and wood products : Apart from the supply of timber to OFDC, as per working plan prescriptions, removal of timber is being done as per applications received from tenants, by following provisions of Odisha Timber and Other Forest Produce Transit Rules, 1980. Recorded removal and passing of timber and firewood from this Division in this manner from 2005-06 to 2020-21 is as shown in the table 7.6.1.

Table 7.6.1: Recorded removal and Passing of Timber & Firewood from 2005-16 to 2020-21					
Year	No. of tenants applied for TT permits	No. of Plots covered	No. of trees allowed for removal	Out-turn of timber in Cums.	Out-turn of firewood in Stacks (12'X3'X3')
1	2	3	4	5	6
2005-06	17	20	88	139.7903	70
2006-07	11	15	124	100.7098	127
2007-08	10	25	342	186.3063	226
2008-09	47	77	340	288.0396	262
2009-10	33	49	332	258.1812	502
2010-11	14	14	351	229.7221	274

2011-12	16	19	641	355.5943	329
2012-13	26	38	555	419.6640	350
2013-14	79	127	1326	1083.2272	1301
2014-15	86	168	2532	1499.2217	1673
2015-16	87	210	2385	1496.3373	1745
2016-17	60	120	1465	969.1142	821
2017-18	91	195	2211	1205.7627	1205
2018-19	116	207	2187	1491.0153	1405.5
2019-20	60	112	1482	924.8421	887
2020-21	8	21	346	213.5223	235.5
Source : O/o the Divisional Forest Officer, Bonai Division					

7.7. Import and Export of NTFPs.

The collection and trade of MFP items have been transferred to the control of Gram Panchayats with effect from 31.03.2000 as indicated vide Item 7.4 above. There is no industry within the jurisdiction of this Division for use of the MFP/NTFP items as raw materials. No record is also available in this Division about import/export of the MFP items by the traders.

Collection of Siali Fibers is being made by Rourkela (KL) Division and the collected Fibers is used for binding of KL bags only. Further, Tassar Cocoons collected by SERIFED, Bhubaneswar are transported to Nuapatna of Cuttack District and State of Chhatishgarh for processing.

7.8. Removal of Fodder.

The removal of fodder from forest has been assessed basing on socio economic data from the Micro Plans of 100 nos VSS taken under OFSDP-I. Further the data of removal of fodder has been assessed from the cattle population of the fringe villages and total removal of fodder have been calculated Range wise and shown in Table No.7.8.1.

7.8.1- Removal of Fodder in Bonai Forest Division				
Sl.No	Name of the Range	No. of VSS	Requirement of fodder for the cattle population in Qtls	Removal of Fodder from forest through cattle in Qtls
1	Barsuan	7	28,248	17,980
2	Bonai	20	50,706	32,111
3	Jarda	13	57,479	36,704
4	Kuliposh	28	77,229	49,208
5	Sole	4	17,412	10,806
6	Tamra	28	75,096	47,576
	Total :-	100	3,06,170	1,94,385
Source : O/o the Divisional Forest Officer, Bonai Division				

7.9. Valuation of the Products : The valuation of the forest product has not been done in the last plan. The valuation of product has been assessed for timber, fire wood and bamboo from the royalty realized from the OFDC, Ltd. The valuation of the Sal seed has been assessed from the collection and royalty of Utkal Forest products Ltd, Sambalpur. Further the VSS in the Division should be empowered financially so that they can make value addition to the Non Timber Forest Produce collected from the forest and sell them at a reasonable price at the market place. The details of royalty realized from the timber, firewood, bamboo and sale of Sal seed by the Division is shown in **TableNo.7.9.1, TableNo.7.9.2, TableNo.7.9.3 and TableNo.7.9.4**

Table No.7.9.1.- Royalty realized from the Timber from OFDC Ltd.			
Year	Royalty fixed	Royalty realized	Balance
1	2	3	4
2005-06	1,81,20,070/-	1,77,47,055/-	3,73,015/-
2006-07	1,78,15,458/-	1,73,61,269/-	4,54,189/-
2007-08	2,55,23,334/-	2,52,63,729/-	2,59,605/-
2008-09	2,63,67,067/-	2,63,67,067/-	-
2009-10	2,39,85,270/-	2,30,99,687/-	8,85,583/-
2010-11	1,87,96,292/-	1,71,42,943/-	16,53,349/-
2011-12	2,76,91,900/-	2,57,03,386/-	19,88,514/-
2012-13	2,81,22,283/-	2,73,54,403/-	7,67,880/-
2013-14	3,30,35,729/-	3,30,35,729/-	-
2014-15	4,81,25,600/-	4,81,25,600/-	-

2015-16	5,47,13,096/-	5,46,67,496/-	45,600/-
2016-17	5,80,85,735/-	5,80,85,735/-	-
2017-18	7,23,82,141/-	7,23,82,141/-	-
2018-19	7,49,45,473/-	6,18,84,090/-	1,30,61,383/-
2019-20	8,00,34,145/-	7,41,44,426/-	58,89,719/-
2020-21	6,61,64,788/-	4,18,50,376/-	2,43,14,412/-
Source : O/o the Divisional Forest Officer, Bonai Division			

Table No.7.9.2.- Royalty realized from the Firewood of salvaged materials from OFDC Ltd.			
Year	Royalty fixed	Royalty realized	Balance
1	2	3	4
2005-06	78,961/-	78,961/-	-
2006-07	54,725/-	54,725/-	-
2007-08	1,22,400/-	1,22,400/-	-
2008-09	87,038/-	87,038/-	-
2009-10	1,32,083/-	1,32,083/-	-
2010-11	61,320/-	61,320/-	-
2011-12	67,525/-	67,525/-	-
2012-13	49,500/-	49,500/-	-
2013-14	31,955/-	31,955/-	-
2014-15	37,345/-	37,345/-	-
2015-16	1,46,300/-	1,46,300/-	-
2016-17	22,138/-	22,138/-	-
2017-18	14,292/-	14,292/-	-
2018-19	44,861/-	44,861/-	-
2019-20	47,640/-	47,640/-	-
2020-21	87,597/-	-	87,597/-
Source : O/o the Divisional Forest Officer, Bonai Division			

Table No.7.9.3.- Royalty realized from the Bamboo					
Year	Agency	No. of coupes actually worked	Royalty due	Royalty paid	Balance
1	2	3	4	5	6
1997-98	OFDC Ltd.	8	61,83,700/-	43,81,000/-	18,02,700/-
1998-99	-do-	8	19,01,207/-	21,64,000/-	2,62,793/-
1999-2k	-do-	7	18,73,348/-	4,97,000/-	13,76,348/-
2000-01	-do-	No working	-	-	-
2001-02	-do-	-do-	-	-	-
2002-03	-do-	-do-	-	-	-
2003-04	-do-	5	3,44,422/-	3,44,422/-	-
2004-05	-do-	5	8,43,272/-	8,43,297/-	25/-
2005-06	-do-	5	13,60,660/-	13,60,660/-	-
2006-07	-do-	4	10,03,158/-	10,03,158/-	-
2007-08	-do-	4	2,40,117/-	2,40,117/-	-
2008-09	-do-	4	3,41,325/-	-	3,41,325/-
2009-10	-do-	4	3,89,418/-	-	3,89,418/-
2010-11	-do-	4	3,33,200/-	3,31,700/-	1,500/-
2011-12	-do-	4	91,015/-	-	91,015/-
2012-13	-do-	1	3,800/-	-	3,800/-
2013-14	-do-	1	46,619/-	46,619/-	-
2014-15	-do-	1	1,600/-	1,600/-	-
2015-16	-do-	No working	-	-	-
2016-17	-do-	-do-	-	-	-
2017-18	-do-	-do-	-	-	-
2018-19	-do-	-do-	-	-	-
2019-20	-do-	-do-	-	-	-
2020-21	-do-	-do-	-	-	-
		G.Total:-	1,49,56,861/-	1,12,13,573/-	37,43,288/-
Source : O/o the Divisional Forest Officer, Bonai Division					

N.B.:- Payment position of royalty of Bamboo is being reconciled at Head Office level.

Table No.7.9.4.- Royalty realized from the sale of Sal seed					
Year	Agency	No. of coupes actually worked	Royalty due	Royalty paid	Balance
1	2	3	4	5	6
1997-98	OFDC Ltd.	211.623	32,625/-	32,625/-	-
1998-99	-do-	215.489	97,500/-	97,500/-	-
1999-2k	TDCC Ltd.	49.030	12,268/-	12,268/-	-
2000-01	-do-	1,371.855	2,43,750/-	2,43,750/-	-
2001-02	-do-	851.418	2,12,854/-	2,12,854/-	-
2002-03	-do-	7.150	1,788/-	1,788/-	-
2003-04	-do-	1,867.064	1,80,000/-	1,80,000/-	-
2004-05	-do-	Nil	Nil	Nil	-
2005-06	-do-	549.679	-	-	-
2006-07 & onwards	Transferred to the control of G.P. vide Notification No.3695/FFAH dt.2.3.2006.				
Source : O/o the Divisional Forest Officer, Bonai Division					

CHAPTER –8

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

8.1. No. of JFM Committees and areas protected by them.

8.1.1. The National Forest Policy, 1988 envisages co-operation of the people in conservation and development of forests. The Government of Orissa have already adopted the policy of Joint Forest Management (JFM) and sought community participation for protection, regeneration and management of the forest wealth. Joint Forest Management is not only a tool for forest regeneration, but also a means of employment generation and social empowerment of the forestfringe dwellers

8.1.2. The State Government enacted the Orissa Village Forest Rules, 1985 which prescribed for a Management Plan for every village forest and sought co-operation of the community in protection of these forests. In 1988, the State Government had passed a resolution to formally introduce a Scheme of Protection of peripheral Reserved Forest areas with participation of the adjoining villagers by forming a Village Level Forest Protection Committee. The scope of this resolution was enlarged in 1990 to include the Protected Forests. To make the forest-people interface more effective and transparent, the Government of Orissa in Forest & Environmen

8.1.3. The National Forest Policy, 1988 envisaged the need of co-operation of people in conservation and management of forests. In this line, Government of Orissa adopted the Joint Forest Management (JFM) approach in protection and management of forest and issued Joint Forest Management Resolution vide No.16700/F&E dtd.03.07.1993. This resolution aimed management of forests jointly by the Forest Department and people sharing responsibilities and authority. In this regard Vana Samrakshana Samitis(VSS) were proposed to be by ensuring participation of forest department and

villagers, and degraded forest area up to 200 ha. adjoining to the village, was proposed to be assigned to these committees for protection. The resolution also prescribed the entitlement of usufruct benefit to VSS members. In the resolution the section Forester was acting as member-secretary of the VSS. Later on in the year 2008 Govt. of odisha brought Resolution No.17454 dtd.22.10.2008 where the role of Forester in the VSS was not as member-secretary, only the Forest Guard was Ex-officio member. Again in the year 2015 Govt. of Odisha brought a Resolution No. 9182/F.& E dtd.01.06.2015 where provisions ammended to selectForester / Forest Guard have as secretary of the VSS.

8.1.4. As on 31.07.2019, 299 number of VanaSamrakhyanSamities (VSS) have formed and they have assigned with 2350 ha. of forest area adjoining to their villages for protection and management of the forest. The list of 299 nos of VanaSamrakhyanSamities with the area allotted to them in the forest blocks is furnished in **Appendix-XI**. Out of these VSSs 100 number of VSSs have covered under OFSDP phase –I project assisted by JICA during 2006-07 to 2014-15. Furhter 114 VSSs have included in the project AJY from 2015-16 onwards. Also in 60 number of VSSs, activities under NAP are under progress. Out of the total number of VSSs, for 214 number of VSSs, microplans have prepared through participatory rural appraisal (PRA). The microplans have been prepared in confirmity with the prescriptions of working plan. The allotted areas are to be clearly delineated in the field with latitude and longitude at different corners of the allotted forest area.

8.1.5.In VSSs included in OFSDP-I, treatment of degraded forest areas to improve the quality of forests through Artificial regeneration, Assisted Natural Regeneration, and Soil and Mosture Conservation activities have taken up. An extent of 8262 ha out of 10189 ha assigned area has treated under this project. Measures taken for protection and management of forests under this division thorough this project is as shown in the following table 8.1.1.

Table 8.1.1- Activities aiming Protection & Management of Forests taken up under OFSDP-I		
1.	ANR without Gap Plantation	1462 ha.
2.	ANR with Gap Plantation	4978 ha.
3.	AR Plantation	1822 ha.
4.	SMC	1921 numbers LBS/ Check dam, 2,70,320 numbers staggered contour trench & 12,60,420 numbers Percolation pit/Half-moon trench/ Honey Comb were constructed.
5.	SSO	Timber – 9676 ha. Bamboo – 5500 ha.
6.	Farm Forestry	3,28,755 numbers seedlings were distributed to 476 numbers farmers.
7.	Maintenance of Forest Roads	11.5 Kms repaired in 9 Nos Forest Roads.
8.	Maintenance of Link Roads	56.15 KMs repaired in 33 Nos. of Link Roads.
9.	Development of Permanent Hi-Tech Nursery	Constructed Office-cum-Watcher Shed (1200 sqft), Cold Storage (450 sqft), Seed Godown (450 sqft), Germination Chamber (450 sqft), Seed Treatment platform (600 sqft), Drying yard (10m x 10m), Vermicompost plant- 2 Nos, Compost pits of Brick masonry 12 Nos. in Brahmani permanent Nursery of Bonai FMU.
Source : O/o the Divisional Forest Officer, Bonai Division		

In case of VSSs included in AJY also a total of 5291.54 ha Ha of degraded forest area has been treated within 2019-20. Under FDA scheme, VSSs are getting funds from Govt. of India through State Forest Development Agency (FDA) to take up JFM activities. A total of 2,691 Ha of forest area has been treated in this regard from 2004-05 onwards.

8.2. Status of empowerment of JFMCs : In VSSs included in OFSDP-I community mobilization, capacity building trainings, livelihood improvement initiatives and provision of alternate employment opportunities to local forest dependent community members have ensured, during the project period. In order to ensure initial motivation of people to work with forest department, Entry Point Activities (EPAs) have also taken up in all VSSs under OFSDP-I. Issue of Agricultural equipments and power tillers, provision of drinking water facilities, solar lights, tent materials , weighing balance, pump sets, Oil sprayers, TV with DTH, development of village roads and water channels, renovation of schools, support to religious places etc have taken up under Entry Point activities. Measures of livelihood improvement & Alternate employment generation, taken up in the above said 100 number of VSSs, have furnished in table 8.2.1.

Table: 8.2.1. Activities aiming Livelihood Improvement taken up under OFSDP-I		
1.	Capacity Building	For capacity building of VSS members, Capacity Building support Agencies were engaged. 133 numbers training and 16 numbers exposure were organised.
2.	Health Camps	34 numbers Health Camp & 1 number Eye Camp organized.
3.	Non-Formal Education	8 Nos.
4.	Smokeless Chullah	11,039 number chullahs installed in 99 number OFSDP VSS & 3055 number installed in 20 number Non-OFSDP VSS
5.	Income Generation Activities	257 numbers SHG involved in IGA & Rs.1,55,50,000/- provided as Revolving Funds. Activities like Poultry farming, Mahua flower trading, Siali leaves business, Phenyl preparation, Rope making, Pisciculture, Agriculture, Vegetable, Rice & paddy trading, Chhatua preparation were taken up. For preparation of Business Development Plan, Market Linkage etc. Partner NGO & IGASA teams were engaged.
Source : O/o the Divisional Forest Officer, Bonai Division		

In VSSs which have included in AJY scheme also measures for community mobilization towards conservation of natural resources, capacity building training, livelihood improvement and provision of alternate employment opportunities in convergence with line departments etc. are under progress. In order to help forest department staff in community mobilization, preparation of microplans etc, one partner NGO (P-NGO) called SGUP(Sundargarh Gram Unnayan Pratishthan) is working with the division management, under this scheme

8.3. Labour Welfare : All works under JFMCs are being conducted as per approved estimate in lines of Government Schedule of rates, and hence proper payment of labour component in lines of Government guidelines is being ensured. In case of project activities also, norms for payment to labour is being given importance in project guidelines. Mostly labour from the same VSS is being ensured, while executing a VSS activity. VSS executive meetings and General body meetings are being conducted regularly, and works groups are being formed in each type of work. Any conflicts arising, are also being resolved in these meetings. Capacity building trainings to improve skills of people towards various JFM activities have also been provided through various scheme during last plan period. In order to ensure the health of labourers, various activities such as conducting health camps, issue of mosquito nets, etc. have taken up. Alternate income generation activities have also been ensured, details of which have already provided in table 8.2.1.

8.4. Use of Indigenous Knowledge.

8.4.1. Indigenous knowledge is the basis for local level decision-making in food security, human and animal health, education, NRM, and other vital economic and social activities. Local knowledge is a huge, but largely untapped. The tribes of this division have developed vast knowledge of plants, which they have acquired through their traditional practices since time immemorial. Use of certain plants for some particular purposes (e.g. Insect repellants, Stupefiers, Cancer, Rheumatism, Diabetes etc) is restricted to some people only and normally they are quite reluctant to share their knowledge with any outsider. It may loose when traditional culture collapse with advent of modernization.

8.4.2. In 2013, a documentation of indigenous traditional knowledge of Paudi Bhuyans in Odisha has been done for the Centre of Biodiversity Conservation, Bhubaneswar, funded by Odisha Forestry Sector Development Project (OFSDP), Bhubaneswar. From this study it is clear that tribal communities largely depend on traditional food crops and wild plant species to fulfill their requirement of food. The study recorded about 71 species of edible fruits and 30 other unidentified edible fruits, 35 species of leafy vegetables, 31 species of mushrooms, 19 species of tubers, and at least 12 species of seeds used for production of edible oil consumed by this primitive tribal group. During this survey 85 species of plants of medicinal importance were recorded from the Paudibhunya habitat and frequently used by the community. The Paudi bhuyans also use six species of plants and two species of animals to cure various diseases in livestock. Similarly they eat variety of animals or animal's products to substantiate their protein requirement. This study also reported 29 species of fodder plants for livestock, 16 species of plants majorly used for making country liquor, 6 major types of pickles and four types of cakes being prepared by the community. 52 species of plants are used for household constructions and sixty two species are used for making agricultural implements. The study identifies the women's knowledge on wild food as exemplary.

8.4.3. Though wild food plants are consumed by elders, the younger generation by and large is reluctant to follow it and not aware of the nutritional value of prolonged consumption of native diet for their health. The reorientation of indigenous communities towards restoration of traditional knowledge is very important in the present scenario. Non-Timber forest products and its various indigenous uses need to be studied, since most of such practices are declining with the time. Also sacred groves are another source of flora of ethnobotanical importance, and hence traditional knowledge. However enough studies have not been done in this regard in the division area till now.

8.5. Extent of Cultural/ Sacred Groves: Sacred groves are patches of primary and natural forests, protected through socio-cultural laws by the local communities near their villages and are always dedicated to certain deities. This practice of conserving such groves is linked to the society since the beginning of human settlement. Bonai

Division is also endowed with a good number of sacred groves. A study on protection and conservation of Sacred Groves in the fringe villages of Bonai Division except Koira Range has been taken up during 2011-12 by Centre for Biodiversity Conservation, M-71, Housing Board Colony, Baramunda, Bhubaneswar funded by OFSDP. As per the report, many such sacred groves were identified in 6 ranges of namely Barsuan, Jarda, Koliposh, Sole, Tamana and Bonai. The size of sacred groves ranges from 0.01 Acre to 7.98 Acre, covering about 2.2% of the total geographical area of the division. The study revealed the presence of 306 species of plants comprising 291 species of angiosperms (107 species of trees, 118 species of herbs, 14 species of shrubs, 47 species of climbers and 10 species of orchids), 11 species of lower plants (4 lichens and 7 bryophytes) and 45 species of fungi were recorded. Similarly 25 species of mammals, 133 species of birds, 22 species of reptiles, 13 species of amphibians, 122 species of butterflies, 26 species of odonates, 27 species of arachnids, 31 species of other invertebrates were also observed in these groves.

8.5.1. These sacred groves are refugees for native flora and fauna of the region. It is very important to uphold traditions and beliefs in order to protect and conserve these unique forest patches which represent the rich vegetation of the concerned area. Ecological services rendered by sacred groves needs to be highlighted and people should be given proper awareness to realize that the conservation of these groves are crucial for their sustenance. In total, 106 Nos. of Sacred Groves in 77 number Villages, covering an area of 22.2368 Ha. have been identified. Detailed planning for its improvement has been prescribed in this management plan in Chapter 7 of Part-II.

Table No.8.5.1 List of existing sacred groves adjoining to the fringe villages.					
Sl No.	Name of the Range	Name of the fringe vilage	No. of Cultural and Sacred groves adjoining the village	Approximate area in ha.	Type of forestry species on the sacred groves
1	Bonai	Sendhpur	1	0.1618	Sal, Banyan, Sahada, Khajuri
2	Bonai	Baghuamunda	1	0.0202	Sal

3	Bonai	Bolang	9	0.9507	Sal, Asan, Arjun, Mahula, Mango, Jali, Bahada
4	Bonai	Dahichore	1	0.2023	Asan, Dhaura, Karda
5	Bonai	Danta	1	0.2023	Asan, Dhaura, Karda, Sal
6	Bonai	Sanbandhabhin	3	0.5461	Sal, Mahul, Neem, Dhaura, Asan, Sal, Mahula
7	Bonai	Bandhabhuin	2	0.6069	Sal, Arjuna, Kenkat, Karue
8	Bonai	Nuadihi	1	0.8093	Sal, Dhaura, Karda, Jamun, Tentuli, Mahula
9	Bonai	Chudakhai	1	0.2023	Asan, Dhaura
10	Bonai	Sibanathpur	1	0.2023	Sal, Asan, Simili, Harida, Bahada
11	Bonai	Khajuridihi	3	0.2831	Sal, Asan, Dhaura, Banyan
	Total :-		24	4.1873	
12	Barsuan	Baurkela	1	0.1416	Sal
13	Barsuan	Chordhara	3	0.8496	Sal, Mahula
14	Barsuan	Kulla	1	0.4046	Sal
15	Barsuan	Manchabeda	4	1.8209	Sal, Mahula, Mango
16	Barsuan	Nuatantra	1	0.1416	Sal
17	Barsuan	Phatatangar	2	0.5664	Asan, Sal, Lahuada
18	Barsuan	Taldihi	2	0.263	Sal, Asan, Mahula
	Total :-		14	4.1877	

19	Jarda	Jarda	1	0.4856	Sal, Piasal, Mango, Mahula, Harida, Bahada (coverd under block plantation)
20	Jarda	Kusumnali	1	0.2428	Sal, Banyan
21	Jarda	Regadabahal	1	0.2023	Sal, Mahula, Harida, Banyan
22	Jarda	Niktimal	1	0.1618	Sal, Asan, Bahada, Kendu, Mahula
23	Jarda	Kainsibahal	1	0.0404	Sal, Asan, Bahada, Kendu, Mahula
24	Jarda	Kello	1	0.0809	Sal, Asan, Arjuna, Mahula, Mahula
25	Jarda	Ghantiali	1	0.1214	Sal, Mahula, Jamu, Pipali, Bahada
26	Jarda	Kunjuria	1	0.089	Sal, Bahada, Veru, Pipali
27	Jarda	Jalei	1	0.607	Sal, Mahula, Harida, Bahada, Siali, Mahula, Pipali
28	Jarda	Balia	1	0.0607	Sal, Jambu, Mahula
29	Jarda	Kansar	3	0.9711	Sal, Mahula, Simili, Banyan, Bahada
30	Jarda	Kundheidiha	2	0.2427	Sal, Mahula, Banyan, Pipali
	Total :-		15	3.3057	
31	Kuliposh	Sihidiha	1	0.2023	Sal, Asan, Amla, Dhaura
32	Kuliposh	Badagaon	1	0.1214	Sal, Asan, Dhaura
33	Kuliposh	Baneikela	1	0.1214	Sal
34	Kuliposh	Kuliposh	1	0.4046	Sal, Mahula
35	Kuliposh	Budhabhuin	1	0.2023	Teak, Sal

36	Kuliposh	Bhagabansahi	1	1.0117	Sal (covered under (OFSDP)
37	Kuliposh	Phuljhar	1	0.1214	Sal, Mahula
38	Kuliposh	Patamund	1	0.2023	Sal, Mahula
39	Kuliposh	Ganighasa	1	0.1214	Sal, Mahula
40	Kuliposh	Sulabdihi	1	0.4046	Asan, Sal
41	Kuliposh	Dhinkianali	1	0.1214	Sal
42	Kuliposh	Badajal	1	0.2023	Sal, Mahula
43	Kuliposh	Dangapani	1	0.1214	Sal
44	Kuliposh	Ranja	1	0.1011	Sal
45	Kuliposh	Budhandihi	1	0.2023	Sal
46	Kuliposh	Lunga	1	0.0607	Sal, Mahula
47	Kuliposh	Ekpadi	1	0.0607	Mango
48	Kuliposh	Daleisara	1	0.0607	Mahula
49	Kuliposh	Derula	1	0.2023	Sal
50	Kuliposh	Banki	1	0.2023	Sal , Mahula
	Total :-		20	4.2486	
51	Sole	Sole	3	0.8172	Sal, Arjuna, Char, Mahul
52	Sole	Tukuda	1	0.1214	Mango
	Total :-		4	0.9386	
53	Tamra	Boneikela	1	0.1214	Kadam, Putusbuda
54	Tamra	Kuleibaga	1	0.0607	Sal, Mahula
55	Tamra	Ludhuni	1	0.4046	Dhaura, sal, Karda, Mahula, Bheru
56	Tamra	Silikata	1	0.0404	Sal, Mahula, Shrub
57	Tamra	Tumbei	1	0.0485	Sal, Mahul, Shrub
58	Tamra	Kantapali	1	0.2023	Sal, Karda, Mahula, Shrub
59	Tamra	Nuniapali	4	0.4855	Sal, Mahula, Mango, Banyan, Pipali
60	Tamra	Dumermunda	1	0.2023	Sal, Mahula, Neem

61	Tamra	Jamudarh	1	0.0607	Sal, Mahula, Shrub
62	Tamra	Bhurung	1	0.2225	Mahula
63	Tamra	Dharanidharpur	1	0.2428	Mahula
64	Tamra	Tamra	1	0.4046	Teak, Mahula, Neem, Bela, Jadi
65	Tamra	Kusumdihi	1	0.2023	Kusum
66	Tamra	Pitagaon	1	0.0404	Sal, Mahula
67	Tamra	Khandamuni	1	0.0607	Sal, Mahula
68	Tamra	Rajabasa	1	0.607	Mahula, Shrub, Sal
69	Tamra	Raikelaposh	1	0.1618	Mango
70	Tamra	Madhupur	1	0.0404	Sal, Mahula, Kendu
71	Tamra	San- Gurundia	1	0.4046	Sal
72	Tamra	Badagaon	2	0.4451	Mahula, Kalam, Sal, Shrub
73	Tamra	San- Badagaon	1	0.2832	Shrub
74	Tamra	Jadaloi	1	0.0809	Sal, Banyan, Pipali, Date, Palm
75	Tamra	San- Jadaloi	1	0.4046	Bamboo
76	Tamra	Balabhadraprasad	1	0.0809	Mahula, Sal, Shrub
77	Tamra	Chandiposh	1	0.0607	Sal, Mahula
Total :-			29	5.3689	
G. Total :-			106	22.2368	
Source : O/o the Divisional Forest Officer, Bonai Division					

8.6. Ecotourism areas and activities.

8.6.1 Ecofriendly tourism activities with the aim of public awareness on conservation of nature and natural resources and provision of alternate employment opportunities to the local forest dependent community play a very good role in conservation of forest and wildlife today. Ecotourism is effectively being used as a tool for protection of natural resources in many areas. In the recent years, Govt. of Odisha have also given enough emphasis on the possibility of Community based sustainable

nature tourism with the aim of Forest & Wildlife conservation on one side, and socio-economic upliftment of local community on the other side. the development eco tourism near the forests.

8.6.2.Amidst thick jungles, Khandadhar is a glittering waterfall, situated in Kuliposh range area of Bonai division, created by a perennial rivulet called Korapani Nala within a few kms. of its origin. With an average of 244 meters in height it is said to be the second highest waterfall in Odisha.This waterfall, 19 Km from Bonai attracts a lot of visitors annually. In order to control and manage ecotourism activities in this waterfall location, one ecotourism society has formed in the year 2017.During the last working plan period, various activities have got implemented in the area to promote community oriented sustainable ecotourism. Activities include upgradation of visitor facilities in Khandadhar day tourism site and establishment of Khandadhar nature Camp as an accommodation facility for visitors. These activities provide opportunity for employment to local forest dependent community & excellent facilities for exploring nature tourism facilities for visitors. Disturbance to the nature in the form of plastic pollution, air pollution, water pollution etc. are also being controlled properly through this community based management. All ecotourism activities are being executed in strict compliance to existing Acts & Rules. Other details of this ecotourism spot is as provided below.

(a) Tourist foot fall: Details of tourist foot fall to Khandadhar for last 10 years and is provided in the following table 8.6.2.1.

Table 8.6.2.1- Tourist foot fall to Khandadhar for last 10 years	
Year	No of visitors to Khandadhar Eco-tourism site
2012	1,21,420
2013	1,40,842
2014	1,48,460
2015	1,56,848
2016	1,62,510
2017	1,74,302
2018	1,78,504
2019	1,12,566
2020	42,913
2021	29,719
Total :-	12,68,084

(a) **Carrying capacity study:** No scientific study has conducted till now to find out the carrying capacity of Khandadar tourism site. However attempts are being taken up to regulate the number of tourists to such extent that whose presence does not have a negative environmental or cultural impact.

(b) **Visitor Management System:** In order to manage Khandadhar Day tourism site one Eco Tourism Group (ETG) of 30 members has formed from Budhabhuin and Ladapani VSSs. This ETG has provided with training on hospitality management and the group manages day to day activities in the site. Sufficient awareness measures are being provided to visitors regarding rules and regulations to be followed within the ecotourism site to keep the environment clean and to ensure no negative impact will be there on environment by tourism activities.

In order to manage Khandadhar Nature Camp, one ETG of 10 members got formed from Budhabhuin and Ladapani VSSs and this group manages day to day activities here. Centralized online Booking is being provided through state ecotourism website www.ecotourismodisha.com.

(c) **Safety audit & Measures to ensure safety of tourists:** Safety of visitors are being ensured in both sites. In order to avoid accidents in water fall site, guides have provided to control the visitors for not entering danger zones. On the hiking route necessary numbers of guides have been provided to help visitors. Visitors are not being allowed to venture into forest areas. Khandadhar Nature camp is provided with proper fencing to avoid entry of wild animals to the nature camp. Necessary briefing on do's and don'ts is being given to visitors in both sites. Necessary signages have also being provided.

(d) **Nature education and interpretation:** Proper awareness measures are being provided to visitors to make them appreciate conservation of forests and wildlife. Trekking is being provided to visitors of Khandadhar Nature camp, through which they are getting opportunity to explore various flora and fauna in the area. Guides of Eco Tourism Group got provided with necessary training regarding flora and fauna of the area. Nature education camps are being provided to School/college students also.

- (e) **No. of mandays created for local communities:** Ecotourism activities at Khandadhar have started in a systematic manner only from 2018. No of mandays created for local community through ecotourism activities from Khandadhar Ecotourism Site, yearwise(from 2018-19 onwards) is as shown in the following table8.6.2.2.

Table8.6.2.2- Yearwise mandays created from Khandadhar ecotourism stie	
Year	No. of mandays created in Khandadhar Eco-tourism site
2018-19	13,160
2019-20	14,760
2020-21	10,249
Total :-	

- (f) **Total revenue from Ecotourism:** The total revenue collected from Khandadhar Nature Camp & Khandadhar Ecotourism site yearwise (from 2018-19 onwards) is depicted in the following table8.6.2.3.

Table 8.6.2.3- Revenue collected (Year wise) from Khandadhar ecotourism site		
Year	Revenue collected from Khandadhar Nature Camp(Rs.)	Revenue collected from Khandadhar Day tourism site.(Rs.)
2018-19	5,50,195.00	19,49,900.00
2019-20	41,49,441.00	19,20,225.00
2020-21	38,45,079.00	6,35,640.00
Total	85,44,715.00	45,05,765.00

- (g) **Draft strategy for ecotourism:**

Community based sustainable nature tourism activities have given emphasis in the division. Alternate employment opportunities to forest dependent community on one hand and providing ecofriendly tourism facilities with the component of nature interpretation and nature awareness on the other had are the main objectives of ecotourism in the division. For both day tourism and nature camping activities at Khandadhar “EcoTourism Groups” (ETGs) have formed from VSSs of nearby villages. These ETG are

managing the ecotourism activities here. These ETG groups have provided with training in this aspect also. Revenue obtained out of the ecotourism is being shared by following a fair benefit sharing system. In case of “Khandadhar Day tourism site” the revenue is being deposited to “Khandadhar Ecotourism Society.”, which is a society registered under Societies Act to manage ecotourism activities at Khandadhar. District Collector and Magistrate, Sundargarh District is the Chair man in the society and Divisional Forest Officer, Bonai Forest Division is the member secretary. Revenue generated out of the ecotourism activities is being utilized for wages of ETG and for improvement of visitor facilities, as per decisions taken by the governing body of Khandadhar Ecotourism Society.

In case of Khandadhar Nature camp, visitors are getting opportunity to do centralized booking and the payment being done centrally to OFDC (Odisha Forest Development Corporation.) The collected amount will be transferred to VSS through Divisional Forest Officer, Bonai. Sharing of the revenue among the beneficiaries is being done as per guidelines of Odisha Forest and Environment Department, in which 90% of the revenue will be rolled back to community in various forms.

8.7. Social Customs.

8.7.1. More than 98% of the human population of Bonai division is characterized by rural population. The scheduled tribes constitute the bulk of population and their percentage in total population is more than 67. The Scheduled Castes constitute 7.2% of total population. Though the area is characterized by variety of tribal customs, no proper documentation has been done in this regard till now. Tribal rituals, Tribal Political organizations, Tribal worship, Tribal festivals etc. need to be studied to keep the identity of each tribal community.

8.7.2. The local people in the fringe villages worship different places in the forest and out side the forest as the places of different goddess and worship on different seasons. On the occasion of annual festivals, they come together to the worship places in large numbers for Puja and other celebrations. Before a new settlement is initiated, a small patch of forest will get demarcated as a sacred grove, for the well being of the inhabitants, and is locally known as “Thakuranisal”. Also burial grounds, places of trees believed to have super natural powers are also getting worshipped by some communities. It also finds that old trees with termite mounts are also being kept as worship places in some locations. The worship is being organized by villagers of the respective sacred grooves every year. Worship is being organized mainly during harvest season such as rice harvesting season, Sal and Mahua flowering season, mango fruiting season etc. Sacrifice of domestic animals such as domestic fowls, goat, sheep for god is common practice among many tribal community. Prayers are offered for rain, protection from animals and diseases as well as overall well being of the village. “Kadabali”, “Bihana”, and “Lakshmipuja” are pujas being done before sowing, after sowing and after harvesting respectively. Social custom of the peripheral forest dwellers are linked with worshipping the “tree” in the tradition of KARMA PUJA and TUSI PUJA which is prevalent age old practice.

8.8. Status of compliance of Forest Right Act, 2006 (FRA).

8.8.1. The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act’2006 came into force with effect from 31.12.2007 vide S.O. No.2224 (E) dt.1.12.2007.

8.8.2. Accordingly, applications from the Schedule Tribes and Other Traditional Forest Dwellers of this Division have been received by the Sub-Divisional Level Committee through the Gram Sabha for issue of Forest Rights in shape of patta. Gram Sabha is the authority to initiate a process to vest rights on marginally and tribal communities after assessment of the extent of their needs from forest lands. After rejecting , claims cannot be admitted as per the act & rules, Gram Sabha then passes such a resolution to sub-divisional level committee (formed by the state governments.), along with the approved claims for consideration at this level. SDLC is being chaired by Subcollector,

Bonai . If one or more communities are not satisfied by such a resolution, they may file a petition to sub-divisional level committee. Sub-Divisional Level committee after its assessment, passes the resolution to District level committee for its final decision. This Committee is being chaired by District Magistrate and Collector, Sundargarh. The district level committee's decisions are considered final and binding. A state-level monitoring committee is constituted by the state government to monitor the process of recognition of these rights. Officers included in the sub-divisional level committee, district level committee and state-level monitoring committee include, officers of Department of Revenue of state government, officers of Department of Forests of state government, officers of Department of Tribal Affairs of state government & Three members of Panchayati Raj Institutions including two Scheduled Tribes members and at least one woman. ACF Bonai Forest Division is member to SDLC, Boani Sub division and DFO, Bonai is member of DLC, Sundargarh Division.

Position of settlement of rights under the Act in Bonai Forest division is as shown in table 8.8.1.

Table: 8.8.1: Position of settlement of rights under “the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act’2006” in Bonai Division.		
Name of the Dist (sub-div wise)	1	Bonai
No. of village in the district	2	596
No. of villages fully covered so far (total)	2 (A)	259
No. of 1st Gram Sabha meetings held	3	301
No. of Gram Sabha meetings held subsequently	4	289
No. of FRCs constituted by Gram Sabha	5	590
No. of claims received by FRCs	6	14372
No. of claims verified by FRCs and sent to Gram Sabha (Out of Col. 6)	7	14037

Gram Sabha Level	No. of claims approved by Gram Sabha and sent to SDLC		8	13484
	Area Involved (in acres) & No. of families	Area in acres	9	-
		No. of families	10	13484
	No. of claims rejected by Gram Sabha		11	553
	No. of claims remanded to FRCs		12	0
	No. of Gram Sabha confirming completion of recognition on claims so far (total)		12 (A)	596
Sub- Divisional Level Committee	No. of claims approved by SDLC (sub-div wise) & Sent to DLC		13	9142
	Area Involved (in acres) & No. of families	Area in acres	14	-
		No. of families	15	9142
	No. of claims rejected by SDLC		16	3947
	No. of claims remanded to Gram Sabha		17	395
	No. of Sub-division confirming completion of recognition on claims so far (total)		17 (A)	-
District Level Committee Level	No. of claims approved by DLC for title		18	3953
	Area Involved (in acres) & No. of families	Area in acres	19	-
		No. of families	20	3953
	No. of claims rejected by DLC		21	286
	No. of claims remanded to SDLC		22	13
No. of certificate of titles distributed			23	3633
Area (in acre)			24	4524.64
No. of certificate of titles distributed by PTG			25	221
Area (in acres)			26	-
No. of claims uploaded			27	6994

8.9. Other Rights and Concessions.

8.9.1. No rights are admitted in the Reserved Forests of this Division. However, as a concession, the forest dependent tribes are permitted to collect free of charge edible fruits, roots, leaves and grass for their own domestic consumption. Free grazing has been abolished in this Division since 1954. In times of calamities like flood or fire, supply of forest materials at schedule of rate is made to the distressed people from nearby forest areas as per provisions contained vide Rule-250 and 251 of "The Odisha Forest Department Code,1979". The tenants are allowed to take bamboos from the annual coupes at scheduled of rates. The tenants are also allowed to collect dry timber and firewood from Khesra Forests at half of the current schedule of rates subject to payment of their Nistarcess. The Prevailing schedule of rates for forest produce, Odisha, 1977 came into force with effect from 24.11.1977.

8.9.2. Certain rights were granted by the Govt. for sanction of relief in distress conditions vide letter no. 71057 dt. 2.12.72. of Revenue Department, Govt. of Orissa in the protected Forests (Khesra Forest or un-Reserved Forests). Concessions were also granted by the Govt. of Orissa, Forest Fisheries and Animal Husbandry Department No. 10F (M) / 14 / 90- 10488 / FFAH dated 11th May 1990 for supply of fuel wood, bamboos, house building materials etc. to public, particularly to nistar-cess paying tenants from B-class and Khesra forests. The concessions were given for supply of:

- a) Fuel wood @ 2 cart loads / annum with a nominal cost of Rs.16.00 / bullock cart and Rs.24.00 / buffalo cart.
- b) Bamboos @ 50 nos. / annum with a cost of Rs.1.50 / piece (long and thick bamboos) and Re.1.00 / piece (thin bamboos) subject to supply from OFDC depots.
- c) Bamboos and small timbers etc. to be supplied by the OFDC Ltd. and SFDC at the scale prescribed under OFD code.
- d) House building materials to be supplied from the OFDC depots at the rate fixed from time to time.

8.9.3. All such supplies / sales were subject to first come and first serve basis. These concessions were further allowed by the Govt. vide notification no. 1696 dt.22.1.91, Forest and Environment Department, Govt. of Orissa. The village wood lots in VFs which have been transferred from Social Forestry Projects to the Territorial Divisions, usufruct rights are admitted under J.F.M. rules. Forest areas are also being allotted to VSS for its protection and management by allowing certain usufruct rights and concessions to the Samities over the forest land they protect vide Govt. of Orissa Forest and Environment Department resolution no. 16700 dated 3rd July 1993.

8.10. Dependency of Local People on NTFPs.

8.10.1. Forests of Bonai Division are rich in biodiversity. Species yielding non-timber forest produce (NTFP) like fruits, seeds, flowers, tubers, barks, leaves, roots and gums are abundant. The livelihood support of people in and around the forests largely depends on these products. NTFP Management was very much unorganized in the past. Even the present practice of collection of NTFPs is not scientific and sustainable. In the previous working plan one Working Circle has constituted with an aim to address the problems with related to collection and management of NTFP resources in the division.

8.10.2. NTFPs are useful in many respects to the local rural inhabitants. Traditionally, many edible NTFP items form part of the staple diet of tribal folk and are consumed by them. Fruits, seeds, flowers, and leaves of many tree species as well as herbs and shrubs are edible and are consumed either raw or cooked. Fruits, flowers, seeds, leaves, bark, roots and gum etc. of many tree species and herbs and shrubs do have medicinal properties and have been traditionally used by the local inhabitants for treating and curing various ailments. Quite a large number of NTFP items have commercial importance. The oil seed, fibres, tannin gum, resin, etc. Procured from different trees species have now been commercially used for diverse purposes.

8.10.3. Most of the NTFP items available in this Division have one year collection cycle. In general, the collection in most of the case starts after the rains (October) and is over by the end of spring (March/April) and hardly coincide with the agricultural crop sowing

and harvesting season. This enables the poor and labour class people to take up the NTFP collection just after planting season and before the harvesting season of major agricultural crops. Thus, it helps the most needy people in earning their livelihood during the period of the year when they are either idle or under employed and are badly in need of additional source of income generation

8.10.4. Majority of gatherers of NTFP are women, and have limited access to the market, and their primary concern is getting a fair price for the materials gathered by them and disposing them off. The prevailing system does not adequately provide these facilities to the primary gatherers. Keeping in view of this fact, the Government of Odisha formulated the Policy on procurement and trade of Non Timber Forest Produce during March 2000. In the present scenario, special efforts are required to strike a balance between protection of interest of the primary gatherers; enhancing their subsistence along with protection/conservation of the natural resources and increasing the productivity and making the forest resource utilization sustainable.

