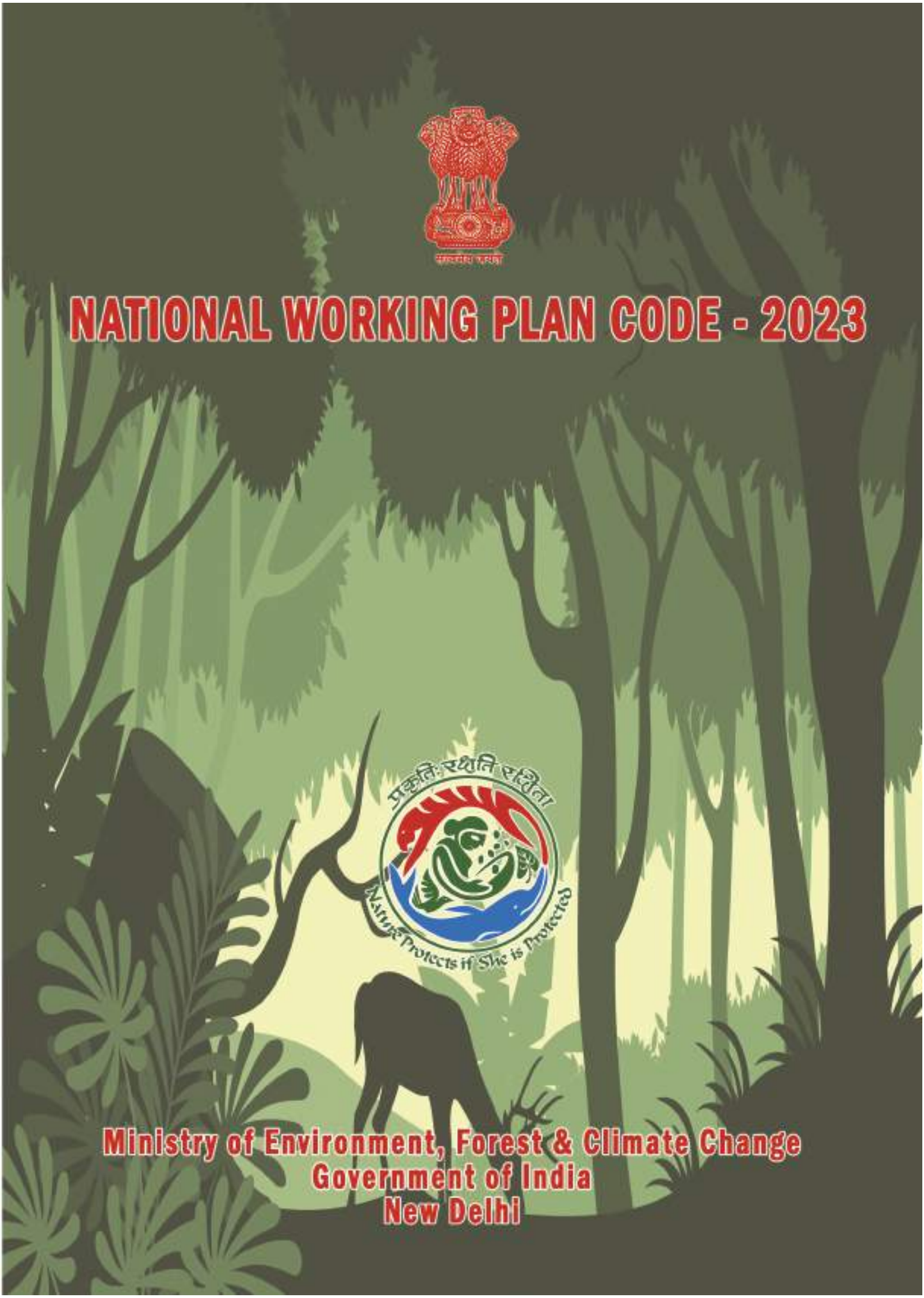
NATIONAL WORKING PLAN CODE - 2023
प्रकृति: रक्षति रक्षिता
Nature Protects if She is Protected
Ministry of Environment, Forest & Climate Change
Government of India
New Delhi

For copy write to:
Assistant Inspector General of Forests
Survey and Utilization Division
Ministry of Environment, Forest and Climate Change
Indira Paryavaran Bhawan,
Jorbagh Road, New Delhi - 110 003.

NATIONAL WORKING PLAN CODE, 2023

(for Sustainable Management of Forests and Biodiversity in India)

June 2023

Ministry of Environment, Forest and Climate Change
Government of India
New Delhi

मंत्री
पर्यावरण, वन एवं जलवायु परिवर्तन
और
श्रम एवं रोजगार
भारत सरकार

सत्यमेव जयते

MINISTER
ENVIRONMENT, FOREST AND CLIMATE CHANGE
AND
LABOUR & EMPLOYMENT
GOVERNMENT OF INDIA

एक कदम स्वच्छता की ओर

आज़ादी का अमृत महोत्सव

भूपेन्द्र यादव
BHUPENDER YADAV

FOREWORD

India is one of the few countries in the world that has a scientific system of forest management. The working plan is the main instrument through which the scientific management of Forests is being achieved in India. National Working Plan Code which was first adopted in 2004 with a subsequent amendment in 2014 brought uniformity and acted as the guiding principle for the preparation of the working plan for scientific management of different forest divisions of our country.

The forests in India are being managed for a multitude of reasons like maintaining environmental stability, conserving natural heritage, checking soil erosion and denudation of catchment areas, checking the extension of dunes, increasing tree and forest cover with people involvement, increasing the productivity of forests etc. Scientific forest management in India and the world is consistently evolving with new approaches, new technologies & innovations and it has become imperative to evolve ourselves to meet the essentials of forest management and the requirements of people who depended on it.

At this juncture, I am happy to share that to manage the forests scientifically according to the evolving needs and involving the principles of sustainable management, the Ministry of Environment, Forest & Climate change has come up with the "National Working Plan Code-2023" to deal with various challenges posed against the forests of India and its scientific management based on National Forest Policy.

"The National Working Plan Code-2023" has been prepared to incorporate the internationally accepted and evolving principles of sustainable forest management and will continue to bring uniformity into scientific forest management in India and integrate multiple functions of forests in the country with the application of modern tools and techniques.

The National Working Plan Code- 2023 includes the "Indian Forest Management Standard", a unique document which provides standards for all principles of sustainable forest management practised in the country in measurable terms. The standard has solutions for the complex issues and challenges posed by the diverse forest management in the country. The Indian Forest Management Standard will also act as an evaluation of the management effectiveness of the working plan prescriptions in the forest area of our country.

I congratulate DGF&SS and his team in the Ministry for the preparation of this important document. I am confident that this code will act as a guiding principle for the forest officers in preparation for the working plan for different forest divisions in the country.

With Best Wishes.

Date: 01 **.06.2023**

(Bhupender Yadav)

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अश्विनी कुमार चौबे
Ashwini Kumar Choubey

सत्यमेव जयते
आहारशुद्धौ सत्त्वशुद्धिः
एक कदम स्वच्छता की ओर

राज्य मंत्री
पर्यावरण, वन एवं जलवायु परिवर्तन
उपभोक्ता मामले, खाद्य और सार्वजनिक वितरण
भारत सरकार
MINISTER OF STATE
ENVIRONMENT, FOREST AND CLIMATE CHANGE
CONSUMER AFFAIRS, FOOD & PUBLIC DISTRIBUTION
GOVERNMENT OF INDIA

प्रस्तावना

भारत में विविध प्रकार के वन हैं। इनमें सदाबहार वन, अर्ध-सदाबहार वन, नम पर्णपाती वन, शुष्क पर्णपाती वन, अल्पाइन वन, कांटेदार वन, मैंग्रोव वन आदि शामिल हैं। भले ही इन विभिन्न वनों का वैज्ञानिक प्रबंधन एक दूसरे से भिन्न हो, वनों के प्रबंधन के सिद्धांत और उद्देश्य समान रहते हैं। वन पारिस्थितिकी तंत्र जटिल है, इसलिए वनों का प्रबंधन भी उसी के अनुसार विकसित होना चाहिए।

''द नेशनल वर्किंग प्लान कोड-2023'' जिसे पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय द्वारा लाया गया है, हमारी आवश्यकताओं के अनुकूल वन प्रबंधन के अंतरराष्ट्रीय स्तर पर स्वीकृत सिद्धांतों में जटिल वन पारिस्थितिक तंत्र के प्रबंधन के लिए समाधान लाता है। नया कोड तुलनात्मक रूप से एक संक्षिप्त दस्तावेज है, जो वनों के वैज्ञानिक प्रबंधन के लिए कार्य योजना तैयार करने के लिए व्यापक सिद्धांतों को निर्धारित करता है।

"भारतीय वन प्रबंधन मानक" जो कि वर्किंग प्लान का एक अभिन्न अंग है, भारत में प्राकृतिक वनों के संधारणीय प्रबंधन के लिए मानदंडों और संकेतकों के एक राष्ट्रीय सेट के रूप में विकसित किया गया है। मानदंडों और संकेतकों के अलावा, इस मानक के माध्यम से संधारणीय वन प्रबंधन के सिद्धांतों को प्राप्त करने के समग्र उद्देश्य से सत्यापनकर्ता, इच्छित स्थिति और आवधिकता का भी उल्लेख किया गया है। यह मानक हमारे देश में वनों की सभी प्रबंधन परिपाटियों के लिए एक निगरानी तंत्र के रूप में कार्य करेगा जिससे वन प्रबंधन के उद्देश्यों को प्राप्त किया जा सके।