CHAPTER - 9

ADEQUACY OF POLICY, LEGAL AND INSTITUTIONAL FRAME WORK

9.1. Existing Policy and Legal Frame Work and their compliance.

9.1.1. In Resolution No. 3-1/86-FP, dated the 7th December 1988, the Government of India in the Ministry of Environment and Forests (Department of Environment, Forests & Wildlife) enunciated a Forest Policy to be followed in the management of State Forests in the country. 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; 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; Checking soil erosion and denudation in the catchment areas of rivers, lakes, reservoirs in the "interest of soil and water conservation, for mitigating floods and droughts and for the retardation of siltation of reservoirs; Checking the extension of sand-dunes in the desert areas of Rajasthan and along the coastal tracts; Increasing substantially the forest/tree cover in the country through massive afforestation and social forestry programmes, especially on all denuded, degraded and unproductive lands; Meeting the requirements of fuel-wood, fodder, minor forest produce and small timber of the rural and tribal populations; Increasing the productivity of forests to meet essential national needs; Encouraging efficient utilisation of forest produce and maximising substitution of wood; and Creating a massive people's movement with the involvement of women, for achieving these objectives and to minimise pressure on existing forests were the objectives of this forest policy. The principal aim of Forest Policy is to ensure environmental stability and maintenance of ecological balance including atmospheric equilibrium which are vital for sustenance of all lifeforms, human, animal and plant. The derivation of direct economic benefit must be subordinated to this principal aim.

9.1.2. Forests and Wildlife of this division are being managed as per the guidelines envisaged under the above said policy. Forest Management Planning must provide for sustainable management of forests and its biodiversity as enshrined in the National Forest Policy encompassing the ecological(environmental), economic(production) and social(including cultural) dimensions. Accordingly the last working plan of the division has prepared in order to achieve the aim of sustainable management of forests and its biodiversity. In compliance to prescriptions under this plan, various activities have taken up in the division to conserve forests and reduce forest degradation, to maintain and enhance ecotourism services, to enhance forest productivity, to improve forest health and vitality, to increase the growing stock and carbon sequestration potential, to maintain of biological diversity, to ensure sustained yield of forest produce, to improve and regulate hydrological regime, to prevent soil erosion, and to ensure people's involvement in planning and management of forests fulfilling socio-economic and livelihood needs of the people. There are various acts and rules enacted by Centre and State to ensure protection of forests & wildlife. Simultaneous implementation of Odisha Forest Act 1972, Wildlife Protection Act, 1972, Forest(Conservation) Act, 1980, Biological Diversity Act, 2002, Forest Rights Act, 2006 etc. are being ensured to protect forests and its biodiversity in the division.

9.2. Status of Approved Working Plan and Compliance: The last approved working plan for the Division is for the period 1997-98 to 2016-17 prepared by Sri Suresh Pant, IFS. Works undertaken in the Division were according to the prescriptions made in this plan. Deviations made in the implementation of the above said working plan have been briefly described in Chapter 11 of Part I. Proposals have been submitted to Principal Chief Conservator of Forests through the Regional Chief Conservator of Forest for necessary approval of the deviation statements.

9.3. Number of Forest offences: A compiled report on various offences booked during the last Working Plan period in the Division is tabulated in table 9.3.1. A total of 48,340 number of cases got booked in the Division out of which 2,385 cases were UD cases and in other cases, offenders got identified and proceeded as per concerned Acts and Rules. Out of the total cases, 321 number of cases were booked under Section 56 of Odisha Forest Act-1972, and 79 number of cases were booked under Wildlife (Protection) Act-1972.

Table 9.3.1.- Various Offence Cases Booked in Bonai Forest Division during last Working Plan Period					
Year	OR cases booked	UD cases booked	Total	Cases booked U/S -56 of OFA-1972 out of total cases	Cases booked under WL Protection Act 1972 out of total cases
1997-98	1772	212	1984	1	3
1998-99	2135	405	2540	24	4
1999-2000	2458	201	2659	6	0
2000-01	3181	199	3380	35	3
2001-02	3960	133	4093	39	4
2002-03	3248	280	3528	22	5
2003-04	2248	79	2327	2	7
2004-05	1963	67	2030	7	2
2005-06	1958	61	2019	2	3
2006-07	2156	56	2212	13	5
2007-08	2482	78	2560	24	3
2008-09	2423	66	2489	19	4
2009-10	2141	39	2180	22	3
2010-11	2160	52	2212	49	5
2011-12	2039	54	2093	17	5
2012-13	1709	39	1748	9	2
2013-14	1645	65	1710	5	6
2014-15	1760	48	1808	5	6
2015-16	2280	94	2374	12	5
2016-17	2237	157	2394	8	4
2017-18	1664	98	1762	4	3
2018-19	1372	46	1418	4	8
2019-20	1502	94	1596	16	2
2020-21	1478	33	1511	11	7
Total :-	51,971	2,656	54,627	356	99
Source : O/o the Divisional Forest Officer, Bonai Division					

9.4. Status of Research and Development: Permanent research plots are not present in the Division for conduct of any research studies. However some research works published during the last Working Plan period by other institutions/individuals are as shown in the table 9.4

Table 9.4: List of published research works of Bonai Forest Division	
(1)	Biodiversity survey of Bonai Forest Division, Odisha, India (<i>Dr. Pratyush P. Mahapatra & Himanshu Shekhar Palei</i>)
(2)	Aquatic Angiosperms of Bonai Forest Division, Sundargarh District, Odisha Plant Science Research (<i>Kishore Kumar Mandal, Sri S.S. Khora & Truptirekha Kar</i>)
(3)	Phyto-sociological studies on Biodiversity of Bonaigarh Forest Division, Sundargarh District (<i>Vikas Kumar & Satyabrata Nayak</i>)
(4)	Protection and Conservation of Sacred Groves of Bonai Forest Division, Odisha (<i>Centre for Biodiversity Conservation (CBC), Bhubaneswar</i>)
(5)	Documentation, protection, conservation and sustainable utilization of indigenous traditional knowledge of Paudi Bhuyan in Khandadhar hills, Bonai division, Orissa (<i>Centre for Biodiversity Conservation (CBC), Bhubaneswar</i>)

9.5. Human Resources Capacity Building Efforts :Bonai Forest Division is under the charge of a Deputy Conservator of Forests of IFS cadre, who is designated as Divisional Forest Officer (D.F.O.), Bonai Forest Division. This Division comes under the administrative jurisdiction of Rourkela Forest Circle headed by Chief Conservator of Forests (R.C.C.F.), Rourkela, which is an administrative unit of Odisha Forest & Environment Department being headed by Principal Chief Conservator of Forests & Head of Forest Force(PCCF & HoFF). The sanctioned and present strength of executive establishment and office establishment of the Division as on 31.03.2021 is as shown in the table 9.5.1.

Table 9.5.1- Sanctioned and Present strength of Executive & Office establishment							
Sl No .	Name of Division	Cadre Circle	Name of the post	Sanctioned strength	Person in position	Vacancy	Remarks
1	2	3	3	4	5	6	7
1	Bonai	Rourkel a	D.F.O.	1	1	-	
2	-do-	-do-	A.C.F.	3	3	-	
3	-do-	-do-	F.R. (Affn.)	1	-	1	
4	-do-	-do-	F.R. (Enf.)	1	-	1	
5	-do-	-do-	F.R. (Range)	7	4	3	1 FR is U/S
6	-do-	-do-	Dy. Ranger	9	6	3	
7	-do-	-do-	F.E.S.	1	1	-	
8	-do-	-do-	<u>Forester</u>				
			Direct	21	17	4	
			Promotee	21	21	-	
			Total Fr.	42	38	4	
9	-do-	-do-	<u>Forest Guard</u>				
			Direct	109	59	50	
			Promotee	6	3	3	
			Total F.G.	115	62	53	
10	-do-	-do-	Head Clerk	1	1	-	
11	-do-	-do-	Jr. Accountant	8	5	3	
12	-do-	-do-	Jr. Clerk	9	6	3	
13	-do-	-do-	Jr. Stenographer	1	-	1	
14	-do-	-do-	Driver (LV)	2	2	-	
15	-do-	-do-	Amin	1	-	1	
16	-do-	-do-	Chain man	1	1	-	
17	-do-	-do-	Dak Runner	2	2	0	

18	-do-	-do-	Office Peon	1	1	-	
19	-do-	-do-	Office Chowkidar	1	0	1	
TOTAL:-				207	133	74	
Source : O/o the Divisional Forest Officer, Bonai Division							

Initial training to the staff after recruitment is being provided from various training institutes. For IFS officers, 2 year training from Indira Gandhi National Forest Academy (IGNFA), for State service Officers, 2 year training from State Forest Service Colleges, for Range Officers, 18 month training from State Forest Service Colleges, for Foresters, 12 months training from various training schools of the state, and for Forest Guards, 6 months training from various training schools under the forest departments are being ensured. Field staff of this Division are being deputed to various Forestry Training institutes under the Departments in various batches. Refresher courses are also being conducted in various institutes for updating the knowledge of the field staff. Further various capacity building trainings are being organized at Division level and Circle level according to the availability of funds. During the last Working Plan period, training programmes have been arranged for staff on topics viz Forest Protection, advanced nursery techniques, different Acts like Orissa Forest Act, 1972, Wild Life (Protection) Act, 1972, Forest Right Act, Right to Information Act and Rules, use of GIS tools in forest protection and management, Joint Forest Management etc.

9.6. Forest Resource Accounting : Forest Resource accounting is an important tool in sustainable forest management. It facilitates the estimation of the economic value of tangible and intangible forest benefits and the contribution of the forestry sector to Gross Domestic Product (GDP). Being endowed with rich forest cover and hence biodiversity, the environmental benefits out of forests of Bonai Division is of utmost importance to the society.

The measure of the capital value of the forest of this Forest Division can be broadly categorized in to the following two major heads viz (i) Insitu capital value of the growing stock of the forest (Value of biomass) and (ii) Imputed value of the environmental services provided by these forests.

For estimation of capital value of the forest and the value of growing stock the following assumptions have been made.

- i.** The data regarding stock has been estimated by analyzing inventory data collected from the field by sample point enumeration and the value from satellite imagery data calculated by NRSA.
- ii.** The growing stock of the entire Division has been converted in shape of round timber, firewood and bamboo.
- iii.** The quantum of firewood obtained from the growing stock above 30 cm gbh is only 20% of total volume and rest 80% is timber.
- iv.** The volume of growing stock below 30 cm gbh (for which enumeration has not conducted), is taken as 50 % of the growing stock of 30-69 cm dbh class trees.
- v.** One metric ton of firewood is equal to 3 cum.
- vi.** The entire stock of bamboo is calculated as if converted to industrial bamboo.
- vii.** The capital value includes the imputed value of environmental services being provided by forests.

9.6.1. Insitu Capital Value :In situ Capital Value of the Forests can be estimated by computing the following parameters

- a. Value of the forest from yield of timber.
- b. Value of the forest from the yield of bamboo.
- c. Value of the forest from the yield of Kendu leaves.
- d. Value of the forest from the sale of the NTFP.
- e. Value of the forest from sale of firewood.

Forest type, crop composition and density vary in various forest blocks of the division. It is quite essential to arrive at the details of the total growing stock of all the constituent forest blocks for the estimation of capital value of the forests. The analysis furnished by NRSA for the sample enumerated blocks are taken and in the rest of the areas the details of growing stocks area collected through law of average as provided by NRSA and through reconnaissance surveys. So the capital value of the forests is calculated from the field exercises and projection of satellite imagery by NRSA.

For the estimation of the capital value of the forest certain facts have formed the basis data. (i) The total area enumerated is 125.904 ha, which is 0.09 % of the total forest area to be managed in this plan.(ii)The criteria for enumeration has been fixed to 0.1% of the forest areas of various blocks but the percentage of sample points was increased to 0.122% by NRSA and ORSAC after analyzing the crown density and satellite imagery data. The GPS coordinates for sample points were provided by ORSAC and NRSA basing upon the stratification through satellite imagery. In this way stock mapping of the growing stock has been carried out for the entire Division byNRSC/ ORSAC.

Comparison of such enumeration data with previous data could not be feasible because of different methodology adopted and non-availability of complete enumeration data. Local volume equations, which are developed by FSI based on their inventory conducted in different parts of Odisha, have been used in estimating the

volume of the growing stock. Thus, the capital value of the forest for timber and firewood is calculated for all the forest blocks. The unit volume of timer has been calculated by the method as prescribed by the office of the Principal Chief Conservator of Forests, Odisha vide Memo No.12224(4) / 5F- S.T.-20/81, dt. 07.06.1982 and Memo No. 5F.S.T.-2083-17544 dated 04.1987. As per the directions in these circular the ratio for conversion into unit volume is given in the table below.

Table No.9.6.1			
The ratio for conversion into unit volume			
Girth Class in Cm	Class species		
	1 st Class	2 nd Class	3 rd Class
Less than 60 cm	0.25	0.12	0.06
60 to 89 cm	0.50	0.25	0.12
90 to 119 cm	1.00	0.50	0.25
120 to 149 cm	2.00	1.00	0.50
150 to 179 cm	4.00	2.00	1.00
More than 180 cm	6.00	3.00	1.50
1 st Class species	Sal, Piasal, Sisoo, Bandhan, Gambhar, Champa & Kangada		
2 nd Class species	Kasi, Asan, Mango, Kendu, Jamu, Kurum, Dhaura, Tentra, Sidha, Mitkinia & Rohini		
3 rd Class species	All others except teak, and Sandalwood.		
Sources- Memo No.7420/F&E dt.08.05.2006 and No.17094/F&E dt.17.10.2006 of the Govt. in F&E Department			

9.6.1.1. Capital value of timber and fire wood:

The basis on which value of Timber and Fire wood have worked out areas furnished below.

- (i) The volume of growing stock below 30 cm gbh (for which enumeration has not conducted), is taken as 50 % of the growing stock of 30-59 cm dbh class trees.
- (ii) Timber production will be taken as 80 % of the total estimated growing stock of all trees above 30 cm dbh.
- (iii) Total fire wood production in the division will be the total of volume of growing stock below 30cm(which is equal to half the volume of 30-69 cm dbh class trees) and 20 % of the total estimated growing stock of 30-69cm dbh class trees.
- (iv) One MT of firewood is equal to 3 CUM(one standard stock of firewood of size 12'x3'x3' or 108 cft or 3 cum is equal to One MT)

Unit price of the forest value is a variable, which depend upon the (i) Availability of forest produces in the market. (ii) Fluctuating market demand and supply. (iii) Rate of inflation in the market. These parameters are responsible for raising/dropping of the unit price of forest produce such as timber, and NTFP. Owing to the closure of coupe working in different forest Divisions by the State Govt. from 1992-93 onwards the unit price structure is not readily available however we have to rely upon the unit price of the previous year to calculate the average unit price of the timber and other NTFP forest produce. The rate of timbers of previous years i.e. 1997-98 to 2020-21 is given below in the table 9.6.1.1.

Table No.9.6.1.1					
The rate of timbers of previous years i.e. 1997-98 to 2020-21					
Year	Timber received during out going Plan period.				
	In unit	In cft	Royalty in Rs.	Unit rate in Rs.	% of raise
1997-98	No working due to moratorium on felling of trees issued by Government vide No.27161/F&E dt.12.11.1992				
1998-99	-do-				
1999-00	-do-				

2000-01	-do-				
2001-02	-do-				
2002-03	-do-				
2003-04	-do-				
2004-05	-do-				
2005-06	14667.00	1,28,560.91	1,29,06,960	880	1 st time fixed for the entire state
2006-07	15903.2555	1,02,951.69	1,47,90,028	930	5.60%
2007-08	22074.5074	1,79,606.86	2,29,57,488	1040	11.82%
2008-09	24013.1875	1,75,944.49	2,49,73,715	1040	No rise
2009-10	21170.1250	1,68,242.26	2,28,63,735	1080	3.85%
2010-11	15093.7150	1,29,489.90	1,71,31,367	1135	5.09%
2011-12	21026.2200	1,64,319.31	2,52,83,064	1200	5.73%
2012-13	20400.5100	1,82,673.42	2,64,39,061	1296	8.00%
2013-14	21583.5550	1,62,274.67	2,99,36,390	1387	7.02%
2014-15	31487.2300	2,23,068.46	4,58,45,408	1456	4.97%
2015-16	33359.5800	2,58,730.72	5,05,06,408	1514	3.98%
2016-17	30919.3500	2,36,876.68	4,96,25,558	1605	6.01%
2017-18	39059.685	3,63,645.67	6,70,65,479	1717	6.97%
2018-19	36722.635	3,27,933.13	6,62,10,916	1803	5.00%
2019-20	38981.437	3,50,832.94	7,51,95,195	1929	6.98%
2020-21	32300.370	2,84,889.26	6,47,94,544	2006	4.00%
Source : O/o the Divisional Forest Officer, Bonai Division					

Accordingly, the capital value of Timber and Firewood has been calculated as follows.

Timber:

Total growing stock estimated (of trees of more than 30 dbh)=191,18,699 cum

Capital value of Timber=80% of Total Growing stock x unit price =152,94,959 cum x Rs 28901 = Rs. 44204 Crores

Firewood:

Total volume of growing stock of >30 cm dbh = 191,18,699 cum

Total volume of growing stock of <30 cm dbh =50% of Total volume of growing stock of 30-60 girth class trees = 50 % of 19,21,500 =95,59,349cum

Capital Value of Fire wood=(20 % of total volume of GS of >30 cm dbh +50% of GS of <30cm dbh) x unit price = (3823739.8 + 4779674.5) cum x 270 Rs/Qtl= Rs. 2323 Crores

9.6.1.2. In-situ capital value of Bamboo:-The average clumps per ha in the enumerated blocks are 35, the average culms per clumps is 3, the quality class of bamboos varies from Q-III to Q-I and the average height of bamboo culms is taken as 6.0 meters. The total sale units in 27 forest blocks have calculated. The average rate of royalty is Rs.500.00 for the year 2016-17. It may increase during subsequent years due to inflation of price index of the market. However for sake of calculation the rate of 2016-17 can be taken into account. The sale units of Bamboo calculated is 54703 SU

Total annual capital value of Bamboo= Total estimated SU54703 SU x Rs .7000=54703 x 7000=Rs.38.3 Crores

9.6.1.3.In-situ value of Kendu Leaves:- In this area Kendu leaf is produced in all Ranges under Bonai Forest Division. In 2016-17, the production of Kendu leaves was 8671.80 Qtl and the sale value was Rs.2225.76 lakh. On average, selling rate per quintal is Rs.25666. The production and sale value of kendu leaf from the year 2011-12 to 2020-21 is given below in the table 9.6.1.3.

Table 9.6.1.3				
Kendu leaves production				
Year	Name of division and KL production in Quintal		Average sale value of KL in Rs. Per Quintal	
	Rourkela (KL)	Kuchinda (KL)	Rourkela (KL)	Kuchinda (KL)
2011-12	7,127.40	1,873.20	11,291.40	10,378.76
2012-13	9,680.40	2,284.80	10,118.43	9,259.05
2013-14	9,460.20	2,412.00	11,600.34	10,196.54
2014-15	8,221.20	2,133.60	11,839.32	9,358.04
2015-16	8,668.20	1,885.20	15,292.89	15,653.63
2016-17	8,671.80	1,890.60	25,666.63	27,990.18
2017-18	8,184.00	1,852.20	17,068.81	24,953.74
2018-19	4,453.80	1,183.20	11,333.03	24,832.45
2019-20	2,864.40	982.20	19,211.25	26,286.87
2020-21	2,865.60	912.00	26,548.14	28,109.06
Total :-	70,197.00	17,409.00		

The average production of KL for 10 years from 2011-12 to 2020-21 comes to 8760.60 Qtl. Hence the Capital value of KL has calculated as follows.

Capial Value of KL= Average production(in qtl) x Average Price per Qtl of 2020-21
 $(27,328.60) = 8760.60 \text{ qtls} \times \text{Rs. } 27,328.60 = \text{Rs. } 23,94,14,933$

Hence the annual capital value of KL has assessed as Rs. 23.94 crores.

9.6.1.4. Insitu value of other Non timber Forest Produce:-A number of NTFP items are collected from the forests of this Division. The accounts of various products and their evaluation for the entire items could not be possible due to want of data. But instead of money value the livelihood needs of primary collectors in different Gram Panchayat level is given more importance. However, based on the available data and field studies, evaluation of various items as listed below in the table 9.6.1.4.

Table 9.6.1.4						
Local Name	Area in ha.	Potential harvesting Quantity per hectare in Kg.	Estimated harvest / hectare in Kg.	Production in Kg	MSP per KG	Total in Rs.
Amala	22676	0.256	0.026	5810	70	406700
Anantamula	11889	0.423	0.002	5025	80	402000
Bahada	38684	0.987	0.211	38173	20	763460
Bela	11889	0.210	0.042	2500	30	75000
Bhuin Neem	28231	0.212	0.035	5984	60	359040
Char	61905	0.584	0.584	36127	100	3612700
Dhatki Flower	28232	0.102	0.067	2890	40	115600
Harida	61905	0.536	0.213	33203	25	830075
Jamu	8438	2.706	2.706	22834	42	959028
Karanja	38686	0.781	0.264	30224	22	664928
Katha Chathu	19793	0.263	0.263	5200	50	260000
Kujri (Ping)	8438	0.296	0.296	2500	120	300000
Kusum	18892	0.932	0.402	17600	23	404800
Mahua	61905	54.758	5.476	3389780	60	203386800
Mahua seed	24691	2.385	2.385	58900	29	1708100

Mushroom	10453	0.201	0.201	2100	50	105000
Nima	19793	0.292	0.040	5785	55	318175
Palasa	19793	0.065	0.014	1284	40	51360
Sal	61905	0.460	3.169	28500	20	570000
Sal	61905	4.324	3.169	267689	35	9369115
Satabari	19793	0.027	0.012	537	107	57459
Siali	61905	3.780	0.549	233987	40	9359480
Tamarind	38686	4.815	0.483	186280	30	5588400
Total :-						23,96,67,220

Total annual capital value of NTFP items has assessed as 23.96 crores

9.6.1.5 In situ capital value of the total growing stock: Forests of Bonai Forest Division provides timber, firewood, bamboo as well as many NTFPs and a variety of medicinal plants. In the present plan, it could assess only for a few items for which data are available. For the purpose of assessment of capital value of the forests at present state only the value of timber, firewood, bamboo, kendu leaves and a few NTFP items have been considered. The estimate is very conservative for the growing stock and real value of the forests will be much more. Estimated capital value is as shown in the following table.

Table 9.6.1.5 : Estimated in-situ Capital value of forests of Bonai Forest Division.		
Sl. No	Item	Annual capital value in Crores
1.	Timber	44204
3.	Firewood	2323
4.	Bamboo	38.30
5.	Kendu leaves	23.94
6.	Other NTFP Items	23.96
		46613.20

9.6.2 Imputed Capital Value of Forests of this Division on Environmental Services:-

9.6.2.1. Many forest values are not easily quantifiable. Most of the environmental services like nutrient cycle, hydrological cycle, pure air, carbon sink and many more all in this category and are often categorized as intangible benefits. Forests of this Division are an open and vast treasure of biodiversity and other valuable resources evolved out of rapid growth of civilization and science. For evaluation of environmental benefits a perfect method has not been standardized and as such actual environmental valuation of the forests is not possible. However, Govt. of India has suggested norms in their letter No.11-16/85 Fry (CONS) dated 15.1.1985 for computation of environmental value of the forests. As per these norms, the environmental value of 1 ha. of fully stocked forests having a density of 1.0 is 126.74 lakhs to be accrued for a period of 50 years, which works out to be Rs. 2.5348 lakhs per hectare per year.

9.6.2.2. The density of forests of this division varies from fully stocked to blank patches. The density class wise list of forest blocks of this division is furnished in. To calculate the imputed capital value of environmental services of forests of the division, the gross area has been reduced to net area of 100 % density by applying density factor to different density classes of the forest blocks using the standard weighted arithmetic mean formula. For sake of convenience of calculation, the forest are belong to different density class has been converted to 1.0 density. This is done by multiplying the average density of each class with the gross forest area of that class. The calculation in this regard has depicted in the following table.

Table No.9.6.2.2					
Imputed Capital Value of Forests on Environmental Services					
Valuation of Environmental Services of Forests of Bonai Forest Division					
Density Class (in %)	Average Density of the class	Area(in ha)under the density class	Converted area(in ha) to fully stocked density i.e. 1.0 density	Ecological Value per ha. in lakhs	Ecological value in Lakhs
>70	1.0	27368	27368	2.538	69460
40-70	0.55	47705	26238	2.538	66592
10-40	0.25	46717	11679	2.538	29641
<10	0.05	13757	688	2.538	1746
Total Ecological Value					167439

9.6.3. Total Capital Value of Forests of Bonai Forest Division:The total capital value of forests of Bonai Forest Division has been assessed by adding the In-situ and imputed values.

- (i) Insitu capital value assessed= Rs.46613.20 crores
- (ii) Imputed value of environmental services assessed= Rs.167439 crores

Total Capital Value = Rs.214052.20 crores

The capital value assessment as done above is a very conservative estimation based on many assumptions. The methodology adopted for this assessment leaves many contradictions. However, with available resources and infrastructure, the laborious exercise and efforts gone into, such estimation will certainly help in future for more quantified and better evaluation of the management practices.

9.7. Budgetary allocation to the Forestry Sector: The budgetary allocation of funds and expenditure for the development of Forest and Wildlife during the last working plan is as shown in **Appendix-XVII**. From the budgetary allocation of fund, it is noticed that the budgetary allocation is in increasing trend. The dependency of the people on forests for their livelihood has increased in the past. For sustainable management of forests, improvement in growing stock through scientific management implementing different silvicultural operations is required.

9.8. Existence of Monitoring Assessment & Reporting Mechanism: Monitoring and evaluation parameters have been provided in the Control Forms to monitor the implementation of different prescriptions of all Working Circles. Besides this, as per guidelines of United Nation Framework Convention on Climate Change, the Carbon stock of forest should be monitored, reported and verified at national and sub-national level. For this, a number of Permanent Sample Plots have been laid in different strata of forest. In these Permanent Sample Plots the growing stock of the forest and Carbon sequestration will be measured periodically. The production of timbers, poles, firewood, Bamboo, etc are to be assessed forest block wise, compartment wise, so that increase or decrease in the production at compartment level can be monitored. The production of compartment can be assessed from the production of coupe by multiplying the per unit area of production with the compartment area. The removal of forest produce, the regeneration activities including the plantations in the compartment shall be maintained in the compartment history.

9.9. Public Awareness and Education: Lack of awareness among public regarding importance of conservation of forests & its biodiversity is one of the identified gap in executing various conservation activities in the field. Hence awareness measures to public, especially, forest dependent communities to be given more importance in forest management. Accordingly Public awareness campaigns have organized at Divisional level, Range level, Section level and at Beat level during the last plan period. Important days related to environment viz. World Environmental Day, World Forestry Day, World Earth Day, World Water Day, International Day of Tigers, Wildlife Week, Vanmahotsav etc are being observed in the division with good people participation.

Hence forests are to be protected, conserved and maintained sustainably. Government of Odisha and Government of India have instituted various awards and prizes along with cash reward of upto two lakhs for protections, conservations of forest by individuals and organizations. Eco-clubs have already been formed in about all the schools of the Division. The students are being motivated to organize rally, meetings and planting of species in their school premises. The Forest and Environment Department is providing financial grant to the Eco-Clubs of the Division.

Details of forestry/environmental awareness and education programmes conducted for students for last Working Plan period is furnished in **Appendix-XXI**.

9.10. Adequate Manpower in Forest Division: Adequate staffs as per sanctioned strength are not in position as there has been long gap in recruitment. The details of sanctioned strength of all staff, Staff in position and vacancy positions of the Division has been furnished vide table 9.5.1. Besides the permanent, Temporary and Contractual staffs, a number of daily wage staffs have been engaged in anti smuggling squads, anti depredation squads, elephant trackers, anti poaching squads , and as watchers to protect plantations and nurseries. The daily wage staffs are getting wages as prescribed under minimum wage Act which is being revised at different years. Rates of past and present wages are as shown in the following table.

Table. 9.10.1: Rates of past and present wages.					
Sl. No.	Category	Past wages			Present wages (2020-21) w.e.f. 01.04.2021
		1997-98	2006-07	2016-17	
1	Un-Skilled	30.00	55.00	200.00	311.00
2	Semi- Skilled	36.00	65.00	220.00	351.00
3	Skilled	42.00	75.00	240.00	401.00
4	Highly Skilled	48.00	85.00	260.00	461.00

CHAPTER – 10

FIVE YEAR PLANS

10.1. General trends in Forestry Investment : Investments in forestry sector require long gestation period and most of the time these inputs are linked with the livelihood needs of the people. It is also difficult to explain the tangible benefits always in monetary terms. Since the commencement of the First Five Year Plan (FYP) in 1951, Rs 85 billion has been spent by the end of the Eighth FYP in 1996-97 on forestry development activities in the whole country. In this period, afforestation activities of about 26.9 million ha. have been carried out. Financial allocation to the forestry sector has been increased from Rs 76 million in the First FYP to Rs 40,818 million in the Eighth FYP, but it has always been less than 1% of the total plan outlay of the country. The priorities in different plan periods and the achievements are discussed in the following paragraphs.

10.2. First Five-Year Plan (1951-56) : The two world wars drew heavily on the forest resources. Major river valley projects, development of industries and communications and other projects so vital to the developing economy of the country also leaned heavily on the utilization of forests and forest areas. While the fundamental concepts underlying the forest policy laid down in 1894 remained the same, the National Forest Policy enunciated in 1952 emphasized that forests should be managed on the principle of progressively increasing, and eventually getting the highest sustained yield to meet the requirements of defence, industries and the people, ensuring at the same time that the production of both wood and fodder is maintained. Therefore attention was focused on rehabilitating the forest that had been over-exploited during the world wars, and consolidation and settlement of private forests taken over by the government. A modest beginning was also made to raise plantations of matchwoods and other economic species.

10.3. Second Five-Year Plan (1956-61) : Most of schemes of the previous plan were continued. Some of the important new schemes initiated related to the creation of plantations of economically valuable species, conservation of wildlife and preparation of working plans. A number of wildlife sanctuaries were established, some degraded forests were rehabilitated and many new forest roads constructed.

10.4. Third Five-Year Plan (1961-66):

10.4.1. While the first two plans centered on rehabilitation and consolidation of forests, in the third plan a beginning was made to lift forests from purely conservative and biological management to increasing production from them by creating man-made forests of quick-growing and valuable species in place of the existing ones. Special emphasis was laid on measures to meet the long-term requirements and more economic and efficient utilization of valuable forest products, and to increase the outturn from the existing depleted forests through better technique of timber extraction, improvement of communication and popularizing the use of secondary timbers after proper seasoning and preservative treatment.

10.4.2. Full assistance from the Centre was given in order to encourage State Governments to undertake large scale plantations of quick-growing species, mainly to meet the requirements of the paper and pulp industry. A new scheme undertaken was “Pre-Investment Survey (PIS) of Forest Resources” implemented in collaboration with the United Nation Special Funds and Food & Agriculture Organization (FAO). This project was designed to investigate by stages the economic availability of surplus forest resources for feeding the wood-based industries. The PIS was the forerunner of the Forest Survey of India of today.

10.4.3. Another project related to the establishment of “Logging Training Centres” was also with the assistance of the United Nation Special Funds. The object was to train forest officers and field executives of State government and forest lessees and contractors in basic logging cableways, planning and efficiency studies etc., with a view to obtain higher timber yields from forests by minimizing wastage.

10.5. Post-Third Plan Period (1966-69) : The progress of departmental activities in forestry during this period was remarkable. Specific emphasis was laid on plantations of quick-growing species and modernization of harvesting and plantation techniques. Training of Officers and Forest Rangers as Resource managers was undertaken to embark upon the next five-year plan.

10.6. Fourth Five-Year Plan (1969-74)

While adhering to the objectives and principles of the third plan, greater emphasis was placed on increased plantation activities and intensive management of forests to attain self-sufficiency. The basic considerations and the guiding principles were: –

- (i) Adequate forest cover to prevent floods, conserve soil and moisture, protect water reservoirs;
- (ii) Adequate supply of forest raw materials for wood based industries and of construction timber for which there was a growing demand;
- (iii) Adequate supply of fuel wood; and
- (iv) Preserving natural environment for scenic beauty, sport, recreation and scientific studies.

Based on these considerations, specific obligations considered were: scientific management of hitherto unorganized forests; strict protective measures against pilfering, excessive grazing, fire, encroachment etc.; formation of manageable units and appointment of adequate staff; replacement of slow-growing and less valuable species by those which are quick growing and valuable; afforestation of barren lands; introduction of improved methods of harvesting; extension of communication; better housing facilities for the staff; wildlife and nature conservation; intensive research and training, provision of statistical cells, etc.

10.7. Fifth Five-Year Plan (1974-79) : This plan introduced an important element of change in the country's strategy in forestry; conservation-oriented forestry was to give way to dynamic progress of production forestry, to increase production of industrial wood and other forest products of economic importance. Extensive man-made forests were to be created, with institutional financing, to feed the existing and prospected industries utilizing forest products. Lands along roads, canal banks, railway lines and flood embankments, mixed plantation for commercial use was to receive greater attention. Farm Forestry and communication were to form an important part of the forestry programme.

10.8. Sixth Five-Year Plan (1980-85) : The Sixth Five-Year Plan continued the momentum gathered during the previous plan period. However the thrust was on social and community forestry and development without destruction. The following broad strategies were adopted –

- (i) The environment got improved thorough creation of man made forests by undertaking massive afforestation on degraded lands;
- (ii) Strict protection was afforded to wildlife and its habitat;
- (iii) A massive social and farm forestry and village fuelwood plantation programme was taken up to meet the ever growing energy needs of the rural people;
- (iv) Employment was provided to the ever increasing rural population with special attention to the weaker sections of the society; and
- (v) The following four programmes of thrusts were introduced during this plan period –
 - (a) tree for every child programme
 - (b) eco-development force of ex-servicemen
 - (c) eco-development camps for students
 - (d) Agro-forestryprogramme.

10.9. Seventh Five-Year Plan (1985-90): The role and importance of forests in the general economic development of the country in terms of protection of the eco-system and supply of forest products was better appreciated. The main objectives, approaches and strategies of this plan were:-

- (i) Conservation of ecologically fragile eco-systems and preservation of biological diversity in terms of fauna and flora;
- (ii) Increasing substantially the vegetative cover by massive afforestation through social forestry, farm forestry and other plantation programmes;
- (iii) Meeting the basic needs of the people in respect of fuelwood, fodder, minor forest produce and small timber;
- (iv) Ensuring close linkages between Forestry programmes and welfare of the tribal and other communities traditionally dependent upon forests;
- (v) Special emphasis on forestry research, education, training and extension
- (vi) Implementing the national wildlife action plan for wildlife conservation, and
- (vii) Creating a massive people's movement for achieving the above objectives.

Main achievements during this plan period were:-

- (a) Massive social and farm forestry programmes were taken up;
- (b) More emphasis was laid on the afforestation of degraded lands and wastelands. The national wastelands development board (NWDB) was set up.
- (c) Research and training were strengthened by the creation of the ICFRE and IGNFA.
- (d) More stress was laid on preserving the eco-system and wildlife.

10.10. Eighth Five-Year Plan (1992-97): The eighth five year plan aims for restoration of ecosystem and taking up massive plantation programmes. In other words, its objectives are to increase afforestation programmes, preserve the eco-system and wildlife and to strengthen forestry research, education and training.

The major objectives for this Plan were:

1. To protect the natural environment;
2. To regenerate and restore degraded ecosystems and increase their productivity and to generate employment through these activities;
3. To decentralise control over nature and natural resources;
4. To develop and share an understanding of nature and natural process;
5. To formulate a national policy for environment and an appropriate institutional and legal framework in support of the policy;
6. To ensure co-ordinated and integrated Governmental action aimed at conserving nature and sustainable use of natural resources;
7. To make individuals and institutions more accountable to the people for their actions impinging on environment and ecosystem; and
8. To monitor the state of environment.

10.11. Ninth Five-Year Plan (1997-2002)

Main objectives of this plan were:

- Empowering the people through information generation, dissemination and access
- Involving the Industry in both the private and the public sector.
- Integrating environment with decision making through valuation of environmental impacts; evolving market based economic instruments as an alternative to the command and control form of environmental regulation; appropriate pricing of natural resources based on their long-term marginal cost of supply; appropriate fiscal reforms and natural resource accounting.
- Evolving the rights for common property resources.
- Inter-sectoral coordination and cooperation.
- Ensuring scientific and technological inputs.
- Participation of people (particularly women) in the management and sharing of usufruct through Joint Forest Management.
- Involvement of NGOs as an interface between forest department and the people through awareness building would be encouraged during the Ninth Plan.

During the Ninth Five Year Plan the expenditure on forestry sector in Bonai Forest Division for the period from 1997-98 to 2001-02 is given in **Appendix – XIV**

10.12. Tenth Five-Year Plan (2002-2007)

10.12.1. India is privileged to host the Eighth Conference of the Parties (COP8) to the UNFCCC in Oct-Nov, 2002. The Hon'ble Prime Minister Shri Atal Behari Vajpayee in his speech at the High Level Segment of the COP8 asserted the high priority given to the forests. In his own words *"India accords high priority to conservation of forests and wildlife for long-term ecological and environmental security. The participation of local communities is ensured through the 'Joint Forest Management' programme. I am happy to say that this has helped to increase our forest cover significantly"*.

10.12.2. The tenth five year plan was a major landmark in the history of development in India. It was the first five year plan of the new century. It aimed at achieving GDP growth of 8% average annual during tenth plan. A.B. Vajpayee the then Prime Minister had given opening remarks at the 50th meeting of the National Development Council, New Delhi, 21 December, 2002 while approach paper to the tenth plan was unanimously approved by NDC. He made specific suggestions viz. the governance reforms, barriers to internal trade, creating an investor friendly climate, and financial and administrative empowerment of Panchayati Raj Institutions for the consideration of that meeting.

10.12.3. The scheme titled National Afforestation Programme (NAP) was formulated by merger of four centrally sponsored afforestation schemes of the Ministry of Environment and Forests namely, Integrated Afforestation and Eco-Development Projects Scheme (IAEP), Area Oriented Fuel wood and Fodder Projects Scheme (AOFFPS), Conservation and Development of Non-Timber Forest Produce Including Medicinal Plants Scheme (NTFP) and Association of Scheduled Tribes and Rural Poor in Regeneration, of Degraded Forest (ASTRP) with a view to reducing multiplicity of schemes with similar objectives, ensuring uniformity in funding pattern and implementation mechanism, avoiding delays in availability of funds to the field level and institutionalising peoples participation in project formulation and implementation.

The Scheme was to be operated by the National Afforestation and Eco-Development Board, Minister of Environment and Forest as a 100% Control Sector/ Centrally Sponsored scheme.

Main objectives of this plan were:-

- Bringing one third geographical area under the forest cover.
- Adopting watershed approach to develop and maintain the forest cover.
- Livelihood needs of the people living adjoining to the forests would be addressed.
- JFM would be given more thrust for the regeneration of the degraded forests.
- Efforts would be taken to reduce the import of the timber and the timber requirement would be met from the community lands, private farm lands and degraded lands.
- Food for work programme would be extensively implemented in the forest pockets to ensure food security and productive employment.
- Efforts would be taken on protecting the natural forests to have a better carbon trading potential to increase the market avenues for forest protection and management.
- The conservation and protection of the medicinal plants has given priority.
- Bio-diesels coming from plants like Jatropha, Pongamia etc., would be promoted to encourage the livelihood opportunities of the rural masses.
- It is also decided to merge all Afforestation programmes under National Afforestation and Eco-development Board (NAEB) into one scheme called 'National Afforestation Programme' and it would be implemented through Forest Development Agency (FDA)

During the Tenth Five Year Plan, the expenditure on forestry sector in Bonai Forest Division for the period from 2002-03 to 2006-07 is given in **Appendix-XIV**

10.13. Eleventh Five Year Plan (2007-12)

10.13.1. Ministry of Environment & Forests had an approved outlay of 10,000 crore for the Eleventh Five Year Plan, 2007-12. Annual Plan 2007-08 had an approved outlay of 1,351.00 crore against which the actual utilization amounted to 1,349.73 crore. In 2008-09, it was allocated an outlay of 1,500.00 crore, against which the actual utilization amounted to 1,483.02 crore. Annual Plan 2009-10 had an approved outlay of 1,880.00 crore, reduced at RE stage to 1,650.00 crore under economy instructions, against which the actual utilization amounted to 1,630.69 crore. Annual Plan 2010-11 had an approved outlay of 2,200.00 crore, against which the actual utilization amounted to 2,181.58 crore. In the last year of the Eleventh Plan, the Annual Plan 2011-12 had an approved outlay of 2,300.00 crore, against which the actual expenditure amounted to 1825.44 crore.

10.13.2. Forests not only provide livelihood to the rural poor and create opportunities for wage employment but also plays a key role in maintaining ecological stability and helps in reducing the impact of natural calamities. As per the Eleventh FYP approach paper, the Forestry Sector Development would adopt an approach combining elements of asset creation, institutional development and social development to promote sustainable forest management practices. It would focus on conservation, protection and development of dense forests, regeneration of open forests, afforestation, capacity building of the forest department and promotion of eco-tourism.

10.13.3. India is a party to the United Nations Framework Conventions on Climate Change, the objective of which is stabilization of the greenhouse gas concentrations in the atmosphere at levels that would prevent dangerous anthropogenic interference with the climate system. In consonance with the Govt. of India strategy, the Climate Change Action Plan, Orissa has formulated the State Climate Change Action Plan. The scoping study was undertaken to understand the range of issues. As an ambitious undertaking, it covered several sectors including agriculture, fisheries, animal husbandry, energy, forestry, health, industry, mining, transport, urban planning and others.

During the Eleventh Five Year Plan the expenditure on forestry sector in Bonai Forest Division for the period from 2007-08 to 2011-12 is given in **Appendix – XIV**

10.14. Twelfth Five Year Plan (2012-17)

10.14.1 Conservation and development of forests for land and water development in the country is key component of management of natural resources for meeting the demands of rising population. Forests have assumed greater significance due to its emerging role in the field of climate change, ecological security, biodiversity conservation, international commitment for sustainable growth and livelihood issues especially the food and water security of the country besides its traditional importance through supply of timber, fuel wood, fodder, medicinal plants and range of NTFPs. Therefore, in order to achieve sound management of the natural resources, it is essential to accord sufficient importance in planning process to the conservation & development of forest resources.

10.14.2 In recognition of these aspects of the forests, the main thrust areas for intervention during 12th Five Year Plan are-

- Conserving forests for bio-diversity and enhancement of ecological services.
- Development of forests for enhancing livelihood options of forest dependent communities.
- Optimizing productivity of the under-utilized/ degraded lands and forest lands by growing multi-storey vegetation/ plantations/ forests through judicious combination of grasses, creepers, herbs, shrubs and trees in different storey for density improvement etc.
- Sustainable development of NTFPs including its value addition and marketing linkages.
- Soil and moisture conservation to ensure water security and better productivity of agricultural land.
- Agro-forestry and silvi-pasture development in rangelands, energy plantation, fodder farms at appropriate distances to reduce the drudgery of women, in areas adjoining forests.

- Greening the urban and peri-urban spaces.
- Institution building for promoting enhanced participation of people in forest management and for better governance.
- Technology based monitoring and evaluation to know the performance of interventions made and its outcome for mid-course corrections / changes if required.
- Capacity building of local communities and forestry officials to sustainably manage the forest resources and augmentation of livelihood of local people including women.
- Develop negotiation potential for attracting international funds like REDD⁺, CDM, ITTO etc.

Proposed schemes under 12th Five year Plan : A total number of 16 schemes got proposed during the 12th FYP . Out of these there were 2 District Sector, 12 State Sector and 3 Centrally Sponsored/Sector Schemes as shown in the following table.