मैं पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय की पूरी टीम को राष्ट्रीय कार्य योजना कोड-2023 तैयार करने के लिए बधाई देता हूं। मुझे पूर्ण विश्वास है कि देश के सभी वन अधिकारी वनों के वैज्ञानिक प्रबंधन के लिए और इस पर निर्भर लोगों और समुदायों को सशक्त बनाने के लिए नए कोड के सिद्धांतों का उपयोग कर बेहतर आगामी कार्य योजना बनाएंगें।

(अश्विनी कुमार चौबे)

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लीना नन्दन
LEENA NANDAN

सचिव
भारत सरकार
पर्यावरण, वन और जलवायु परिवर्तन
SECRETARY
GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT, FOREST
& CLIMATE CHANGE

FOREWORD

It is a matter of great pride that the "National Working Plan Code – 2023" is being released by the Ministry of Environment, Forest and Climate change. This code gives uniform principles for scientific forest management in the country. The principles have been drawn from the internationally established, as well as from the currently evolving systems and criteria, along with indicators for sustainable forest management.

Forests in India are vulnerable to constantly increasing pressures and it is essential to find solutions for the upkeep of this complex natural ecosystem. The National Working Plan Code deals in detail with the essentials of forest management planning, incorporating the principles of sustainable management of forests which includes : Maintenance/increase in the extent and condition of forest and tree cover; maintenance, conservation and enhancement of biodiversity including wildlife; maintenance and enhancement of forest health and vitality; conservation and management of soil and water resources; maintenance and enhancement of forest resource productivity; optimization of forest resource productivity; maintenance and enhancement of social, economic, cultural and spiritual benefits; and providing the appropriate policy, legal and institutional framework.

The Code also includes the aspects of preparation of the working plan, submission of the plan, approval, midterm review, monitoring, assessment and reporting of the implementation of the working plan, formats for Preliminary working plan report, format for the working plan, all of which would assist forest officers in the efficient implementation of these activities in future.

Contd...2/-

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The "Indian Forest Management Standard" which is a part of this Code, is a carefully drafted document that takes into account the diverse forest ecosystem in our country, while trying to bring in uniformity in management. The standard is a basis for monitoring, with guidelines for sustainable forest management in terms of a broad framework comprising criteria, indicators and verifiers, that overall recognizes the environmental, economic and social objectives of maintaining forests. The State Forest Departments can adopt these indicators and verifiers according to their specific conditions and local needs.

I am confident that the National Working Plan Code – 2023 will be implemented in letter and spirit by forest officers across the country. The goal is scientific management of our forests, and innovative solutions to the problems faced by forests, as also for empowering the people who are dependent on the forest for their livelihood. I congratulate the entire team of the Ministry of Environment, Forest and Climate Change, for their pain-staking efforts towards bringing out this Code, and also for their future endeavours.

(Leena Nandan)

Dated: June 1, 2023.

चन्द्र प्रकाश गोयल
CHANDRA PRAKASH GOYAL

सत्यमेव जयते

वन महानिदेशक एवं विशेष सचिव
भारत सरकार
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
DIRECTOR GENERAL OF FOREST & SPL. SECY.
GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT FOREST AND
CLIMATE CHANGE

FOREWORD

It is indeed a pleasure that the Ministry of Environment, Forest & Climate change is bringing out the National Working Plan Code - 2023 for scientific management of forests which is a revision of the Working Plan Code of 2014. Historically, India is one of the few countries in the world where scientific forest management is being practised. Forests are valuable resources which need to be protected for their economic, ecological, scientific & cultural values and also for the ecosystem services like water, medicine, carbon sequestration etc.

In the past, scientific forest management was focused more on timber production as per the prescriptions of the working plans. However, the scope of scientific forest management has been broadened during the last 3-4 decades to include other aspects of management including biodiversity conservation, participatory management, eco-tourism, ecosystem services, carbon sequestration etc. The working plans for the forest divisions are the main instrument to attain the objectives of forest management and the principles of forest management need to evolve as per the current needs and requirements of the country.

The new code lays down the principles for the preparation of working plans and procedures for its approval. For the first time, the new code has suggested state forest departments engage in continuous data collection and its updation in a centralized database. The new code has also suggested guidance for state-level consultative committees and Integrated Regional Offices for examination and approval of Preliminary working plan reports and working plans.

The National Working Plan Code – 2023 will be a primary referral document to all forest officers for scientific forest management in our country incorporating the principles of sustainable forest management. I congratulate Chairperson, Members and special invitees of the National Working Plan Code Revision Committee for the commendable job done in drafting the new code.

30.05.2023
(Chandra Prakash Goyal)

Place: New Delhi
Date: 30th May, 2023

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ABBREVIATIONS

ABS	Access and Benefit Sharing
AGB	Above Ground Biomass
AIGF	Assistant Inspector General of Forest
ANR	Assisted Natural Regeneration
APL	Above Poverty Line
BA	Basal Area per Ha
BCFT	British Commonwealth Forest Terminology
BD Act	Biological Diversity Act, 2002
BGB	Below Ground Biomass
BMCs	Biodiversity Management Committees
BPL	Below Poverty Line
BSI	Botanical Survey of India, Kolkata
CBD	Convention on Biological Diversity
CV	Coefficient of Variation
CW	Crown Width
CWLW	Chief Wildlife Warden
DBH	Diameter at Breast Height
DBT	Double Bark Thickness
DCO	Directorate of Census Operations
DFO	District/Divisional Forest Officer
DIGF	Deputy Inspector General of Forest
DOM	Dead Organic Matter
FAO	The Food and Agriculture Organization, Rome
FCA	Forest Conservation Act, 1980
FFVs	Forest Fringe Villages
FOD	Field Operation Division
FRA	Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006
FRI	Forest Research Institute, Dehradun
FSI	Forest Survey of India, Dehradun
FSU	First Stage Units
GIS	Geographical Information System
GPS	Global Positioning System
GVE	General Volume Equations
ICFRE	Indian Council of Forestry Research and Education, Dehradun
IFA	Indian Forest Act, 1927
IGF	Inspector General of Forest
IIFM	Indian Institute of Forest Management, Bhopal
IRO	Integrated Regional Office
IUCN	International Union for Conservation of Nature
LPG	Liquefied Petroleum Gas

LVE	Local Volume Equation
MADP	Medicinal, Aromatic, and Dye Plants
MAP	Medicinal and Aromatic Plants
MoEF&CC	Ministry of Environment, Forest and Climate Change
NPP	Net Primary Productivity
NSO	National Statistical Office
NTCA	National Tiger Conservation Authority
NTFP	Non-Timber Forest Produce
NWPC	National Working Plan Code
PCCF (HoFF)	Principal Chief Conservator of Forests & Head of Forest Force
PDF	Plot Description Form
PESA	Panchayats Extension to Scheduled Areas Act, 1996
PF	Protected Forest
PWPR	Preliminary Working Plan Report
RF	Reserved Forest
RFA	Recorded Forest Area
SCC	Standing Consultative Committee
SFDs	State Forest Departments
SRS	Simple Random Sampling
SSU	Second Stage Units
ToF	Trees Outside Forests
TSU	Third Stage Sampling Units
UFS	Urban Frame Survey
WC	Working Circles
WGS	World Geodetic System
WII	Wildlife Institute of India, Dehradun
WP	Working Plan
WPO	Working Plan Officer
ZSI	Zoological Survey of India, Kolkata

PREAMBLE

Whereas, the National Forest Policy envisages that no forests shall be worked without the Government approved management plan in the prescribed format;

Whereas, the National Forest Policy further envisages that the Central Government should issue necessary guidelines to the State Governments in this regard and monitor compliance;

Whereas, it is necessary to evaluate the status of a forest and other biodiversity resources of a forest division, assess the impact of past management practices, forecast future pressures on natural forests and plan for sustainable management of the forests based on sound silvicultural principles;

Whereas, it is essential to plan for area-specific prescriptions for the forests towards continuity of management of a particular forest crop in a forest division;

Whereas, it is realised that there is a need to bring uniformity in the forest management planning process in the country;

Whereas, it is realised that there is an interrelationship between forest land use and water yield of a catchment, both in quality and quantity. Realising the trade-off between water quality and quantity from any forested catchment, it is affirmed that forest may be manipulated through appropriate silvicultural interventions to maximise the water yield from the catchment while ensuring water quality within permissible limits;

Whereas, it is recognised that forests are affected not only by the ways they are being managed but also by what is happening in the surrounding landscape. It is therefore imperative that there shall be cross learnings amongst the management plans developed for wildlife, biodiversity, wetlands, coastal zones, agriculture, industry, regional and rural development activities;

Whereas, it is affirmed that promotion and monitoring of Trees Outside Forest (ToF) is essential for a sustainable supply of wood, enhancing the income of the farmers/tree growers and increasing the green cover for climate resilient development;

Whereas, it is realised that forests play a vital role in the mitigation of climate change as a natural carbon sink. At the same time, they may also be a source of emissions if managed unmindfully. There is a need to create a robust inventory of data on current carbon stock, the rate of carbon sequestration in different forest types, and climate change mitigation. At the same time, climate resilient management strategies with requisite adaptations are necessary.