S. No.	Scheme No.	Scheme Name	Scheme Sector
1	7882	Implementation of Working Plans	DS
2	2536	Extension Forestry	DS
3	792	Employee Welfare	SS
4	4342	Strengthening of Forest Infrastructure	SS
5	6397	Preparation of Plants in Nurseries	SS
6	2723	Strengthening of Administration	SS
7	5108	Studies and Research	SS
8	5830	Grant to Ecotourism Board	SS
9	5109	Compensation for Relocation and Acquisition of Rights in Protected Areas	SS
10	5828	Compensation for Crop Damage by wild Animals	SS
11	6349	Protection of Wildlife outside PAs	SS
12	6853	Omkareshwar Fund	SS

13	6898	Finance Commission Grant	SS
14	6355	Zoo-cum-Rescue and Breeding Center	SS
15	5231	MFP-Federation Grant-in-Aid	CSS
16	3730	Integrated Development of Wildlife Habitat	CSS
17	5317	Intensification of Forest Management	CSS

Details of funds received in Bonai Forest Division during 12 Five year plan period is as discussed below.

On Going Schemes

1. National Afforestation Programme (NAP) Scheme
2. Intensification of Forest Management Scheme

10.14.3.National Afforestation Programme (NAP) Scheme : NAP scheme provides support both in physical and capacity building terms to the Forest Development Agencies (FDAs) which in turn are the main organs to move forward institutionalization of Joint Forest Management. The FDA has been conceived and established as a federation of Joint Forest Management Committees (JFMCs) at the Forest Division level to undertake holistic development in the forestry sector with peoples' participation including women as well as local institutions. From the year 2010-11, State Forest Development agency (SFDA) has been constituted at the State level to smoothen the fund flow to the FDAs. This decentralized three-tier institutional structure (SFDA, FDA and JFMC) allows greater participation of the community, both in planning and implementation, to improve forests and livelihood of the people living in and around forest areas. The village has recognised as a unit of planning and implementation and all activities under the programme are conceptualized at the village level. The three-tier approach, apart from building capacities at the grassroots level, significantly empowers the local people to participate in the decision making process. Under Entry Point Activities, community assets are created with a 'care and share' concept. Objectives of the schemes are as follows.

- Protection and conservation of natural resources through active involvement of the people, especially women.
- Checking land degradation, deforestation and loss of biodiversity.
- Ecological restoration and environmental conservation and eco-development.
- Involving village level people's organization including women groups and local institutions which can manage the natural resources in and around village in a sustainable manner.
- Fulfillment of broader objectives of productivity, equity, and sustainability for the general well being of the people.
- Improve quality of life and self-sustenance aspect of people living in and around forest areas.
- Capability endowment and skill enhancement for improving employability of the rural people.

10.14.4. Intensification of Forest Management Scheme: Summary of suggestions for future management of the Division, based on prescriptions given in this working plan:

1. Densification of existing forests through enrichment plantations, generation of higher bio-mass, and better protection

- A time-bound program aimed at rehabilitating the forests would be carried out after identifying such areas with the help of comprehensive surveys and treating the affected areas according to site-specific needs.
- Secondary regeneration work in dense forests, improvement of forest in degraded forest areas and wastelands, irrigated plantations in suitable areas

2. Expansion and development of forest and tree cover

- Afforestation work on a large scale with the help of local communities including the women in the denuded forest areas to help in establishing ecological balance, checking desertification and providing employment to local

communities, especially the women.

- Increase tree cover on private and community lands in a planned way through massive people's participation
- Development of green belts in the urban areas to establish environmental balance and ground water recharging
- Plantation on road side, canal side and sidelines of railway lines as per the new policy of the State Government using PPP funds where possible

3. Sustainable utilization of forest products (Timber & NTFPs)

- Adoption of Selection cum improvement silvicultural system in coupes earmarked for production forestry
- Proper planning and allocation of coupes
- Timely execution of felling and subsidiary silvicultural operations
- Improvement of forest quality wherever necessary
- Improvement of NTFPs through proper measures
- Training beneficiaries on sustainable collection and utilization.
- Improving marketing facilities

4. Conservation of environment and the ecological stability

- Treatment of catchment areas of rivers and areas sensitive for soil erosion for water and soil conservation.
- Support to effective implementation of the Environment (Protection) Act, 1986.
- Adequate conservation of ecologically sensitive important natural areas

5. Consolidation of boundaries

- Time-bound settlement of pending disputes regarding forest boundaries
- Consolidation of forest blocks boundaries in undisputed areas
- Notification of maximum extent of forests as RF/PF, which have not yet notified
- Measures for consolidation of records of the forestland

6. Expanding existing models of forest based sustainable livelihoods and trying to create new viable models

- Joint Forest Management Measures
- Strengthening of village level institutions.
- Improvement of forests near villages
- Provision of alternate employment opportunities
- Improving socio economic conditions of the forest dependent community

7. Conservation of wildlife and its habitat

- Inventory on existing wildlife potential
- Protection and monitoring measures
- Habitat improvement
- Bringing potential areas under the coverage of legal PA
- Mitigation of man-wildlife conflict

8. Maintain proper balance between conservation and development.

- Regulation of mining and other developmental activities through strict implementation of Forest Conservation Act, 1980.
- Compensatory Afforestation/ and other compensatory activities.
- Proper utilization of Compensatory money.

9. Biological diversity & its conservation

- Research
- Documentation
- Awareness

10. Development of Human Resources in management of forests

- Providing necessary infrastural facilities
- Capacity building training

CHAPTER – 11

PAST SYSTEM OF MANAGEMENT

11.1 General history of the forests;- The history of the forest administration and management prior to 1886 is obscure. During that time forests were considered as the abode of aboriginal tribes and wild animals. The aboriginal tribes consisting of Bhuyans, Kolhas etc., inhabiting the dense jungle tract were the sole monarch of the forest and were for all purposes dependent upon forests. Shifting cultivation locally known as Podu cultivation was very common that time. The main feature of this practice was rotation of fields rather than the rotation of crops. Under this practice, patches of forest on hills having moderate slopes used to be cleared by slash and burn method and afterwards without ploughing, ground seeds of pulses, maize, rice etc. used to sown. After cultivating for two to three years, such cleared patches used to be abandoned by the tribals due to loss of fertility and afterwards they used to switchover to new areas. Tribal people used to return to old cleared patches after a gap of 20 to 30 years for re-cultivation purpose. The even aged crop in many of the reserved forest of East Bonai owes their origin to this old shifting cultivation practice. This pernicious practice is still in vogue among few tribals but confined to few Demarcated Protected Forests & Revenue Forests primarily of East Bonai.

11.1.1 First attempt of forest conservancy:- During the period 1890-92, first effort for forest management was initiated by Raja Indra Dev Dayanidhi. During that time, the construction work for Calcutta-Nagpur Railway line was in progress and heavy demand was there for sleepers. Keeping these facts in view, it was felt necessary by the then ruler of the Bonai State to initiate some actions for the purpose of forest management. Accordingly in 1892, few simple rudimentary rules were framed for the management of the forest. Under these rules, the hitherto unrestricted rights of tenants were restricted to the areas within three to five miles of their villages and forest were classified as reserved and unreserved areas.

11.1.2 Sleeper Operations:- From the year 1888 the sleeper operations were started and permission in this regard was granted by the then ruler of Bonai State, first to one European firm called the Nagra Timber Trading Company (Subsequently named as Bengal Timber Trading Company) and then in the following year to H.Deer and Co. The Bengal Timber Trading Company started their work in the forest of East Bonai while H.Deer and Co. commenced their work in the West Bonai. For the forest of west of Bonai, the lease for sleeper operation was originally taken up by B.Barooaha but he in turn transferred the lease to H.Deer & Co. Apparently, the revenue realized from these sleeper operation, was charged on the basis of tree as a unit. Under this system, the royalty was fixed Rs.6.00 for Sal trees having grith 6 ft. to 9 ft. While it was fixed Rs.9.00 for sal trees of girth 9 ft. and over. During 1889-90 this system was modified and royalty was fixed by taking sleeper as a unit. Under this changed system, the royalty was fixed eight annas (50 paise) per B.G. sleeper and four annas (25 paise) per N.G. sleeper for the Bengal Timber Trading Company while for H.Deer & Co. which was working on long term lease it was fixed six annas and three annas respectively. For checking the number of sleepers converted and extracted, depots were opened at Banki and Kalunga. Till the year 1900, exploitation of sleepers used to be done merely by taking permission from the rulers on payment of certain royalty with a few control over work. Since 1901, regular leases were drawn-up with enhanced royalties and supervisory control. In order to exercise control over the work, three Moharrirs were appointed by the ruler on the salary of Rs.10.00 each. The duty of Moharrirs was to mark the tree and submit an account of numbered trees to the Raja. These uncontrolled sleeper operations had caused the rapid depletion of trees of higher girth classes from the forests. By 1895 Mundikat business was started and dry logs (Mundikat) were floated down the river Brahamani for sale in jenapur and Cuttack market. The rate of royalty fixed was Rs.7.80 per pana (80) for local people and Rs.15.00 for outsiders. In 1905, the numbers of Moharrirs were increased from three to ten but still their sole duty was to mark the trees and pass the sleepers. However, due to indiscriminate girdling and burning of trees by tribal people for carrying out shifting cultivation in Pauri and Kudmi areas led the appointment of two addional Moharrirs in 1906. In true sense, the organisation of forest department in proper direction began in 1908 with the appointment of Forest Daroga (who was paid a monthly salary of Rs.30.00), 9 Forest Gards and 8 Moharrirs.

Subsequently, the post of Daroga was held by a Forester trained in Kurseong (West Bengal).

11.1.3 Reservation of Forests : The post of Agency Forest Officer was created in 1905 with the object of providing professional advice on forest conservancy and management to the ruling chiefs and to organize the Forest Department in the States under direct Government. Mr. A.N. Grieve, IFS was the first Agency Officer, who visited the Bonai State in 1911. He selected areas of forest to be reserved and gave his suggestions to the ruler for expansion of the Forest Department with inclusion of more trained personnels. The work of demarcation and survey of forest area was initiated under the direction of Agency Forest Officer and was completed by 1928-29. Likewise, the administrative strength of Forest Department of State was also increased from time to time on the advice of Agency Forest Officer. The utilization and exploitation of the various Minor Forest Produces also commenced at the same time.

11.1.4 Fuel cess and Grazing fees :- Up to 1908, the tenants of the State used to get their requirement of forest produce free of cost while professional graziers used to pay in kind of ghee and milk to the ruling chiefs in return for grazing their cattle in the forest. But afterwards from 1909-10 fuel cess and grazing fees were introduced along with settlement operations. The grazing rates fixed for professional graziers in 1913 were two annas per buffalo and one anna per cow.

11.1.5 Framing of Forest Rules :- Rudimentary form of Management and control of felling in both Khesra and reserved forests commenced from 1918. However, systematic felling and regulation of yield could not be introduced owing to the terms of leases to the timber companies which were working in the State by that time. Cultural operations such as creeper cutting and improvement felling were first proposed in 1916 by Mr. G.N. Cooper, IFS and Agency Forest Officer. As per his suggestion cultural operation as mentioned above were carried out in Lunga & Toda Forest Blocks. In 1921 attempts were made for raising Sunari plantations but these were failed subsequently.

Forest Rules were published first time in the year 1926. The first working plan for the forest management of the State was prepared by the then Forest Officer Babu J.N. Ghosh under the direction of the Agency Forest Officer and was published in the year 1935. With merger of the State with the present province of Orissa on first January 1948, Bonai Forest Division was created and the post of State Forest Officer was designated as “Divisional Forest Officer”.

11.2 Past System of Management and their Results : Prior to the year 1911, forests of Bonai State were not subjected to any systematic form of management. Timber Trading Companies were given long term lease with no stipulation for systematic felling or regulation of the yield. Felling, extraction and conversion operations for railway sleepers etc. used to be carried out in very un-systematic and haphazard manner. Also, no steps were taken for safeguarding the yield and for the improvement of forests. However, with the visit of Agency Forest Officer in 1911 and as per his suggestions, some sort of regulatory control in the working of forests was introduced. The Agency Forest Officer inspected forests annually or at periodical intervals and suggested measures to improve the forest management and administration and the same were gradually implemented. The management of forest in a systematic direction began with the preparation of first working plan in 1935.

11.2.1 Babu J.N. Ghosh plan (1935-36 to 1952-53): This was the first working plan and was of preliminary nature and simple as to its prescription. Under this plan following four working circles were constituted.

1. The High Forest Working Circle
2. The Dandpat Working Circle
3. The Coppice Working Circle
4. The Bamboo Working Circle

11.2.1.1 The High Forest Working Circle :-

This Working Circle embraced all the then existing principal forests of the state. The silvicultural system prescribed was Selection-cum-Improvement felling. For the working purpose, the included forest area was divided into three felling series, i.e. East Bonai felling series, Burjor and Kunjar felling series. The Burjor and Kunjar felling series were comprised of the forests of West Bonai while East Bonai felling series included forests of East Bonai. The felling cycle was fixed 24 years for East Bonai and Kunjar felling series while it was kept 20 years for Burjor felling series. The reason for keeping different felling cycle for Burjor felling series was not explained in the plan. As a matter of fact, the original intention was to adopt a felling cycle for thirty years so as to provide adequate time to the forests to recover from past over exploitation. But, under the then prevailing circumstances, i.e. financial requirement and poverty of the State compelled a sacrifice to be made and accordingly, the felling cycle was reduced. Similarly, though it was felt and desired by the author to keep the exploitable girth 5 feet or 5 feet 6 inches in better quality areas but keeping in view the over exploitation of forest for sleeper operations whereby trees of girth more than 5 feet were removed, the exploitable girth for Sal, Asan, Kurum and Gambhar was reduced and fixed at 4 feet 6 inches.

Though, yield was fixed by area but neither the annual coupes were depicted on the 4" to 1 mile management map nor the area of annual coupes was given in the tabular statement of fellings. Also the sequence of fellings was not properly organized.

Results:-

Selection felling in annual coupes were fully carried out during the plan period but unfortunately, owing to the lack of any desire to spend money on unremunerative work, the prescribed improvement fellings were totally neglected as the materials obtained from such operations were not having any market demand during that time. So, the prescribed selection-cum-improvement fellings degenerated

into revenue fellings. This resulted in complete removal of sound trees of girth 4.5 feet and more in the course of plan period (20 years) while at the same time, unsound and defective stock was not at all removed which in turn interfered with the proper growth of future young stock.

There were considerable area having pole and middle aged crops and which were suffering from congestion but the required thinning operations in these areas were not carried out. Besides, circumstantial evidence proved that a 2nd timber operation had been carried out for supplying timber to the defence department during the Second World War. Due to revenue oriented forestry operations in the plan period, non-removal of defective and diseased stock and on want of any cultural operations, the forest vegetation under this work was 20 years earlier, i.e. in the year 1931. However, the regeneration was abundant every where, although establishment of seedlings was badly checked by fire.

11.2.1.2 The Dandapat Working Circle:-

This was not a working circle from silvicultural-system point of view and was basically a felling series for the working of the forest of Dandapat estate. Prescriptions provided here were the same as provided for the High Forest Working Circle viz. Selection-cum-Improvement fellings. The felling cycle was fixed 20 years with an exploitable girth of 5 feet and more. The yield was based on the enumeration result of whole area and was fixed at annual removal of 540 numbers of sal trees of 5 feet girth, 15 Nos. of Bija trees of 5 feet girth and 12 numbers of Bandhan trees of 4 feet girth. The removal of unsound trees of girth between 4 feet and 5 feet was also prescribed.

Results :-

Exploitation was carried out as per the prescription of the plan and no over exploitation had taken place. Due to relatively large distance from the nearest railhead it was difficult to dispose-off the unsound trees and for that reason no

improvement fellings were carried out. Here once again, the underlying principle of the exploitation was revenue generation. As improvement fellings could not have yielded revenue so those were totally neglected.

11.2.1.3 The coppice Working Circle:-

This Working Circle was comprised of three felling series, viz- Champajharan felling series covering areas of North and South Champajharan blocks (5,825 acres) Sirigida felling series covering forest areas on Bamra-Gangpur border (11,904 acres) and Kusumdihi felling series covering part of Kusumdihi block (14000 acres). Though, there were other forest areas suitable for working under this system but on want of local demand and due to their remoteness, such available areas were not included under this working circle. The rotation was fixed at 40 years and yield was regulated by coupes of equal area. Thinning operations in 11th, 21st & 31st year of the rotation were also prescribed. Thinnings were to be accompanied with climber cuttings.

Results:

Due to lack of demand and remoteness of the areas from the market towns like Rourkela etc. out of three felling series, only one felling series, i.e. Sirigida felling series could be worked out whereas no work was taken up in Champajharan and Kusumdihi felling series. In Sirigida felling series, 18 coupes out of twenty were worked out. As good work had been carried out in the Sirigida block, so it had resulted in the good growth of young age crop of very promising potential. But even here also, no thinning operation were carried out, else, the young crop might have been still better.

11.2.1.4 The Bamboo Working Circle :-

Though, this working circle was provided in the working plan , no definite area was allotted to it. It was overlapping with the other working circles and few cutting rules were also prescribed.

Results :-

During that period, there was no sale and demand of bamboo in Bonai and adjoining areas, hence working in bamboo area didn't carry out during plan period. Though, a contract for bamboo working was given in Champajharan area but contractor failed to carry out the work. If the communication net-work in West Bonai had improved during that time then bamboo forests which were almost entirely confined to west Bonai could have been greatly developed and would have yield a good amount of revenue.

11.2.2 S.N. Das plan (1953-54 to 1972-73).

Revised working plan for the duration of 1953-54 to 1972-73 was prepared by S.N.Das, IFS and was brought into force from the year 1953-54. Under this working plan, following six working circles were constituted:-

1. Conversion Working Circle.
2. Selection Working Circle.
3. Selection Coppice Working Circle.
4. Coppice Working Circle.
5. Bamboo Working Circle.
6. Protection Working Circle.

11.2.2.1 Conversion Working Circle :-

This working circle was inclusive of good Sal forests of the Division and was covering an area of 26,915.014 Ha. Six forest blocks viz.Toda, Karo, Sarkunda, Khajurdihi, Lunga & Kathmal were allotted to this working circle. The basic object of management was to gradually convert the irregular and uneven aged crop to regular even-aged uniform crop. P.B.-I was not formed as availability of mature age group trees were very less. P.B. II had been formed and was allotted definite area. P.B. VI was also not formed and all areas other than P.B. II were allotted to P.B. Inter. This was

purposefully done so as to provide better scope for selection of P.B. I area in the future at the time of revision of working plan.

There were no exploitation in P.B.II areas except for climber cutting and cleaning operations on a cycle of five year. Under the prescribed cleaning rules, only absolutely hollow and unsound trees interfering with the growth of principal species were to be removed and defective stems under 8" diameter were to be cut-back if found interfering with the growth of principal species or with established regeneration.

Selection-cum-Improvement fellings and thinning were prescribed for P.B.-Inter areas. In total, four felling series were formed and a felling cycle of 20 years was adopted. Exploitable diameter for all species except for Sissoo and Gambhar was fixed 20". For the Sissoo and Gambhar it was fixed at 16" and 12" respectively. The yield was regulated by coupes of approximately equal area. All the annual coupes were laid on 2" = 1 mile topo sheet. Improvement felling down to 8" diameter was prescribed. It included removal of dead, dying, diseased and defective trees and inferior species interfering with the growth of Principal species. Thinning upto 8" diameter and cleaning after main felling was also prescribed.

Results :-

Except for compartment 49, 50, & 51 of Toda block, no climber cutting and cleaning operation were carried out in areas allotted to P.B.II. As the crop in the P.B.II areas was already congested and lack of cleaning operations during plan period had further worsened the situation, so the desired girth increment could not be achieved and regeneration was also affected adversely. However, good regeneration had come up in areas having adequate openings.

All the annual coupes in P.B.- inter were worked out during the plan period and most of the un-sound and over-matured trees were removed. Heavy exploitation of approach class trees under improvement marking had resulted in poor distribution of higher girth class-trees. Active mining operations had been carried out in

the compartments 1, 2, 3, 26, 27, & 51 of Toda block and compartment 1 & 6 of Sarkunda block and this had adversely affected the vegetation of these compartments.

Irrespective of the crop composition, crop quality and configuration of the ground, whole portions of forest blocks of Khajurdihi, Toda and Lunga were allotted to conversion working circle, though quite a few portions of these block were unsuitable for inclusion under this working circle on account of either poor quality of crop or steep gradient. Khajurdihi block, being very hilly with steep gradients was not suitable for clear felling. Except for few valley portions, the major remaining portions of Lunga block were containing either poor quality Sal or Miscellaneous crop and for that reason inclusion of entire block under this working circle was not justified. Likewise, compartments 1, 2, 3, 4, & 5 being hilly with steep slopes and upper portions of compartments 10, 14, 17, 28, 33, 34, 38, 39, 40, 41, 42, 43, 44, 45, 48, 49, 50 & 51 of Toda block containing poor quality Sal or miscellaneous crop and having steep gradients in some cases were also not suitable for conversion system. However, no damage had been done to the forest crop of these areas as no clear felling was done in plan period due to non formation of P.B.-I.

11.2.2.2 Selection Working Circle :-

This working circle included all forest blocks of west Bonai except small blocks around Bonaigarh. The total area covered under this working circle was 60,856.414 ha. The silvicultural system adopted was Selection-cum-Improvement felling and thinning. Six felling series viz. Dandapat, Dhenkiam, Kelo, Kunjar, Rushimath and Ulsura felling series were formed and a felling cycle of 20 years coinciding with plan period was adopted. Yield was regulated by laying coupes of approximately equal area. Annual coupes were laid on 2' = 1 mile management map. An arbitrary safeguarding factor for retaining 25 percent of the sound exploitable trees was prescribed. For Dandapat, Dhenkiam and Rushimath felling series, the exploitable diameter for Sal was fixed at 16". For Kunjar and Ulsura felling series, the exploitable diameter for Sal was fixed at 18" and it was fixed 20" for Kelo felling series. For all the felling series, the exploitable diameter was fixed 16" for Bija, Sisoo & Gambhar and 20" for Kurum, Mundi

and Asan and 12" for Ban-dhan. Sal was to be treated as principal species and species like Bija, Sissoo, Gambhar, Kurum, Mundi, Bandhan and Asan were to be given preferential treatment. The rest of the species were classified as inferior species. Improvement fellings and thinning were prescribed down to 12" diameter. Under the operation, all damaged and defective trees and inferior species interfering with the growth of principal and secondary species were to be removed.

Results :-

Most of these forest blocks in west Bonai are having hilly terrain with quite a few dry and exposed hill slope. Quality of Sal trees was varying from III to V with a good proportion of miscellaneous species. Also there was no demand for small timber in west Bonai. So, keeping in view the above facts, the selection system adopted for the forests of these blocks was the most suitable system.

As per the prescriptions of the plan, all the annual coupes were worked out. Major portion of the unsound and defective stock was also removed. However, the repeated annual fire was causing unsoundness in the trees at an early stage and was also an adverse factor for the establishment of Sal seedlings. Cleaning operations were not carried out to the desired extent mainly for paucity of funds. Communication network in the west Bonai was not well developed at that time and forests of Jarda Range were quite inaccessible and probably for that reason, coupes of this Range were made very large so as to attract the contractors. For example, the Kelo series covering 4 (four) blocks had an area of 16195.467 ha., while Kunjar felling series covering 4(four) blocks had an area of 13,838.607 ha. This has resulted in ill-distribution of work in different sections of the Range. Also Ulsura felling series was overlapping two Ranges which was not desirable from the sound management point of view.

11.2.2.3 - Selection- Coppice Working Circle :-

Originally eight forest blocks were included under this working circle and two felling series were formed. Subsequently, Rakshi coppice felling series which had remained unworked for number of years was also included under this working circle. The silvicultural system adopted was selection-cum-Improvement felling but with relatively low exploitable diameter so as to remove marketable tree before they become unsound. Coppice regeneration was relied upon for future crop. A felling cycle of 20 years was adopted. Yield was fixed by coupes of approximately equal area. Annual coupes were laid on boundary survey traced maps. Exploitable diameter for Sal and Bandhan was fixed at 12". For Bija, Kurum & Mundi it was fixed at 16" and for Asan, Sissoo & Gambhar it was fixed at 14".

Though, exploitable diameter for Sal was fixed at 12", it was prescribed to retain all good sound Sal trees up to 16" diameter. Improvement felling and thinning were to be carried out down to 8" diameter. A cleaning after main felling was also prescribed. Under the cleaning operations, all damaged and defective stems and all inferior species interfering with principal species were to be removed. Thinning operations were to be carried out wherever the crop was congested. Artificial regeneration in blank areas was to be taken up under the direction of the Divisional Forest Officer.

Results :-

Due to hilly terrain of the forest blocks included under this working circle, clear felling was not desirable. So adoption of selection felling was totally justified.

All the coupes of Champajharan and Silkuta felling series were worked out during the plan period. In the Rakshi felling series which was subsequently included in this working circle, two coppice felling series were combined to form one selection felling series with twenty coupes. But only 10 annual coupes could be worked out

during the remaining plan period. Though, entire area of North Champajharan block was included in the plan but an area of 749.494 ha., which had already been worked out under coppice system prior to the implementation of this plan was left out from working. Though, it was intended to depend upon coppice regeneration for future crop but this could not be achieved due to poor coppicing from felled trees of 3 feet girth. The topographical features had not been taken into consideration while laying down the coupes in trace maps which in turn had caused difficulty in field working. The prescription for retaining all sound trees of Sal up to 16" diameter was hardly followed. The crop was still containing a lot of unsound stock. No attempts had been made to fill the blanks by artificial regeneration. However, teak plantations were raised in some portions of Dhanghar and Rakshi blocks by clear felling the crop. These plantations were fairly successful.

11.2.2.4 -Coppice Working Circle: -

This working circle was inclusive of 20 forest blocks with an area of 13237.960 ha. The silvicultural system adopted was coppice with standards. In total, 9 felling series were formed. Rotation period adopted was 60 years for Amrudhi and Sirigida felling series and it was 40 years for the rest of felling series. Yield was fixed by coupes of approximately equal area. Annual coupes were laid down on boundary survey traced maps. 12 to 15 trees per acre of principal species within 6" to 12" diameter range were prescribed to be retained as standards. Bija trees up to 16" diameter were also prescribed to be retained as standards. Cleaning was to be carried out after main felling. Thinning operations were to be done in the worked over coupes in the 11th, 26th & 41st year over a rotation cycle of 60 years. A tabular statement of felling was also provided with. Plantation of bamboo was prescribed in the areas of Bonaigarh felling series.

Results:-

Annual coupes in Rakshi-I & II could not be worked out due to lack of demand for small timber and for that reason, these blocks were subsequently allotted

to selection coppice working circle. The area of Bhawanipahad was taken to be 370.255 ha., but later on the result of resurvey had shown that available area after excluding encroachment is only 160.057 ha. So accordingly re-allotment of coupes was done but the coupe area became too small for working. The good quality crop in the Mendhamaruni block should have been worked under 60 years rotation as there was no local demand for firewood and small timber from this felling series. Coppice regeneration was satisfactory in all blocks except those covered under Bonaigarh felling series, which had already been reduced to poor scrub jungle due to severe biotic interference and were requiring immediate restocking measures through artificial regeneration. Some attempts were made to raise plantations of *Acacia auriculiformis*, *Cassia siamiae* and *Tectona grandis* in these blocks. Teak plantations raised in Janakinagar block over an area of 32.376 ha. was quite successful. Coppice regeneration in Sirigida block had come up very well even though entire block has hilly terrain.

11.2.2.5 Bamboo Working Circle :-

This working circle was overlapping with the areas of Selection, Selection-coppice and coppice working circle. In total, 16 forest blocks covering an area of 43189.801 ha. were allotted to this working circle. Six felling series were formed and a cutting cycle of 3 years was adopted. The standard cutting rules were also prescribed.

Result :-

The three year cutting cycle was not found to be suitable and was subsequently changed to 4 years conforming to the cutting cycle adopted in other Divisions of the State. Forest block of Kunjar, Kusumdihi, Jada, Solguda, Rushimath and Gurundia probably did not contain sufficient bamboo for working for which initially they were not included in this working circle, however, later on these forest blocks were found to have appreciable growth of bamboo. So later on, two new felling series, viz. Kusumdihi and Rushimath were formed and were leased out to paper Mills. Only a few years before the expiry of the working plan, Kunjar felling series, comprising of Kunjar, Jada and

Solguda blocks were formed. All the felling series were leased out to Titagarh Paper Mills on long term lease basis.

11.2.2.6 Protection Working Circle :-

Only Khandadhar block having an area of 927.560 ha. was kept under this working circle as it formed the catchment of Khandadhar waterfall. No felling of any kind was prescribed as that would have endangered the stability of the soil.

11.2.3 G.G. Das Plan (1973-74 to 1992-93) :-

The revised working plan for the duration of 1973-74 to 1992-93 was prepared by Sri G.G. Das, IFS. This plan was further extended up to 1995-96 vide Govt. letter No.24786/F&E dated 26.11.93. It has been further extended up to 30.06.98 vide No.18-F C-W P-OS-Bonai dt.13.12.97 of the C.C.F (Central), Bhubaneswar. Also, some of the prescriptions of the plan were amended as per the provisions of the Forest Conservation Act, 1980 vide P.C.C.F of Orissa Memo No.26961(4) dt.28.12.90. Under this plan, following six working circles were constituted:-

1. The Sal Conservation Working Circle.
2. The Selection Working Circle.
3. The Coppice Working Circle.
4. The Plantations Working Circle.
5. The Bamboo Working Circle.
6. The Protection Working Circle.

11.2.3.1 The Sal Conservation Working Circle :-

Areas included under this working circle were having the best Sal forests of the Division situated in the valleys and lower slopes of the hills. In total, 4 Forest blocks viz. Toda, Sarkunda, Karo and Kathmal were covered under this working circle. Forest blocks viz. Khajurdihi and Lunga which had been included in this working in S.N.

Das plan were excluded as these were not found to be suitable for conservation to uniform system due to steepness of hill slopes or poor condition of crop. Likewise, portions of Toda block having steep hilly terrain and containing poor quality Sal forests or miscellaneous crops were also excluded. Total area covered under this working circle was 11,788.385 ha. The basic object of management was to convert the uneven-aged crop to more or less even-aged uniform crop and to get maximum sustained yield. Rotation period was fixed at 140 years with a Conversion period of 120 years and regeneration period of 40 years. Six periodic blocks of 20 years each were prescribed. However, P.B.VI was not formed as there had been no P.B.I. in S.N. Das Plan and only P.B.I., P.B.II and P.B. Inter were constituted with definite area allotted to each. As the rest of areas after excluding areas allotted to P.B.I. & P.B.II were containing crop of middle age group with no much distinction in age classes. So no attempt was made to differentiate the remaining three periods, i.e. P.B.III, P.B.IV, & P.B.V and instead only P.B. Inter was formed. Three felling series covering areas of P.B.I, P.B.II & P.B. Inter respectively were constituted. Annual coupes were laid down on 2"=1mile management map.

P.B.I :-Areas having the most mature crop and adequate established regeneration were allotted to this periodic block. Areas of this periodic block were mostly selected from P.B.II of S.N. Das plan but some areas of P.B.II of last plan which did not have a good crop were excluded while some areas of P.B. Inter of the same plan having good mature crop with adequate established regeneration were included. The system prescribed was clear felling with retention of advance growth and standards. During the main felling all trees below 20 cm diameter and 10 to 15 sound Sal trees per acre within 20 to 25 cm diameter range were to be retained. Besides, all good Bija and Sissoo trees of 20 to 30 cm diameter were also to be retained. Under cleaning operation, all damaged, defective and suppressed trees of principal and secondary species and all inferior species were to be removed. All shrubs interfering with regeneration of principal and secondary species and all climbers found on the trees retained as future crop were also to be cut under cleaning operation. A light mechanical thinning was to be carried out at the age of 10 years of the new crop.

P.B. II :-Areas containing comparatively larger number trees of the approach class were allotted to this periodic block. While allotting forest areas to this periodic block, presence or absence of regeneration had not been taken into consideration as steps were to be taken to induce regeneration in this P.B. There were to be no exploitation felling in the forests covered under this P.B. Improvement felling, cleaning and thinning operation were to be carried out in the trees in the approach class. Only dead & hollow trees in the approach class were to be removed. In the area deficient in regeneration of principal species, all inferior species below 30 cm diameter were to be felled. 'C' grade thinning was prescribed for the congested crop below 30 cm diameter. The basic objective of these silvicultural operations was to provide better growing space to the trees in approach class and to induce adequate regeneration of principal species and this was to be achieved primarily by creating required openings in the canopy. However, all these cultural operations were to be carried from 1977-78 and onwards only and prior to that forest areas under this P.B. were prescribed to be closed for any kind of silvicultural operations.

P.B. Inter :-The rest of areas containing crop of middle age groups with not much differentiation in age classes were allotted to this periodic block. The primary object of the management was to remove the over mature, unsound and defective stock so that crop would pass on to next P.Bs in healthy state. Accordingly, the silvicultural system prescribed was Selection-cum-Improvement fellings and thinnings. Yield was to be regulated by coupes of approximately equal areas. Sal, Bija, Sissoo, Gambhar and Champa were to be treated as principal species. Bandhan, Kurum, Mundi, Asan, Kasi, Tendra, Simul, Mango & Mahul were to be treated as secondary species and all other as inferior species. The exploitable diameter was fixed 20" for Sal, 18" for Simal, 16" for Sissoo, 12" for Bandhan and 20" for all other species.

Results :- Prescribed clear felling with retention of advance growth and standards in the P.B.I areas have not been implemented and instead restricted markings and fellings have carried-out. Though, selection marking was done in the coupe No. XX , it was not worked out due to imposition of moratorium on green fellings. The work in the coupe No.II, V & VII was not carried out as per the prescribed felling sequence and they were

worked out as arrear coupes in the subsequent years. In most of the areas, the proportion of pole stage crops and saplings is quite less and the status of natural regeneration is also very poor. Canopy cover at many places was too congested and this has created conditions which are very unfavourable for the proper growth of crop as well as for the inducement of natural regeneration. This has happened primarily for poor implementation of prescribed subsidiary silvicultural operations like-cleaning, thinning, climber cuttings etc. Area is also subjected to repeated annual fires and severe biotic pressure.

In the P.B.II areas, mainly thinning and improvement marking and felling have been carried-out. However, at some places over exploitation of approach class and pre-approach class trees has been noticed. Though, improvement marking was carried out in coupe No.XVI, it was not worked out due to imposition of moratorium on green felling. The work in the coupe No.I,II, III & IV was not carried out as per the felling sequence prescribed in the plan and they were worked out as arrear coupes in the subsequent years. The natural regeneration is either negligible or very poor and very fewer efforts have been made for inducing the same. Prescribed cleaning and climber cutting operations have not been carried out to the desired extent. Severe biotic interference and annual repeated fires have also affected adversely the growth of forest crop. The crop in the P.B.II areas was already congested and in order to achieve desired girth increment in the approach class trees and for the inducement of natural regeneration of principal species, opening in the canopy was prescribed but these objectives could not be achieved as the required openings in the canopy have not been created during the plan period.

In the P.B. inter areas, prescribed Selection-cum-Improvement marking and felling have been carried out. Coupe No.I was not worked out. Coupe No.II to XVIII was worked out by O.F.D.C. Ltd. while coupe No.XIX and XX were worked out departmentally. The work in the coupe No.II, III, IV, V & VII was not carried out as per the felling sequence prescribed in the plan and they were worked out as arrear coupes

in the subsequent years. On the whole, working in the forest areas kept under P.B. Inter have done satisfactorily.

11.2.3.2 Selection Working Circle:-

This working circle was inclusive of all forest blocks that had been allotted to Selection and Selection-Cum-Coppice Working Circle in S.N.Das Plan and also covered areas excluded from Sal conversion working circle due to their unsuitability for concentrated felling. The crop in most of these blocks included under this working circle was much poorer than the forests allotted to Conversion Working Circle. Total areas covered under this working circle were 85142.776 ha. The Silvicultural system adopted was Selection-cum-Improvement felling and thinning. In total, 15 felling series were formed and a felling cycle of 20 years coinciding with the plan period was adopted for all the felling series. In Jada and Kusumdihi felling series, the work was to commensurate from 1977-78 while in the remaining felling series it was to begin from 1973-74. All annual coupes were laid down on the management maps of 2"=1mile scale. Yield was fixed by coupes of more or less equip-productive areas. In order to safeguard the Future yield, a percentage check on removal of Selection trees as derived from Smythis Safeguarding was also prescribed. As per this Safeguarding formula, removal of only 66 2/3% of exploitable girth class trees was prescribed for 12 felling series, viz, Tensa, Khajurdihi, Rushimath, Dhenkiam, Kususmdihi, Lunga, Dandpat, Ulsura, Majurdima, Raipiri, Kunjar & Jada. A higher percentage of removal, i.e., 75% of exploitable girth class trees was prescribed for the Rakshi, Champajharan and Silkuta felling series as trees were developing unsoundness at an early stage in these areas. In addition to Sal, other species like Bija, Sissoo, Gambhar and Champa were to be treated as principal species. Asan, Kusum, Mundi, Dhaura, Bandhan, Kasi, Tentra, Simal, Mango and Bamboo were chosen as secondary species and all other species were to be treated as inferior species. The Table 11.2.3.2. showing exploitable diameters fixed for different species in different felling series is as shown below.

Table 11.2.3.2.				
Exploitable diameters fixed for different species in different felling series				
Name of species	Khajurdihi Lunga & Raipiri FS	Kelo, Kunjar & Jada FS.	Tensa, Dandapat, Ulsura, Kusumdihi, Dhendiam & Rushimath FS	Champajharan, Silkuta & Rakshi FS
1	2	3	4	5
Sal	50 cm.	45cm.	40cm	30 cm
Bija	50 cm.	50 cm.	50cm	45 cm
Asan	50 cm.	50 cm.	50cm	40 cm
Kurum	50 cm.	50 cm.	50cm	40 cm
Mundi	50 cm.	50 cm.	50cm	40 cm
Sissoo	40 cm.	40 cm.	40 cm.	40 cm.
Gambhar	40 cm.	40 cm.	40 cm.	40 cm.
Bandhan	30 cm.	30 cm.	30 cm.	30 cm.
Other species	40 cm.	40 cm.	40 cm.	40 cm.

Under exploitable marking, all trees which had attained prescribed exploitable girth were to be marked for felling subject to retention of 25% of sound trees of principal species in case of Rakshi, Champajharan and Silkuta felling series and 33.3% of such trees in all other felling series. The retained trees were to have diameter 10 cm. higher than the fixed exploitable diameter and were to be of good growth and vigor. Trees standing in the open areas with no established regeneration on along nallah banks, in open eroded or precipitous slopes and fruit bearing trees and all girdhini (*sterculia urens*) trees were also not to be marked for felling. Improvement marking and thinning down to 20 cm. diameter were prescribed. Under improvement marking all dead, hollow, diseased and secondary & inferior species interfering with the growth of principal species were to be marked for felling. Subsidiary silvicultural

operations like cleaning and supplementary felling and sowing and planting were also prescribed.

Results: Prescribed selection and improvement marking was not carried out in the coupe No.IV & V of Dandapat felling series and in the coupe NO.I, II, III, IV & V of Raipiri felling series and they were not worked out during the plan period. Though, prescribed marking was carried out in the coupe No.XVI of Jada and Kusumdihi felling series and the coupe No.XX of the remaining 13 felling series, these coupes were not worked out due to imposition of moratorium on green felling. For the same reason, prescribed marking and felling in the coupe No.XVI, XVII, XVIII, XIX & XX of Jada & Kusumdihi felling series were not carried out. Coupe No.I of Jada F.S., Coupe No.VI of Majurdima felling series were worked out one year ahead of the prescribed felling sequence. The work in the coupe No.V to VII of Dhenkiam felling series, in the coupe No.IV of Khajurdihi felling series, in the coupe No.I to IV of Lunga felling series, Coupe No.VI to VIII of Rushimath felling series, in the coupe No.I,II, IV & VII of Rakshi felling series, in the coupe No.V of Majurdima felling series, in the coupe No.I to VII of Tensa felling series and in the coupe No.V & VII of Ulsura felling series were not carried out as per the felling sequence prescribed in the plan they were worked as arrear coupes in the subsequent years. In the remaining coupes of all felling series, works got carried out as per the felling sequence prescribed in the plan.

Since all the blocks included under this working circle are having fairly steep slopes, the prescribed removal of 75% of exploitable girth trees in Champajharan, Silkuta and Rakshi felling series and 66.7% in the balance 12 felling series was on higher side and has caused over exploitation, In view of hilly nature of the area, at least 50% of exploitable girth trees should have been retained. Under improvement marking and felling, some over felling in pre-exploitable girth class were noticed. Prescriptions with regards to climber cutting, thinning and protection from fire and grazing have not been properly implemented. No artificial sowing and planting in blanks and eroded areas and in steep hilly patches with poor stocking was prescribed as no serious difficulty was

anticipated in obtaining adequate natural regeneration. But contrary to the expectations, the natural regeneration in such areas is poor and there is urgent need to replenish these areas through enrichment plantations. Though, the natural regeneration in other areas was good, its establishment was poor due to repeated annual fires. Repeated annual fire has also caused unsoundness in the trees at early stage.

11.2.3.3 The Coppice Working Circle :-

This working circle was inclusive of areas containing poor quality of crop and which were not very hilly where from extraction of small timber and fire wood would not have been difficult. All forest blocks allotted to this working circle were situated near Koira, Lahunipada and Rajgangpur where there was sufficient demand for firewood and small timber. The object of management was to meet the local demand of small size timber, firewood etc. The total area covered under this working circle was 8117.564 ha.

The silvicultural system adopted was coppice with standards for areas having moderated gradients and coppice with reserves standards for the areas having steep slopes. In total, six felling series, viz. Mendhamaruni, Sirigida, Amrudhi, Kundheibira, Kucheita and Kukia were constituted. All annual coupes were laid down on 2" to a mile management maps, Yield was fixed by annual coupes of approximately equal area. Rotation period was fixed at 40 years for Kucheita, Kukia and Kundheibira filling series was of poor quality. Amrudhi, Sirigida and Mendhamaruni felling series which were containing forests mainly of Sal of fairly good quality were to be worked under a rotation period of 60 years. Sal, Bija, Sisoo, Gambhar and Bandhan were to be treated as principal species with preferential treatment to Sal while Asan, Kurum, Mundi, Kasi, Siris, Dhaura, Karada, Mahul, Sidha, Simul and Bamboos were chosen as secondary species, All other species were to be treated as inferior species.

Under the marking rule for standards, 25 to 40 trees per hectare of principal species having d b h in between 15 cm to 25 cm were to be selected for retention. Such retained standards were to be well-grown with well developed crowns and were to be evenly distributed over entire coupe area. All sound Bija and Sisoo trees upto 30 cm d b d h were also to be retained as standards. In Sirigida and Amrudi felling series, all trees below 15 d b h were to be retained as reserves. Cleaning after main felling was prescribed. Under cleaning oeparation, cutting back of damaged stems and removal of defective stems of principal species and inferior species interfering with the growth of principal species were to be carried out. In the felling series having 40 years rotation, thinning was prescribed in the 11th and 26th year after main felling while for 60 year rortations felling series, it was to be carried out in the 11th and 26th and 41st year after the main felling. Plantation of valuable species like Teak, Sissoo, Bija, Gambhar and Bamboo was prescribed in all the blanks or in areas having poor stocking.