Whereas, it is affirmed that societal needs and aspirations are to be incorporated into the sustainable management of the forests. The international conventions on Biodiversity Conservation, Climate Change and Combating Desertification to which India is a Party, are also to be considered.

Whereas, mindful of the fact that natural forests are primarily managed for conservation objectives, it is necessary that the role of forests in providing goods and services are looked upon

with equal emphasis, if not more, for ensuring that pressures on forests on account of unregulated removal are minimised. This requires enhancing the production function of the forests. Valuation of various goods and ecological services provided by the forests is necessary for attracting payments by the sectors receiving benefits of the goods and services and channelizing the same;

Whereas, Rule 10 of the Forest (Conservation) Rules 2022 has provided the procedure for seeking the approval of the working plan from the central government;

Therefore, in light of the above, now the National Working Plan Code 2023 is hereby formulated for preparation of working plans, their approval and monitoring. The preparation of Working Plan initiated after 1st July 2023 shall comply with National Working Plan Code (NWPC) 2023.

CHAPTER 1

GENERAL

1.1 Introduction

i) Working Plan is the main instrument of forest management planning in India since the dawn of scientific forest management. Evaluation of the status of forest crop and its biodiversity, assessment of the past systems of management and prescribing future treatments as per the management objectives are the essential components of working plans.

ii) The principles of working of forests were first drafted in 1837 by Mr. U. V. Munro, the then Superintendent of Forests in Travancore. Later in 1856, Dr. Dietrich Brandis propounded the fundamental principle that the first-class trees (trees over a prescribed diameter) to be felled in a year should be restricted to the growing stock of the second-class trees that will eventually replace them in that year. Based on this principle of yield control, he prepared the first forest management plan using strip sampling for the Pegu Yoma Forests of Myanmar in the year 1860.

iii) In 1884, Sir Wilhelm D Schlich, Inspector General of Forests, initiated a scientific approach towards the preparation of Working Plans. In 1891, W.E.D'arcy brought out a treatise "Preparation of Forest Working-Plans in India".

iv) In 1906, the Superintendent of Working Plans, Forest Research Institute, Dehradun was entrusted with checking of working plans prepared across the country. The research undertaken by FRI on silvicultural of important tree species and regeneration techniques led to science-based prescriptions of the working plans

v) With the enactment of Government of India Act 1935, the management of forests was transferred to the Provincial governments. After independence in 1947, the State forest departments brought substantial areas under scientific forest management by adopting state specific processes for the preparation of the WP as there was no uniform code for the preparation and approval of working plan in the country.

vi) The principal aim of the National Forest Policy, 1988 is ensuring environmental stability and maintenance of ecological balance. The management of forests for derivation of direct economic benefit must be subordinated to this principal aim. The policy also mandates management of forests with approved WP.

vii) The Hon'ble Supreme Court of India in its order dated 12-12-1996 in the case titled T.N. Godavarman Thirumalpad Vs Union of India and others ordered that the felling of trees in all forests is to remain suspended except in accordance with the Working Plans of the State Governments, as approved by the Central Government thereby emphasise the primacy of working plan in the sustainable management of forests. The Ministry of Environment and Forests (MoEF), Govt. of India adopted the National Working Plan Code – 2004 with a standardised procedure for preparation and approval of working plans for management of forests in the Country.

viii) In 2014, the National Working Plan Code was amended. Grid based sampling design was also introduced in the changing scenario of forest resource management with more

emphasis on the use of technological advancements. National Working Plan Code 2014 provided a framework for meeting the requirements of the objectives of the National Forest Policy and other international conventions/agreements by simultaneous implementation of the Indian Forest Act (IFA), 1927, Wildlife (Protection) Act, 1972, the Forest Conservation Act,(FCA) 1980, the Panchayats (Extension to the Scheduled Areas) Act,1996 (PESA), the Biological Diversity Act, 2002, and Scheduled tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006 (FRA).

ix) Now, this Code among other things endeavours to harmonise the management prescriptions of other area-based management such as national parks, wildlife sanctuaries, wildlife corridors, mangroves, eco-sensitive zones/areas, coastal regulation zones, wetlands and areas rich in biodiversity while finalising the management prescriptions in the working plans. The code also proposes continuous forest inventory and the use of national data base for the storage of data on forest inventory collected by the SFDs.

x) The code further prescribes a manual for the preparation of the working plan as **Annexure-I** and Indian Forest Management Standard as **Annexure-II**

1.2 Scope

i) All forests are to be managed under the prescriptions of a working plan/scheme. Working plans under this code are to be prepared generally for a period of 10 years for a territorial forest division. A provision for mid-term review of progress in implementation of Working Plans and scope for its extension for a further period of five (5) years has also been provided on case to case basis. It has been asserted that while considering management prescriptions in a WP a reference must be drawn to all the long-term management plans of adjoining areas (e.g. Wildlife Protected Areas, Eco-Sensitive Zones, Coastal Zones, Wetlands of Significance; and Biodiversity Heritage sites, wild animal corridors etc.) so as to bring in synergy in management endeavours.

ii) This Working Plan Code can also be made use for developing management Plans/working schemes for forests with the forest corporations, other government departments/District, Regional and Village Councils or under community or private ownerships, by the managers of such forests. These working schemes are generally prepared for 5 years and should not exceed 10 years.

iii) During the revision of a working plan, there shall be no annual working scheme for a forest division.

iv) For the forest division with forest area less than 1000 ha, management plans/working schemes may be prepared for a time period of 10 years.

CHAPTER 2

ESSENTIALS OF FOREST MANAGEMENT PLANNING

The forests are primarily managed for maintaining environmental stability, conserving natural heritage by preserving the natural forests, checking soil erosion and denudation of the catchments, checking the extension of sand dunes, increasing the forest/tree cover through afforestation programmes with active involvement of the people, meeting the requirements of the rural and tribal populations, increasing the productivity of forests to meet essential national needs and encouraging efficient utilisation of forest produce on the principles of sustainable forest management as provided in Indian Forest Management Standard (**Annexure-II**)

The essentials of sustainable management of forests are derived from the rich heritage of scientific forest management in India and internationally evolving system of criteria and indicators for sustainable forest management. These include 1) maintenance/increase in the extent and condition of forest and tree cover 2) maintenance, conservation and enhancement of biodiversity including wildlife 3) maintenance and enhancement of forest health and vitality together with establishment of regeneration 4) conservation and management of soil and water resources 5) maintenance and enhancement of forest resource productivity 6) optimization of forest resource utilization 7) maintenance and enhancement of social, economic, cultural and spiritual benefits and 8) providing appropriate policy, legal and institutional framework.

2.1 Extent and Condition of Forests and tree cover: Forest boundaries in India are legally defined and activities to be done within the forests are regulated. The diversions of forests for non-forest use are governed by the Forest (Conservation) Act 1980. The increase in green cover includes tree cover inside forests and the trees outside the forests. The changes in the legal status and the extent of forest area reflect whether the forest tree cover is maintained or increased or reduced. The change in the extent and the status of the forests are indicated by the following:

2.1.1 Area of forests under different legal status (Reserved Forests/Protected Forests/ Un-classed Forests / Village Forests and any other forests): Forests in India are legally classified as reserved forests, protected forests, village forests and un-classed forests under IFA 1927 with State specific amendments and State specific Forest Acts and the orders of Hon'ble SC dated 12-12-1996 in the case titled T.N. Godavarman Thirumalpad Vs Union of India and others. There are other categories of forests as well and a compilation of the legal categories of the forests and their change, if any, over a period of time reflects on the maintenance and extent of forests of a forest division.

2.1.2 Area of different forest types: Forest type is a unit of vegetation which possess characteristics in physiognomy and structure sufficiently pronounced to permit the differentiation from other such units. Description of natural forests into distinct forest types and their extent provide a scientific basis for their management. The assessment in the change in the extent of overtime is a reflection of alteration in productivity, and the status of the forest crop which will assist in the choice of silvicultural principles to be followed for suitable management practices.

2.1.3 Change in the category of forest cover: The FSI categorises the forest cover based on canopy density into very dense, moderately dense, open and scrub. Change in forest cover over a period of time reflects the actual changes of forest on the ground. The positive changes could be, among other things, attributed to better forest protection and related

conservation measures, including compensatory afforestation, whereas negative changes could be attributed to change of land use on account of developmental projects, excessive degradation due to anthropogenic pressures, harvesting of short rotation crop etc.

2.1.4 Area of different working circles: The forest is divided into different management zones as working circles based on the object of management. The working circles indicate the application of different set of silvicultural prescriptions and management practices in that area. A change in the area of working circle is often a reflection of change in the object of management and/or change in the status of vegetation.

2.1.5 Area of the Trees Outside Forests (ToF) : ToF contributes significantly to increase in the forest and tree cover of a forest division. Periodic monitoring of the change in area of ToF reflects the overall change in the forest and tree cover of the forest division.

2.1.6 Details of area of forests diverted under FCA: Diversion of forest lands allowed under the Forest (Conservation) Act envisage certain mandatory conditions for mitigating the impacts of such diversions. An analysis of the compliance of these conditions and progress in notification of the- Compensatory Afforestation areas as RF/PF is therefore, important.

2.1.7 Details of forest land where rights are given under the FRA: The FRA recognises specified forest rights in favour of forest dwelling scheduled tribes and other traditional forest dwellers and their communities. The nature and extent of individual forest rights recognised under FRA, the nature and extent/quantum of forest resources on which the community forest rights, and community forest resource rights have been recognised and the management practices prevalent to be indicated.