Result :Marking and felling in the coupe No.I, II, III, IV, VII, XVI, XVII, XVIII, XIX & XX of Kundheibira felling series, in the coupe No.XIX & XX of Kucheita felling series and in the coupe No.XX of Amrudhi felling series were not carried out due to non availability of exploitable girth trees. Though, marking was carried out in the coupe No.XX of Mendhamaruni, Kukia and Sirigida felling series, these were not worked out due to imposition of moratorium on green felling. The work in the coupe No.VII of Mendhamaruni felling series, in the Coupe No.VI of Amrudhi felling series, in coupe No.IV, V & VI of Kukia felling series, in the coupe No.VI, VII, VIII of Sirigida felling series, in the coupe No.VII of Kucheita felling series and in the coupe No.VIII of Kundheibira felling series were not carried out as per the felling sequence prescribed in the plan and they were worked out as arrear coupes in the subsequent years. Works in the coupe No.XXI, XXII, XXIII & XXIV of Bhawanipahar felling series which had been prescribed in S.N. Das plan were also carried out though the same were not prescribed in Sri G.G. Das Plan. In the remaining coupes of all felling series, works were carried out as per felling sequence.

In most of the worked out areas, the result of coppicing were quite discouraging and the status of natural regeneration was also not satisfactory. Prescribed subsidiary silvicultural operations for creating favourable conditions for the growth of future crop have also not been implemented properly. Supplementary plantations in the blanks and eroded patches were also not carried out though the same were prescribed in the plan. Also, little attention has been given for protecting the area from over grazing, fire hazards and illicit felling. Most of the reserve forest blocks allotted to this working circle are situated near thickly populated tracts and have been subjected to severe biotic interference. Illicit felling and over grazing are common phenomena in these areas. In most of the worked out coupes, the trees left as standards have already been illicitly removed by the neighboring villagers. Due to above cited factors, the worked out coupes have become very much degraded and to a great extent, stumps of felled trees were not able to produce vigorous coppice shoots. Hence it can be said that on the whole the crop did not respond to the system. Therefore, it was felt necessary to abandon coppice system and to reallocate and work the areas of coppice working circle under other more suitable silvicultural systems. So, coppice worked out areas were to be worked under rehabilitation-cum-plantation working circle and coppice unworked areas were to be worked under selection working circle.

11.2.3.4 The Plantation Working Circle:-

This working circle was constituted with a view to tend the old plantations and for raising plantations of valuable species in replenishment of miscellaneous crops of poor quality and defective Sal Crop of poor value and for rehabilitating the degraded areas. The old plantations raised in the parts of R.F. blocks Dhanghar, Amrudi, Rakshi, Sinduria, Janakinagar and Budhapahad were covered under this working circle. In addition to these old plantation areas, a few portions of R.F. blocks, Kucheita, Jharbeda, Amrudi and Rakshi which were containing mostly miscellaneous species with occasional growth of Sal of very poor quality and all small R.F. blocks around Bonaigarh which were already degraded due to heavy illicit felling

and grazing were also inclusive of this working circle. The area allotted to this working circle was 2175.071 ha.

The silvicultural system adopted was clearfelling followed by artificial regeneration of teak and other suitable species and tending of existing plantations, In total five plantation series, viz. Rakshi, Banki, Amrudi, Janakinagar and Dharanidharpali were constituted. Since the revision work of Plan was delayed till 1977, so the plantation operations as per the plan were to be commenced from the year 1978-79. Rakshi, Banki, Amrudhi and Janakinagar plantation series were divided into 15 numbers of annual coupes while Dharanidharpali plantation series was divided into 25 numbers of annual coupes. The old plantations were shown in the stock map and management map. The annual plantation coupes were laid in 2' = 1 mile management map. Teak and bamboo were to be planted in all plantation series except Dharanidharpali plantation series where plantation of *Accacia auriculiformis*, *Cassia seameia*, *Eucalyptus* and bamboo was prescribed. Provisions were made for raising plantation stock in the nurseries. Thining in the existing plantations were to be carried out in 8th, 13th, 20th, 30th & 45th year plantation. Thining statement for old as well as new plantation was also provided with. All plantation areas were to be strictly closed to grazing and were to be rigidly protected from fire for a period of 10 years at least.

Results :-Plantation activity as per the prescription of the plan commenced from 1978-79. However, a few plantations were raised during the period 1973-74 to 1977-78 in Kelo'B' R.F., Talita R.F., Kendrikela R.F. & Jankinagar R.F. In most of the cases, plantations have not been raised strictly as per the areas earmarked for planting annually in the plan. Most of the plantations raised during the plan period are of mixed type barring few pure teak plantations. In most of the plantations, the prescribed tending operation could not be carried out mainly due to paucity of funds. The plantation areas have not been fully protected from the grazing menace and fire hazard.

Though, for the Amrudi plantation series, 182.113 ha area was prescribed for plantation but the same was not carried out. As against the prescribed plantation target at 242.817 ha for Rakshi Plantation series, only 29 ha was attended to during the plan period. In the Kucheita RF block of Banki Plantation series, besides the prescribed target, an additional degraded coppice area has been planted with suitable species. However, in Jharbeda block of the same plantation series, set plantation target was not achieved.

In Dharanidharpalli plantation series, set target of plantation was achieved in the RF Blocks of Dharanidharpalli, Kelo”B”, Talita and Chandiposh. While the plantation raised in Gogua RF is quite short of set target. However, even in these blocks prescribed plantation sequence has not been followed. In this plantation series, plantation has been raised ahead of the prescribed sequence in Sundhikon RF, Baliatota RF, Huluku RF, Banarai RF and Baghiakucha RF, In the Janakinagar plantation series, the plantation raised in the Kendrikela RF block is little short of the set target while in the Janakinagar block, set target of the plantation has been achieved. However, the prescribed plantation sequence has not been followed in this plantation series also.

Apart from earmarked areas as prescribed in the plan, few gap planting have been done in some degraded patches of the forest blocks of Dandapat West RF, Ulsura RF, Khandadhar RF, Nagaria PRF, Kuradhi RF, Mendhamaruni PRF, Kukia RF, Sarkunda RF, Toda RF, Khandadhar RF, Bhawanipahar PRF and Kusumdihi RF. Under various plantation schemes, viz.F.D.-8443 ecological, W.F.P. Scheme, D.R.D.A. (Under E.A.S. Scheme), D.R.D.A. (I.J.R.Y.Scheme) etc. plantation have been raised in degraded areas of various Khesera Forest Blocks.

11.2.3.5 The Bamboo (overlapping) Working Circle.

This working circle covered all the areas that had been allotted to Bamboo (overlapping) Working Circle in S.N. Das plan and few other RF blocks such as Kusumdihi, Rushimath, Gurundia, Kunjar, Sulguda, Jada and parts of Lunga. It was overlapping with major portions of Selection Working Circle and with one felling series

of coppice working circle. All the blocks allotted to this working circle were containing fair proportion of bamboos. The total area covered under this working circle was 70607.204 ha. The basic object of management was to meet the growing needs of industries to meet the needs of people and to improve the quality and size of clumps for securing increasing yield.

The silvicultural system adopted was selection cutting with cleaning. The yield was to be regulated by area. A cutting cycle of 4 years was adopted. In total, ten felling series viz. Champajharan, Mahulpada, Ulsura, Dhenkiam, Kusumdihi, Rushimath, Kantamunda, Kelo, Kunjar and Sirgida were constituted. Each felling series was divided into 4 numbers of coupes. The annual coupes were laid on 2" = 1 mile management map. The cutting rules were also prescribed. The basic principle of cutting rules was that in a 4 years cutting cycle, a maximum of $2/3^{\text{rd}}$ of the total number of culms were to be removed from a clump and nothing was to be felled from a clump of formative stage except removal of only dead and dry bamboo. A clump containing 10 or less numbers of culms was to be taken as formative stage.

Results: In addition to prescribed 10 felling series, a new bamboo F.S., Viz. Bonai B.C.C. covering bamboo bearing DPF of Jarda Range was constituted and worked in this F.S. from 1983-84. Barring the year 1977-78 & 1990-91, bamboo coupes of Champajharan F.S. could not be worked-out from the year 1973-74 to 1993-94 due to non-availability of exploitable bamboos. Likewise, few bamboo coupes of Ulsura F.S. (1975-76) Dhenkiam F.S. (1983-84, 1984-85, 1986-87, 1988-89 & 1992-93), Kusumdihi F.S. (1986-87), Kunjar F.S. (1973-74) and Bonai B.C.C.F.S. (1989-90 & 1993-94) could not be worked out due to non availability of exploitable bamboos. During the year 1987-88, bamboo coupes of Ulsura, Dhenkiam, Kusumdihi, Rushimath, Kantamunda, Kello, Kunjar, Sirgida F.S. could not be worked out due to default in payment of royalty by M/s Titagarh Paper Mills Ltd. As per the prescription of the plan, Bamboo coupes of Mahulpada F.S. were sold out on permit system to local people from 1973-74 to 1981-82. Since 1982-83, Bamboo coupes of Mahulpada F.S. have been settled with M/s O.P. Mills on long term lease basis and are being worked out by them.

Up to the year 1986-87, most of the bamboo coupes of the Division have been worked out directly by M/s Mitagarh Paper Mills Ltd. Since 1988-89, the lease for bamboo coupes of the Division has been given to O.F.D.C. Ltd. Further, M/s Orient Paper Mills Ltd. was the raw material procurer (R.M.P) of the O.F.D.C. Ltd. With respect to bamboo extraction all the cutting rules have got neglected and very little attention has given to the prescribed silvicultural operations. At many places, occurrence of illicit removal of bamboo has also observed. Adequate measures for protecting bamboo bearing forest areas from the fire hazard and over grazing have also not been taken up. Due to above cited factors, most of the bamboo clumps have been degraded and in many places they have lost the vigour of regeneration. However, with ongoing bamboo silvicultural operations in the annual coupe areas some improvement in the bamboo forest is expected.

11.2.3.6 The Protection Working Circle :-

This working circle was inclusive of Khandadhar RF block which forms the catchment of Khandadhar nalla. All forest areas which had been disforested for establishment of tribal colonies or for resettlement of displaced persons but not disreserved by that time were also included under this working circle. Besides these, the encroached forest areas were also covered under this working circle. The total area of this working circle was 6380.178 ha.

The basic object of management was to maintain adequate forest cover in the catchment area of Khandadhar nalla and to maintain a record of disforested areas till their final disreservation. No felling was to be carried out in Khandadhar RF block and it was to be closed to grazing and rigidly protected from fire. No subsidiary silvicultural operations were prescribed for the areas of this working circle. The villages inside the forest areas as well as encroached areas had been surveyed and were shown in the 2" = 1 mile management map.

Results:- Inclusion of catchment area of Khandadhar nalla under this working circle was fully justified as the area is ecologically fragile and requires complete protection. However, no speedy action has been taken up regarding issue of disreservation notifications in case of resettled vallages. Likewise, very little attention has been given regarding the final decision for the encroached areas.

11.2.4 Sri Suresh Pant Plan (1997-98 to 2016-17)

The expired Revised Working Plan prepared by Sri Suresh Pant, IFS, Working Plan Officer, Sambalpur came into force with effect from 1997-98 and was valid up to 2016-17. In this plan, the PRF areas (already notified u/s-4 of O.F. Act'1972) of 43 blocks out of 46 Blocks have been included for the first time for its systematic management along with the R.F. areas. The area of 3 PRF blocks i.e. Jada PRF (105.544 Ha.) Toda-V PRF (4.856 Ha.) and Kathmal PRF (213.678 Ha.) total of 324.078 Ha. has not been included for its management. But while preparing the Working Plan, the area of R.F. and P.R.F. Blocks have been computed by the W.P.O Sambalpur from latest Topo Sheet of 1:25,000 scale and included in the plan for its management. The details of area of R.F. and P.R.F. blocks as per Government Notification and area found as per computation based on Topo Sheet and included in the Plan is as detailed below.

Category of Forest.	Area in Ha as per Government Notification.	Area computed by WPO from latest Topo Sheet of 1:25,000 Scale and included in the Working Plan.
1	2	3
1. Reserved Forests	1,16,212.893 (59 blocks)	1, 15, 455.452 (59 blocks)
2. P.R.F. (U/S-4)	35,310.178 (43 blocks)	33, 937.382 (43 blocks)
G Total:-	1, 51, 523.071	1, 49, 392.834

The above computed RF & PRF area of 1, 49, 392.834 Ha were being managed under the following seven Working Circles:-

1. Selection Working Circle (1,20,295.172 Ha.)
2. Protection Working Circle (8,426.860 Ha.)
3. Rehabilitation-cum-Plantation Working Circle (20, 670.802 Ha.)
4. Bamboo (overlapping) Working Circle (70,190.802 Ha.)
5. Wild life (overlapping) Working Circle (1,48,156.952 Ha.)
6. N.T.F.P (overlapping) Working Circle (1,48,156.952 Ha.)
7. Misc. (overlapping) Working Circle (3,809.992 Ha.)

11.2.4.1 Selection Working Circle (SWC)

Total area allotted to this Working Circle is 1,20,295.172 Ha which is about 81% of the total area of 1,49,392.834 Ha covered under this plan.

Sal conversion & coppice system which had been adopted in the previous plan (1973-74 to 1992-93) could not achieve the set targets. On account of these reasons and as per Govt. of India guide lines, forest areas worked under these systems have been incorporated in this Working Circle so as to improve the crop status by taking suitable silvicultural operations. In addition to 15 felling series of the previous plan (1973 -74 to 1992-93), 7 (Seven) more felling series have been incorporated in this working circle. So, in total, there were 22 felling series covering the entire area of this Working Circle. Addition of 7 (Seven) more felling series is due to inclusion of conversion & coppice un-worked areas of the previous plan and R.F.& PRF blocks of Mahulpada , which have been incorporated for the first time to the selection system.

Out of 22 felling series, 2 (Two) felling series i.e. Champajharan & Silkuta covering an area of 11,878.147 Ha. (5,348.236 Ha+6,529.911 Ha) comes under Banki Range and merged with Rourkela Division with effect from 1.10.2003. Thus, 20 coupes (22-2) covering an area of 1,08,417.025 Ha. (1,20,295.172 Ha – 11,878.147 Ha) was under management in this Division, from the above said date onwards. The main objectives of management of this working circle were set as below;

(a) To improve the density and composition of forest crop and to encourage the natural regeneration and establishment of principal species by taking suitable silvicultural operation with due emphasis on soil and water conservation.

(b) Consistent with primary objectives, removal of matured & silviculturally available trees before they become unsound on sustained yield basis.

(c) Removal of unsound and defective trees under improvement felling so as to improve & increase the stocking of principal species.

(d) To re-stock the blank areas, if any, by artificial regeneration as per para-413 of the working plan with due approval of the schemes by the competent authority.

Implementation

Although, the working plan was valid from 1997-98, no coupe working was taken up from 1997-98 to 2004-05 (, i.e., Coupe No.I to VIII), due to moratorium on felling of trees issued by Govt. in F&E Deptt. during 1992 in each felling series. However, Coupe working was started from, i.e., 2005-06 and onwards. .

Though, marking in all the coupes was taken up from 2005-06 and coupes were delivered to OFDC Ltd for working in the year due for working, the OFDC Ltd have surrendered the following coupes without working during the period 2005-06 to 2016-17.

(a)	Amrudi F.S	-----	IX,XI,XII,XIII,XIV,XV,XVI	= 7 Coupes
(b)	Rakshi F.S	-----	IX,X,XI,XII,XIII,XIV,XV,XVI	= 8 Coupes
(c)	Toda F.S	-----	IX,X,XI,XIII,XIV,XV,XVI	= 7 Coupes
(d)	Sarkunda PRF F.S.	-----	IX,XV,XVI,XVII	= 4 Coupes
(e)	Nagria F.S	-----	XII,XIII	= 2 Coupes
(f)	Karo F.S	-----	XIII,XIV,XV,XVI,XVII	= 5 Coupes
(g)	Sarkunda F.S	-----	XIII,XIV,XV	= 3 Coupes
(h)	Tensa F.S	-----	XIII,XIV,XV,XVII	= 4 Coupes
Total:- 40 Coupes				

Out of above 40 numbers of un-worked coupes, Coupe No.XIII & XIV of Amrudi F.S. & Coupe No. XIII of Nagaria F.S. has not been worked by OFDC Ltd as it was un-economical for them. Besides, Coupe No. XVI & XVII of Sarkunda PRF F.S. were not marked in the year due for working due to non-availability of exploitable trees. The rest 35 coupes have not been worked due to Maoist activities. The topography of forest area covered under this working circle is of varied type. Most of blocks in this Working Circle are hilly having moderate to steep slopes. The working of PRF blocks has been included under this working circle for the first time. Some of the areas have degraded due to biotic interferences in various forms. Due to these reasons, the standing crop in most of the PRF blocks is quite dissimilar & regeneration status is also not satisfactory.

As per Para- 412 of the expiring Working Plan, subsidiary silvicultural operations in the year following the main felling have been taken up in this Division based on availability of funds. Subsidiary Silvicultural Operation over 42,093.088 ha.has been taken up during the previous plan period. Apart from this, plantation activities over 9164.77 Ha.have been taken up under Compensatory Afforestation Scheme under CAMPA & through VSS under OFSDP.

The year-wise and coupe-wise details of area covered under Subsidiary Silvicultural Operation are furnished in Table 11.2.4.1

Table 11.2.4.1				
Details of Timber Coupes where Subsidiary Silvicultural Operation taken up under Selection Working Circle for the period from 1997-98 to 2020-21.				
Year	Name of the Coupe	Area of the coupe in ha.	Area covered under SSO in Ha.	Remarks
1	2	3	4	5
1997-98	NIL			
1998-99	NIL			
1999-2K	NIL			
2000-01	NIL			
2001-02	NIL			
2002-03	NIL			
2003-04	NIL			
2004-05	NIL			
2005-06	NIL			
2006-07	1. Amrudihi SWC - IX	282.055	0.000	Not worked because of LWE issues
	2. Dandpat SWC - IX	132.738	132.738	
	3. Lunga SWC - IX	157.625	157.625	
	4. Nagaria SWC - IX	238.313	132.000	
	5. Ulsura SWC - IX	162.977	162.977	
	6. Jada SWC - IX	516.389	362.389	
	7. Kunjar SWC - IX	426.237	320.237	
	8. Majurdima SWC - IX	407.469	407.469	
	9. Raipiri SWC - IX	434.366	434.366	
	10. Sirigida SWC - IX	135.841	135.841	

	11. Karo SWC - IX	138.399	138.399	
	12. Khajurdihi SWC - IX	91.987	91.987	
	13. Rakshi SWC - IX	114.329	0.000	Not worked because of LWE issues
	14. Sarkunda SWC - IX	210.388	180.388	
	15. Tensa SWC - IX	371.312	371.312	
	16. Toda SWC - IX	224.313	0.000	Not worked because of LWE issues
	17. Sarkunda PRF SWC - IX	295.625	0.000	
	18. Dhenkiam SWC - IX	297.875	297.875	
	19. Kusumdihi SWC - IX	286.773	286.773	
	20. Rushimath SWC - IX	422.998	422.998	
	Total:-	5348.009	4035.374	
Source : O/o the Divisional Forest Officer, Bonai Division				

Year	Name of the Coupe	Area of the coupe in ha.	Area covered under SSO in Ha.	Remarks
1	2	3	4	5
2007-2008	1. Amrudihi SWC - X	328.937	184.000	
	2. Dandpat SWC - X	270.978	196.000	
	3. Lunga SWC - X	284.385	184.000	
	4. Nagaria SWC - X	272.188	184.000	
	5. Ulsura SWC - X	178.262	178.000	
	6. Jada SWC - X	368.438	230.000	
	7. Kunjar SWC - X	377.508	230.000	
	8. Majurdima SWC - X	485.949	221.000	
	9. Raipiri SWC - X	351.998	230.000	
	10. Sirigida SWC - X	140.823	140.823	
	11. Karo SWC - X	118.419	118.419	

2007-08	12. Khajurdihi SWC - X	109.261	109.000	
	13. Rakshi SWC - X	124.153	0.000	Not worked because of LWE issues
	14. Sarkunda SWC - X	197.645	195.890	
	15. Tensa SWC - X	398.312	184.000	
	16. Toda SWC - X	227.438	0.000	Not worked because of LWE issues
	17. Sarkunda PRF SWC - X	205.658	205.658	
	18. Dhenkiam SWC - X	231.438	184.000	
	19. Kusumdihi SWC - X	357.603	194.000	
	20. Rushimath SWC - X	415.518	184.000	
	21. Amrudihi SWC - IX	282.055	60.000	Part of 2006-07
	22. Sarkunda SWC - IX	210.388	30.000	Balance of 2006-07
	23. Kunjar SWC - IX	426.237	106.000	Balance of 2006-07
	24. Jada SWC - IX	516.389	154.000	Balance of 2006-07
	Total:-	6879.980	3702.790	
Source : O/o the Divisional Forest Officer, Bonai Division				

Year	Name of the Coupe	Area of the coupe in ha.	Area covered under SSO in Ha.	Remarks
1	2	3	4	7
2008-2009	1. Amrudi SWC - XI	381.312	0.000	Not worked because of LWE issues
	2. Dandpat SWC - XI	125.848	125.848	
	3. Lunga SWC - XI	288.083	288.000	
	4. Nagaria SWC - XI	237.500	237.500	
	5. Ulsura SWC - XI	153.284	153.284	
	6. Jada SWC - XI	435.722	434.500	
	7. Kunjar SWC - XI	515.440	365.000	
	8. Majurdima SWC - XI	337.535	337.535	
	9. Raipiri SWC - XI	480.360	480.360	
	10. Sirigida SWC - XI	122.471	122.471	
	11. Karo SWC - XI	111.823	111.823	
	12. Khajurdihi SWC - XI	109.892	109.892	
	13. Rakshi SWC - XI	96.921	0.000	Not worked due to MCC problem.
	14. Sarkunda SWC - XI	231.143	231.143	
	15. Tensa SWC - XI	322.126	322.126	
	16. Toda SWC - XI	191.938	0.000	Not worked because of LWE issues
	17. Sarkunda PRF SWC - XI	346.400	281.400	
	18. Dhenkiam SWC - XI	292.563	292.563	
	19. Kusumdihi SWC - XI	404.830	404.830	
	20. Rushimath SWC - XI	648.136	574.000	
	21. Amrudihi SWC - X	328.937	114.937	Part of 2007-08

	22. Dandpat SWC - X	270.978	40.000	Part of 2007-08
	23. Lunga SWC - X	284.385	70.000	Part of 2007-08
	24. Nagaria SWC - X	272.188	48.000	Part of 2007-08
	25. Jada SWC - X	368.438	50.000	Part of 2007-08
	26. Kunjar SWC - X	377.508	50.000	Part of 2007-08
	27. Majurdima SWC - X	485.949	205.000	Part of 2007-08
	28. Raipiri SWC - X	351.998	71.000	Balance of 2007-08
	29. Tensa SWC - X	398.312	214.312	Balance of 2007-08
	30. Dhenkiam SWC - X	231.438	47.438	Balance of 2007-08
	31. Kusumdihi SWC - X	357.603	163.603	Balance of 2007-08
	32. Rushimath SWC - X	415.518	231.518	Balance of 2007-08
	33. Dandpat SWC - XII	134.191	50.000	Part
	34. Lunga SWC - XII	351.688	100.000	Part
	35. Rushimath SWC - XII	578.558	100.000	Part
	36. Kusumdihi SWC - XII	603.594	80.000	Part
	Total:-	11644.610	6508.083	
Source : O/o the Divisional Forest Officer, Bonai Division				

Year	Name of the Coupe	Area of the coupe in ha.	Area covered under SSO in Ha.	Remarks
1	2	3	4	7
2009-2010	1. Amrudi SWC - XII	286.598	0.000	Not worked because of LWE issues
	2. Dandpat SWC - XII	134.191	84.191	50 Ha. taken up in 2008-09
	3. Lunga SWC - XII	351.688	251.688	
	4. Nagaria SWC - XII	331.938	0.000	Not worked because of LWE issues

	5. Ulsura SWC - XII	164.842	164.842	
	6. Jada SWC - XII	569.760	102.000	
	7. Kunjar SWC - XII	506.202	99.000	
	8. Majurdima SWC - XII	354.147	354.147	
	9. Raipiri SWC - XII	504.336	504.336	
	10. Sirigida SWC - XII	116.984	116.000	
	11. Karo SWC - XII	101.174	0.000	
	12. Khajurdihi SWC - XII	94.383	94.383	
	13. Rakshi SWC - XII	93.191	0.000	Not worked because of LWE issues
	14. Sarkunda SWC - XII	281.485	191.485	
	15. Tensa SWC - XII	369.000	140.313	
	16. Toda SWC - XII	215.313	101.000	
	17. Sarkunda PRF SWC - XII	257.783	191.000	
	18. Dhenkiam SWC - XII	289.687	255.000	
	19. Kusumdihi SWC - XII	603.594	472.687	80 Ha. taken up in 2008-09
	20. Rushimath SWC - XII	578.558	478.000	100 Ha. taken up in 2008-09
	Total:-	6204.854	3600.072	
Source : O/o the Divisional Forest Officer, Bonai Division				

Year	Name of the Coupe	Area of the coupe in ha.	Area covered under SSO in Ha.	Remarks
1	2	3	4	7
2010-2011	1. Amrudihi SWC - XIII	201.563	0.000	Not worked - uneconomical .
	2. Dandpat SWC - XIII	116.620	116.620	
	3. Lunga SWC - XIII	312.842	312.842	
	4. Nagaria SWC - XIII	427.188	0.000	Not worked - uneconomical.
	5. Ulsura SWC - XIII	163.330	125.000	
	6. Jada SWC - XIII	394.633	394.633	
	7. Kunjar SWC - XIII	440.342	440.342	
	8. Majurdim SWC - XIII	317.267	317.267	
	9. Raipiri SWC - XIII	360.684	357.482	
	10. Sirigida SWC - XIII	152.616	152.616	
	11. Karo SWC - XIII	120.625	0.000	Not worked because of LWE issues
	12. Khajurdihi SWC - XIII	89.591	89.591	
	13. Rakshi SWC - XIII	104.257	0.000	Not worked because of LWE issues
	14. Sarkunda SWC - XIII	174.813	67.250	
	15. Tensa SWC - XIII	250.250	0.000	
	16. Toda SWC - XIII	253.937	0.000	
	17. Sarkunda PRF SWC - XIII	268.750	268.750	
	18. Dhenkiam SWC - XIII	324.438	324.438	
	19. Kusumdihi SWC - XIII	350.759	350.759	
	20. Rushimath SWC - XIII	403.673	403.673	
	21. Kunjar SWC - X	377.508	97.508	Balance of 2007-08
	22. Dandapat SWC - X	270.978	34.978	Balance of 2007-

				08
	23. Kunjar SWC - XI	515.440	150.440	Balance of 2008-09
	24. Jada SWC - X	368.438	88.438	Balance of 2007-08
	25. Toda SWC - XII	215.313	114.313	Balance of 2009-10
	26. Kusumdihi SWC - XII	603.594	50.907	Balance of 2009-10
	27. Tensa SWC - XII	369.000	228.687	Balance of 2009-10
	28. Sarkunda SWC - XII	281.485	90.000	Balance of 2009-10
	29. Sarkunda PRF SWC - XII	257.783	66.783	Balance of 2009-10
	30. Jada SWC - XII	569.760	398.600	Balance of 2009-10
	31 Kunjar SWC - XII	506.202	392.802	Balance of 2009-10
	Total:-	9563.679	5434.719	
Source : O/o the Divisional Forest Officer, Bonai Division				

Year	Name of the Coupe	Area of the coupe in ha.	Area covered under SSO in Ha.	Remarks
1	2	3	4	7
2011-2012	1. Amrudihi SWC - XIV	233.319	233.319	Not worked-uneconomical.
	2. Dandpat SWC - XIV	126.796	126.796	
	3. Lunga SWC - XIV	389.125	389.125	
	4. Nagaria SWC - XIV	388.687	0.000	

	5. Ulsura SWC - XIV	114.780	114.780	
	6. Jada SWC - XIV	455.495	455.495	
	7. Kunjar SWC - XIV	567.793	567.793	
	8. Majurdima SWC - XIV	324.704	324.704	
	9. Raipiri SWC - XIV	413.402	413.402	
	10. Sirigida SWC - XIV	127.832	127.832	
	11. Karo SWC - XIV	136.438	0.000	
	12. Khajurdihi SWC - XIV	121.745	121.745	
	13. Rakshi SWC - XIV	139.943	0.000	Not worked because of LWE issues
	14. Sarkunda SWC - XIV	228.813	228.813	
	15. Tensa SWC - XIV	290.750	290.750	
	16. Toda SWC - XIV	298.499	0.000	
	17. Sarkunda PRF SWC - XIV	221.043	221.043	
	18. Dhenkiam SWC - XIV	260.125	260.000	
	19. Kusumdihi SWC - XIV	261.419	261.000	
	20. Rushimath SWC - XIV	507.221	507.221	
	21. Toda SWC - XIII	253.937	253.937	
	22. Tensa SWC - XIII	250.250	250.250	
	23. Amrudihi SWC - XIII	201.563	201.563	
	24. Nagaria SWC - XIII	427.188	427.188	
	25. Rakshi SWC - XIII	104.257	104.257	
	26. Karo SWC - XIII	120.625	120.625	
	27. Sarkunda SWC - XIII	174.813	107.563	
	Total:-	7140.562	6109.201	
Source : O/o the Divisional Forest Officer, Bonai Division				

Year	Name of the Coupe	Area of the coupe in ha.	Area covered under SSO in Ha.	Remarks
1	2	3	4	5
2012-2013	1. Amrudihi SWC - XV	247.674	0.000	Not worked because of LWE issues
	2. Dandpat SWC - XV	113.143	113.143	
	3. Lunga SWC - XV	296.357	296.357	
	4. Nagaria SWC - XV	414.063	414.063	
	5. Ulsura SWC - XV	107.294	107.294	
	6. Jada SWC - XV	604.333	354.333	
	7. Kunjar SWC - XV	373.245	373.245	
	8. Majurdima SWC - XV	340.656	338.620	
	9. Raipiri SWC - XV	462.390	462.390	
	10. Sirigida SWC - XV	126.822	126.822	
	11. Karo SWC - XV	175.875	0.000	Not worked because of LWE issues
	12. Khajurdihi SWC - XV	101.695	101.695	
	13. Rakshi SWC - XV	86.017	0.000	Not worked because of LWE issues
	14. Sarkunda SWC - XV	278.000	0.000	
	15. Tensa SWC - XV	308.749	0.000	
	16. Toda SWC - XV	217.750	0.000	
	17. Sarkunda PRF SWC - XV	201.674	0.000	
	18. Dhenkiam SWC - XV	265.250	265.250	
	19. Kusumdihi SWC - XV	411.074	411.074	
	20. Rushimath SWC - XV	609.563	609.563	
	Total:-	5741.624	3973.849	

2013- 2014	1. Amrudihi SWC - XVI	271.125	0.000	Not worked because of LWE issues
	2. Dandpat SWC - XVI	144.242	130.000	
	3. Lunga SWC - XVI	370.948	350.000	
	4. Nagaria SWC - XVI	369.062	300.000	
	5. Ulsura SWC - XVI	223.859	200.000	
	6. Jada SWC - XVI	311.999	300.000	
	7. Kunjar SWC - XVI	611.072	500.000	
	8. Majurdima SWC - XVI	357.847	300.000	
	9. Raipiri SWC - XVI	537.106	450.000	
	10. Sirigida SWC - XVI	121.020	100.000	
	11. Karo SWC - XVI	168.063	0.000	Not worked because of LWE issues
	12. Khajurdihi SWC - XVI	108.316	100.000	
	13. Rakshi SWC - XVI	118.051	0.000	Not worked because of LWE issues
	14. Sarkunda SWC - XVI	268.250	240.000	
	15. Tensa SWC - XVI	284.000	224.000	
	16. Toda SWC - XVI	163.437	0.000	Not worked because of LWE issues
	17. Sarkunda PRF SWC - XVI	320.218	0.000	Not marked because of non-availability of trees
	18. Dhenkiam SWC - XVI	247.000	220.000	
	19. Kusumdihi SWC - XVI	333.732	310.000	
	20. Rushimath SWC - XVI	653.250	550.000	
	Total:-	5982.597	4274.000	

Source : O/o the Divisional Forest Officer, Bonai Division

Year	Name of the Coupe	Area of the coupe in ha.	Area covered under SSO in Ha.	Remarks
1	2	3	4	5
2014-15	1. Amrudih SWC - XVII	239.469	235.000	
	2. Dandpat SWC - XVII	124.963	120.000	
	3. Lunga SWC - XVII	245.712	240.000	
	4. Nagaria SWC - XVII	281.250	280.000	
	5. Ulsura SWC - XVII	185.379	180.000	
	6. Jada SWC - XVII	385.019	380.000	
	7. Kunjar SWC - XVII	509.518	500.000	
	8. Majurdima SWC - XVII	269.792	260.000	
	9. Raipiri SWC - XVII	371.231	370.000	
	10. Sirigida SWC - XVII	144.102	140.000	
	11. Karo SWC - XVII	199.262	0.000	No marking due to LWE issues
	12. Khajurdihi SWC - XVII	121.935	120.000	
	13. Rakshi SWC - XVII	113.293	0.000	
	14. Sarkunda SWC - XVII	208.551	200.000	
	15. Tensa SWC - XVII	318.313	0.000	No marking due to LWE issues
	16. Toda SWC - XVII	203.312	200.000	
	17. Sarkunda PRF SWC - XVII	247.442	0.000	Non availability of exploitable trees
	18. Dhenkiam SWC - XVII	356.062	350.000	
	19. Kusumdihi SWC - XVII	343.963	340.000	
	20. Rushimath SWC - XVII	542.562	540.000	
	Total:-	5411.130	4455.000	

Year	Name of the coupe	Area of the coupe in Ha.	Area covered under SSO in Ha.	Remarks
1	2	3	4	5
2015-16	-	-	-	

Year	Name of the coupe	Area of the coupe in Ha.	Area covered under SSO in Ha.	Remarks
1	2	3	4	5
2016-17	Sarkunda SWC-XIX	256.125	256.125	
	Ulsura SWC-XIX	218.596	218.596	
	Majurdima SWC-XIX	256.254	256.254	
	Raipuri SWC-XIX	432.429	432.429	
	Karo SWC-XIX	132.000	132.000	
	Toda SWC-XIX	257.124	257.124	
	Kunjar SWC-XIX	406.522	406.522	
	Sirigida SWC-XIX	150.156	150.156	
	Jarda SWC-XIX	288.308	288.308	
	Lunga SWC-XIX	277.051	277.051	
	Dhenkiam SWC-XIX	293.875	293.875	
	Kusumdihi SWC-XIX	324.010	324.010	
	Rushimath SWC-XIX	640.250	640.250	
	Dandapat SWC-XIX	156.694	156.300	
	Nagaria SWC-XIX	413.000	413.000	
	Total (2016-17):-	4502.394	4502.000	

Year	Name of the coupe	Area of the coupe in Ha.	Area covered under SSO in Ha.	Remarks
1	2	3	4	5
2017-18	Tensa SWC No.XIX	236.125	236.125	
	Sarkunda PRF SWC No.XIX	287.813	287.813	
	Khajurdihi SWC No.XIX	117.206	117.206	
	Roxy SWC No.XIX	85.509	85.509	
	Amrudihi SWC No.XIX	300.291	300.291	
	Karo SWC No.XX	155.750	155.750	
	Toda SWC No.XX	248.750	248.750	
	Tensa SWC No.XX	261.438	261.438	
	Sarkunda PRF SWC No.XX	186.313	186.313	
	Khajurdihi SWC No.XX	99.677	99.677	
	Roxy SWC No.XX	100.163	100.163	
	Sarkunda SWC No.XX	244.705	244.705	
	Amrudihi SWC No.XX	308.809	308.809	
	Lunga SWC No.XX	261.381	261.381	
	Dandapat SWC No.XX	159.222	159.222	
	Nagaria SWC No.XX	392.501	392.501	
	Kunjar SWC No.XX	501.760	501.760	
	Sirigida SWC No.XX	162.138	162.138	
	Jada SWC No.XX	513.359	513.359	
	Ulsura SWC No.XX	231.441	231.441	
	Majurdima SWC No.XX	319.110	319.110	
	Raipuri SWC No.XX	488.710	488.710	
	Dhenkiam SWC No.XX	208.626	208.626	
	Kusumdihi SWC No.XX	283.088	283.088	
	Rushimath SWC No.XX	478.125	478.125	
	Total (2017-18):-	6632.010	6632.010	

Year	Name of the coupe	Area of the coupe in Ha.	Area covered under SSO in Ha.	Remarks
1	2	3	4	5
2018-19	Amrudhi SWC-I	122.526	122.526	
	Lunga SWC-I	243.517	243.517	
	Nagaria SWC-I	292.5	292.5	
	Ulsura SWC-I	166.438	166.438	
	Dandpat SWC-I	147.925	147.925	
	Karo SWC-I	159	159	
	Khajurdihi SWC-I	114.747	114.747	
	Rakshi SWC-I	155.413	155.413	
	Sarkunda SWC -I	274.813	274.813	
	Tensa SWC-I	342.5	342.5	
	Sarkunda PRF SWC-I	274.358	274.358	
	Toda SWC-I	237.063	237.063	
	Total (2018-19):-	2530.800	2530.800	

Year	Name of the coupe	Area of the coupe in Ha.	Area covered under SSO in Ha.	Remarks
1	2	3	4	5
2019-20	-	-	-	

Year	Name of the coupe	Area of the coupe in Ha.	Area covered under SSO in Ha.	Remarks
1	2	3	4	5
2020-21	Dandapat SWC -III	144.298	75.90	
	Ulsura SWC -III	182.202	113.56	
	Amrudhi SWC -III	255.792	128.45	
	Lunga SWC-III	335.784	139.92	
	Dhenkiam -III	430.500	314.70	
	Kusumdihi SWC-III	211.500	129.56	
	Rushimath-III	487.799	222.57	
	Majurdima SWC-III	209.528	142.64	
	Raipuri-SWC-III	426.981	294.46	
	Jada SWC -III	294.678	221.16	
	Kunjar SWC-III	405.640	307.02	
	Sirigida-SWC-III	237.477	131.23	
	Nagaria SWC-III	278.125	-	
	Rakshi-III	166.324	-	
	Sarkunda-III	122.938	-	
	Tensa SWC-III	402.438	147.42	
	Sarkunda PRF- III	225.312	-	
	Karo SWC-III	246.225	-	
	Khajurdihi-III	82.781	-	
	Toda-SWC-III	202.375	-	
	Total (2020-21):-	5348.697	2368.562	

Source : O/o the Divisional Forest Officer, Bonai Division

Apart from this, plantation activities over 9164.77 ha. have been taken up under Compensatory Afforestation Schemes under CAMPA and through VSS under OFSDP. There is no failure in the implementation of the prescriptions under selection Working Circle except non-working of the coupes because of reasons specified above. However, the deviation for non-working of the timber coupes of 2005-06 due to LWE issues has been sanctioned vide S.O. No. 244/IIF (WP) 1/07 dt.2.3.2007 of the PCCF, Odisha. Besides, the deviation report for non-working of the timber coupes due to MCC problem for the year 2009-10 & 2010-11 has been submitted by the DFO, Bonai vide his Memo No.6999 dt.8.11.2010 & No.5891 dt.27.7.2011. The reason of non-working of some of the coupes in each year has been furnished in the remarks column as reported earlier along with Production of Timber and Firewood of each Coupe.

11.2.4.2 Protection Working Circle (PWC).

Areas not allotted to any other working circle owing to their specific nature of problems requiring specific silvicultural treatment and administrative measures i.e. ecologically fragile areas covering entire Khandadhar RF, portions of RF and PRF blocks covered under active encroachment for cultivation and rehabilitation purpose and areas affected by shifting cultivation have been covered under this working circle. The total area covered under this working circle is 8,426.860 Ha. out of this, an area of 604.562 ha. (Mahura RF 117.940 Ha.+ Silkuta-I RF 486.622 Ha.) comes under Banki Range and merged with Rourkela Division with effect from 1.10.2003. Thus, the net area of Bonai Division comes to 7,822.298 Ha for its management as detailed in Table No. 11.2.4.2.

Table No. 11.2.4.2					
Blocks & Compartments allotted to Protection Working Circle.					
Sl. No.	Range	Name of RF / PRF	Compt. No.	Area (in ha.)	Remarks
1.	Bonai	Ulsura RF	1 (a)	12.869	
2.	Kuliposh	Amrudhi RF	3 (c), 4 (c)	173.813	

3.	Kuliposh	Nagarai PRF	1 (a) to 13 (a) & 15 (a) to 16 (a)	3157.686	
4.	Sole	Balai RF	7 (a) & 8 (a)	120.375	
5.	Sole	Kunjar RF	2 (a) to 4 (a)	333.644	
6.	Sole	Solguda RF	4 (a), 6 (a) & 7 (a)	224.860	
7.	Koira	Bhawanipahar RF	Part	209.108	
8.	Koira	Raxi-I RF	8	355.169	
9.	Koira	Toda RF	2 (a) 8 (a), 11 (a), 12 (a), 17 (a), 25 (c), 29 (a), 30 (b), 44 (c), 46 (b) and 47 (b)	996.570	
10	Barsuan	Khandadhar RF	Entire	927.560	
11	Barsuan	Khajurdihi PRF	1 (a), to 3 (a) and 6 (a)	323.050	
12.	Barsuan	Sarkunda PRF	8 (c), 11 (c), 12 (a), 13 (a)	167.341	
13.	Tamra	Dhenkiam	3 (a), 5 (a), 6 (a), 7 (a), 8 (a), 16 (a) to 18 (a), 20 (a), 21 (a) and 22	724.49	
14	Tamra	Kusumdihi	9 (a), 11 (a)	49.499	
15	Tamra	Rushimath RF	7 (a), 8 (a), 11 (a), 12 (a)	46.264	
TOTAL :-				7822.298	

Main objective of management of areas under this working circle have been set as follows.

(a) To keep the delicate ecological balance intact in the eco-sensitive area of Khandadhar RF by maintaining adequate vegetative cover in the catchment area of Khandadhar nallah and by taking required soil moisture conservation and other rehabilitation measures.

(b) To keep proper records of encroached areas and areas under shifting cultivation till their restoration / eviction as the ease may be.

(c) The rehabilitation of the forest area subjected to encroachment or shifting cultivation by taking required social, administrative and silvicultural measures.

(d) All the old and abandoned areas under shifting cultivation lying in degraded condition are to be restocked as per the prescriptions given in Rehabilitation Working Circle.

Implementation.

Para-649 of the expiring Working Plan prescribes only removal of dead and fallen trees from Khandadhar block. In case of shifting cultivation areas, no felling operation of any kind was proposed to be carried out. No dead or fallen trees are found for departmental salvation in Khandadhar RF.

As per joint verification made with Revenue Officials during 2002-2003 and 2003-2004, there was no encroachment in RF area. Encroachment has been detected in PRF and Revenue forest land only. The position of Pre-80 and Post-80 encroachment has been furnished vide Table 2.5.2 of Chapter-2. Besides, no application from any Gram Sabha has been received for settlement of RF area under Forest Rights Act'2006. Only, the revenue forest land (KF) has been settled with the encroachers as furnished vide Table -8.8.1 of Chapter-8 above.

Anti-smuggling squads, Anti-poaching squad as well as Anti-depredation squad have been constituted in this Division every year under FC Grant and CAMPA for protection purpose.

It is observed that there is no further encroachment inside RF area. Further, the shifting cultivation system has been discontinued to large extent due to alternate employment opportunities given to members of the local tribal community in the mining areas. These areas have been infested by Maoist activities. Hence, no verification of the abandoned areas has been taken up in these areas to take up further silvicultural operation.