2.1.8 Details of forest land under encroachments: Forest encroachment often leads to change in land use and has an impact on the integrity of the forest. Encroachments could also lead to honeycombing of the forest leading to habitat fragmentation and adversely affecting wildlife.

2.1.9 Demarcation of boundaries: Area of forests with clear demarcation of boundary with boundary pillars, trenches and other measures enable protection of forest areas and analysis of all the measures taken up for protection of forest areas.

2.1.10 Details of any other factors affecting the existence of forests such as shifting cultivation, illegal mining etc.

2.2 Maintenance, Conservation and enhancement of forest biodiversity

The forests offer diverse habitats for plants, animals and microorganisms. Forest biodiversity encompasses not only the trees but also the multitude of plants, animals and microorganisms that inhabits the forest ecosystem and their genetic diversity. Higher the diversity, higher is the climate resilience and better livelihood opportunities for the forest-dependent communities. At the same time, loss of biodiversity makes it difficult for the ecosystem to recover from disturbances adversely affecting the forest dependent communities. Analysis of the impact of climate change and other factors including existing forest management may provide insight into suitable adaptive and corrective measures for conservation and biodiversity development. Different approaches are adopted in India for biodiversity conservation such as area-based conservation measures by establishing protected areas, species recovery programmes of threatened species and in-situ and ex-situ conservation programmes etc. These are indicated by the following:

2.2.1 Adjoining Protected Areas: Details of adjoining protected areas under Wildlife Protection Act, 1972 (National Parks/Wildlife Sanctuaries/Conservation Reserves/ Community Reserves/Tiger Reserves), Environment Protection Act, 1986 (Eco-sensitive zones/areas, Coastal Zone Regulation, Wetlands notified under Wetland Rules), Biological Diversity Act 2002 are important to be recorded as the status of these areas influences the status of forests and vice versa.

2.2.2 Species diversity: Diversity indices indicate the abundance and richness of species in a locality. Evaluation of these indices considering the management prescriptions provides insight into management options. Biodiversity richness is a proxy for the productivity and stability of a forest ecosystem.

2.2.3 Details of any species-specific conservation programmes: The presence of endemic, endangered species and actions taken up for their conservation, the progress and their impact.

2.2.4 Details of species prone to over exploitation: Some species, especially those that have a narrow ecological niche produce a smaller number of their individuals are more vulnerable to over exploitation than others. Identification of such species and their distribution and extent is helpful in devising the management interventions.

2.2.5 Details of unique/special habitats and high conservation value areas: Identification and mapping of these ecosystems which may include inviolate areas forms basis for special management interventions.

2.2.6 Details of diverse ecosystems such as grasslands, meadows, wetlands, mangroves, marine, deserts etc: Identification and mapping of these ecosystems and change over time forms the basis for sustainable management interventions.

2.2.7 Details of threats and challenges to vulnerable flora and fauna: Habitat fragmentation and unsustainable extraction and trade are serious threats that affect the population of flora and fauna. An analysis of various threats will help in formulating mitigation strategies.

2.3 Maintenance and Enhancement of Forest Health and Vitality

Natural forests are affected by various anthropogenic factors such as grazing, encroachment, forest fire, invasive alien species etc. Forests are also affected by natural phenomenon like flood, landslides, windstorms, pests and diseases etc. Presence or absence of regeneration is an indicator of good health of a forest. Inadequate regeneration necessitates an appropriate silvicultural intervention removing the factors that inhibit regeneration and its establishment. Forest vitality is the ability of the forest ecosystem to survive external disturbances and unfavourable conditions. Low vitality is normally caused by repetitive disturbances that allow very little time for the forests to recuperate. This needs attention of the manager for taking necessary steps. Following parameters help in understanding of health and vitality of forests and in deciding appropriate actions:

2.3.1 Status of regeneration of the principal species and its associates: The status of forest regeneration is estimated during the field survey. The regeneration status could be adequate, moderate or poor. In case the regeneration is inadequate or poor, then the factors that inhibit regeneration must be analysed and brought out clearly to enable suitable silvicultural/management interventions.

2.3.2 Details of forest fire: Forest fire is one of the agents that has a direct impact on the regeneration and vitality of the forest ecosystem. Uncontrolled fire has a deleterious effect on the regeneration. Repeated fire impacts the capacity of the forest to recover from its impact and thus reduces the vitality of the ecosystem. Fire frequency mapping and preparation of fire vulnerability maps help in effective forest fire management. The use of real time monitoring tools is a potential mechanism for effective fire management.

2.3.3 Natural factors such as floods, landslides and windstorms etc: Though natural calamities may not be prevented but their negative effects can be reduced. Documentation and assessment of all incidences of natural calamities and their impacts on forests, biodiversity and local communities can be useful for better planning and management.