Deviation in working :No specific Silvicultural system is prescribed for the areas included under this Working Circle except for removal of dead and fallen trees. No departmental salvation has been taken up due to non-availability of dead and uprooted

trees. The deviation statement for the year 2009-10 to 2010-11 has been submitted by DFO, Bonai vide his Memo No.6999 dt.8.11.2010 and No.5891 dt.27.7.2011. However, proposal will be submitted shortly for all the years up to 2015-16 to obtain approval of the PCCF, Odisha.

11.2.4.3 Rehabilitation-cum-Plantation Working Plan.

Forest areas of this Working Circle cover 25 RF blocks and 21 PRF blocks (both full and in part). This Working Circle is inclusive of Coppice worked out areas and areas where plantations have been raised in the past . PRF blocks have been incorporated for the first time in the regular plan. The total area of this working circle comes to 20,670.802 Ha. which is about 13.8% of the total plan area. Out of this already planted area is of 2,024.716 Ha. and the rest area of 18,646.086 Ha. has been formed with 16 Nos. of Rehabilitation and other allied activities.

Further, out of 16 Nos. of Rehabilitation series, 2 series namely Kucheita and Kukia covering an area of 2,245.288 Ha. come under Banki Range and merged with Rourkela Division with effect from 1.10.2003. Thus, the balance 14 Nos. of Rehabilitation series covering an area of 16,400.798 Ha. (18,646.086 Ha. – 2,245.288 Ha.) was under the management in Bonai Division during the plan period.

The main objectives of management.

- (a) To tend and improve the existing growing stock through suitable silvicultural measures.
- (b) To regenerate the barren and blank patches by planting suitable hardy species.
- (c) To rehabilitate and improve the productivity of the depleted and degraded forest through enrichment plantation and other suitable measures.
- (d) To tend the existing plantation so as to get maximum annual increment.

(e) To raise block plantation preferably of economically important species in the large gaps having more than 4 Ha.

(f) To improve micro-edaphic conditions, especially in dry and open patches by taking suitable soil and water conservation measures.

(g) To provide effective protection against illicit felling, encroachment, shifting cultivation, overgrazing and fire hazards in these areas.

(h) To meet the bonafide needs and requirement of local inhabitants in regard to firewood, small timber and fodders etc.

Due to in-appropriate system of management applied in the past and due to severe biotic interference in the form of illicit felling, overgrazing, fire hazards, shifting cultivation etc, most of the areas covered under this working circle are in various stages of degradation. Particularly, the forest vegetation in the small RF blocks around Bonaigarh i.e. Baliatota, Sundhikon, Baghiakucha, Banarai, Chandiposh, Dharnidharpali, Kello, Gogua, Jankinagar, Talita and Kendrikela have been depleted to a great extent and reduced to scrubby type of growth. A good number of plantations have been taken up in the degraded patches of these blocks. At present, the natural vegetation in these blocks is very poor and most of the vegetation cover is of artificial nature. However, plantation in some of the degraded blocks has been taken up under compensatory afforestation schemes and details furnished in the subsequent item.

Implementation

As per Para-439 of the expiring Working Plan, the first and foremost concern of management is to protect and improve the existing growth through enrichment plantation and other rehabilitation measures. No exploitation is to be done in the natural vegetated areas except removal of dead, dying and diseased trees.

The plantation and other activities in the areas allotted in each year vide Para-481 of the Working Plan have not been followed due to paucity of funds. Coupe No.I to VIII of each felling series remained as such due to moratorium on felling of trees. Although coupe working started from Coupe No.IX, i.e., from the year 2005-06, no

operation was taken up due to delay in receipt of Govt. Order and required funds. The demarcation and marking of dead and fallen trees of 14 coupes (coupe No.X) covering an area of 822.358 Ha. was only taken up during 2006-07 and found only 55 Nos. of dead and uprooted trees in 6 Nos. of coupes namely Sirgida, Gonua, Mendhamaruni, Sarkunda, Khajurdihi PRF and Nalghati-Rajabasa PRF. The trees were salvaged departmentally and found 22.3987 cums. of timber only which was disposed off through OFDC Ltd. In other years, no dry and uprooted trees are found for its departmental salvation.

As regards plantation activities, plantations in all the rehabilitation series have not been taken up in each year as per working Plan prescription. But, plantations have been taken up in most of the RF and PRF areas of the rehabilitation series each year under different schemes basing on receipt of allotment of funds.

Deviation in implementation of the Prescriptions

There is deviation in rehabilitation process as indicated above Plantation based on area allotted in each year in the working plan has not been taken up during that year due to non availability of funds. However, plantation over 6062.296 Ha.out of 16400.798 Ha.have been taken up under compensatory afforestation under CAMPA, OFSDP, MGNREGA and FC Grant. The deviation for the year 2005-06 has been sanctioned vide the PCCF, Odisha vide S.O. No.244/IIF (WP)1/07 dt.2.3.2007. The deviation statement for the year 2009-10 and 2010-11 has been submitted by the DFO, Bonai vide his Memo No.6999 dt.8.11.2010 and No.5891 dt.27.7.2011. However, fresh proposal for all the years up to 2015-16 will be submitted shortly to obtain approval of the Principal Chief Conservator of Forests, Odisha, Bhubaneswar.

11.2.4.4- Bamboo (Over Lapping) Working Circle.

This working circle overlaps the bamboo bearing areas of Selection Working Circle. In total, 24 RF blocks, one extension RF and PRF blocks either in full or part covering an area of 70,190.802 Ha is included in this working circle. This constitutes

about 47% of the total area of the plan. 10 Nos. of Bamboo felling series have been formed in the present plan. Out of this Champajharan felling series covering an area of 5098.422 Ha. (6 RF blocks) comes under Banki Range and merged with Rourkela Division with effect from 1.10.2003 after reorganisation of Forest Divisions. Thus, the net area of remaining 9 (nine) felling series of Bonai Division comes to 65,092.380 Ha. (70,190.802-5,098.422) The main objectives of management are:-

(a) To follow proper silvicultural principles while working the bamboo bearing forests in order to secure a sustained yield consistent with the improvement of quality and quantity of bamboo clumps.

(b) To revive and rehabilitate the exhausted bamboo bearing areas through appropriate measures like tending and planting wherever necessary.

(c) To meet the demand of local people and Paper Industries.

Bamboos are mostly confined to the forests of West Bonai. The availability of bamboos in East Bonai is very poor and confined in the middle and upper slopes of Mahulpada and Lunga RF only. In other areas of East Bonai, it is practically absent.

The following three species of bamboos are mainly found in this Division.

1. Salia bamboo (*Dendrocalamus strictus*)
2. Daba bamboo (*Bambusa arundinacea*)
3. Kanta bauns (*Bambusa bambus*)

Out of these, Salia bamboo occurs over extensive areas in substantial quantities. Daba and Kanta bamboos are available but in a limited quantity and their growth is confined to few pockets only.

Implementation.

Working of bamboo has been nationalised by Govt. of Odisha, F & E Department from 1988-89 and thus coupe working is undertaken by OFDC Ltd since then.

The bamboo coupes due for working in each year were demarcated in the field and handed over to OFDC Ltd. for working. But most of the bamboo coupes have remained un-worked and surrendered by OFDC Ltd. On the ground of non-availability of bamboos for commercial exploitation. The details of un-worked bamboo coupes from 1997-98 to 2015-16 are furnished below.

(i) Mahulpada F.S:-	From 2000-01 to 2016-17= 17 coupes.
(ii) Ulsura F.S:-	From 1999-2000 to 2003-04, 2006-07 to 2007-08, 2010-11 to 2011-12, 2013-14 to 2016-17= 13 coupes.
(iii) Kantamunda F.S:-	From 2000-01 to 2002-03, 2007-08, 2011-12 to 2016-17= 10 coupes.
(iv) Kello F.S:-	From 2000-01 to 2002-03, 2012-13 and 2016-17= 6 coupes.
(v) Kunjar F.S:-	From 1998-99, 2000-01 to 2002-03, 2008-09 to 2009-10 and 2012-13 to 2016-17= 11 coupes.
(vi) Sirgida F.S:-	From 2000-01 to 2002-03 and 2004-05 to 2016-17= 16 coupes.
(vii) Dhenkiam F.S:-	From 1997-98, 1999-2000 to 2016-17= 19 coupes.
(viii) Kusumdihi F.S:-	From 2000-01 to 2002-03, 2004-05 to 2006-07, 2008-09 to 2010-11 and 2012-13 to 2016-17= 14 coupes.
(ix) Rushimath F.S:-	From 2000-01 to 2003-04 and 2012-13 to 2016-17= 9 coupes.
Total:-	115 coupes

From the above discussion, it is clear that there was no working in Mahulpada, Ulsura, Sirgida, Dhenkiam and Kusumdihi felling series. Besides, the production of bamboo in each coupe has decreased by more than 60% in comparison to

the previous plan period. The present degraded status of bamboo clumps in the bamboo bearing forests is most probably due to rampant and reckless removal of bamboo shoots (Karadi) and young green culms by local inhabitants for the consumption and trade purpose. Besides, the rhizome formation does not take place in a short span of time due to several climatic factors. Again, the tender bamboo is a very good fodder for the wild Elephants. They are depending mostly on the bamboo clumps for their food and rampantly damage the clumps while grazing.

As per Para-534 of the expiring Working Plan, simultaneous silvicultural operation of bamboo coupes have been taken up in each year basing on the receipt of allotment of funds under CAMPA and F.C. grant. Silvicultural Operation over 72,930.154 Ha has been taken up during the period from 1997-98 to 2014-15.

Deviation in implementation of prescriptions.

There is practically no deviation in working of the bamboo coupes during the period from 1997-98 to 2014-15 except non working of bamboo coupes by OFDC Ltd due to non-availability of bamboo for commercial exploitation. However, proposal for non-working of the coupes from 1997-98 to 2014-15 will be submitted to the PCCF, Odisha for approval

11.2.4.5 Wildlife (Over Lapping) Working Circle.

For highlighting the importance of wild life and to improve the wild life population in this Division, constitution of this working circle has been done. This working circle overlaps the entire area of Selection Working Circle, Rehabilitation-cum-Plantation Working Circle and Protection Working Circle except 1,235.882 Ha of Protection Working Circle. The total area of this working circle comes to 1, 48,156.952 Ha. Out of this, 14,650.244 Ha comes under Banki Range which merged in Rourkela Forest Division with effect from 1.10.2003. Thus, at present net area of Bonai Division comes to 1, 33,506.708 Ha. (1,48,156.952-14,650.244) for management under this Working Circle.

The constitution of this Working Circle aimed at:-

(a) To improve the habitat of wildlife by reducing biotic interference caused in the form of illicit felling, poaching, grazing, shifting cultivation, encroachment, over exploitation of timber and bamboo and forest fire etc.

(b) To conserve and preserve the diversity and integrity of flora and fauna within natural eco-system.

(c) To carry out extensive as well as intensive research concerning to the improvement and development of wild habitat and wildlife.

(d) To educate the local inhabitants about the importance of the fauna in the forest eco-system.

(e) To conserve the existing prime wild life habitats like the areas which are frequently visited by wild animals and birds for their shelter, food, water etc. by providing adequate protection and by taking various developmental measures.

Prescriptions :

The following measures were prescribed for future management of Wildlife of this Division.

1. Habitat improvement measures to ensure sufficient welfare factors such as Food, Cover, Water and Space have prescribed in the plan.
2. Silvicultural measures
3. Legal and administrative measures.
4. Scientific study and wild life census.
5. Integrated development.
6. Fire protection measures.
7. Development of Eco-Tourism.
8. Measures to reduce damage caused by wildlife.

Implementation.

All precautionary measures for wild life protection have taken up in this Division during the plan period and the details are furnished below.

a. Improving food availability.

Plantations of timber and bamboos has been taken up in RFs, PRFs, and KFs of this Division over 30,162.864 Ha under different schemes as per details furnished earlier during the period from 1997-98 to 2015-16, which inturn improved the wildlife habitat.

b. Improving water availability.

In total 90 Nos. of water bodies under various schemes have be created during the last plan period.

2007-08	Karo RF	1 No.	2,00,000/-
2008-09	Kusumdihi and Kunjar RF	2 Nos.	2,00,000/-
2011-12	Balai, Dandpat, Rushimath and Raipiri RFs.	4 Nos.	8,00,000/-
2012-13	Rushimath, Raipiri, Kunjar, Majurdima, Gurundia	6 Nos.	12,00,000/-
2013-14	Kusumdihi, Kello, East-Dandpat, Rushimath, Gurundia, Dhenkiam, Sirigida, Lunga, Lachhada,	12 Nos.	30,00,000/-
2014-15	Lunga PRF, Nagaria, Amrudi PRF, Kundheibira, Amrudi RF, Lachhada, Kantamunda, Solguda, Balai, Kunjar, Sinduria, Dohichur, Budhapahar, Sisoojharan, Talbahal PRF, Khandadhar PRF, Lunga RF, Gurundia PRF, Rushimath, Kusumdihi, Dhenkiam, Kello, Majurdima, Raipiri and Budhapahar RFs.	38 Nos.	91,00,000/-
2015-16	-	-	-
2016-17	Jhinknali near Lunga RF, Balia RF & Toda RF	3 Nos.	13,00,000/-
2017-18	Budhapahar RF, Balia RF, Raipiri RF, Karo DPF, Khandadhar PRF, Toda RF (2 Nos.) & Khajurdihi PRF	8 Nos.	35,00,000/-
2018-19	-	-	-
2019-20	Balia RF, Raipiri RF (2 Nos.), Karo DPF, Dhenkiam RF & Linga RF	6 Nos.	34,80,000/-
2020-21	Sirigida RF (2 Nos.), Talbahali-Barhaguda PRF, Lunga RF (2 Nos.), Raipiri RF, Kello RF, Danta KF, Dhenkiam RF & Nagaria PRF	10 Nos.	59,68,000/-
Total:-		90 Nos.	2,87,48,000/-
Source- O/o Divisional Forest Officer, Bonai Division.			

- c. **Measures for improving cover** :Measures for improving cover for wildlife has ensured through proper execution of Artificial Regeneration & Assisted natural Regeneration works in suitable areas. Special care has given to more fodder and fruitbearing species in plantations. Details of afforestation activities taken up over 36,893.135 Ha. from 1997-98 to 2016-17 have been furnished vide Appendix-XVI.
- d. **Measures for improving wilderness**: Through activities to improve habitat of wildlife explained above, attempts have done to increase the wilderness.
- e. **Measures taken for Protection of forests and wildlife**

Protection measures taken are as detailed below

(1) A Division Mobile squad headed by a Forest Ranger/Deputy Ranger with Forester & Forest Guards has been constituted and the squad is performing the protection duty as per direction of the ACF.

(2) Mobile squad at Range level has also been constituted for the purpose.

(3) One control room has been functioning at Division Office and 3 persons on daily wages basis have been engaged to receive and communicate messages to the Range for protection of forests.

(4) The Forester and Forest Guards of the vulnerable areas have been supplied with Mobile phones to communicate messages on protection of forests & wild life.

(5) Different squads such as Anti smuggling squad, Anti-poaching squad, critically endangered squad, Community youth squad, Protection of Elephant squad with Tracker, Ex-Army squad, Anti-depredation squad have been engaged under different schemes in each Range for protection of forests & wild life. Hired vehicles with other implements have also been supplied for the purpose.

(6) Para Forest staff @ 2 people for each Beat has been deployed in important and theft prone beats to assist the Beat Forest Guard in protection of Forests & Wild life.

(7) Networks of camping location, road network and VHF network have got improved.

f. Deviation in implementation of the Prescriptions

There is no deviation and the objectives of management of the working plan prescriptions have been implemented as described above.

11.2.4.6 NTFP(Over Lapping) Working Circle.

This is an overlapping Working Circle and includes the areas coming under Selection Working Circle, Protection Working Circle and Rehabilitation-cum-Plantation Working Circle. The total area of this, Working Circle is 1, 48,156.952 Ha. Out of this, 14,650.244 Ha comes under Banki Range and merged in Rourkela Forest Division with effect from 1.10.2003. At present net area of Bonai Division comes to 1, 33,506.708 Ha. (1,48,156.952-14,650.244).

The term Non-Timber Forest Produce (NTFP) includes all the items of forest produces except timber, small timber and fuel wood. The NTFP potential of this Division is at higher side. The tribals as well as other rural inhabitants are dependent upon various NTFP items for their livelihood and consumable requirements. On the other hand, the collection, transportation and marketing of NTFP items provide remunerative work to them. Constitution of this working circle has been made basing on the above facts for economic development of the rural and tribal people as well as for contributing significant amount of revenue to the state exchequer.

Objectives of Management

The objectives of management are as follows:

- (a) To regulate the collection and extraction of various NTFPs with a view
 - (i) To sustain desired species composition,

- (ii) To encourage regeneration of the forests,
 - (iii) To promote sustainable management of forests and
 - (iv) To protect the interests of the primary gatherers.
- (b) To optimize collection and extraction of various NTFPs consistent with the first objective.
- (c) To enhance the value of forests by way of
 - (i) Developing new NTFPs in the forest,
 - (ii) Creating opportunities for value-addition in existing NTFPs, and
 - (iii) Strengthening marketing and other local institutions.
- (d) To enhance the stakes of local people in NTFPs and to extend skills to local people for sustainable collection, extraction and utilization of various NTFPs.
- (e) To encourage greater financial and managerial inputs in forests to promote regeneration of valuable and desirable NTFPs and to enhance productivity of forests.
- (f) To involve VSS members in NTFP extraction, value addition, disposal and marketing.

Implementation.

The method and agencies of harvesting of some of the important NTFP items are furnished below.

(i) Kendu Leaf:-	The K.L. trade is regulated under the provisions of The Odisha KL (Control of Trade) Act'1961 and under operation by K.L. wing of Odisha Forest Department.
(ii) Sal Seed:-	It is a specified forest produce vide Notification No.34308/FFAH dt.9.12.82 and is regulated under The Odisha Forest Produce (Control of Trade) Act'1981. The OFDC Ltd. was appointed as Agent for collection and trade of Sal seed up to 2005 crop.
(iii) Tasar cocoons:-	Lease settled with M/s. ST & SCS Ltd, BBSR a Govt. of Odisha undertaking.

(iv) Siali fibre:-	Lease settled with Rourkela (KL) Division.
(v) Siali leaves:-	Settled with Sri P.K. Agarwal, Bisra along with TDCC Ltd for 3 years from 1996-97 to 1998-99 vide F&E Department No.21794/FFAH dt.25.9.96. Again, the lease settled with Sri Amit Kumar Singh, Bisra for 3 years from 1999-2000 to 2001-02.
(vi) Mohua seed and Char seed:-	Settled with Sri Sawarmal Gododia, Rajgangpur for 3 years from 1999-2000 to 2001-02.
(vii) Lodh and Medha bark:-	Settled with Sri Sawarmal Gododia, Rajgangpur for 3 years from 1999-2000 to 2001-02.

Apart from this, lease of 32 MFP items in this Division were settled with M/s- Utkal Forest Products Ltd, Sambalpur vide G.O. No.28403/FFAH dt.6.12.89 for 10 years from 1989-90 to 1998-99. Subsequently, the order was cancelled vide No.10046/FFAH dt.5.5.90 and 29 MFP items out of 32 items were settled with the said company for 10 years from 1990-91 to 1999-2000 vide No.23632/FFAH dt.26.9.90. Out of this collection of 10 MFP items were surrendered by the company during 1995 and 18 items were worked out by the company.

The lease of Lac, Tamarind, Myrobalans and Kantabadhuni were settled with TDCC Ltd during 1997-98. During 1998-99 other item i.e. Gum, Honey, Hill broom, Baidanka, Jute seed, Nageswar, Baghnakhi, Ananta seed, Marda seed, Polanga seed, Kamalagundi, Lodobaguli, Katkal and Makhna seed were settled with TDCC Ltd. But during 1999-2000, TDCC Ltd. had surrendered these extra items and worked only on Lac, Tamarind, Myrobalans and Siali leaves in this Division.

However, as per Govt. Policy, in total, 60 items were treated as MFP items in stead of NTFP items and their collection and disposal was transferred to Gram Panchayats with effect from 31.3.2000. Subsequently, another 9 items were also transferred to the control of G.P. during 2000 and 2006 as detailed below.

No.5503/FFAH dt.31.3.2000	-	60	items
No.13285/FFAH dt.23.8.2000	-	7	items
No.15325/FFAH dt.21.9.2000	-	1	item (Baibirang seed)
No.3695/FFAH dt.2.3.2006	-	1	item (Sal seed)
Total	-	69	Items

The NTFP items like Gum, Sal resin, Sal leaves, Khaira and Catechu, Barks of trees (Sunari, lodh, Medha, Phenphena, Arjun etc), Roots of Patala garuda, Tassar cocoons, Sandal wood and Canes are now under the control of Forest Department.

There is ban on collection of Sal leaves and Resin in this Division as its collection will affect the regeneration of Sal forests. Collection of any bark has also been prohibited from Silvicultural point of view. Availability of Khaira, Patala garuda, Sandal wood and cane are very less for its commercial exploitation. The item like Tasar cocoon is only worked out through SEREFED (ST&SCS ltd previously), Bhubaneswar.

There is no control over the management of the 69 MFP items as the Gram panchayats are not reporting details of traders engaged in collection and transportation each year as well as the monthly return on collection of the items entrusted with them. Regular regular monitoring is required in this matter.

The NTFP survey was carried out in all Ranges of this Division during 2011-12 and 2012-13 under 13th F.C. Grant and the result of out-turn of NTFP both tree and shrub species based with its value are furnished below.

Range	Category of NTFP	Total collection found from sample survey.			Total value in Lakhs.		
		Consumption in Q tls.	Sale in Qtls.	Total quantity in Qtls.	Value based on consumption.	Value as per sale.	Total value.
1	2	3	4	5	6	7	8
Bonai	Tree based	572.200	3,180.530	3,752.730	7.780	55.869	63.649
Kuliposh	- do -	3,676.895	4,435.300	8,112.195	71.630	78.941	150.571
Barsuan	- do -	1,231.000	3,837.000	5,068.000	17.640	97.098	114.738
Koira	- do -	190.000	453.000	643.000	2.087	5.190	7.277
Tamra	- do -	154.200	676.485	830.685	2.980	11.510	14.490
Jarda	- do -	1,124.420	6,431.564	7,555.984	19.902	113.830	133.732
Sole	- do -	442.000	2,459.500	2,901.500	6.033	41.595	47.628
Total:-		7,390.715	21,473.379	28,864.094	128.052	404.033	532.085

Bonai	Shrub based	5.50	30.70	36.20	0.101	0.588	0.689
Kuliposh	- do -	988.70	431.60	1,420.30	4.943	2.158	7.101
Barsuan	- do -	-	5,000.00	5,000.000	-	5.110	5.110
Koira	- do -	47.00	100.00	147.00	0.630	1.250	1.880
Tamra	- do -	28.08	37.62	65.70	0.480	0.626	1.106
Jarda	- do -	77.01	141.75	218.76	0.962	1.770	2.732
Sole	- do -	0.25	0.25	0.50	0.007	0.008	0.015
Total:-		1,146.540	5,741.920	6,888.460	7.123	11.510	18.633

Afforestation over 44052.169 ha. have been taken up in this Division during the period from 1997-98 to 2020-21 where in NTFP species like Assan, Arjun, Harida, Bahada, Anla, Neem, Mango, Karanj, Mahul, Tamarind etc. have been planted in these areas. It is expected that there will be increase in production of NTFP items in future.

Deviation in implementation of the Prescriptions

There is no deviation in the management of the working plan prescriptions during the plan period.

11.2.4.7 : MISC. (Overlapping) Working Circle.

Major portion of the forests of East Bonai are rich with mineral of economic significance. Out of these, Iron and Manganese are the most important. The most significant Iron ore deposits are available at Khandadhar, Barsuan, Toda, Malangtoli, Basada, Baliapahar, Badamgarh pahar, Kalta under Koira and Barsuan Range. The Koira valley portion is having significant deposits of Manganese ore especially near podadihi, Khajurdihi, Patbeda, Malda, Mahulsukha, Sarkunda, Orahuri, Nadidihi, Bhutuda, Ranisal and Nuagaon. The commercial exploitation of these minerals has been undergoing for last 7-8 decades. These mining operations have contributed significantly towards the industrial development by catering the requirement of Iron and Steel industrial.

However, these mining operations have been carried out in careless and reckless manner without giving any due importance to the forest and environment aspect. As a result, these activities have caused almost irreparable damage to the forests and wild life and have polluted the surrounding environment. Besides, no rehabilitation measures in the mining degraded areas have been initiated and implemented by the User Agencies in the past.

Keeping these field realities in view and to high light the extent of damage caused to the forest and environment due to reckless mining activities, this working Circle has been constituted to rehabilitate the mining degraded areas to their original level. This is an overlapping Working Circle comprising the areas leased out for mining.

Objectives of management

(i) To draw up Eco-friendly plans and schemes so as to minimise the destruction of forests and wild life during and after mining operation.

(ii) To check the environmental degradation caused due to increasing air, water and noise pollution in the mining sites and in the adjoining areas by taking suitable preventive measures.

(iii) To take measures for reclamation of the broken forest land for its restoration by the User Agencies.

(iv) To take up Soil and Moisture Conservation measures in the mining sites and adjoining areas.

(v) To compensate the loss of the forest cover due to mining activities through compensatory afforestation programme with the indigenous species.

Implementation

There are 76 No of mining leases in this Division at present. Out of this, 5 No. of leases are in non-forest land only and the rest 71 leases are within both forest and non-forest land as per detailed below.

Abstract of 71 Nos. of M.L. both in forest and non-forest land.

R.F.	2,575.417 Ha.
P.R.F.	2,512.085 Ha.
K.F.	1,728.873 Ha.
DLC land	2,968.392 Ha.
Total:-	9,784.767 Ha.
N.F.	1,913.2527 Ha.
Total:-	11,698.0197 Ha.

Abstract of 5 No. of M.L. in non-forest land.

N.F. land	84.7467 Ha.
G. Total:-	11,698.0197 Ha. (76 leases)

Forest (Conservation) Act'1980 came in to force with effect from 25.10.1980. Thus, the broken land position of each M.L. area prior to 25.10.1980 was jointly verified by Forest Department with the staff of D.D.M. Koirra and the User Agency. As per provisions of F.C. Act'1980, the User Agencies have submitted Diversion proposals to obtain approval under the said Act for mining in the forest areas. Final approval in 34 No of mining leases covering forest area of 6,397.780 Ha has so far been obtained under F.C. Act'1980. Besides, in 9 (nine) cases, stage-1 approval has been accorded by Government of India and under process for final approval. Apart from this, diversion proposal in respect of 13 (thirteen) cases are pending at different levels and are under process. A statement showing the User Agency wise details of Mining Lease with area and position of approval under FC Act'1980 has been furnished vide Appendix-VII(a).

Realisation of NPV

At present, mining operation is going on in forest lands after clearance under F.C. Act'1980, Environment (Protection) Act'1986 and other clearances in force. As per decision of the Apex court, the User Agency has to deposit the NPV for the forest area diverted/ to be diverted under F.C. Act'1980. Besides, NPV has also been realised for diversion of forest land for other Project for which lease is yet to be granted by Government. An amount of Rs.1061,88,22,526/- has got realised as NPV, Penal NPV, Interest, NPV for other Projects and NPV for which lease is yet to be granted.

The amount so realised from the User Agencies have been deposited with CAMPA. The NPV amount will be utilised for developmental works both for forest and wild life. The works under CAMPA have been started from 2009-10 in this Division and the detail utilisation of fund out of the fund released by PCCF, Odisha and PCCF (WL), Odisha in APO 2009-10 to 2020-21 are furnished below in table 11.2.4.7.1.

Table 11.2.4.7.1.- Utilization of funds under CAMPA			
APO	Expenditure out of the fund released by PCCF, Odisha.	Expenditure out of the fund released by PCCF (WL), Odisha.	Total expenditure.
1	2	3	4
2009-10	4,46,80,000	15,00,000	4,61,80,000
2010-11	2,82,59,260	12,50,000	2,95,09,260
2011-12	3,03,85,836	34,50,000	3,38,35,836
2012-13	6,71,06,000	48,20,000	7,19,26,000
2013-14	9,70,45,003	84,90,000	10,55,35,003
2014-15	14,69,75,306	1,34,70,023	16,04,45,329
2015-16	9,37,13,820	2,54,46,156	11,91,59,976
2016-17	6,63,21,419	3,78,08,158	10,41,29,577
2017-18	7,16,82,601	5,30,18,414	12,47,01,015
2018-19	-	-	-
2019-20	7,97,10,261	3,55,76,978	11,52,87,239
2020-21	10,98,71,393	3,92,88,100	14,91,59,493
G. Total:-	83,57,50,899	22,41,17,829	105,98,68,728

Realisation of Regional Wildlife Conservation Plan Fund

The Regional Wildlife Conservation Plan both for Bonai and Keonjhar Forest Division was prepared combinedly by Keonjhar Division for 10 years and has already been approved by F&E Department, Government of Odisha. An amount of Rs.49,11,58,037/- has so far been realised.. Different works for management of wild life

is under progress as per Annual Plan of operation prepared for each year and funds released as indicated above.

Realisation of Site Specific Wildlife Management Cost.

While according final approval for diversion of forest land for non-forestry purpose under F.C. Act'1980, the Central Government is imposing condition in certain cases for preparation of Site Specific Wildlife Conservation Plan and to implement the same, realising its cost from the User Agency.

Accordingly, wild life conservation plan in respect of 46 Nos. of Projects have been prepared and demand has been raised for payment. A sum of Rs.115,98,79,800/- has been realised so far and deposited in CAMPA account.

Measures for afforestation activities in Compensatory Afforestation areas, Penal Compensatory Afforestation areas, Safety Zone area and 1.5 times of the Safety Zone areas.

While granting approval under F.C. Act'1980, the Government of India is insisting for Compensatory Afforestation, Penal Compensatory Afforestation, Safety Zone area Plantation and 1.5 times of the Safety Zone Plantation in lieu of diversion of forest land for mining operation. Necessary scheme for the purpose have been prepared for each project and approved by the competent authority. The details of achievements made so far in different categories of afforestation are furnished below in table 11.2.4.7.3.

Table 11.2.4.7.2.- Afforestation activities in Mining area (as on 31.03.2021)						
Items	Stipulation			Achievement		
	Inside Bonai Division in Ha.	Outside Division in Ha.	Total in Ha.	Inside Bonai Division in Ha.	Outside Division in Ha.	Total in Ha.
1	2	3	4	5	6	7
Comp. Affn.	5510.159	3672.296	9182.455	5481.370	583.532	6064.902
Addl. C.A.	2,465.522	-	2,465.522	2,465.522	-	2,465.522
Penal C.A.	1665.878	227.590	1893.467	1665.878	227.590	1893.467
SZ Plantation.	328.264	-	328.264	321.705	-	321.705
1.5 SZ	487.460	-	487.460	487.460	-	487.460
CATP	1200.000	-	1200.000	1200.000	-	1200.000
Total:-	11657.280	3899.885	15557.170	11621.935	811.121	12433.060
Source : O/o the Divisional Forest Officer, Bonai Division						

Measures for afforestation in dumping yard areas and other abandoned quarries.

There is condition to take up afforestation in dumping yard and other abandoned quarries by the User Agencies at their cost. The details of seedlings supplied to the mine owners and sponge industries during last 10 (Ten) years is furnished below.

Year	Nos. of seedlings supplied
2011-12	4,10,035
2012-13	3,12,803
2013-14	3,62,275
2014-15	1,23,150
2015-16	1,83,600
2016-17	5,62,200
2017-18	2,67,074
2018-19	1,73,331
2019-20	6,81,860
2020-21	15,63,061

Measures for supply of fuel wood to the workers engaged in mining works.

While granting final approval for diversion of forest lands for mining purpose, a condition is imposed by the Government of India, to supply fuel wood or coal to the labourers free of cost. The User Agencies are supplying fuel wood to the labourers by purchasing from OFDC Ltd.

Measures for preservation and re-use of Top soil.

There is pre-condition in the approved Mining Plan to preserve the top soil separately for re-use in reclamation of the left over broken areas. The same is being implemented in this Division.

Administrative measures.

Protection squad with vehicle has been deployed in both Koira and Barsuan Range for patrolling over the mining areas to check illicit removal of Iron and Manganese ore and also to check illegal mining by the User Agencies.

As per instructions of Government of Odisha, Steel and Mines Department, DGPS survey in some of the mining areas has been taken up and 4 feet

height concrete pillars are posted around the mining lease areas for easy identification as well as to check illegal mining beyond the lease areas.

State Level Enforcement Squad and District Level Task Force have been created to keep watch on the mining activities in the field. Joint raids with the personels of I.B.M, Revenue Department, Forest Department and Mining Department have been conducted at frequent intervals and the details of vehicles with materials seized are furnished below in table 11.2.4.7.3.

Table 11.2.4.7.3.- Details of vehicles & Material seized					
Year	No. of vehicles seized.	Iron ore seized in M.Ts.	Manganese ore seized in M.Ts.	Total in M.Ts.	Remarks.
1	2	3	4	5	6
2004-05	3	-	21.020	21.020	
2005-06	-	-	-	-	
2006-07	5	22.300	6.500	28.800	
2007-08	5	24.800	-	24.800	
2008-09	3	10.200	12.400	22.600	
2009-10	16	17,607.595	206.600	17,814.195	
2010-11	25	9,114.743	647.110	9,761.853	
2011-12	7	1,357.710	134.250	1,491.960	
2012-13	4	50.420	-	50.420	
2013-14	4	32.640	21.240	53.880	
2014-15	1	238.800	40.000	278.800	
2015-16	2	108.000	83.690	191.690	
2016-17	-	-	32.200	32.200	
2017-18	2	20.000	79.860	99.860	
2018-19	2	-	66.180	66.180	
2019-20	4	6.500	10.941	17.441	
2020-21	-	-	-	-	
Total:-	83	28,593.708	1361.991	29,955.699	
Source : O/o the Divisional Forest Officer, Bonai Division					

11.3 Special Works of Improvement Undertaken

- i. **Fire Protection Measures:** The position of occurrence of forest fire and steps taken so far in this Division to reduce the forest fire has been described in detail in Chapter 4.2 of Part-I
- ii. **Improvement in Communicaiton:** VHF network of the division got strengthened during the last plan period. The present VHF network includes 18 number of base stations.
- iii. **Activiites implemented to reduce negative interaction at Man-wildlife interface:**
In order to check man-wildlife conflicts physical barriers such as elephant proof trenches, solar fencing etc. got erected in various locations. Also necessary attention has paid in timely payment of compensation to victims of wildlife attack/depredation.
- iv. **Staff amenities: Staff amenities got improved as lot during the last working plan period:** From funds allotted under CAMPA residential buildidngs have consutructed for forest guards, Foresters and Range Officers in many locations.
- v. **Application of modern tools in Protection activiites:** Use of GIS & GPS tools in protection activities and regulation of mining activiites got improved a lot in the last working plan period. Further use of modern tools such as camera traps etc. have also got started during the last working plan period.

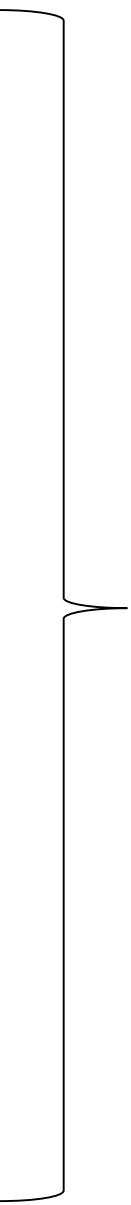
11.4 Past Yield, Revenue and expenditure

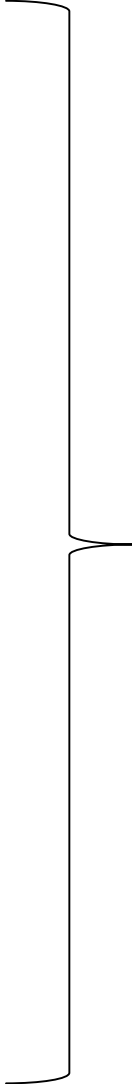
11.4.1. The year-wise details of Coupes due for working, trees marked for felling and out-turn of timber and firewood obtained from each Coupes are furnished below in table 11.4.1.

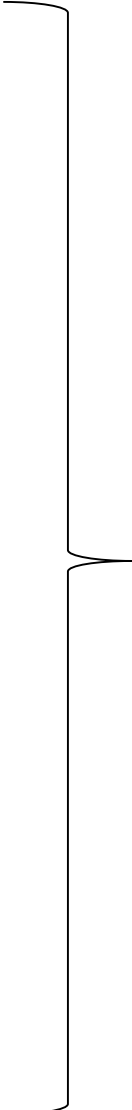
Table 11.4.1.- Details of Timber Coupes under Selection Working Circle allotted for working with out-turn obtained for the period from 1997-98 to 2020-21.

Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remarks
						Timber in Cums.	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
1997-98	1. Amrudihi SWC - I	122.526				No coupe working during 1997-98 was taken up due to moratorium on felling of trees issued by Government in F&E Department during 1992.		
	2. Dandpat SWC - I	147.925						
	3. Lunga SWC - I	243.517						
	4. Nagaria SWC - I	292.500						
	5. Ulsura SWC - I	166.438						
	6. Jada SWC - I	465.965						
	7. Kunjar SWC - I	326.402						
	8. Majurdima SWC - I	514.706						
	9. Raipiri SWC - I	484.674						
	10. Sirigida SWC - I	137.228						
	11. Karo SWC - I	159.000						
	12. Khajurdihi SWC - I	114.747						
	13. Rakshi SWC - I	155.413						
	14. Sarkunda SWC - I	274.813						
	15. Tensa SWC - I	342.500						
	16. Toda SWC - I	237.063						
	17. Sarkunda PRF SWC - I	274.358						
	18. Dhenkiam SWC - I	212.375						
	19. Kusumdihi SWC - I	174.125						
	20. Rushimath SWC - I	377.744						
	Total:-	5224.019						

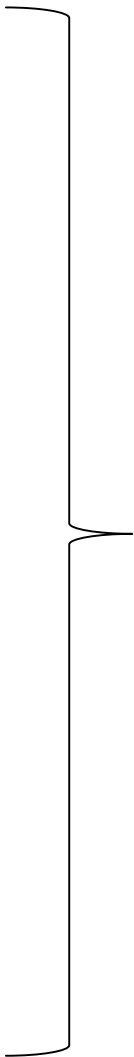
Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remarks
						Timber in Cums.	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
1998-99	1. Amrudihi SWC - II	191.106	 No coupe working during 1998-99 was taken up due to moratorium on felling of trees issued by Government in F&E Department during 1992.					
	2. Dandpat SWC - II	117.277						
	3. Lunga SWC - II	266.145						
	4. Nagaria SWC - II	315.000						
	5. Ulsura SWC - II	140.482						
	6. Jada SWC - II	318.438						
	7. Kunjar SWC - II	272.925						
	8. Majurdima SWC - II	381.518						
	9. Raipiri SWC - II	625.807						
	10. Sirigida SWC - II	165.405						
	11. Karo SWC - II	129.438						
	12. Khajurdihi SWC - II	103.272						
	13. Rakshi SWC - II	127.947						
	14. Sarkunda SWC - II	267.188						
	15. Tensa SWC - II	406.312						
	16. Toda SWC - II	427.500						
	17. Sarkunda PRF SWC - II	243.724						
	18. Dhenkiam SWC - II	226.312						
	19. Kusumdihi SWC - II	119.626						
	20. Rushimath SWC - II	574.472						
Total:-		5419.894						

Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remark
						Timber in Cums.	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
1999-2K	1. Amrudihi SWC - III	255.792						
	2. Dandpat SWC - III	144.298						
	3. Lunga SWC - III	335.784						
	4. Nagaria SWC - III	278.125						
	5. Ulsura SWC - III	182.202						
	6. Jada SWC - III	294.678						
	7. Kunjar SWC - III	405.640						
	8. Majurdima SWC - III	209.528						
	9. Raipiri SWC - III	426.981						
	10. Sirigida SWC - III	237.477						
	11. Karo SWC - III	246.225						
	12. Khajurdihi SWC - III	82.781						
	13. Rakshi SWC - III	166.324						
	14. Sarkunda SWC - III	122.938						
	15. Tensa SWC - III	402.438						
	16. Toda SWC - III	202.375						
	17. Sarkunda PRF SWC - III	225.312						
	18. Dhenkiam SWC - III	430.500						
	19. Kusumdihi SWC - III	211.500						
	20. Rushimath SWC - III	487.799						
	Total:-	5348.697						
						No coupe working during 1999-2000 was taken up due to moratorium on felling of trees issued by Government in F&E Department during 1992.		

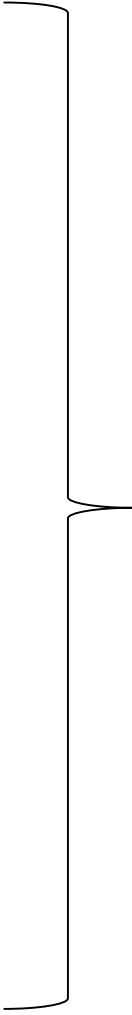
Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remark
						Timber in Cums.	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
2000-2001	1. Amrudihi SWC - IV	106.323	 No coupe working during 2000-2001 was taken up due to moratorium on felling of trees issued by Government in F&E Department during 1992.					
	2. Dandpat SWC - IV	140.576						
	3. Lunga SWC - IV	264.703						
	4. Nagaria SWC - IV	267.000						
	5. Ulsura SWC - IV	158.018						
	6. Jada SWC - IV	340.115						
	7. Kunjar SWC - IV	407.845						
	8. Majurdimma SWC - IV	229.072						
	9. Raipiri SWC - IV	312.726						
	10. Sirigida SWC - IV	138.426						
	11. Karo SWC - IV	254.979						
	12. Khajurdihi SWC - IV	145.136						
	13. Rakshi SWC - IV	198.549						
	14. Sarkunda SWC - IV	238.250						
	15. Tensa SWC - IV	307.853						
	16. Toda SWC - IV	170.499						
	17. Sarkunda PRF SWC - IV	252.107						
	18. Dhenkiam SWC - IV	280.188						
	19. Kusumdihi SWC - IV	337.100						
	20. Rushimath SWC - IV	458.509						
	Total:-	5007.974						

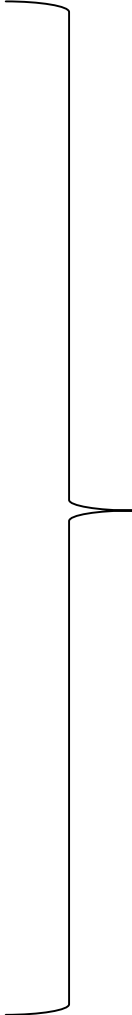
Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remark
						Timber in Cums	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
2001-2002	1. Amrudihi SWC - V	206.682						
	2. Dandpat SWC - V	152.648						
	3. Lunga SWC - V	254.424						
	4. Nagaria SWC - V	271.937						
	5. Ulsura SWC - V	196.446						
	6. Jada SWC - V	346.416						
	7. Kunjar SWC - V	438.079						
	8. Majurdima SWC - V	250.620						
	9. Raipiri SWC - V	339.575						
	10. Sirigida SWC - V	171.472						
	11. Karo SWC - V	121.591						
	12. Khajurdihi SWC - V	126.662						
	13. Rakshi SWC - V	215.675						
	14. Sarkunda SWC - V	171.313						
	15. Tensa SWC - V	327.314						
	16. Toda SWC - V	189.125						
	17. Sarkunda PRF SWC - V	151.875						
	18. Dhenkiam SWC - V	219.250						
	19. Kusumdihi SWC - V	257.544						
	20. Rushimath SWC - V	530.161						
	Total:-	4938.809						

No coupe working during 2001-2002 was taken up due to moratorium on felling of trees issued by Government in F&E Department during 1992.

Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remark
						Timber in Cums.	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
2002-2003	1. Amrudihi SWC - VI	115.368						
	2. Dandpat SWC - VI	112.488						
	3. Lunga SWC - VI	287.206						
	4. Nagaria SWC - VI	401.062						
	5. Ulsura SWC - VI	220.879						
	6. Jada SWC - VI	410.950						
	7. Kunjar SWC - VI	356.825						
	8. Majurdima SWC - VI	279.935						
	9. Raipiri SWC - VI	406.215						
	10. Sirigida SWC - VI	132.751						
	11. Karo SWC - VI	132.119						
	12. Khajurdihi SWC - VI	111.720						
	13. Rakshi SWC - VI	146.159						
	14. Sarkunda SWC - VI	147.438						
	15. Tensa SWC - VI	365.062						
	16. Toda SWC - VI	242.562						
	17. Sarkunda PRF SWC - VI	233.940						
	18. Dhenkiam SWC - VI	245.062						
	19. Kusumdihi SWC - VI	294.335						
	20. Rushimath SWC - VI	467.057						
	Total:-	5109.133						

No coupe working during 2002-2003 was taken up due to moratorium on felling of trees issued by Government in F&E Department during 1992.

Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remark
						Timber in Cums	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
2003-2004	1. Amrudihi SWC - VII	151.742	 No coupe working during 2003-2004 was taken up due to moratorium on felling of trees issued by Government in F&E Department during 1992.					
	2. Dandpat SWC - VII	120.033						
	3. Lunga SWC - VII	227.000						
	4. Nagaria SWC - VII	352.062						
	5. Ulsura SWC - VII	152.104						
	6. Jada SWC - VII	328.646						
	7. Kunjar SWC - VII	376.162						
	8. Majurdima SWC - VII	323.657						
	9. Raipiri SWC - VII	433.798						
	10. Sirigida SWC - VII	157.913						
	11. Karo SWC - VII	132.246						
	12. Khajurdihi SWC - VII	106.865						
	13. Rakshi SWC - VII	154.302						
	14. Sarkunda SWC - VII	104.813						
	15. Tensa SWC - VII	315.374						
	16. Toda SWC - VII	203.250						
	17. Sarkunda PRF SWC - VII	197.983						
	18. Dhenkiam SWC - VII	220.563						
	19. Kusumdihi SWC - VII	369.558						
	20. Rushimath SWC - VII	357.757						
	Total:-	4785.828						

Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remark
						Timber in Cums	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
2004-2005	1. Amrudhi SWC - VIII	224.580						
	2. Dandpat SWC - VIII	144.305						
	3. Lunga SWC - VIII	218.500						
	4. Nagaria SWC - VIII	417.063						
	5. Ulsura SWC - VIII	222.688						
	6. Jada SWC - VIII	456.763						
	7. Kunjar SWC - VIII	400.287						
	8. Majurdima SWC - VIII	341.697						
	9. Raipiri SWC - VIII	510.485						
	10. Sirigida SWC - VIII	158.102						
	11. Karo SWC - VIII	163.262						
	12. Khajurdihi SWC - VIII	79.882						
	13. Rakshi SWC - VIII	184.579						
	14. Sarkunda SWC - VIII	195.816						
	15. Tensa SWC - VIII	216.687						
	16. Toda SWC - VIII	236.063						
	17. Sarkunda PRF SWC - VIII	242.278						
	18. Dhenkiam SWC - VIII	157.812						
	19. Kusumdihi SWC - VIII	336.782						
	20. Rushimath SWC - VIII	436.700						
	Total:-	5344.331						

No coupe working during 2004-2005 was taken up due to moratorium on felling of trees issued by Government in F&E Department during 1992.

Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remarks
						Timber in Cums.	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
2005-2006	1. Amrudhi SWC - IX	282.055	564	260	-	-	-	No working due to MCC problem.
	2. Dandpat SWC - IX	132.738	531	83	83	25.1149	12	
	3. Lunga SWC - IX	157.625	315	267	267	89.1096	35	
	4. Nagaria SWC - IX	238.313	477	450	450	115.1100	54	
	5. Ulsura SWC - IX	162.977	326	72	72	31.6332	36	
	6. Jada SWC - IX	516.389	2582	1443	1443	702.5451	48	
	7. Kunjar SWC - IX	426.237	1705	1704	1704	647.1368	60	
	8. Majurdima SWC - IX	407.469	1222	1222	1222	885.7490	233	
	9. Raipiri SWC - IX	434.366	869	869	869	512.8514	162	
	10. Sirigida SWC - IX	135.841	408	407	407	202.2055	54	
	11. Karo SWC - IX	138.399	415	241	241	75.9980	6	
	12. Khajurdihi SWC - IX	91.987	276	268	268	97.4491	72	
	13. Rakshi SWC - IX	114.329	343	26	-	-	-	No working due to MCC problem.
	14. Sarkunda SWC - IX	210.388	421	420	420	79.9768	17	

	15. Tensa SWC - IX	371.312	2228	59	59	23.2784	-	No working due to MCC problem.
	16. Toda SWC - IX	224.313	1346	75	-	-	-	
	17. Sarkunda PRF SWC - IX	295.625	591	103	-	-	-	
	18. Dhenkiam SWC - IX	297.875	1489	142	142	10.5538	72	
	19. Kusumdihi SWC - IX	286.773	860	258	258	18.4763	180	
	20. Rushimath SWC - IX	422.998	1269	573	573	122.7021	306	
	Total:-	5348.009	18237	8942	8478	3639.8900	1347	

Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remark
						Timber in Cums.	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
2006-2007	1. Amrudihi SWC - X	328.937	658	139	139	6.9170	-	
	2. Dandpat SWC - X	270.978	1084	139	139	97.4005	15	
	3. Lunga SWC - X	284.385	569	535	535	143.2070	60	
	4. Nagaria SWC - X	272.188	544	118	118	6.4020	-	
	5. Ulsura SWC - X	178.262	357	105	105	49.3816	24	
	6. Jada SWC - X	368.438	1842	1136	1136	354.5170	115	
	7. Kunjar SWC - X	377.508	1510	1509	1509	558.2823	120	
	8. Majurdim SWC - X	485.949	2430	1680	1680	1078.4417	150	
	9. Raipiri SWC - X	351.998	704	704	704	217.6193	175	
	10. Sirigida SWC - X	140.823	422	409	409	49.5108	66	
	11. Karo SWC - X	118.419	355	115	115	21.3227	-	
	12. Khajurdihi SWC - X	109.261	328	117	117	20.4900	-	

	13. Rakshi SWC - X	124.153	372	73		-	-	No working due to MCC problem
	14. Sarkunda SWC - X	197.645	395	76	76	6.3566	1	
	15. Tensa SWC - X	398.312	2390	625	625	179.5739	12	
	16. Toda SWC - X	227.438	1365	240		-	-	No working due to MCC problem
	17. Sarkunda PRF SWC - X	205.658	411	76	76	6.5926	1	
	18. Dhenkiam SWC - X	231.438	1157	83	83	-	18	
	19. Kusumdihi SWC - X	357.603	1073	443	443	15.7668	30	
	20. Rushimath SWC - X	415.518	1247	294	294	103.0453	163	
	Total:-	5444.911	19213	8616	8303	2914.8271	950	

Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remarks
						Timber in Cums.	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
2007-2008	1. Amrudihi SWC - XI	381.312	763	85	-	-	-	Not worked due to MCC problem.
	2. Dandpat SWC - XI	125.848	503	110	110	66.2655	29	

3. Lunga SWC - XI	288.083	576	512	512	100.8066	20	
4. Nagaria SWC - XI	237.500	475	53	53	6.5754	-	
5. Ulsura SWC - XI	153.284	307	235	235	84.1553	40	
6. Jada SWC - XI	435.722	2179	2178	2178	1159.1600	252	
7. Kunjar SWC - XI	515.440	2062	2061	2061	1418.3154	244	
8. Majurdima SWC - XI	337.535	1688	1703	1703	1252.6184	330	
9. Raipiri SWC - XI	480.360	961	905	905	458.9728	102	
10. Sirigida SWC - XI	122.471	367	367	367	100.0617	40	
11. Karo SWC - XI	111.823	335	109	109	20.5364	6	
12. Khajurdihi SWC - XI	109.892	330	374	374	69.8734	12	
13. Rakshi SWC - XI	96.921	291	51	-	-	-	Not worked due to MCC problem.
14. Sarkunda SWC - XI	231.143	462	124	124	27.0038	12	
15. Tensa SWC - XI	322.126	1933	351	351	138.7000	24	
16. Toda SWC - XI	191.938	1152	75		-	-	Not worked due to MCC problem.
17. Sarkunda PRF SWC - XI	346.400	693	211	211	39.3690	36	
18. Dhenkiam SWC - XI	292.563	1463	105	105	25.6809	12	
19. Kusumdihi SWC - XI	404.830	1444	356	356	17.5295	72	
20. Rushimath SWC - XI	648.136	1944	563	563	99.5081	277	
Total:-	5833.327	19927	10528	10317	5085.1322	1508	

Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remark
						Timber in Cums.	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
2008-2009	1. Amrudihi SWC - XII	286.598	573	339	-	-	-	Not worked due to MCC problem.
	2. Dandpat SWC - XII	134.191	537	156	156	71.6169	24	
	3. Lunga SWC - XII	351.688	703	299	299	114.8900	60	
	4. Nagaria SWC - XII	331.938	664	68	-	-	-	Not worked due to MCC problem.
	5. Ulsura SWC - XII	164.842	330	250	250	11.2883	12	
	6. Jada SWC - XII	569.760	2049	2464	2464	1309.9657	30	
	7. Kunjar SWC - XII	506.202	2025	2025	2025	1103.2009	35	
	8. Majurdima SWC - XII	354.147	1771	1786	1786	946.3120	156	
	9. Raipiri SWC - XII	504.336	3026	1009	1009	869.7173	101	
	10. Sirigida SWC - XII	116.984	351	351	351	61.6851	36	
	11. Karo SWC - XII	101.174	304	37	37	6.5874	-	
	12. Khajurdihi SWC - XII	94.383	283	223	223	12.2660	-	
	13. Rakshi SWC - XII	93.191	280	51	-	-	-	Not worked due to MCC problem

	14. Sarkunda SWC - XII	281.485	563	177	177	40.6362	-	
	15. Tensa SWC - XII	369.000	2214	203	203	13.2000	6	
	16. Toda SWC - XII	215.313	1292	221	221	88.4950	31	
	17. Sarkunda PRF SWC - XII	257.783	516	200	200	15.3705	12	
	18. Dhenkiam SWC - XII	289.687	1448	206	206	51.7186	-	
	19. Kusumdihi SWC - XII	603.594	2538	205	205	72.1683	18	
	20. Rushimath SWC - XII	578.558	1736	403	403	192.3228	86	
	Total:-	6204.854	23201	10673	10215	4981.4410	607	

Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remark
						Timber in Cums.	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
2009-2010	1. Amrudihi SWC - XIII	201.563	403	210	-	-	-	Not worked due to uneconomical.
	2. Dandpat SWC - XIII	116.620	466	141	141	40.7520	-	
	3. Lunga SWC - XIII	312.842	626	246	246	68.7951	-	
	4. Nagaria SWC - XIII	427.188	854	214	-	-	-	Not worked due to uneconomical.
	5. Ulsura SWC - XIII	163.330	490	455	455	225.8191	162	
	6. Jada SWC - XIII	394.633	1579	1578	1578	1091.0353	77	
	7. Kunjar SWC - XIII	440.342	1761	1240	1240	796.1429	60	
	8. Majurdima SWC - XIII	317.267	1586	1585	1585	1135.628 3	210	

9. Raipiri SWC - XIII	360.684	865	867	867	778.5804	48	
10. Sirigida SWC - XIII	152.616	458	356	356	116.0968	37	
11. Karo SWC - XIII	120.625	724	112	-	-	-	Not worked due to MCC problem
12. Khajurdihi SWC - XIII	89.591	269	322	322	93.6527	-	
13. Rakshi SWC - XIII	104.257	313	67	-	-	-	Not worked due to MCC problem
14. Sarkunda SWC - XIII	174.813	1049	122	-	-	-	
15. Tensa SWC - XIII	250.250	1502	507	-	-	-	
16. Toda SWC - XIII	253.937	1524	113	-	-	-	
17. Sarkunda PRF SWC - XIII	268.750	538	176	176	35.7210	18	
18. Dhenkiam SWC - XIII	324.438	1622	274	274	25.7901	18	
19. Kusumdihi SWC - XIII	350.759	1134	311	311	163.9794	66	
20. Rushimath SWC - XIII	403.673	1211	511	511	191.3780	120	
Total:-	5228.178	18973	9407	8062	4763.3711	816	

Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remark
						Timber in Cums.	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
2010-2011	1. Amrudhi SWC - XIV	233.319	467	215		-	-	Not worked due to uneconomical.
	2. Dandpat SWC - XIV	126.796	507	260	260	136.6787	24	
	3. Lunga SWC - XIV	389.125	778	228	228	70.0440	12	
	4. Nagaria SWC - XIV	388.687	777	204	204	123.8470	30	
	5. Ulsura SWC - XIV	114.780	344	175	175	81.6036	36	
	6. Jada SWC - XIV	455.495	1650	710	710	436.0218	48	
	7. Kunjar SWC - XIV	567.793	2271	917	917	595.8530	89.5	
	8. Majurdima SWC - XIV	324.704	1624	1656	1656	1151.7232	150	
	9. Raipiri SWC - XIV	413.402	1288	782	782	415.0160	48	
	10. Sirigida SWC - XIV	127.832	383	293	293	112.3334	18	
	11. Karo SWC - XIV	136.438	819	150		-	-	Not worked due to MCC problem
	12. Khajurdihi SWC - XIV	121.745	365	258	258	106.4654	24	
	13. Rakshi SWC - XIV	139.943	420	210	-	-	-	Not worked due to MCC problem
	14. Sarkunda SWC - XIV	228.813	1373	240	-	-	-	
	15. Tensa SWC - XIV	290.750	1745	70	-	-	-	
	16. Toda SWC - XIV	298.499	1791	103	-	-	-	
	17. Sarkunda PRF SWC - XIV	221.043	442	45	45	16.4270	-	
	18. Dhenkiam SWC - XIV	260.125	1301	165	165	31.5332	18	
	19. Kusumdihi SWC - XIV	261.419	784	290	290	166.5502	42	
	20. Rushimath SWC - XIV	507.221	1014	501	501	222.0957	24	
	Total:-	5607.929	20143	7472	6484	3666.1922	563.5	

Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remarks
						Timber in Cums.	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
2011-2012	1. Amrudihi SWC - XV	247.674	495	198		-	-	Not worked due to MCC problem.
	2. Dandpat SWC - XV	113.143	453	207	207	78.0310	12	
	3. Lunga SWC - XV	296.357	593	223	223	52.5265	18	
	4. Nagaria SWC - XV	414.063	828	329	329	157.7015	12	
	5. Ulsura SWC - XV	107.294	322	222	222	121.3370	72	
	6. Jada SWC - XV	604.333	1957	1630	1630	1602.7779	169	
	7. Kunjar SWC - XV	373.245	1493	1492	1492	1053.7983	109	
	8. Majurdimas SWC - XV	340.656	1703	1100	1100	521.9701	252	
	9. Raipiri SWC - XV	462.390	925	853	853	675.7439	120	
	10. Sirigida SWC - XV	126.822	380	380	380	62.4329	42	
	11. Karo SWC - XV	175.875	1055	70		-	-	Not worked due to MCC problem.
	12. Khajurdihi SWC - XV	101.695	305	182	182	59.7430	12	

	13. Rakshi SWC - XV	86.017	258	64		-	-	Not worked due to MCC problem.
	14. Sarkunda SWC - XV	278.000	1668	241		-	-	
	15. Tensa SWC - XV	308.749	1852	217		-	-	
	16. Toda SWC - XV	217.750	1307	106		-	-	
	17. Sarkunda PRF SWC - XV	201.674	403	41		-	-	
	18. Dhenkiam SWC - XV	265.250	1326	220	220	11.4333	56	
	19. Kusumdihi SWC - XV	411.074	1115	581	581	103.4394	42	
	20. Rushimath SWC - XV	609.563	1219	731	731	151.3673	126	
	Total:-	5741.624	19658	9087	8150	4652.3021	1042	

Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remarks
						Timber in Cums.	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
2012-2013	1. Amrudhi SWC - XVI	271.125	542	-		-	-	Not worked due to MCC problem.
	2. Dandpat SWC - XVI	144.242	577	251	251	121.8320	60	
	3. Lunga SWC - XVI	370.948	742	400	400	101.5202	36	
	4. Nagaria SWC - XVI	369.062	738	354	354	130.3410	24	
	5. Ulsura SWC - XVI	223.859	672	326	326	180.5467	72	
	6. Jada SWC - XVI	311.999	1248	1245	1245	1276.6019	336	
	7. Kunjar SWC - XVI	611.072	2444	1837	1837	1563.9737	303	
	8. Majurdima SWC - XVI	357.847	1733	1071	1071	709.8557	354	
	9. Raipiri SWC - XVI	537.106	1586	685	685	440.6604	174	

10. Sirigida SWC - XVI	121.020	363	366	366	74.6847	72	
11. Karo SWC - XVI	168.063	1008	35		-	-	Not worked due to MCC problem.
12. Khajurdihi SWC - XVI	108.316	325	295	295	96.7165	48	
13. Rakshi SWC - XVI	118.051	354	94		-	-	Not worked due to MCC problem.
14. Sarkunda SWC - XVI	268.250	1610	225	225	134.5799	54	
15. Tensa SWC - XVI	284.000	1704	250	250	152.1899	54	
16. Toda SWC - XVI	163.437	981	175		-	-	Not worked due to MCC problem.
17. Sarkunda PRF SWC - XVI	320.218	640	-		-	-	Not marked for non-availability of trees
18. Dhenkiam SWC - XVI	247.000	1235	314	314	70.4511	24	
19. Kusumdihi SWC - XVI	333.732	1001	400	400	43.6468	12	
20. Rushimath SWC - XVI	653.250	1078	820	820	74.3537	162	
Total:-	5982.597	20581	9143	8839	5171.9542	1785	

Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remark
						Timber in Cums.	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
2013-2014	1. Amrudihi SWC - XVII	239.469	479	310	310	33.0686	6	
	2. Dandpat SWC - XVII	124.963	500	105	105	36.5170	19	
	3. Lunga SWC - XVII	245.712	491	465	465	189.4904	74	
	4. Nagaria SWC - XVII	281.250	563	338	338	82.2770	50	
	5. Ulsura SWC - XVII	185.379	556	420	420	234.6927	84	
	6. Jada SWC - XVII	385.019	1540	1231	1231	706.2506	228	
	7. Kunjar SWC - XVII	509.518	2038	1541	1541	933.2899	228	
	8. Majurdima SWC - XVII	269.792	1349	769	769	489.3140	160	
	9. Raipiri SWC - XVII	371.231	742	544	544	508.1979	114	
	10. Sirigida SWC - XVII	144.102	432	455	455	179.3582	30	
	11. Karo SWC - XVII	199.262	1196	0		0.0000	0	No marking due to MCC problem
	12. Khajurdihi SWC - XVII	121.935	366	132	132	57.8783	83	
	13. Rakshi SWC - XVII	113.293	340	106	106	43.0801	10	
	14. Sarkunda SWC - XVII	208.551	1012	700	700	695.2006	205	
	15. Tensa SWC - XVII	318.313	1910	0		0.0000	0	No marking due to MCC problem
	16. Toda SWC - XVII	203.312	1220	510	510	285.3143	42	
	17. Sarkunda PRF SWC - XVII	247.442	495	0		0.0000	0	Non availability of exploitable trees

	18. Dhenkiam SWC - XVII	356.062	1780	351	351	21.8518	6	
	19. Kusumdihi SWC - XVII	343.963	1032	387	387	28.7025	60	
	20. Rushimath SWC - XVII	542.562	1085	742	742	69.9292	270	
	Total:-	5411.130	19126	9106	9106	4594.4131	1669	

Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remarks
						Timber in Cums.	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
2014-2015	1. Amrudihi SWC - XVIII	321.998	644	210	210	22.8712	16	
	2. Dandpat SWC - XVIII	118.578	474	182	182	196.8064	36	
	3. Lunga SWC - XVIII	166.733	333	360	360	202.4893	55	
	4. Nagaria SWC - XVIII	438.125	876	166	166	50.1218	6	
	5. Ulsura SWC - XVIII	142.513	428	424	424	214.9381	76	
	6. Jada SWC - XVIII	306.406	1226	1532	1532	866.2286	208	
	7. Kunjar SWC - XVIII	471.793	1887	1887	1887	1030.9287	432	
	8. Majurdima SWC - XVIII	224.604	1123	1056	1056	713.2330	108	
	9. Raipiri SWC - XVIII	432.723	865	864	864	828.5478	102	
	10. Sirigida SWC - XVIII	161.823	485	485	485	207.2447	72	
	11. Karo SWC - XVIII	188.425	1131	300	300	360.9437	62	
	12. Khajurdihi SWC - XVIII	107.559	323	306	306	62.9816	30	

13. Rakshi SWC - XVIII	105.872	318	67	67	10.6029	5	
14. Sarkunda SWC - XVIII	258.017	516	747	747	501.3924	270	
15. Tensa SWC - XVIII	252.938	1518	365	365	312.3580	72	
16. Toda SWC - XVIII	247.312	1484	373	373	241.1406	140	
17. Sarkunda PRF SWC - XVIII	288.401	577	334	334	21.4630	122	
18. Dhenkiam SWC - XVIII	377.063	1885	1107	1107	405.9519	30	
19. Kusumdihi SWC - XVIII	294.462	883	897	897	126.8582	42	
20. Rushimath SWC - XVIII	496.033	992	853	853	91.4414	162	
Total:-	5401.378	17968	12515	12515	6471.1220	2071	

Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remarks
						Timber in Cums.	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
2015-2016	1. Amrudih SWC – XIX	300.291	601	277	277	75.1199	23	
	2. Dandpat SWC - XIX	156.694	627	456	456	550.2123	85	
	3. Lunga SWC - XIX	277.051	554	277	277	310.4607	100	
	4. Nagaria SWC - XIX	413.000	826	17	17	3.0229	5	

5. Ulsura SWC - XIX	218.596	656	655	655	313.8109	67	
6. Jada SWC - XIX	288.308	1153	1441	1441	780.6596	108	
7. Kunjar SWC - XIX	406.522	1626	2040	2040	1800.5373	360	
8. Majurdima SWC - XIX	256.254	1284	1284	1284	603.5347	300	
9. Raipiri SWC - XIX	432.429	865	865	865	693.0078	186	
10. Sirigida SWC – XIX	150.156	450	751	751	471.4863	72	
11. Karo SWC - XIX	132.000	396	89	89	70.0582	39	
12. Khajurdihi SWC - XIX	117.206	352	355	355	142.9179	61	
13. Rakshi SWC - XIX	85.509	257	106	106	47.9352	10	
14. Sarkunda SWC - XIX	256.125	512	547	547	453.2621	146	
15. Tensa SWC - XIX	236.125	1417	226	226	171.6544	42	
16. Toda SWC - XIX	257.124	1543	176	176	115.5751	40	
17. Sarkunda PRF SWC - XIX	287.813	288	128	128	80.6354	20	
18. Dhenkiam SWC - XIX	293.875	1469	702	702	331.4016	96	
19. Kusumdihi SWC - XIX	324.010	972	656	656	52.1120	54	
20. Rushimath SWC - XIX	640.250	1281	1208	1208	257.9278	216	
Total:-	5529.338	17128	12256	12256	7325.3321	2030	

Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remarks
						Timber in Cums.	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
2016-2017	1. Amrudihi SWC - XX	308.809	618	282	282	49.7230	10	
	2. Dandpat SWC - XX	159.222	637	301	301	222.9595	30	
	3. Lunga SWC - XX	261.381	523	284	284	123.0877	50	
	4. Nagaria SWC - XX	392.501	785	414	414	364.6379	221	
	5. Ulsura SWC - XX	231.441	694	466	466	183.9321	35	
	6. Jada SWC - XX	513.359	2565	1560	1560	910.9317	150	
	7. Kunjar SWC - XX	501.760	2007	1820	1820	1238.0000	180	
	8. Majurdima SWC - XX	319.110	1596	1221	1221	1073.0000	96	
	9. Raipiri SWC - XX	488.710	977	976	976	990.5373	61	
	10. Sirigida SWC - XX	162.138	486	485	485	345.0624	42	
	11. Karo SWC - XX	155.750	467	84	84	51.6021	12	
	12. Khajurdihi SWC - XX	99.677	299	165	165	51.5569	10	
	13. Rakshi SWC - XX	100.163	300	70	70	6.2371	5	
	14. Sarkunda SWC - XX	244.705	489	404	404	288.5740	80	
	15. Tensa SWC - XX	261.438	1569	253	253	157.4608	30	
	16. Toda SWC - XX	248.750	1493	182	182	88.9283	20	
	17. Sarkunda PRF SWC - XX	186.313	373	15	15	5.5226	6	
	18. Dhenkiam SWC - XX	208.626	1043	604	604	264.9084	72	
	19. Kusumdihi SWC - XX	283.088	849	500	500	125.6122	72	
	20. Rushimath SWC - XX	478.125	956	664	664	164.3140	44	
	Total:-	5605.066	18726	10750	10750	6706.5880	1226	

Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remarks
						Timber in Cums.	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
2017-18	1. Amrudihi SWC - I	122.526	245	212	212	30.6790	5	
	2. Dandpat SWC - I	147.925	444	399	399	90.4577	58	
	3. Lunga SWC - I	243.517	487	463	463	458.0125	160	
	4. Nagaria SWC - I	292.500	585	323	323	69.9054	55	
	5. Ulsura SWC - I	166.438	333	337	337	152.2180	54	
	6. Jada SWC - I	465.965	1398	1398	1398	1060.2987	144	
	7. Kunjar SWC - I	326.402	1306	1306	1306	402.3194	66	
	8. Majurdima SWC - I	514.706	1785	1764	1764	915.0442	120	
	9. Raipiri SWC - I	484.674	1460	1460	1460	1309.4955	324	
	10. Sirigida SWC - I	137.228	412	412	412	114.0813	24	
	11. Karo SWC - I	159.000	954	598	598	375.3191	105	
	12. Khajurdihi SWC - I	114.747	344	344	344	26.3572	10	
	13. Rakshi SWC - I	155.413	466	255	255	30.2166	18	
	14. Sarkunda SWC - I	274.813	1649	761	761	301.8368	30	
	15. Tensa SWC - I	342.500	2055	950	950	145.7920	20	
	16. Toda SWC - I	237.063	1422	712	712	150.3530	24	
	17. Sarkunda PRF SWC - I	274.358	549	338	338	104.1204	70	
	18. Dhenkiam SWC - I	212.375	1062	1062	1062	151.8666	30	
	19. Kusumdihi SWC - I	174.125	871	871	871	111.4508	30	
	20. Rushimath SWC - I	377.744	1133	1133	1133	179.1162	54	
	Total:-	5224.019	18960	15098	15098	6178.9404	1401	

Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remarks
						Timber in Cums.	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
2018-19	1. Amrudhi SWC –II	191.106	382	309	309	30.2243	24	
	2. Dandpat SWC –II	117.277	351	223	223	40.8874	15	
	3. Lunga SWC –II	266.145	532	492	492	563.8602	292	
	4. Nagaria SWC - II	315.000	630					
	5. Ulsura SWC - II	140.482	280	283	283	113.9652	48	
	6. Jada SWC - II	318.438	955	955	955	600.0008	126	
	7. Kunjar SWC - II	272.925	1091	514	514	140.1819	30	
	8. Majurdima SWC - II	381.518	1221	881	881	540.8269	60	
	9. Raipiri SWC - II	625.807	2242	2105	2105	1246.5138	354	
	10. Sirigida SWC - II	165.405	496	496	-	-	-	
	11. Karo SWC - II	129.438	776	421	421	463.0000	146	
	12. Khajurdihi SWC - II	103.272	309	306	306	171.8110	81	
	13. Rakshi SWC - II	127.947	383	217	-	-	-	
	14. Sarkunda SWC - II	267.188	1603	625	625	173.7767	40	
	15. Tensa SWC - II	406.312	2437	652	652	280.4070	30	
	16. Toda SWC - II	427.500	2565	1650	-	-	-	
	17. Sarkunda PRF SWC - II	243.724	487	239	239	87.1852	30	
	18. Dhenkiam SWC - II	226.312	1131	1132	1132	259.5737	36	
	19. Kusumdihi SWC - II	119.626	598	599	599	208.1952	78	
	20. Rushimath SWC - II	574.472	1723	1708	1708	271.3726	126	
	Total:-	5419.894	20192	13807	11444	5191.7819	1516	

Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remarks
						Timber in Cums.	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
2019-20	1. Amrudih SWC - III	255.792	511	318	-	-	-	
	2. Dandpat SWC - III	144.298	432	88	88	52.9673	30	
	3. Lunga SWC - III	335.784	671	435	435	105.9578	24	
	4. Nagaria SWC - III	278.125	556	302	302	50.0000	18	
	5. Ulsura SWC - III	182.202	364	364	364	142.7733	41	
	6. Jada SWC - III	294.678	884	797	797	254.7812	63	
	7. Kunjar SWC - III	405.640	1622	1622	1622	767.1915	105	
	8. Majurdima SWC - III	209.528	628	628	628	581.6899	226	
	9. Raipiri SWC - III	426.981	1028	1010	1010	560.4697	183	
	10. Sirigida SWC - III	237.477	711	711	-	-	-	
	11. Karo SWC - III	246.225	738	404	404	184.4057	61	
	12. Khajurdihi SWC - III	82.781	248	246	246	164.8189	85	
	13. Rakshi SWC - III	166.324	498	242	-	-	-	
	14. Sarkunda SWC - III	122.938	737	510	510	161.2910	20	
	15. Tensa SWC - III	402.438	2414	1107	1107	1053.3783	247	
	16. Toda SWC - III	202.375	1214	708	-	-	-	
	17. Sarkunda PRF SWC - III	225.312	450	232	232	45.7491	20	
	18. Dhenkiam SWC - III	430.500	2152	2153	2153	732.4187	80	
	19. Kusumdihi SWC - III	211.500	1057	832	832	234.0513	66	
	20. Rushimath SWC - III	487.799	1463	1355	1355	327.3394	198	
	Total:-	5348.697	18378	14064	12085	5419.2786	1467	

Year	Name of the Coupe	Area in ha.	Max. No. of trees to be marked as per Para-397 of WP	No. of trees marked	No. of trees felled	Out-turn obtained		Remarks
						Timber in Cums.	Firewood in stacks (12X3X3)	
1	2	3	4	5	6	7	8	9
2020-21	1. Amrudhi SWC - IV	106.323	212	171	-	-	-	
	2. Dandpat SWC - IV	140.576	562	193	193	79.3646	30	
	3. Lunga SWC - IV	264.703	529	470	470	588.7432	198	
	4. Nagaria SWC - IV	267.000	534	181	-	-	-	
	5. Ulsura SWC - IV	158.018	316	316	316	107.4173	36	
	6. Jada SWC - IV	340.115	1020	566	566	396.3940	147	
	7. Kunjar SWC - IV	407.845	1631	813	813	441.8614	171	
	8. Majurdima SWC - IV	229.072	687	687	687	680.7777	298	
	9. Raipiri SWC - IV	312.726	625	625	625	503.8706	120	
	10. Sirigida SWC - IV	138.426	415	415	415	236.1928	214	
	11. Karo SWC - IV	254.979	765	283	283	142.6202	30	
	12. Khajurdihi SWC - IV	145.136	435	434	434	253.2162	204	
	13. Rakshi SWC - IV	198.549	595	311	-	-	-	
	14. Sarkunda SWC - IV	238.250	1429	755	755	304.8408	30	
	15. Tensa SWC - IV	307.853	1846	620	-	-	-	
	16. Toda SWC - IV	170.499	1022	1009	-	-	-	
	17. Sarkunda PRF SWC - IV	252.107	504	462	462	101.1592	51	
	18. Dhenkiam SWC - IV	280.188	1400	1205	-	-	-	
	19. Kusumdihi SWC - IV	337.100	1011	824	-	-	-	
	20. Rushimath SWC - IV	458.509	1375	1161	1161	365.4190	240	
	Total:-	5007.974	16913	11501	7180	4201.8770	1769	

	N.B. The position of Champajharan and Silikuta felling series have not found place in the above report as the coupes were not worked from 1997-98 to 2004-05 due to moratorium on felling of trees and subsequently, both the coupes coming under Banki Range merged with Rourkela Division with effect from 1.10.2003.

The year-wise details of bamboo coupes due for working area of each coupe, production of industrial and commercial bamboos are furnished below in table 11.4.2.

<u>11.4.2.- Details of Bamboo Coupes under Bamboo (overlapping) Working Circle allotted for working with out-turn obtained for the period from 1997-98 to 2020-21.</u>								
Year	Mahulpada FS				Ulsura FS			
	Area In Ha.	Coupe No.	I.B. In SU	C.B. in Nos.	Area In Ha.	Coupe No.	I.B. In SU	C.B. in Nos.
1	2	3	4	5	6	7	8	9
1997-98	1528.709	A	251.14	-	977.954	B	390.11	6920
1998-99	931.998	B	204.77	1100	1473.703	C	23.71	-
1999-2k	1479.748	C	53.73	-	1034.157	D	Not worked for non-availability of bamboos	
2000-01	992.304	D	No Working		1435.813	A	No working	
2001-02	1528.709	A			977.954	B		
2002-03	931.998	B			1473.703	C		

2003-04	1479.748	C	Not worked for non-availability of bamboo for commercial exploitation	1034.157	D	Not worked for non-availability of bamboos	
2004-05	992.304	D		1435.813	A	510.21	4840
2005-06	1528.709	A		977.954	B	139.47	-
2006-07	931.998	B		1473.703	C	Not worked for non-availability of bamboos	
2007-08	1479.748	C		1034.157	D		
2008-09	992.304	D		1435.813	A	318.88	2115
2009-10	1528.709	A		977.954	B	63.03	-
2010-11	931.998	B		1473.703	C	Not worked for non-availability of bamboos	
2011-12	1479.748	C		1034.157	D		
2012-13	992.304	D		1435.813	A	-	3800
2013-14	1528.709	A		977.954	B	Not worked for non-availability of bamboos	
2014-15	931.998	B		1473.703	C		
2015-16	1479.748	C		1034.157	D		
2016-17	992.304	D		1435.813	A		
2017-18	1528.709	A		977.954	B		
2018-19	931.998	B		1473.703	C		
2019-20	1479.748	C		1034.157	D		
2020-21	992.304	D		1435.813	A		

Year	Kantamunda FS				Kello FS			
	Area In Ha.	Coupe No.	I.B. In SU	C.B. in Nos.	Area In Ha.	Coupe No.	I.B. In SU	C.B. in Nos.
1	2	3	4	5	6	7	8	9
1997-98	1328.007	B	1742.65	17781	3043.164	B	2916.68	27570
1998-99	2002.767	C	1020.31	25250	2824.527	C	1082.01	19200
1999-2k	3033.489	D	988.45	39.195	2788.612	D	382.98	23040
2000-01	2205.800	A	No working		3339.250	A	No working	
2001-02	1328.007	B			3043.164	B		
2002-03	2002.767	C			2824.527	C		
2003-04	3033.489	D	254.02	-	2788.612	D	247.23	10780
2004-05	2205.800	A	714.69	200	3339.250	A	502.40	1500
2005-06	1328.007	B	1138.72	-	3043.164	B	1489.54	3000
2006-07	2002.767	C	863.86	-	2824.527	C	779.90	2770
2007-08	3033.489	D	Not worked for non-availability of bamboos		2788.612	D	209.48	-
2008-09	2205.800	A	173.41	-	3339.250	A	266.97	-
2009-10	1328.007	B	221.75	-	3043.164	B	422.14	-
2010-11	2002.767	C	411.61	-	2824.527	C	539.44	1500
2011-12	3033.489	D	Not worked for non-availability of bamboo for commercial exploitation		2788.612	D	10.06	-
2012-13	2205.800	A			3339.250	A	Not worked for non-availability of bamboos	
2013-14	1328.007	B			3043.164	B	163.21	5000
2014-15	2002.767	C			2824.527	C	-	1600
2015-16	3033.489	D			2788.612	D	Not worked for non-availability of bamboos	

2016-17	2205.800	A	Not worked for non-availability of bamboo for commercial exploitation	3339.250	A	Not worked for non-availability of bamboos
2017-18	1328.007	B		3043.164	B	
2018-19	2002.767	C		2824.527	C	
2019-20	3033.489	D		2788.612	D	
2020-21	2205.800	A		3339.250	A	

Year	Kunjar FS				Sirigida FS			
	Area In Ha.	Coupe No.	I.B. In SU	C.B. in Nos.	Area In Ha.	Coupe No.	I.B. In SU	C.B. in Nos.
1	2	3	4	5	6	7	8	9
1997-98	1714.500	D	2425.74	14750	989.724	B	772.6	-
1998-99	2657.763	A	Not worked for non-availability of bamboos		887.309	C	98.57	-
1999-2k	1933.280	B	415.47	22000	1076.576	D	276.87	-
2000-01	2568.020	C	No Working		1513.266	A	No Working	
2001-02	1714.500	D			989.724	B		
2002-03	2657.763	A			887.309	C		
2003-04	1933.280	B	217.1	-	1076.576	D	70.55	-
2004-05	2568.020	C	216.36	-	1513.266	A	Not worked for non-availability of bamboo for commercial exploitation	
2005-06	1714.500	D	193.48	-	989.724	B		
2006-07	2657.763	A	896.7	2558	887.309	C		
2007-08	1933.280	B	73.41	-	1076.576	D		
2008-09	2568.020	C	Not worked for non-availability of bamboos		1513.266	A		
2009-10	1714.500	D			989.724	B		

2010-11	2657.763	A	326.77	-	887.309	C	Not worked for non-availability of bamboo for commercial exploitation
2011-12	1933.280	B	220.57	1110	1076.576	D	
2012-13	2568.020	C	Not worked for non-availability of bamboo for commercial exploitation		1513.266	A	
2013-14	1714.500	D			989.724	B	
2014-15	2657.763	A			887.309	C	
2015-16	1933.280	B			1076.576	D	
2016-17	2568.020	C			1513.266	A	
2017-18	1714.500	D			989.724	B	
2018-19	2657.763	A			887.309	C	
2019-20	1933.280	B			1076.576	D	
2020-21	2568.020	C			1513.266	A	

Year	Dhenkiam FS				Kusumdihi FS			
	Area In Ha.	Coupe No.	I.B. In SU	C.B. in Nos.	Area In Ha.	Coupe No.	I.B. In SU	C.B. in Nos.
1	2	3	4	5	6	7	8	9
1997-98	1652.844	B	Not worked for non-availability of bamboos		1518.427	C	88.15	-
1998-99	1288.866	C	160.55	-	1715.478	D	84.52	-
1999-2k	1518.448	D	Not worked for non-availability of bamboos		1160.356	A	344.45	8533
2000-01	1213.719	A	No Working		1178.615	B	No Working	
2001-02	1652.844	B			1518.427	C		
2002-03	1288.866	C			1715.478	D		

2003-04	1518.448	D	Not worked for non-availability of bamboo for commercial exploitation	1160.356	A	159.89	1565
2004-05	1213.719	A		1178.615	B	Not worked for non- availability of bamboo for commercial exploitation	
2005-06	1652.844	B		1518.427	C		
2006-07	1288.866	C		1715.478	D		
2007-08	1518.448	D		1160.356	A	90.21	-
2008-09	1213.719	A		1178.615	B	Not worked for non- availability of bamboo for commercial exploitation	
2009-10	1652.844	B		1518.427	C		
2010-11	1288.866	C		1715.478	D		
2011-12	1518.448	D		1160.356	A	9.06	-
2012-13	1213.719	A		1178.615	B	Not worked for non- availability of bamboo for commercial exploitation	
2013-14	1652.844	B		1518.427	C		
2014-15	1288.866	C		1715.478	D		
2015-16	1518.448	D		1160.356	A		
2016-17	1213.719	A		1178.615	B		
2017-18	1652.844	B		1518.427	C		
2018-19	1288.866	C		1715.478	D		
2019-20	1518.448	D		1160.356	A		
2020-21	1213.719	A		1178.615	B		

Year	Rushimath FS				Champajharan FS			
	Area In Ha.	Coupe No.	I.B. In SU	C.B. in Nos.	Area In Ha.	Coupe No.	I.B. In SU	C.B. in Nos.
1	2	3	4	5	6	7	8	9
1997-98	2950.439	B	1715.46	16823	793.554	B	Not worked for non-availability of bamboo for commercial exploitation	
1998-99	2196.633	C	287.78	13280	925.67	C		
1999-2k	1480.569	D	247.09	-	1746.626	D		
2000-01	3458.445	A	No Working		1632.572	A	No Working	
2001-02	2950.439	B			793.554	B		
2002-03	2196.633	C			925.67	C		
2003-04	1480.569	D	Not worked for non-availability of bamboos		1746.626	D	The Coupe coming under Banki Range merged with Rourkela Division with effect from 1.10.2003.	
2004-05	3458.445	A	211.49	2199	1632.572	A		
2005-06	2950.439	B	509.32	-	793.554	B		
2006-07	2196.633	C	435.29	-	925.67	C		
2007-08	1480.569	D	257.27	2465	1746.626	D		
2008-09	3458.445	A	32.18	-	1632.572	A		
2009-10	2950.439	B	245.14	1215	793.554	B		
2010-11	2196.633	C	78.63	-	925.67	C		
2011-12	1480.569	D	10.06	-	1746.626	D		
2012-13	3458.445	A	Not worked for non-availability of bamboo for commercial exploitation		1632.572	A		
2013-14	2950.439	B			793.554	B		
2014-15	2196.633	C			925.67	C		
2015-16	1480.569	D			1746.626	D		
2016-17	3458.445	A			1632.572	A		
2017-18	2950.439	B			793.554	B		
2018-19	2196.633	C			925.670	C		
2019-20	1480.569	D			1746.626	D		
2020-21	3458.445	A			1632.572	A		

<u>Grand abstract of year-wise production</u>				
Year	No. of coupes due for working	No. of coupes worked	Production	
			I.B. In SU	C.B. in Nos.
1	2	3	4	5
1997-98	10	8	10302.53	83844
1998-99	10	8	2962.22	58830
1999-2k	10	7	2709.04	92768
2000-01	10	No Working		
2001-02	10			
2002-03	10			
2003-04	9	5	948.79	12345
2004-05	9	5	2155.15	8739
2005-06	9	5	3470.53	3000
2006-07	9	4	2975.75	5328
2007-08	9	4	630.37	2465
2008-09	9	4	791.44	2115
2009-10	9	4	952.06	1215
2010-11	9	4	1356.45	1500
2011-12	9	4	249.75	1110
2012-13	9	1	-	3800
2013-14	9	1	163.21	5000
2014-15	9	1	-	1600
2015-16	9	-	-	-
2016-17	9	-	-	-
2017-18	9	-	-	-
2018-19	9	-	-	-
2019-20	9	-	-	-
2020-21	9	-	-	-
Total:-			29667.29	283659

The details of year-wise and coupe-wise area treated under SSO is furnished below in table 11.4.3.

Table 11.4.3- Area treated under SSO				
Year	Name of the Coupe	Area of the coupe in ha.	Area covered under SSO in Ha.	Remarks
1	2	3	4	5
1997-98	Ulsura BCA	1435.813	800	
	Mahulpada BCD	992.304	750	
	Sirigida BCA	1513.266	500	
	Kantamunda BCA	2205.800	630	
	Kunjar BCD	1714.500	300	
	Kello BCA	3339.250	520	
	Rushimath BCA	3458.445	300	
	Dhenkiam BCA	1213.719	800	
	Kusumdihi BCB	1178.615	180	
	Champajharan BCA	1632.572	200	
	Rushimath BCB	2950.439	150	
Total :-		21634.723	5130	
1998-99	Ulsura BCB	977.954	250	
	Mahulpada BCA	1528.709	600	
	Sirigida BCA	1513.266	40	
	Kantamunda BCB	1328.007	280	
	Kunjar BCC	2568.020	60	
	Kello BCB	3043.164	300	
	Rushimath BCB	2950.439	230	
	Dhenkiam BCB	1652.844	200	
	Kusumdihi BCC	1518.427	160	
	Champajharan BCB	793.554	200	
	Sirigida BCB	989.724	250	
	Kunjar BCA	2657.763	250	

Total :-		21521.871	2820	
1999-2K	Ulsura BCB	977.954	45	
	Mahulpada BCA	1528.709	480	
	Sirigida BCB	989.724	120	
	Kantamunda BCB	1328.007	130	
	Kunjar BCA	2657.763	165	
	Kello BCA	3339.250	35	
	Rushimath BCB	2950.439	62	
	Dhenkiam BCB	1652.844	155	
	Kusumdihi BCC	1518.427	85	
	Champajharan BCB	793.554	80	
	Rushimath BCC	2196.633	63	
	Kello BCB	3043.164	145	
	Kusumdihi BCD	1715.478	215	
	Dhenkiam BCC	1288.866	85	
Total :-		25980.812	1865	

2000-01	Ulsura BCB	977.954	500	
	Mahulpada BCB	931.998	500	
	Sirigida BCD	1076.576	340	
	Kantamunda BCD	3033.489	305	
	Kunjar BCB	1933.280	103	
	Kello BCD	2788.612	300	
	Rushimath BCB	2950.439	190	
	Kusumdihi BCA	1160.356	300	
	Champajharan BCB	793.554	350	
	Kantamunda BCC	2002.767	200	
	Kello BCC	2824.527	200	
	Kunjar BCA	2657.763	100	
	Rushimath BCD	1480.569	420	
Total :-		24611.884	3808	

2001-02	NIL			
2002-03	NIL			
2003-04	NIL			
2004-05	NIL			
2005-06	Ulsura BCA	1435.813	543	
	Mahulpada BCD	992.304	668	
	Sirigida BCA	1513.266	96	
	Kantamunda BCA	2205.800	178	
	Kunjar BCC	2568.020	89	
	Kello BCB	3043.164	132	
	Rushimath BCA	3458.445	158	
	Kusumdihi BCB	1178.615	68	
	Kantamunda BCB	1328.007	38	
	Kello BCA	3339.250	327	
	Dhenkiam BCA	1213.719	135	
	Ulsura BCB	977.954	156	
	Sirigida BCB	989.724	139	
	Maulpada BCA	1528.709	90	
	Kusumdihi BCC	1518.427	195	
	Dhenkiam BCB	1652.844	470	
Total :-		28944.061	3482	

Year	Name of the Coupe	Area of the coupe in ha.	Area covered under SSO in Ha.	Remarks
1	2	3	4	5
2006-07	Mahulpada BCB	931.998	141	
	Dhenkiam BCC	1288.866	161	
	Kusumdihi BCD	1715.478	420	
Total :-		3936.342	722	

2007-08	Rushimath BCC	2196.633	230	
	Kello BCC	2824.527	175	
	Kantamunda BCC	2002.767	220	
	Kunjar BCA	2657.763	140	
Total :-		9681.690	765	
2008-09	Ulsura BCD	1034.157	168	
	Mahulpada BCC	1479.748	786	
	Sirigida BCD	1076.576	290	
	Kantamunda BCD	3033.489	310	
	Kunjar BCB	1933.280	135	
	Kello BCD	2788.612	1919	
	Rushimath BCD	1480.569	790	
	Kusumdihi BCA	1160.356	962	
	Dhenkiam BCD	1518.448	982	
Total :-		15505.235	6342	
2009-10	Ulsura BCA	1435.813	490	
	Mahulpada BCD	992.304	992	
	Sirigida BCA	1513.266	451	
	Kantamunda BCA	2205.800	430	
	Kunjar BCC	2568.020	390	
	Kello BCA	3339.250	514	
	Rushimath BCA	3458.445	2790	
	Kusumdihi BCB	1178.615	471	
	Dhenkiam BCA	1213.719	932	
	Mahulpada BCA	1528.709	542	
Total :-		19433.941	8002	

Year	Name of the Coupe	Area of the coupe in ha.	Area covered under SSO in Ha.	Remarks
1	2	3	4	5
2010-11	Ulsura BCB	977.954	634	
	Mahulpada BCA	1528.709	658.185	
	Sirigida BCB	989.724	765	
	Kantamunda BCB	1328.007	900	
	Kunjar BCD	1714.500	998.99	
	Kello BCB	3043.164	1169	
	Rushimath BCB	2950.439	700	
	Kusumdihi BCB	1178.615	37	
	Kusumdihi BCC	1518.427	673	
	Dhenkiam BCB	1652.844	850	
	Dhenkiam BCC	1288.866	700	
	Sirigida BCC	887.309	453.4	
	Mahulpada BCB	931.998	250	
	Mahulpada BCC	1479.748	200	
	Kusumdihi BCD	1715.478	750	
	Ulsura BCC	1473.703	750	
Total :-		24659.485	10488.575	

Year	Name of the Coupe	Area of the coupe in ha.	Area covered under SSO in Ha.	Remarks
2011-12	Kello BCC	2824.527	987	
	Kantamunda BCC	2002.767	637	
	Kunjar BCA	2657.763	500	
	Rushimath BCC	2196.633	987	
	Sirigida BCC	887.309	100	
	Kantamunda BCD	3033.489	450	
	Sirigida BCD	1076.576	400	
	Mahulpada BCC	1479.748	400	
	Dhenkiam BCD	1518.448	1150	
	Ulsura BCD	1034.157	400	
	Kello BCD	2788.612	450	
	Rushimath BCD	1480.569	750	
	Total :-	22980.598	7211	

Year	Name of the Coupe	Area of the coupe in ha.	Area covered under SSO in Ha.	Remarks
2012-13	Kello BCD	2788.612	835	
	Kusumdihi BCA	1160.356	832	
	Kunjar BCB	1933.280	970	
	Rushimath BCA	3458.445	188	
	Sirigida BCD	1076.576	320	
	Kantamunda BCD	3033.489	1485.879	
	Mahulpada BCC	1479.748	440.04	
	Dhenkiam BCD	1518.448	270	
	Ulsura BCD	1034.157	392.66	
	Dhenkiam BCA	1213.719	98	
	Rushimath BCD	1480.569	379	
	Mahulpada BCD	992.304	700	
	Kantamunda BCA	2205.800	1200	
	Kunjar BCC	2568.020	1600	
	Sirigida BCA	1513.266	800	
	Ulsura BCA	1435.813	700	
	Kusumdihi BCB	1178.615	1000	
	Total :-	30071.217	12210.579	

Year	Name of the Coupe	Area of the coupe in ha.	Area covered under SSO in Ha.	Remarks
2013-14	Kello BCA	3339.250	2500	
	Rushimath BCA	3458.445	2000	
	Ulsura BCD	1034.157	84	
	Dhenkiam BCA	1213.719	1000	
Total :-		9045.571	5584	
2014-15	Mahulpada BCA	1528.709	700	
	Kantamunda BCB	1328.007	900	
	Kunjar BCD	1714.500	1200	
	Ulsura BCB	977.954	700	
	Kusumdihi BCC	1518.427	1000	
Total :-		7067.597	4500	
2015-16	SSO in Bamboo Coupes	-	-	
2016-17	Kello BC 'A'	339.250	1200.000	
	Rushimath BC 'A'	3458.445	1300.000	
	Kantamunda BC 'A'	2205.800	800.000	
	Total:-	6003.495	3300.000	
2017-18	Mahulpada BC 'A'	1528.709	800.000	
	Ulsura BCB	977.954	393.677	
	Kantamunda BCB	1328.007	1046.914	
	Kello BCB	3043.164	2068.384	
	Kunjar BCD	1714.500	530.703	
	Sirigida BCB	989.724	699.666	
	Dhenkiam BCB	1652.844	574.707	
	Kusumdihi BCC	1518.427	287.354	
	Rushimath BCB	2950.439	1092.740	
	Total:-	15703.768	7494.145	

Year	Name of the Coupe	Area of the coupe in ha.	Area covered under SSO in Ha.	Remarks
2018-19	Mahulpada BC 'B'	931.998	500.00	
	Ulsura BCC	1473.703	990.761	
	Total:-	2405.701	1490.761	
2019-20	Mahulpada BC C	1479.748	300.000	
	Ulsura BC D	1034.157	300.000	
	Kantamunda BC D	3033.489	400.000	
	Kello BC D	2788.612	400.000	
	Kunjar BC B	1933.28	350.000	
	Sirigida BC D	1076.576	300.000	
	Dhenkiam BC D	1518.448	350.000	
	Kusumdihi BC A	1160.356	300.000	
	Rushimath BC D	1480.569	300.000	
	Total:-	15505.235	3000.000	
2020-21	Mahulpada BC D	992.304	500.000	
	Ulsura BC A	1435.813	900.000	
	Kantamunda BC A	2205.800	600.000	
	Kello BC A	3339.250	800.000	
	Kunjar BC C	2568.020	700.000	
	Sirigida BC A	1513.266	100.000	
	Dhenkiam BC A	1213.719	200.000	
	Kusumdihi BC B	1178.615	200.000	
	Rushimath BC A	3458.445	500.000	
	Total:-	17905.232	4500.000	

Working Shemes from 2017-18 to 2020-21

The 5th Working Plan of this Division had to be prepared w.e.f. 2017-18. But due to delay in preparation of the Working Plan, from 2017-18 to 2020-21, forests & wildlife of this division got managed as per the annual Working Schemes with due approval of the Eastern Regional Office of the MoEF & Climate Change (Govt. of India), Chandra Sekharpur, Bhubaneswar. Details of approval of workings schemes for various years is as detailed below;

2017-18	:-	Approved vide No.8 (31) 31/2016-FCE dt.21.7.2017.
2018-19	:-	Approved vide No.8 (31) 31/2016-FCE dt.19.7.2018.
2019-20	:-	Approved vide No.8 (31) 31/2016-FCE dt.3.10.2019.
2020-21	:-	Approved vide No.8 (31) 7/2017-FCE dt.19.8.2020.

Results for the year 2017-18:

(a) Selection Working Circle.

In continuation to the expired working plan, annual coupes were prescribed. Marking in all the regular timber coupes (20 Nos.) covering an area of 5,224.019 Ha. was taken up and marked 15,098 trees for felling. All the coupes have been worked by OFDC Ltd., Rourkela (CKL) Division. The total royalty was fixed at Rs.6,70,65,479/- and paid by OFDC Ltd. The total out-turn obtained by OFDC Ltd. was 6,178.9404 cums. of timber and 1,401 stacks of firewood of 12'X3'X3' size. Subsidiary Silvicultural operation over 6,632.01 ha. has been taken up in the timber coupes during the year.

(b) Protection Working Circle.

Total area was 7,822.298 Ha. No specific Silvicultural system was prescribed for the areas except removal of dead & fallen trees. No fallen and uprooted trees were found in the area for departmental salvation. Anti-smuggling squad with other squads were provided for protection of forests during the year under report.

(c) Rehabilitation-cum-Plantation Working Circle.

Total area under the felling series was 861.936 Ha. in 14 Nos. of rehabilitation series. Plantations over 1,877.843 Ha. both within Working Plan & outside Working Plan areas have been taken up during the year under different schemes as per details below;

Location	AR in Ha.	ANR in Ha.	Total area in Ha.
Within Working Plan area	70.000	1181.935	1251.935
Out side Working Plan area	44.073	581.835	625.908
Total:-	114.073	1763.770	1877.843

Besides, 1,73,331 Nos. of seedlings have been distributed to the public for taking up plantations in private areas during the year.

(d) Bamboo (over lapping) Working Circle.

Demarcation of 9 Nos. of Bamboo coupes covering an area of 15,703.768 Ha. has taken up and offered to OFDC Ltd. for working. But the OFDC Ltd. have not taken up any working due to non-availability of bamboos for commercial exploitation as the allotted areas were coming under Treatment type-'B' and 'C'. SSO over 7,494.145 ha. has been taken up during the year in the Bamboo Coupes.

(e) Mining (over lapping) Working Circle.

Plantation over 282.843 Ha. for CA and PCA have been taken up outside the ML area during the year. In total, 1,73,331 Nos. of seedlings have been supplied to the mines and other industries for plantation. An amount of Rs.2,21,70,956/- towards SSWLCP and Rs.1,56,37,202/- out of the Regional Management of Wild life fund have been utilized during the year.

(f) NTFP (over lapping) Working Circle.

The total area under this Working Circle was 1,34,255.988 Ha. The lease of Siali fibres and Tassar Cocoons of this Division have been worked out by Rourkela (KL) Division and by SERIFED, Bhubaneswar respectively.

(g) Wildlife (over lapping) Working Circle.

The total area under the said Working Circle was 1,34,255.988 Ha. Different protection activities have been taken up during the year by engaging the 04 Nos. of Elephant Trackers 15 Nos. of Anti-depredation squads, 10 Nos. of Anti-poaching squads and 80 Nos. of other squads. Besides, fire protection has been taken up by engaging fire protection squads. Apart from this, fire lines have laid in all ranges according to the vulnerability of areas towards forest fire. Activities undertaken in SSWLCP and Regional Wild Life Management Plan has been given vide item- (e) above.

Results for the year 2018-19:

(a) Selection Working Circle.

20 number of timber coupes were got approved in the schcme. Marking in all the regular timber coupes (20 Nos.) covering an area of 5,419.894 Ha. was taken up and marked 13,807 trees for felling in 19 Nos. of Coupes One Coupe named Nagaria SWC No.II has not been marked due to non-availability of exploitable trees for working. All the balance 19 coupes were offered to OFDC Ltd., Rourkela (CKL) Division for working. But the OFDC Ltd. have worked 16 Coupes only leaving 3 Coupes namely Toda, Rakshi & Sirigida Coupes due to objection raised by the local villagers on the plea of PESA and surrendered by OFDC Ltd. The total royalty was fixed at Rs.6,62,10,916/- and the OFDC Ltd. have paid Rs.5,31,49,533/- leaving Rs.1,30,61,383/-. The OFDC Ltd. have felled 11,444 trees only & the total out turn of timber was 5,191.7819 cums of timber & 1,516 stacks of Firewood of 12x3x3 size.

Subsidiary Silvicultural Operation over 2,530.800 Ha. has been taken up in the timber coupes during the year.

(b) Protection Working Circle.

Total area was 7,822.298 Ha. No specific Silvicultural system was prescribed for the areas except removal of dead & fallen trees. No fallen and uprooted trees were found in the area for departmental salvation. Anti-smuggling squad with other squads were provided for protection of forests during the year under report.

(c) Rehabilitation-cum-Plantation Working Circle.

Total area under the felling series was 858.062 Ha. in 14 Nos. of rehabilitation series. No afforestation within the allotted areas have been taken up due to either non-availability of suitable area/ paucity of funds. But plantation over 1,325.820 Ha. both within Working Plan & outside Working Plan areas have been taken up during the year under different schemes as per details below;

Location	AR in Ha.	ANR in Ha.	Total area in Ha.	Remarks
Within Working Plan area	130.000	1,068.820	1,198.820	
Out side Working Plan area	47.000	80.000	127.000	
Total:-	177.000	1,148.820	1,325.820	

Besides, 6,81,860 Nos. of seedlings have been distributed to the mines owners and others for plantation during the year.

(d) Bamboo (over lapping) Working Circle.

Demarcation of 9 Nos. of Bamboo coupes covering an area of 15,979.044 Ha. was taken up and offered to OFDC Ltd. for working. But the OFDC Ltd. have not taken up any working of the coupes due non-availability of bamboos for commercial exploitation as the areas coming under Treatment type-‘B’ and ‘C’. SSO over 1,490.762 ha. has been taken up in the Bamboo Coupes during the year.

(e) Mining (over lapping) Working Circle.

Plantation over 217.820 Ha. for CA and PCA have been taken up outside the ML area during the year. In total, 6,81,860 Nos. of seedlings have been supplied to the mining owners and others for plantation. An amount of Rs.4,28,55,483/- towards SSWLCP and Rs.1,01,62,931/- out of the Regional Management of Wild life fund have been utilized during the year.

(f) NTFP (over lapping) Working Circle.

The total area under the said Working Circle was 1,34,255.988 Ha. The lease of Siali fibres and Tassar Cocoons of this Division have been worked out by Rourkela (KL) Division and by SERIFED, Bhubaneswar respectively. The other MFP items (69 Nos.) transferred to Gram Panchayats are operated by them.

(g) Wild Life (over lapping) Working Circle.

The total area under the said Working Circle was 1,34,255.988 Ha. Different protection activities have been taken up during the year by engaging the 04 Nos. of Elephant Trackers 15 Nos. of Anti-depredation squad, 10 Nos. of Anti-poaching squad and 80 Nos. of other squads etc. Besides, fire protection has been taken up by engaging fire protection squad. Apart from this, fire line creation has been taken up and fire distinguished with the help of squad and engaging the VSS people. Total expenditure incurred for fire protection comes to Rs.59,20,000. The activities undertaken in SSWLCP and Regional Wild Life Management Plan has been given vide item- (e) above.

For the year 2019-20

(a) Selection Working Circle.

Marking in all the regular timber coupes (20 Nos.) covering an area of 5,348.697 Ha. was taken up and marked 14,064 trees for felling. All the coupes were offered to OFDC Ltd., Rourkela (CKL) Division for working. But the OFDC Ltd. have worked 17 Coupes only leaving 3 Coupes namely Amrudhi, Rakshi & Sirigida SWC No.III due to Maoist activities. The total royalty was fixed at Rs.7,51,95,195/- and the OFDC Ltd. have paid Rs.6,93,05,476/- only leaving Rs.58,89,719/-. The OFDC Ltd. have felled 10,834 trees only & the total out-turn of timber was 5,276.4477 cums of timber & 1,292 stacks of Firewood of 12x3x3 size.

No subsidiary silvicultural operation has been taken up in any timber coupes during the year due to obstructions of the local people on the plea of PESA.

(b) Protection Working Circle.

Total area was 7,822.298 Ha. No specific Silvicultural system was prescribed for the areas except removal of dead & fallen trees. No fallen and uprooted trees were found in the area for departmental salvation. Anti-smuggling squad with other squads were provided for protection of forests during the year under report.

(c) Rehabilitation-cum-Plantation Working Circle.

Total area under the felling series was 830.489 Ha. in 14 Nos. of rehabilitation series. No afforestation within the allotted areas have been taken up due to either non-availability of suitable area/ paucity of funds. But plantation over 2,631.927 Ha. both within Working Plan & outside Working Plan areas have been taken up during the year under different schemes as per details below;

Location	AR in Ha.	ANR in Ha.	Total area in Ha.	Remarks
Within Working Plan area	14.000	1,989.319	2,003.319	
Out side Working Plan area	53.608	575.000	628.608	
Total:-	67,608	2,564.319	2,631.927	

Besides, 15,63,061 Nos. of seedlings have been distributed to the mines owners and others for plantation during the year.

(d) Bamboo (over lapping) Working Circle.

Demarcation of 9 Nos. of Bamboo coupes covering an area of 15,505.235 Ha. was taken up and offered to OFDC Ltd. for working. But the OFDC Ltd. have not taken up any working of the coupes due to non-availability of bamboos for commercial exploitation as the areas coming under Treatment type-‘B’ and ‘C’.

SSO over 2,912.489 ha. has been taken up in the Bamboo Coupes during the year.

(e) Mining (over lapping) Working Circle.

Plantation over 136.228 Ha. for CA and PCA have been taken up outside the ML area during the year. In total, 15,63,061 Nos. of seedlings have been supplied to the mining owners and others for plantation. An amount of Rs.2,71,00,913/- towards SSWLCP and Rs.84,76,065/- out of the Regional Management of Wild life fund have been utilized during the year.

(f) NTPF (over lapping) Working Circle.

The total area under the said Working Circle was 1,34,255.988 Ha. The lease of Siali fibres and Tassar Cocoons of this Division have been worked out by Rourkela (KL) Division and by SERIFED, Bhubaneswar respectively. The other MFP items (69 Nos.) transferred to Gram Panchayats are operated by them.

(g) Wild Life (over lapping) Working Circle.

The total area under the said Working Circle was 1,34,255.988 Ha. Different protection activities have been taken up during the year by engaging the 04 Nos. of Elephant Trackers 25 Nos. of Anti-depredation squad, 10 Nos. of Anti-poaching squad and 80 Nos. of other squads etc. Besides, fire protection has been taken up by engaging fire protection squad. Apart from this, fire line creation has been taken up and fire extinguished with the help of squad and engaging the VSS people. Total expenditure incurred for fire protection comes to Rs.53,37,000/-. The activities undertaken in SSWLCP and Regional Wild Life Management Plan has been given vide item- (e) above.

For the year 2020-21

(a) Selection Working Circle.

Marking in all the regular timber coupes (20 Nos.) covering an area of 5,007.974 Ha. was taken up and marked 11,501 trees for felling. All the coupes have been offered to OFDC Ltd., Rourkela (CKL) Division for working. The total royalty have been fixed at Rs.6,47,94,544/- and the due date of payment is 31.03.2021.

Subsidiary Silvicultural Operation over 1,705.39 ha.has so far been taken up in the timber Coupes during the year.

(b) Protection Working Circle.

Total area was 7,822.298 Ha. No specific Silvicultural system was prescribed for the areas except removal of dead & fallen trees. No fallen and uprooted trees were found in the area for departmental salvation. Anti-smuggling squad with other squads have been provided for protection of forests during the year under report.

(c) Rehabilitation-cum-Plantation Working Circle.

Total area under the Working Circle is 820.820 Ha. in 14 Nos. of rehabilitation series. There is proposal to take up plantation over 1,402.00 Ha. both within Working Plan area and outside Working Plan area under different schemes as per details below;

Location	AR in Ha.	ANR in Ha.	Total area in Ha.	Remarks
Within Working Plan area	02.00	1,035.00	1,037.00	
Out side Working Plan area	30.00	335.00	365.00	
Total:-	32.00	1,370.00	1,402.00	

Besides, 6,48,000 Nos. of seedlings have been raised in different Nurseries for distribution to Mine Owners, Public & VSS.

(d) Bamboo (over lapping) Working Circle.

Demarcation of 9 Nos. of Bamboo coupes covering an area of 17,905.232 Ha. was taken up and offered to OFDC Ltd. for working. But the OFDC Ltd. have not taken up any working of the coupes due to non-availability of bamboos for commercial exploitation as the areas coming under Treatment type-'B' and 'C'.

SSO over 3,300 ha. have so far been taken up in the Bamboo Coupes during the year.

(e) Mining (over lapping) Working Circle.

There is no target for taking up C.A. & P.C.A. plantation in this Division. In total, 6,48,000 Nos. of seedlings have been raised in different Nurseries for supply to the mining owners and others for plantation. An amount of Rs.1,42,16,155/- under SSWLCP and Rs.47,37,540/- out of the Regional Management of Wild life fund have been incurred during the year.

(f) NTPF (over lapping) Working Circle.

The total area under the said Working Circle was 1,34,255.988 Ha. The lease of Siali fibres and Tassar Cocoons of this Division have been worked out by Rourkela (KL) Division and by SERIFED, Bhubaneswar respectively. The other MFP items (69 Nos.) transferred to Gram Panchayats are operated by them.

(g) Wild Life (over lapping) Working Circle.

The total area under the said Working Circle was 1,34,255.988 Ha. Different protection activities have been taken up during the year by engaging the 04 Nos. of Elephant Trackers, 25 Nos. of Anti-depredation squad, 10 Nos. of Anti-poaching squad and 80 Nos. of other squads etc. Besides, fire protection has been taken up by engaging fire protection squad. Apart from this, fire line creation has been taken up to extinguish fire with the help of squad and engaging the VSS people. Total expenditure incurred for fire protection comes to Rs.33,26,200/-. The activities undertaken in SSWLCP and Regional Wild Life Management Plan has been given vide item- (e) above.

CHAPTER -12

STATISTICS OF GROWTH AND YIELD

12.1. Statistics of Growth

The growing stock of forests depends upon different parameters like Geology, rock, climatic factor, position of ground water table, mineral content of soil and biomass on the particular patch. Soil formation on the earth's surface is a slow continuous process, taking ages. Even changing climatic factors like temperature, rainfall, humidity, wind, light etc. exert considerable impact upon the growth of forest. The yield of the growing stock also gets affected by these parameters.

12.1.1. Experimental Plots

At the time of assessment of growth and yield of growing stock, a localized patch need to be considered and all research works need to be focused on that patch to curb the impacts of the above factors. For the assessment of growth and yield of growing stock, experimental plots should have been established in the division to study the effect climatic and edaphic factors on the growth rate of growing stock of the forest. At present, no experimental plot or Permanent Sample Plot exists in the Division for ascertaining the growth and yield of Sal and other important species. Systematic study of any species has not so far been made in this Division. Sal is the principal and predominant species in the forests of this Division. Other important species found in this Division are Asan, Piasal, Kurum, Dhaura, Sissoo, Bandan, Gambhar, Halandu, KasiMoi, Simili, etc. In the absence of any statistical data in the Division regarding the growth and yield of various species, the following published literature for growth statistics for Sal and other species can be referred and used.

1. Yield and stand table for Sal by A.L.Griffith and Bakshi Sant Ram (Published as Indian Forest Records (New series) Silvicultural series Vol.4A, No.4 1943.)
2. General volume table for Sal by S.H.Howard (Published as Indian Forest Records (Silvicultural series) Vol.X Part-VI, 1924., No.4 1943.)

3. Volume and out turn table for Sal by S.H. Howard (Published as Indian Forest Records (Silvicultural series) Vol.XII, Part-I,1924.,No.4 1925.)
4. General standard and commercial Volume table for Asan by A.L. Griffith and BakshiSant Ram (Published as Indian Forest Records(New series) Silvicultural Vol.A.,No.5 1947)
5. General volume table for Bija based on data procured from Andra Pradesh, Maharashtra,Orissa& Bihar and (Published as Indian Forest Records(New series) Silvicultural Vol.II.,No.7 1969.)
6. General standard volume table and commercial volume table based on data from Bihar, Orissa, Maharashtra and Madhya Pradesh by S.N. Dabral,(Published as Indian Forest Records(New series) Silvicultural Vol.II.,No.5 1964.)
7. Standard volume table for Moi based on data from AndhraPradesh, Maharashtra, Bihar and U.P. by S.N. Dabral and D.C. Sharma,(Published as Indian Forest Records(New series) Silvicultural Vol.II.,No.7 1969.)

All the research papers shown above pertain to the volume table which are antic. These have been used in the preparation of the volume table at the National level based on research data from different localities outside Odisha. As such it is not wise to directly use such data and statistics to calculate the yield of different species in this division. So it is wise to develop and devise volume and yield tables locally for this Division independently.

12.1.2. Mean Annual Increment;

Owing to the absence of any research activities for assessment of rate of growth of different species and other aforesaid reasons it would be very difficult to assess the mean annual increment as the past enumeration data year wise for last 20 years is not available. Illicit felling is one of the identified threats to biomass reduction in most of the forest blocks. This would also make the calculation of MAI even more difficult task.

12.1.3. Local Volume Equations.

In Bonai Forest Division, till now, no local volume table has been developed. The Forest Survey of India has developed local volume equation for different forest species both principal and secondary species taking forests of Phulbani, Sambalpur and Koraput districts as per their sampling for Odisha state. Since the forest area of Sambalpur Division and Bonai Division is having similar type of geographical terrain and forest vegetation, it is assumed that local volume equations developed for the forests of Sambalpur Division will also be applicable for assessing the volume and yield of growing stock of forests of Bonai Forest Division. Local volume equations of different species have been used in this Working Plan. The diameter corresponding to the mid girth class have been taken as representative of that girth class. Accordingly the value of diameter (D) for different girth classes are calculated. The volume of the different species are calculated applying the volume equation developed by Forest Survey of India as given in the following **Table12.1.3.**

Table12.1.3- Local volume equation of different species adopted in Bonai Forest Division.			
Sl. No.	Name of the Species		Local value regression equation to be adopted
	Local	Botanical	
1	Sal	<i>Shorea robusta</i>	$\sqrt{V} = 0.19994 + 4.57179 D - 1.56823 \sqrt{D}$
2	Piasal (Bija)	<i>Pterocarpus marsupium</i>	$\sqrt{V} = -0.16276 + 2.82002 D + 0.04034 \sqrt{D}$
3	Asan	<i>Terminalia tomentosa</i>	$V = 0.05061 - 1.11994 D + 8.77839 D^2$
4	Dhaura	<i>Anogeissus latifolia</i>	$V = 0.13928 - 2.87067 D + 20.22404 D^2 - 13.80572 D^3$
5	Kendu	<i>Dyospyros melanoxylon</i>	$\sqrt{V} = 0.06728 + 4.06351 D - 0.99816 \sqrt{D}$
6	Kuruma	<i>Adina cardifolia</i>	$V = 0.08507 + 0.19669 D + 7.16812 D^2$
7	Jamu	<i>Syzigium Cumini</i>	$\sqrt{V} = 0.30706 + 5.12731 D - 2.0987 \sqrt{D}$
8	Sidha	<i>Lagerstroemia parviflora</i>	$V = 0.07199 - 1.25923 D + 9.28416 D^2$
9	Bandhan	<i>Ougeinia oojenensis</i>	$\sqrt{V} = 0.03456 + 3.81921 D - 0.80884 \sqrt{D}$
10	Bahada	<i>Terminalia bellerica</i>	$V = -0.14823 + 2.44138 D - 6.86434 D^2 + 18.05444 D^3$
11	Sisoo	<i>Dalbergia latifolia</i>	$V = 0.00965 + 0.58546 D - 2.5605 D^2 + 24.34215 D^3$

12	Mundi	<i>Mitragynaparviflora</i>	$V = 0.08444 - 1.26801 D + 8.75274 D^2$
13	Kasi	<i>Brideliaretusa</i>	$\sqrt{V} = 0.1162 + 4.12711 D - 1.08508 \sqrt{D}$
14	Moi		$V = -0.01071 - 0.66528 D + 9.54478 D^2 - 4.58876 D^3$
15	Simuli	<i>Bombaxceiba</i>	$V = 0.02834 + 4.68381 D^2$
16	Salai	<i>Boswelliaserrata</i>	$V = 0.36432 - 1.32768 D + 9.48471 D^2$
17	Mahul	<i>Madhukalatifolia</i>	$V = 0.10423 - 1.38429 D + 8.39379 D^2$
18	Misc.	Other species like, Kusuma, Gambhar, etc.	$\sqrt{V} = 0.06063 + 3.43666 D - 0.75571 \sqrt{D}$
19	Karada	<i>Clinthuscollinus</i>	$\sqrt{V} = 0.12956 + 3.7891 D - 1.04671 \sqrt{D}$
20	Tentera		$V = 0.27 - 2.953 D + 12.836 D^2$
21	Kumbhi	<i>Caryaarborea</i>	$V = 0.003 - 0.848 D + 7.342 D^2$
22	Anla	<i>Embelicaofficinalis</i>	$V = -0.406 + 3.54 D - 3.231 D^2$

12.1.4. Quality Classes.

The following quality classes for Sal as given in the All India Yield and Volume Table for Sal have been recognized and adopted in this Revised Working Plan. The assessment of quality classes of Sal has made basing on the height of matured crop.

Quality I: where the height of matured crop is more than 33 m.

Quality II: where the height of matured crop is 27 m to 33 m.

Quality III: where the height of matured crop is 21m to 27m.

Quality IV: where the height of matured crop is 15m to 27 m.

Quality V: where the height of matured crop is less than 15 m

12.1.5: Study of Growth and yield in this plan:

In this plan, advanced technologies of Remote Sensing and Geographical Information System (GIS) have been used to make an assessment of the growing stock of the forests of this division. Forest Survey of India and NRSA have developed the methodology for use of this technology in the recent past. Satellite remote sensing and GIS based methods have been operationally used to provide working plan inputs in various forests divisions across the country. These efforts have demonstrated that significant reductions in cost and time can be achieved by relying on stratified sampling methods based on mapping forest canopy density and forest type using satellite remote sensing.

12.1.5.1. Methodology adopted:

As per Annexure II of the Working Plan Code- 2014, for assessment of Growing Stock, Volume or number of stems, 0.1 ha. is optimum sample size, Similarly for assessment of shrubs and regeneration (3m x 3m plot), for assessment of herbs and grasses (1m x 1m plot), for assessment of Dead Wood Mass (5m x 5m plot), and for assessment of soil organic carbon a 3-dimensional pit of 30cm x 30cm x 30cm have fixed as optimum sample sizes. Further, as per the new Code, sample plots are to be laid systematically in the forest area which need to be indicated in Survey of India Topo sheet (1:50,000 scale). Grid based systematic sampling offers best opportunity to revisit the area for change detection and its attribution to carbon sequestration and climate change. Some suitable sample plots can be made permanent sample plots for study of regeneration, growth, and carbon sequestration. But to save time, reduce expenditure it has been decided at the State level to approach ORSAC and NRSC to provide sample points for all the 34 Forest Divisions where the preparation of Working Plan is due. The ORSAC and NRSC have provided sample points on Stratified Random Sampling method. In this method, the sample variance has been reduced by dividing the population into number of homogenous vegetation strata and then inventory sample points have been selected randomly using stratification with the advantage of forest type classified map and forest crown density map available from remote sensing.

Therefore to optimize the intensity of ground inventory and to enhance the precision of the estimates, stratified random sampling procedure has been adopted for growing stock assessment.

The forest type map used for inventory purpose has three strata viz; (i) forest with > 66% Sal dominance (Named as “Sal”) (ii) forest with 10-66% dominance of Sal (Named as “Mixed Sal”) (iii) the remaining forest with miscellaneous composition (< 10% Sal and crown density map has four strata such as < 10% crown cover, 10 to < 40% crown cover, 40 to < 70% crown cover, 70 and above crown cover The area of these strata at different management and administrative units were then generated for the subsequent use in sampling design and estimation.

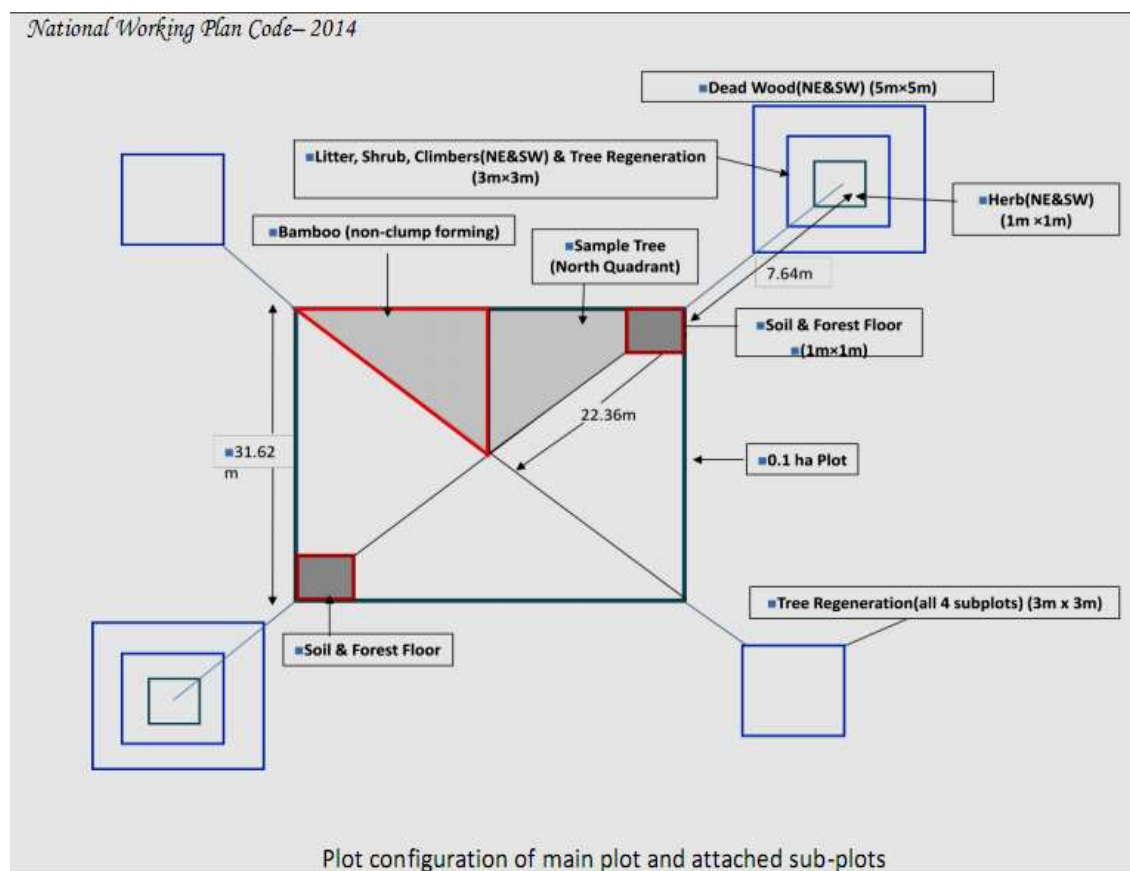
Sample points provided by ORSAC/NRSC are approached through navigation. While approaching the Sample Point, stock assessment and mapping (earmarking the stocked area on the map), ground data are recorded by traversing the forests (Compartment / Management Unit) so as to cover the entire area making assessment of site quality, tree species composition and its health, density, crop age, etc. and Plot Approach Form (Form-I) is filled up. Changes at all locations are described in this Form. Grassy patches, scattered trees, plantations raised, etc. have described in Form-I. Regeneration status of main species has observed. Information on undergrowth, climbers, important herbs, grasses, shrubs, MAPs, bamboos, NTFP yielding species, flagship faunal species and their traces, eco-tourism potential areas, special wildlife habitats and their interface with humans, biotic factors have recorded. On arrival of the sample point, the general information around the Sample point over an area of 2ha. *i.e.* at a radius of 80mtrs from the centre of the Sample Point and are recorded and Form II- Plot description Form has filled up.

Sample plot of 0.1 ha. has laid by fixing four points at a distance of 22.36 m from the centre of sample point on four corners i.e. on NE, SE, SW, and NW directions at 45 degree, 135 degree, 225 degree and 315 degree respectively. All these four corner points are joined to lay the 0.1 ha. plot.

Nested quadrates of size 3m x 3m and 1m x 1m are laid at a distance of 30mtrs from the central point along the four diagonals.

All trees having girth 30 cm and above have enumerated, species wise and girth class wise and recorded and Plot Enumeration Form-AI has filled up. Trees/bamboo clumps touching north and west border lines of the plot have enumerated and trees/bamboo clumps touching the east and south border lines have not been enumerated. Enumeration of trees/bamboos have started from NE corner of the plot and proceeded in clock wise direction and recorded. Height of all the trees in North-quadrant have got measured and recorded. The data of all the bamboo clumps occurring in the plot have got recorded in shrub, climbers and regeneration status from all four quadrates of 3m x 3m are collected and recorded and Plot Enumeration Form B has filled up. The data of herbs from all nested quadrates of 1mx1m laid within each quadrate of 3mx3m have collected, recorded and Plot Enumeration Form C has filled up.

An outline of the methodology adopted for assessment of the growing stock and yield in this forest division is as under.



12.1.5.2. Development of Base Layers- As per methodology , following input layers have been developed by NRSC and ORSAC based on data and information provided for Bonai Forest Division.

(i) Administrative layer having details like roads, rivers, administrative boundaries of the division, Range Sections and Beats.

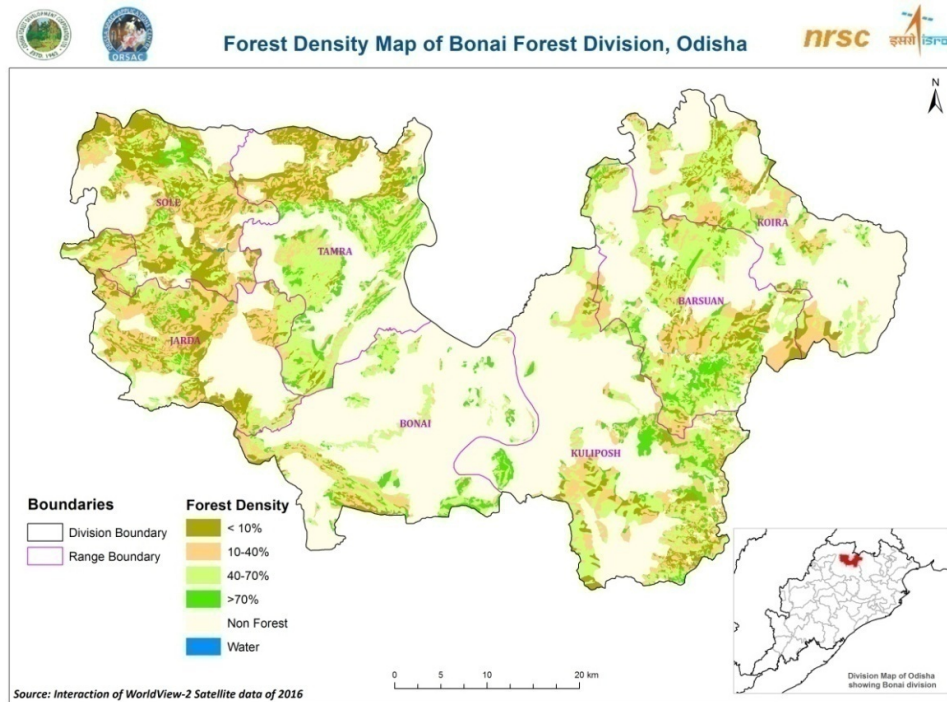
(ii) Management Layer showing all the forest blocks covered under the revised Plan

12.1.5.3. Satellite Data Preparation: Cloud free, optimal season multi spectral and panchromatic satellite data were used in the study by NRSC and ORSAC. All the satellite data and base layers adopted in the study were geo-corrected with reference to master images of UTM projection and WGS84 datum. Quality standards followed in various national projects carried out by ISRO/DOS were followed by NRSC/ORSAC.

12.1.5.4. Mapping Forest Type Multi-season :

Satellite data has been used to prepare a forest type map of this Division by NRSC. The discrimination of major phonological types and gregarious formations was based on hybrid classification methods and resulted in map products on 1:50,000 scales. In addition to the forest types major non-forest/ land use classes were also classified. The Division area is covered with different land cover categories viz. Sal, Mixed Sal, Miscellaneous forests, agriculture, plantations, orchards, water, sand, scrub, etc. The classification was done using supervised classification approach with maximum likelihood algorithm. Two optimal seasons IRS, LISS-III scenes were selected for the classification process. These scenes were geometrically rectified with reference to the master images of UTM projection and WGS84 datum. The classification of the image started with the identification of a homogenous area in terms of spectral properties based on which particular land cover classes can be discreetly separated based on some measure of statistical distance between them. The representative areas of different land cover classes especially the forest classes were delineated based on reflection properties and confirmed during repeated field survey. The forest vegetation in this Division being very complex, the final classification was achieved after several rounds of iterative processes. In the final step, the final set of inventory data helped considerably in terms of the species composition and its abundance. Through the phyto-sociological analysis it was observed that the ground inventory points could be separated into three discrete classes such as (i) forest with > 66% Sal dominance (Named as “Sal”) (ii) forest with 10-66% dominance of Sal (Named as “Mixed Sal”) (iii) the remaining forest with miscellaneous composition (< 10% Sal. The distributions of inventory points belonging to these three classes were taken into consideration while classifying them using relatively pure signature sets

12.1.5.5. Crown Density – Delineating forest canopy density IRS Panchromatic satellite data with a spatial resolution of 5.8 m was used by ORSAC to prepare a forest canopy density layer for this Division using visual interpretation methods. Forest of this Division is classified into the following canopy density classes such as < 10% crown cover, 10 to < 40% crown cover, 40 to <70% crown cover, 70 and above crown cover. The crown density map of this Division is shown below.

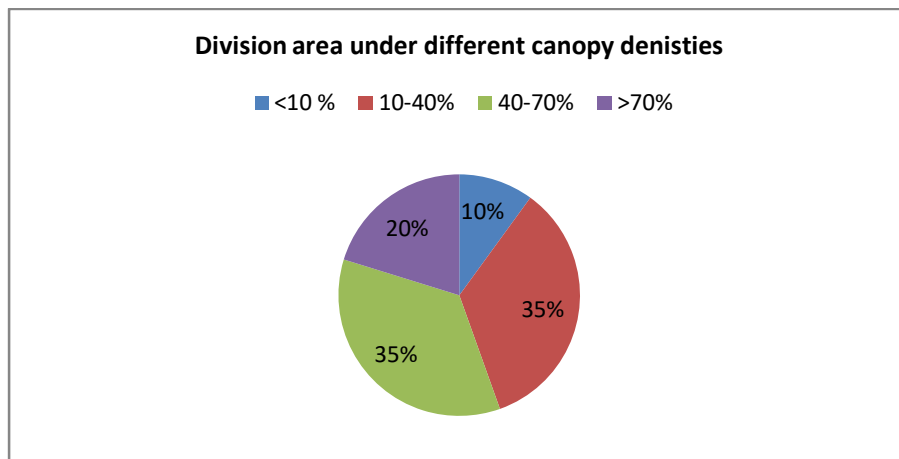


Crown density data (strata wise) for all the compartments of the division has appended as Appendix.II-A

12.1.5.6. Strata Wise Area – The Range wise distribution of area into strata wise canopy is as under.

Table No.- 12.1.5.6						
Range wise and strata wise canopy density						
Range	Canopy density and its extent of area in ha.				NF	Total area in ha.
	<10%	10-40%	40-70%	>70%		
Barsuan	1706.39	9660.08	9664.77	4438.08	517.64	25986.96
Bonai	1430.68	4368.03	2476.94	869.64	260.10	9405.39
Jarda	926.83	4488.40	8536.75	4804.16	44.48	18800.61
Koira	543.36	4893.45	7190.25	2274.58	876.47	15778.10
Kuliposh	2462.80	9327.59	7039.30	2845.59	383.85	22059.13
Sole	870.54	4772.87	7130.85	7725.78	173.23	20673.26
Tamra	3314.69	9206.05	5665.74	4409.89	245.98	22842.35
Total :-	11,255.29	46716.47	47704.60	27367.72	2501.75	135545.80
Sources :- NRSC data						
NB: Area mentioned in the table is the polygon area used by NRSC for calculation and may not match with the computed Working Plan area.						

Division area under various canopy densities is as shown in the pie chart below.



12.1.5.7 Geo-database Organization: The above input layers were integrated and organized in geo-databases. Metadata, codification, projection, layer types completeness and correctness etc. were in accordance with the standards followed by ISRO/ DOS in various national projects.

12.1.5.8 Sampling Design : The objective of field inventory was to provide estimates of the growing stock of economically important species. Inventory design was based on a stratified random sampling design which was followed based on the forest canopy density and forest type layers generated using satellite remote sensing. A pre-inventory was first carried out to assess the variability within and across strata.

The entire Division was divided into Selection Working Circle (SWC), Rehabilitation working Circle (RWC), Plantation Working Circle (PLWC) and Protection Working Circle (PWC) based on historical information of growing stock and as per the approval of 2nd PWPR. In order to generate stand, stock and yield information for the Selection Working Circle (SWC) areas and growing stock information for other working circle areas, suitable sampling design and estimation procedures were followed.

An optimal sampling design with high precision in the estimate was adopted to address the large variability of forest composition and stock in the Division. The precision of the sample estimate of the population depends not only on the size of the sample but also on the variability in the population. When the variability in the population was very high, then dividing the population into number of homogenous vegetation strata and then selecting the inventory points randomly reduced the sample variance. This procedure is called as stratified random sampling. The use of stratification was very convenient with the advantage of forest type classified map and forest crown density map available from remotely sensed data. Therefore, to optimize the intensity of ground inventory and enhance the precision of the estimates, stratified random sampling procedure was adopted for growing stock assessment.

One of the major information requirements for the SWC areas is the growing stock and yield levels of Sal, Asan, Dhaura, Bija and other species. Therefore, to account the spatial variability of these compositional classes and guide the field inventory, forest type map was used as one of the strata. In addition the forest crown density, which serves as surrogate for growing stock, was used to further subdivide the each forest type map used for inventory purpose has two strata viz; Sal (>10% Sal of the crop) and Non Sal (<10% of Sal of the crop) and crown density map has four strata viz. <10% crown cover, 10 to 40% crown cover, 40 to 70% crown cover, 70% and above crown cover. The area of these strata at different management and administrative units were then generated for the subsequent use in sampling design and estimation.

Precise sample estimates are generated based on adequate sample size and its distribution pattern and finally estimation procedure followed against a defined error, time and cost limits. Sample size and distribution were determined in consonance with spatial variability in the strata distribution and growing stock conditions. There were 1030 number of sample points based on type stratification were distributed randomly across the entire Division and as pre inventory points to understand the spatial trends in the variability of growing stock and estimate the sample size of 0.1 ha. Based on the spatial semi variance estimated using geo-statistical analysis of the pre inventory data sampling intensities in various strata of crown densities have estimated. Taking this sampling intensity as a rule, sample size was determined for the six strata mentioned above. The total number of points thus allocated for each strata were further reallocated over all the compartments based on the probability proportion to the size of the strata present in each compartment. The sample points allocated over compartments were distributed randomly across the strata maintaining a maximum distance of 01 km between each point. However considering the details required for non SWC areas are limited to only total growing stock at forest block level, the sampling intensity of 0.05% was fixed. The strata wise sampling intensity in SFC and Non-SFC area is as shown in the following table 12.1.5.8.1.

Table No. 12.1.5.8.1				
Strata wise sampling intensity in different working circles				
Forest	Strata	Area in ha.	Plots	% of sampling intensity
SWC	>70	23237	189	0.08
	40-70	37721	349	0.09
	10-40	30410	288	0.09
	<10	7162.	19	0.03
Non-SWC	>70	4133	25	0.06
	40-70	10011	76	0.08
	10-40	28269	79	0.03
	<10	4121	5	0.01
Overall	>70	27370	214	0.0632
	40-70	47732	425	0.0767
	10-40	58679	367	0.0574
	<10	11284	24	0.0213
Total :-		145065	1030	
Sources :- NRSC data				

Inventory points were allotted at the compartment level. Inventory points were located on the ground using GPS receivers. As an alternate method inventory points were also transferred on to 1:50,000 scale SOI topographic sheets as complementary information to the field staff to reach the desired locations. The Range wise distribution of sample points in different crown density classes, whose inventory have been recorded, are as under.

Table No. 12.1.5.8.2- Canopy density strata wise distribution of Inventory Points						
Sl. No.	RANGE	Number of Sample Points By Canopy Density Class				Total
		>70%	40-70%	10-40%	<10%	
1.	Barsuan	19	51	36	3	109
2.	Bonai	9	29	38	2	78
3.	Jarda	33	71	44	0	148
4.	Koira	11	54	28	1	94
5.	Kuliposh	27	90	87	11	215
6.	Sole	78	73	45	1	197
7.	Tamra	37	57	89	6	189
	Total :-	214	425	367	24	1030

12.1.5.9 Forest Inventory: The field inventory was carried out by field staff of Bonai Division. Inventory crews were trained and equipped in accordance with the inventory manual prepared by NRSC / ORSAC. Sample points distributed over the compartments were overlaid on the 1:50,000 scale Survey of India (SOI) map. Sample point location maps along with latitude and longitude positions were provided to the field party. A field inventory workshop and orientation camp was organized for all the field Officers to train them about the methodology, use of GPS and different types of maps and maintain uniform methodology across the teams. Field inventory manual detailing all the steps of data collection was provided to field Officers.

(i) Collection of Inventory Data : Enumeration sheets given to field staff consisted of 3 formats such as Form No. A, B and C. Form No. “A” meant for recording of data of situation of the point its longitude, latitude, map index, landscape forest type, slope, soil type and texture, reference point etc. and about the identity of enumeration party including regeneration survey. Form No. “B” for recording enumeration result of different forest species of a particular point within 0.1 ha. area beyond the girth class of 30 cms including clear bole height and tree height. Form No.

“C” meant to record information of bamboo enumeration. The growth of the bamboo circumference of the clump in meters, culms height in metres and number of culms existing in clump in 1st year, 2nd year, 3rd year, 4th year and above. Data generated by the field inventory crews were entered into the inventory database. The data collected through point enumeration were compiled and all data have sent to NRSC for further analysis. This data was integrated with the geo-database.

(ii) Data Analysis and Outputs :After the final phase inventory was completed, the total inventory details were overlaid on the forest type / crown density intersected layer. For the estimation of growing stock, the crown density map was collapsed into two major classes. Similarly the Forest type layer consisting Sal/ Mixed Sal classes were intersected with the crown density layer with two classes as mentioned above. Thus the six main spatial strata were obtained. Similarly, inventory points, spatial layer were intersected with six strata with infrastructure layer.

As a first step, timber volume was computed for each inventory point for the identified economic species as well as for miscellaneous category. The timber volume was computed using the local volume equation.

Now, for each compartment, based on the mean value for the plots falling in each stratum, the stand and stock for each economic species was computed. The stratum in the compartments where we have at least three sample points are called “represented” where we can extrapolate the mean timber volume for the specific stratum. The remaining strata are called “unrepresentative” for which minimum number of inventory points are not available. As the compartment number is fairly large, it was not optimal to have at least three points in each stratum in each compartment. Moreover, based on the remotely sensed data as well as sample points it is known that similarly to exist amongst the compartments in terms of volume ranges and species composition. In order to resolve this, the similar compartments were

grouped into nine zones in terms of context, neighbourhood, hypsography, terrain and species composition. Thus, for the unrepresentative stratum in the compartment, the zone level mean for the particular stratum was taken and the value for the stand stock was computed.

After analysis, NRSC has communicated the output in under the following heads.

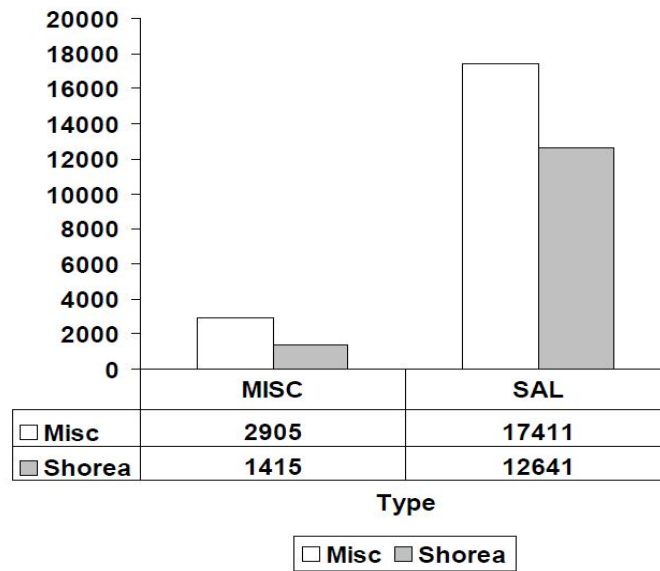
- a. Block wise area statistics
- b. Strata wise enumerated stems
- c. Sample points used in estimation
- d. Realized sampling intensity
- e. Stand-Working Circle wise
- f. Compartment wise, block wise and range wise stand table (for SWC and non-SWC areas)
- g. Stock-Working Circle wise
- h. Compartment wise, block wise and range wise stock table (for SWC and non-SWC areas)
- i. SWC- yield data
- j. Crown Density Strata areas
- k. Forest Type Strata areas
- l. Division Maps showing Forest Type, Crown Density, Carbon stock, biodiversity and Forest Fire
- m. Compartment maps

12.1.5.10 Estimated stand and Stock of Timber

(i) Strata wise Number of enumerated trees.

The strata wise distribution of enumerated trees for the entire area of this Division is given below.

Strata Wise Distribution of Enumerated Trees



(ii) Stand (number of trees) – Estimated stand for the entire division (SIWC and non-SIWC) is as shown in the following table.

Range	WC	SPECIES	GIRTH CLASSES					Total
			30-60	60-90	90-120	120-150	150-300	
Barsuan	Non-SIWC	All species	20,33,761	13,24,801	7,80,615	3,14,969	2,18,069	46,72,204
	Sub-Total		20,33,761	13,24,801	7,80,615	3,14,969	2,18,069	46,72,204
	SIWC	Ano lat	1,52,675	90531	48148	18416	9644	3,19,408
		Dio mel	1,39,419	87789	46285	22161	8875	3,04,539
		Misc	13,73,021	6,84,001	3,26,687	114277	85954	25,83,955
		Sho rob	7,96,151	7,51,167	5,29,510	221366	165299	24,63,486
		Ter tom	26,885	17,305	10,959	5,200	2,724	63,079
	Sub-Total		24,88,150	16,30,793	9,61,588	3,81,420	2,72,495	57,34,467
	Total		45,21,910	29,55,594	17,42,203	6,96,389	4,90,564	1,04,06,671
Bonai	Non-SIWC	All species	14,79,970	9,93,186	5,92,837	2,42,052	1,66,624	34,74,656
	Sub-Total		14,79,970	9,93,186	5,92,837	2,42,052	1,66,624	34,74,656
	SIWC	Ano lat	47,850	28774	15446	6124	2982	1,01,173
		Dio mel	45,101	29075	15907	7032	2995	1,00,115
		Misc	4,35,761	2,21,052	1,02,662	33,549	28347	8,21,381
		Sho rob	2,35,913	2,08,481	1,47,714	61,910	44,799	6,98,817
		Ter tom	7829	5475	2967	1355	736	18360
	Sub-Total		7,72,455	4,92,858	2,84,696	1,09,969	79,859	17,39,845
	Total		22,52,424	14,86,044	8,77,532	3,52,021	2,46,483	52,14,501

Jarda	Non-SIWC	All species	2,57,386	1,72,728	1,03,102	42,096	28,978	6,04,288
	Sub-Total		2,57,386	1,72,728	1,03,102	42,096	28,978	6,04,288
	SIWC	Ano lat	1,58,418	97,094	55,532	20,946	11,000	3,42,979
		Dio mel	1,56,321	1,00,203	59,276	27,302	12,741	3,55,846
		Misc	14,89,417	7,93,532	4,04,946	1,29,782	1,07,179	29,24,847
		Sho rob	7,65,918	7,63,870	5,71,707	2,46,646	1,83,540	25,31,681
		Ter tom	26681	21863	13110	4526	2427	68600
	Sub-Total		25,96,755	17,76,561	11,04,571	4,29,201	3,16,888	62,23,954
	Total		28,54,141	19,49,289	12,07,673	4,71,297	3,45,866	68,28,242
Koirra	Non-SWC	All species	22,52,128	15,11,370	9,02,143	3,68,340	2,53,558	52,87,520
	Sub-Total		22,52,128	15,11,370	9,02,143	3,68,340	2,53,558	52,87,520
	SWC	Ano lat	93,788	56,852	29209	11217	6229	1,97,295
		Dio mel	87,142	55,918	30075	13685	6146	1,92,975
		Misc	8,53,221	4,26,141	2,04,998	68,432	57,707	16,10,497
		Sho rob	4,84,156	4,56,889	3,27,914	1,38,046	1,07,040	15,14,064
		Ter tom	19642	10952	7273	3216	1848	42935
	Sub-Total		15,37,949	10,06,752	5,99,470	2,34,595	1,78,969	35,57,766
	Total		37,90,076	25,18,122	15,01,612	6,02,935	4,32,527	88,45,286
Kuliposh	Non-SIWC	All species	26,38,207	17,70,462	10,56,796	4,31,484	2,97,025	61,93,952
	Sub-Total		26,38,207	17,70,462	10,56,796	4,31,484	2,97,025	61,93,952
	SIWC	Ano lat	1,39,389	78,390	47788	18396	8929	2,92,894
		Dio mel	1,18,218	74,868	39168	18562	6797	2,57,618
		Misc	12,70,393	6,22,329	2,87,444	96,457	75654	23,52,274
		Sho rob	6,41,565	5,46,506	3,86,289	1,60,557	1,24,143	18,59,058
		Ter tom	21774	14386	7765	5153	2160	51244
	Sub-Total		21,91,338	13,36,478	7,68,453	2,99,125	2,17,682	48,13,089
	Total		48,29,545	31,06,940	18,25,249	7,30,609	5,14,707	1,10,07,041
Sole	Non-SIWC	All species	7,07,812	4,75,002	2,83,531	1,15,764	79,690	16,61,792
	Sub-Total		7,07,812	4,75,002	2,83,531	1,15,764	79,690	16,61,792
	SIWC	Ano lat	1,67,547	1,07,037	64477	22685	13454	3,75,201
		Dio mel	1,67,598	1,28,983	63522	27368	13833	4,01,311
		Misc	15,96,833	8,66,660	4,23,528	1,32,291	1,12,765	31,32,072
		Sho rob	8,17,950	8,45,154	6,14,111	2,59,081	1,97,220	27,33,518
		Ter tom	26622	19572	12170	4875	2783	66021
	Sub-Total		27,76,550	19,67,406	11,77,808	4,46,300	3,40,056	67,08,123
	Total		34,84,362	24,42,408	14,61,339	5,62,064	4,19,745	83,69,915

Tamra	Non-SIWC	All species	12,22,584	8,20,458	4,89,735	1,99,956	1,37,646	28,70,368
	Sub-Total		12,22,584	8,20,458	4,89,735	1,99,956	1,37,646	28,70,368
	SIWC	Ano lat	173089	99168	52536	19067	9541	3,53,402
		Dio mel	177187	102782	54905	19881	9790	3,64,549
		Misc	14,44,757	7,53,831	3,52,936	112234	82883	27,46,644
		Sho rob	7,81,208	7,00,587	5,04,538	207194	158485	23,52,007
		Ter tom	30579	21505	12945	6600	1812	73436
	Sub-Total		26,06,820	16,77,872	9,77,859	3,64,975	2,62,511	58,90,037
	Total		38,29,403	24,98,330	14,67,594	5,64,931	4,00,156	87,60,405
	Grand Total		2,55,61,861	1,69,56,727	1,00,83,201	39,80,246	28,50,047	5,94,32,061

Estimated stand range wise, block wise, and compartment wise for SIWC and non-SIWC have appended in Annexure IIA

(iii) Stock (volume in cum) – Calculation of volume of growing stock has been done block wise for SIWC and Non SIWC. A volume equation as provided is used for computations of Volume. The total estimated volume of the trees in this Division is 22400157 cum.

Estimated stock for the entire division(for SWC and non-SWC) is as shown in the following table.

Range	WC	SPECIES	GIRTH CLASSES					
			30-60	60-90	90-120	120-150	150-300	Total
Barsuan	Non-SIWC	All species	1,36,451	2,59,588	3,20,479	2,29,185	3,04,496	12,50,197
	Sub-Total		1,36,451	2,59,588	3,20,479	2,29,185	3,04,496	12,50,197
	SIWC	Ano lat	16,359	29575	34037	22871	21942	1,24,784
		Dio mel	10,945	24906	28719	23641	16947	1,05,158
		Misc	1,50,280	2,28,795	2,34,202	146856	205642	9,65,775
		Sho rob	55,775	1,84,701	2,98,419	239764	353554	11,32,213
		Ter tom	1,601	3,584	5,500	5,129	5,887	21,701
	Sub-Total		2,34,960	4,71,561	6,00,877	4,38,261	6,03,972	23,49,631
	Total		3,71,411	7,31,149	9,21,356	6,67,446	9,08,468	35,99,828
Bonai	Non-SIWC	All species	38,846	62,863	79,489	47,243	76,743	3,05,184
	Sub-Total		38,846	62,863	79,489	47,243	76,743	3,05,184
	SIWC	Ano lat	4,872	9112	10561	7248	6550	38,343
		Dio mel	3,420	7951	9544	7057	5410	33,381
		Misc	44,975	67,985	71,106	40,947	64574	2,89,585
		Sho rob	15,946	50,150	82,333	65,622	92,972	3,07,021
		Ter tom	468	1085	1407	1243	1422	5,624
	Sub-Total		69,680	1,36,282	1,74,950	1,22,115	1,70,927	6,73,953
	Total		1,08,526	1,99,145	2,54,439	1,69,358	2,47,670	9,79,137

Jarda	Non-SIWC	All species	3,490	6,475	8,093	5,357	7,839	31,254
	Sub-Total		3,490	6,475	8,093	5,357	7,839	31,254
	SIWC	Ano lat	18,222	34,217	41,978	27,464	28,219	1,50,100
		Dio mel	13,119	30,545	39,031	30,019	25,496	1,38,210
		Misc	1,75,562	2,79,861	3,20,296	1,74,882	2,76,616	12,27,217
		Sho rob	59,175	2,07,800	3,61,428	2,94,162	4,34,085	13,56,649
		Ter tom	1838	4846	6773	4586	5110	23,152
	Sub-Total		2,67,916	5,57,268	7,69,505	5,31,113	7,69,526	28,95,327
Koirra	Non-SIWC	All species	82,357	1,56,215	1,99,721	1,38,061	1,99,780	7,76,134
	Sub-Total		82,357	1,56,215	1,99,721	1,38,061	1,99,780	7,76,134
	SIWC	Ano lat	10,297	18,599	20089	13733	14021	76,739
		Dio mel	6,787	15,863	18823	14782	11641	67,896
		Misc	96,668	1,41,356	1,48,772	89,381	1,36,162	6,12,339
		Sho rob	36,147	1,19,568	1,95,004	1,55,052	2,23,957	7,29,728
		Ter tom	1343	2247	3465	3248	3983	14,286
	Sub-Total		1,51,242	2,97,633	3,86,153	2,76,196	3,89,764	15,00,988
Kuliposh	Non-SIWC	All species	1,15,160	2,21,540	2,82,247	1,96,929	2,73,913	10,89,787
	Sub-Total		1,15,160	2,21,540	2,82,247	1,96,929	2,73,913	10,89,787
	SIWC	Ano lat	12,996	23,656	31712	21664	18983	1,09,011
		Dio mel	8,512	19,850	22831	18107	12405	81,705
		Misc	1,18,686	1,78,810	1,87,131	1,16,766	1,64,600	7,65,993
		Sho rob	41,424	1,27,756	2,08,984	1,64,741	2,51,349	7,94,254
		Ter tom	1257	2785	3584	4808	4027	16,461
	Sub-Total		1,82,875	3,52,857	4,54,242	3,26,086	4,51,364	17,67,424
	Total		2,98,035	5,74,397	7,36,489	5,23,015	7,25,277	28,57,211
Sole	Non-SWC	All species	37,567	80,904	99,136	71,401	67,531	3,56,539
	Sub-Total		37,567	80,904	99,136	71,401	67,531	3,56,539
	SWC	Ano lat	19,286	37,744	47973	29918	34454	1,69,374
		Dio mel	14,091	39,924	42730	30646	28467	1,55,857
		Misc	1,87,166	3,06,658	3,23,606	1,86,217	2,88,320	12,91,967
		Sho rob	63,765	2,31,384	3,90,891	3,11,442	4,72,345	14,69,826
		Ter tom	1815	4540	6547	5082	6039	24,023
	Sub-Total		2,86,122	6,20,249	8,11,747	5,63,305	8,29,624	31,11,047
Tamra	Non-SIWC	All species	63,450	1,26,851	1,58,537	1,13,376	1,47,894	6,10,108
	Sub-Total		63,450	1,26,851	1,58,537	1,13,376	1,47,894	6,10,108
	SIWC	Ano lat	18429	33916	36661	23045	21318	1,33,368
		Dio mel	13915	29274	33474	20867	17341	1,14,871
		Misc	1,59,080	2,39,946	2,50,999	143222	213330	10,06,576
		Sho rob	57,869	1,82,563	2,97,487	231155	354516	11,23,589
		Ter tom	2093	4982	6176	5275	4198	22,723
	Sub-Total		2,51,385	4,90,681	6,24,797	4,23,562	6,10,702	24,01,126
	Total		3,14,835	6,17,532	7,83,334	5,36,938	7,58,596	30,11,234
	Grand Total		19,21,500	38,40,966	49,69,972	34,82,188	49,04,073	1,91,18,699

12.1.5.11. Yield Calculation :

The yield will be regulated by area with a percentage check on the removal of exploitable trees as calculated by Smythies' safeguarding formula. This formula is also known as U.P. safeguarding formula. Smythies evolved it for the Sal forests of Uttar Pradesh for sustainable yield. The formula is based on the following assumptions, which holds true for the forest blocks allotted to Selection Working Circle.

The exploitable (Selection) trees already exist and are being recruited almost throughout the area (and not in any particular compartments) and that felling passes regularly through the forests in consecutive annual coupes in a felling cycle of 10 or 20 years. The basic objective of management is to ensure, as far as possible, sustained yield of exploitable trees and volume above the exploitation limit at every felling cycle. The middle aged and younger diameter classes are well represented and the present rate of recruitment into the two highest diameter classes (I and II) is not likely to decrease in the near future. Sustained yield of Selection trees is adequately safeguarded, if in any area, the number that may be felled is limited to the number that will pass up from below by the time felling comes round again.

The yield available during the felling cycle as the number of trees of the next lower class (Class-II) hereafter referred to as approach class that can be expected to grow to exploitable size (Class-I) during the period of the felling cycle is determined by following tree formula. The annual yield is then expressed as a percentage of the selection trees present in the coupe at the time of marking.

Formula – $Y = (X / 1 + X/2) 100 + A$, (where Y = Annual yield expressed as percentage, X = The number of class-II trees (approach class) that survive and enter into class-I trees (exploitable class) during the felling cycle, I = The number of selection trees as enumerated, A = An arbitrary fraction for rounding of the value of Y).

The value of X can be calculated by the formula given below.

$$X = (II - Z\% \text{ of } II) F/T.$$

Where,

F = The felling cycle.

T = The average period that the class-II trees will take to enter in to class-I

II = The number of class-II trees enumerated in felling series.

Z = The mortality percentage (% of class-II trees disappear in T years)

Detailed yield calculation for various blocks have illustrated in the Chapter -2 of Part II of the Plan.

12.1.5.12 Enumeration and Analysis of Bamboo:

Bamboo enumeration has been taken up during sample point enumeration in the field. The bamboo clumps available inside the main plot have been enumerated simultaneously with the tree enumeration and recorded in form No. "C" with details of average clump diameter, number of sound green culms, number of green-damaged/twisted culms, number of dry sound culms, and number of dry-damaged/twisted culms, and culms height Unlike the quality class of the Sal, the bamboo has been classified into three quality classes as per the culms height as shown below in the table 12.1.5.12.1.

Table No. 12.1.5.12.1		
Quality Classes of Bamboo		
Sl. No.	Quality	Height of culms in mt.
1.	Class-I	09 and above
2.	Class-II	06 to <09
3.	Class-III	<06
Sources- Out going Working Plan of Bonai Forest Division		

Effort has been made to estimate the growing stock of the Bamboo. For this it is necessary to first calculate the total number of clumps per hector, this when multiplied by the total bamboo producing area of the Division gives the total number of clump in entire Division. Similarly when total number of clumps multiplied by the average number of culms per clumps gives the total numbers of culms in the Division. Efforts have also been made to estimate the entire production of bamboo of the Division in terms of sale units (SU). As such the average height of the culms of each bamboo bearing block has been calculated separately basing on the inventory data.

Total number of culms of bamboo in the Division multiplied by mean height of the culms gives the total length of bamboo. Sale Unit is the total running meter of bamboo culms in the Division divided by 2400. This gives the total sale unit of the bamboo of the Division. Whereas 2400 running meter is taken as on standard sale of bamboo, which is equal to 01 metric ton.

General observation and enumeration results indicate poor availability of commercially exploitable bamboos in majority of forest blocks, However, after extrapolation of data in the enumerated blocks, growing stock has estimated and it come to 54703 sale units. An estimate of the total number of culms and clump in the Division along with the estimate of the production of bamboo is as under in table 12.1.5.12.2.

Table 12.1.5.12.2: An estimate of total growing stock of bamboo in the division(Forest Block wise)												
Name of Block	Area in Ha	Area enumerated (in ha)	No. of clumps enumerated	Average No. of Clumps per ha	Total No.of culms enumerated	No. of culms per clumps	Total No. of clumps in the block	Total No. of culms in the block	Average Height	Total culm length (meter)	Total Sale Units (No.)	
Balai RF	3295.938	1	10	10.0	62	6.2	32959	204348	6	1226089	511	
Balia RF	1435.813	2.1	21	10.0	819	81.9	14358	1175931	6	7055585	2940	
Budhapahad RF	1064.465	0.4	4	10.0	79	7.9	10645	84093	6	504556	210	
Dhenkiam RF	5673.877	2.5	42	16.8	56	3.3	95321	317737	6	1906423	794	
Gurundia RF	2514.282	3.1	100	32.3	257	8.0	81106	646170	6	3877023	1615	
Jada RF	1714.5	0.7	16	22.9	5	0.2	39189	8573	6	51435	21	
Kantamunda RF	4349.688	9.5	740	77.9	809	10.4	338818	3518898	6	21113386	8797	
Kello RF	2041.978	1.9	19	10.0	610	61.0	20420	1245607	6	7473639	3114	
Kunjar RF	4591.043	6.6	180	27.3	265	9.7	125210	1216626	6	7299758	3042	
Kusumdihi RF	5227.625	1.3	17	13.1	31	2.4	68361	162056	6	972338	405	
Lunga RF	1528.709	0.7	7	10.0	2	0.2	15287	3057	6	18345	8	
Mahulpada RF	3403.15	1	10	10.0	27	2.7	34032	91885	6	551310	230	
Majurdima RF	3339.25	2.2	34	15.5	503	32.5	51607	1679643	6	10077857	4199	
Raipiri RF	6614.326	2.2	34	15.5	641	41.5	102221	4239783	6	25438698	10599	
Rushimath RF	6666.303	7.7	442	57.4	770	13.4	382663	5133053	6	30798320	12833	
Sinduria RF	1034.157	0.5	5	10.0	100	10.0	10342	103416	6	620494	259	
Sirigida RF	4393.563	3.2	38	11.9	269	22.7	52174	1181868	6	7091211	2955	
Suluguda RF	2505.208	1.9	63	33.2	91	2.7	83067	227974	6	1367844	570	
Ulsura RF	1387.192	2.3	75	32.6	353	10.8	45235	489679	6	2938073	1224	
Balai PRF	88.5	0.8	8	10.0	46	4.6	885	4071	6	24426	10	
Gurundia PRF	905.501	1	35	35.0	125	3.6	31693	113188	6	679126	283	

Kantamunda PRF	229.75	0.3	3	10.0	49	4.9	2298	11258	6	67547	28
Kantamunda-I(Part-II) PRF	289.5	0.5	16	32.0	6	0.2	9264	1737	6	10422	4
KUSMDIHI PRF	345.251	0.6	7	11.7	26	2.2	4028	8977	6	53859	22
Mahuldihi (Part-I) PRF	315.685	1	32	32.0	22	0.7	10102	6945	6	41670	17
Sirigida PRF	73.312	0.5	5	10.0	53	5.3	733	3886	6	23313	10
Solguda PRF	62.812	0.5	15	30.0	15	0.5	1884	942	6	5653	2
Total :-	65092	56	1978	597	6091	350	1663900	21881400	162	131288399	54703

12.2. Statistics of Forest Carbon Stock:

12.2.1 Carbon stock of forests within Working Plan area

Carbon stock of the forest has been estimated by considering the enumeration results of all the sample plots.

Along with nested quadrates of 3m x 3m and 1mx1m, one more quadrate of size 5m x 5m at NE and SW direction may be laid out for the estimation of carbon stock. In 5m x 5m, all the dead wood above 5cm diameter (15cm girth) are to be collected, weighed and recorded. In 3m x 3m, all the woody litter *i.e.* branches below 5cm diameter (15cm girth), are to be collected, weighed and recorded. In 3mx3m, all shrubs and climbers are to be up-rooted, weighed and recorded. In 1mx1m plot, all herbs/grasses including leaf litter are to be collected, weighed and recorded. In 1mx1m plot, forest floor are to be swept, collected, recorded and a portion will be kept for carbon analysis. After that a pit of 30cmx30cmx30cm are to be dug at the centre of these 1mx1m plots and a composite sample of soil weighing 200gm are to be kept for organic carbon analysis. But the shrubs, climbers, herbs, grasses in all the quadrates of 3m x 3m and 1m x 1m have not been uprooted. For estimation of the carbon stock, a

default value may be multiplied to the total bio mass of shrubs, climbers, herbs, grasses.

From the enumeration data of trees above 30cm girth, the volume of individual species is calculated from the volume table for the species. The bole mass of the species can be calculated by multiplying the specific gravity of that species with the volume of the species. The Above Ground Biomass (AGB) of the species of 30 cm girth and above are found out by multiplying the total bio mass of the species with the Bio mass Expansion factor (BEF) of that species. For Sal and its associates the BEF (IPCC 2006) is 1.74. From the data of AGB, the Below Ground Biomass (BGB) i.e bio mass of roots of the species can be calculated by multiplying a default value of 0.26(IPCC 2006) with the Above Ground Biomass (AGB). The Dead Wood Biomass are calculated by weighing the dry fallen wood, branches, twigs and humus. The Dead Organic Biomass can also be calculated by multiplying the constant factor 0.11(IPCC,2006) with the sum of AGB and BGB. The total Bio mass of 0.1ha.area is calculated by summing up the Above Ground Biomass (AGB), Below Ground Biomass (BGB) and Dead Wood Biomass (DWB). The carbon stock of total Biomass is calculated by multiplying a constant factor 0.47. (IPCC 2006) with the value of total Bio mass.

The soil Carbon stock can be calculated by analyzing the Carbon content of 200 gms of soil collected from pits of 30cm x 30cm x 30cm on South-East and North-West corners of main plot. The Soil Carbon stock of 0.1 ha. area is estimated and is added to the Carbon stock derived from the total Bio mass (AGB+BGB+DWB).

In this manner the Carbon stock of 0.1ha. area is calculated and Carbon stock per ha is estimated. The Carbon stock of a Forest Block is calculated by taking the average Carbon stock of the sample plots of that Forest Block and then multiplying the average Carbon stock of 1ha. area with the area of that Forest Block.

The Carbon stock of a Forest Division is estimated by adding Carbon stocks of all the Forest Ranges under the jurisdiction of the Division. The estimation of carbon stock of a Forest Division should be as accurate as possible and it should be transparent. As per guidelines of Intergovernmental Panel on Climate Change (IPCC) there should be mechanism for measurement, reporting and verification (MRV) of Carbon stock at national and sub-national level. For this purpose Permanent Sample Plots (PSP) are to be laid in the Division in different strata of forest.

The estimation of Carbon stock of forests within the working plan area(range wise) and whole of Bonai Forest Division has been made from the volume estimated by NRSC/ORSAC and the same is furnished in the table 12.2.1

Table 12.2.1- Carbon Stock of forests within the working plan area

Forest Range	Working Circle	Name of Species	Total Volume(in cub m)	Specific gravity	Bole mass (4 x 5)	Above Ground Biomass (6x1.74)	Below Ground Biomass (7x0.26)	Dead Organic Biomass (7+8)x0.11)	Total Biomass (7+8+9)	Carbon Stock (10x0.47) in Tons
1	2	3	4	5	6	7	8	9	10	11
Barsuan	SWC	Ano lat	124784.0	0.76	94461	164363	42734	22781	229878	108043
		Dio mel	105158.0	0.69	72244	125704	32683	17423	175809	82630
		Misc	965775.0	0.60	579465	1008269	262150	139746	1410165	662778
		Sho rob	1132213.0	0.68	774434	1347515	350354	186766	1884634	885778
		Ter tom	21701.0	0.60	13021	22656	5891	3140	31686	14893
	Non SWC	All species	1250197.0	0.60	750118	1305206	339353	180902	1825461	857967
	Subtotal		3599828.0		2283743	3973712	1033165	550756	5557634	2612088

Bonai	SWC	Ano lat	38342.5	0.76	29025	50504	13131	7000	70635	33198
		Dio mel	33380.5	0.69	22932	39902	10375	5530	55807	26230
		Misc	289585.0	0.60	173751	302327	78605	41902	422834	198732
		Sho rob	307021.0	0.68	210002	365404	95005	50645	511054	240195
		Ter tom	5624.0	0.60	3374	5871	1527	814	8212	3860
	Non SWC	All species	38846.0	0.60	23308	40555	10544	5621	56721	26659
	Subtotal		712799.0		462393	804564	209187	111513	1125263	528874
Jarda	SWC	Ano lat	150099.8	0.76	113626	197708	51404	27402	276515	129962
		Dio mel	138209.5	0.69	94950	165213	42955	22899	231067	108601
		Misc	1227216.8	0.60	736330	1281214	333116	177576	1791906	842196
		Sho rob	1356649.0	0.68	927948	1614629	419804	223788	2258221	1061364
		Ter tom	23152.3	0.60	13891	24171	6284	3350	33805	15889
	Non SWC	All species	3490.0	0.60	2094	3644	947	505	5096	2395
	Subtotal		2898817.3		1888839	3286579	854511	455520	4596610	2160407

Koirā	SWC	Ano lat	76739.0	0.76	58091	101079	26281	14010	141369	66444
		Dio mel	67896.0	0.69	46645	81162	21102	11249	113513	53351
		Misc	612339.0	0.60	367403	639282	166213	88604	894100	420227
		Sho rob	729728.0	0.68	499134	868493	225808	120373	1214674	570897
		Ter tom	14286.0	0.60	8572	14915	3878	2067	20860	9804
	Non SWC	All species	82357.0	0.60	49414	85981	22355	11917	120253	56519
	Subtotal		1583345.0		1029259	1790911	465637	248220	2504768	1177241
Kuliposh	SWC	Ano lat	109011.0	0.76	82521	143587	37333	19901	200821	94386
		Dio mel	81705.0	0.69	56131	97669	25394	13537	136599	64202
		Misc	765993.0	0.60	459596	799697	207921	110838	1118456	525674
		Sho rob	794254.0	0.68	543270	945289	245775	131017	1322082	621378
		Ter tom	16461.0	0.60	9877	17185	4468	2382	24035	11297
	Non SWC	All species	115159.5	0.60	69096	120227	31259	16663	168149	79030
	Subtotal		1882583.5		1220490	2123653	552150	294338	2970142	1395967

Sole	SWC	Ano lat	169374.0	0.76	128216	223096	58005	30921	312022	146650
		Dio mel	155857.0	0.69	107074	186308	48440	25822	260571	122468
		Misc	1291967.0	0.60	775180	1348814	350692	186946	1886451	886632
		Sho rob	1469826.3	0.68	1005361	1749328	454825	242457	2446611	1149907
		Ter tom	24022.5	0.60	14414	25079	6521	3476	35076	16486
	Non SWC	All species	37567.0	0.60	22540	39220	10197	5436	54853	25781
	Subtotal		3148613.8		2052785	3571846	928680	495058	4995584	2347924
Tamra	SWC	Ano lat	133367.5	0.76	100959	175669	45674	24348	245691	115475
		Dio mel	114870.8	0.69	78916	137314	35702	19032	192048	90262
		Misc	1006575.5	0.60	603945	1050865	273225	145650	1469740	690778
		Sho rob	1123589.3	0.68	768535	1337251	347685	185343	1870279	879031
		Ter tom	22722.5	0.60	13634	23722	6168	3288	33178	15594
	Non SWC	All species	63450.0	0.60	38070	66242	17223	9181	92646	43544
	Subtotal		2464576		1604059	2791063	725676	386841	3903581	1834683
TOTAL			16290562	0.00	10541568	18342329	4769005	2542247	25653581	12057183

12.2.2. Carbon stock of ToF:

Carbon stock of trees outside forests has got calculated and furnished in the following table. 12.2.2.

12.2.2. Carbon stock of Trees outside Forests											
Name of Range	Category of ToF	Area in ha.	G.S./ha.	Total Volume (3x4)	Specific gravity	Bole Mass (5X6)	Above Ground Bio Mass (7x1.74)	Below Ground Bio Mass (8x0.26)	Dead Organ Mass (8+9)x0.11	Total Biomass (8+9+10)	Carbon Stock (in Ton) (11x0.4)
1	2	3	4	5	6	7	8	9	10	11	12
Barsuan	Plantations raised in Revenue Forest lands	869.00	45	39105	0.75	29328.75	51032.03	13268.33	7073.04	71373.39	28549.36
	Plantations raised in Non-Forest lands	204.08	50	10204	0.75	7653.00	13316.22	3462.22	1845.63	18624.07	7449.63
Bonai	Plantations raised in Revenue Forest lands	2539.78	55	139688.01	0.75	104766.01	182292.85	47396.14	25265.79	254954.78	101981.91
	Plantations raised in Non-Forest lands	165.38	50	8269	0.75	6201.75	10791.05	2805.67	1495.64	15092.36	6036.94
Jarda	Plantations raised in Revenue Forest lands	1180.59	55	64932.45	0.75	48699.34	84736.85	22031.58	11744.53	118512.95	47405.18
	Plantations raised in Non-Forest lands	39.30	45	1768.5	0.75	1326.38	2307.89	600.05	319.87	3227.82	1291.13
Koira	Plantations raised in Revenue Forest lands	459.73	50	22986.6	0.75	17239.95	29997.51	7799.35	4157.66	41954.52	16781.81
	Plantations raised in Non-Forest lands	171.74	55	9445.645	0.75	7084.23	12326.57	3204.91	1708.46	17239.94	6895.97
Kuliposh	Plantations raised in Revenue Forest lands	3284.50	45	147802.5	0.75	110851.88	192882.26	50149.39	26733.48	269765.13	107906.05
	Plantations raised in Non-Forest lands	89.18	55	4904.9	0.75	3678.68	6400.89	1664.23	887.16	8952.29	3580.92

Sole	Plantations raised in Revenue Forest lands	488.00	45	21960	0.75	16470.00	28657.80	7451.03	3971.97	40080.80	16032.32
	Plantations raised in Non-Forest lands	1394.43	45	62749.395	0.75	47062.05	81887.96	21290.87	11349.67	114528.50	45811.40
Tamra	Plantations raised in Revenue Forest lands	3179.13	50	158956.7	0.75	119217.53	207438.49	53934.01	28750.98	290123.48	116049.39
	Plantations raised in Non-Forest lands	68.92	55	3790.6	0.75	2842.95	4946.73	1286.15	685.62	6918.50	2767.40
Total		14133.77	700	696563.30		522422.48	909015.11	236343.93	125989.49	1271348.53	508539.41

12.2.3. Total Carbon Stock: From the above discussed paras(Para.12.2.1& para.12.2.2) the total carbon stock is worked out to be 12,565³ tons.