2.3.4 Area affected by and protected from grazing: Uncontrolled livestock grazing in forest areas is detrimental to forest health and ecosystem vitality as it adversely impacts natural regeneration causes soil compaction and consequently diminishes the infiltration capacity of the soil. WPOs may ascertain livestock numbers from Animal Husbandry department and take the assistance of Grazing Settlement Officers to determine carrying capacity for grazing in forest areas.

2.3.5 Area infested with invasive alien species: Invasive alien species are a major threat to the forest ecosystem's vitality and its health in terms of biodiversity. They affect regeneration of principal species and their associates. Effective steps for eradication of invasive species are necessary for maintaining desired forest functions.

2.3.6 Details of incidence of pests and diseases: Pests and diseases affect the health and vitality of a forest ecosystem. Mapping of frequency of such events and the extent of area affected may help in devising effective strategies for prevention as well as control of such incidents. These strategies may include adoption of suitable silvicultural practices, use of healthy planting material, reducing risks that cause injuries to the forest crop thus making them susceptible to pest attacks and diseases.

2.3.7 Details of Forest degradation due to pollution: Incidence and extent of forest degradation due to pollution (soil, water, and in some cases air), and the mitigation measures taken and the impacts thereof may be recorded.

2.3.8 Other drivers of forest degradation: There are other drivers of forest degradation and deforestation and barriers to reforestation. Identification of these with inputs from stakeholders shall provide further insights for better management prescriptions.

2.4 Conservation and Management of Soil and Water Resources

The nature of soil and availability of water greatly influence the composition and quality of forests. Similarly, a good forest growth adds to the quality and abundance of soil and water. Given this complementary nature, the forest management prescriptions have to be so crafted as to minimise risks of degradation and maximize benefits of goods and services. For this, following information may be useful:

2.4.1 Inventory of water bodies and sources: The water bodies inside the forests not only improve the water regime but also provide diverse ecosystem for supporting biodiversity. Over exploitation of the ground water resources creates water-stress that necessitates

suitable management interventions. Mapping of all water resources in the forests including springs forms a basis for conservation and management intervention.

2.4.2 **Area treated under soil and water conservation measures**: The soil and water conservation measures reduce the surface flow, help infiltration and reduce the soil erosion. Planning for soil and water conservation structures greatly help in improving forest growth, however, in the low rainfall areas such structures have to be considered carefully as they may adversely affect water availability in downstream areas.

2.4.3 **Monitoring of ground water**: Periodical recording of water level in open wells during dry and wet seasons to determine the ground water level. It will help in the assessment of the impact of interventions taken in the catchment on the groundwater.

2.4.4 **Identification of areas vulnerable to erosion and prescription for treatment**: Identifying areas vulnerable to erosion and planting of local grasses in such areas are very effective for immediate control of soil erosion. Later on, plantation of suitable species may also be done.

2.4.5 **Mapping of riparian zones for special management prescriptions**: Riparian zones act as discharge zones and with appropriate vegetation help in lowering of water temperature, better dissolved oxygen, less turbidity and maintenance of channel shape. In areas with low rainfall, riverine plantations are likely to have a negative impact on the stream flow. Therefore, riverine plantation should be rainfall specific.

2.4.6 **Monitoring of streams, lakes, wetlands, ponds and other water bodies in forested catchments**: Eco-restoration, natural regeneration, tree/shrub/grass planting, soil and water conservation structures protect streams, lakes, wetlands, ponds and other water bodies and sea shores. The important forested catchments need to be monitored to assess the discharge and silt load. This data shall help in developing long term strategies for managements of streams and all water bodies.

2.5 Maintenance and Enhancement of Forest Resource Productivity

The net primary productivity (NPP) is the total energy accumulated by the plants during photosynthesis. The NPP of a forest is an indicator of how much it can produce in terms of timber, fodder, grass, Non-timber/wood Forest Produce (NTFP or NWFP) etc. However, productivity of not all of these produces can be maximised simultaneously. Therefore, there are trade-offs depending on the objective of management. The estimation of growing stock of timber is not the complete reflection of the productivity of a forest. Some forests by their open nature such as dry deciduous forests have low timber volume in terms of growing stock but compensate it by higher grass yield. The productivity of forests depends on the species composition, growing stock, increment and distribution of dia-class/age-class. Information on growing stock and its growth is necessary for efficient planning and management of the forests. The forest inventory, survey and mapping provide this important input. An assessment and the analysis of the following parameters indicate the status of the forests and the management interventions required:

2.5.1 **Estimation of growing stock**: Growing stock is the standing volume of a forest crop. In forest management parlance it is the existing wood resources and an estimation of carbon stock. Estimation of growing stock thus forms the basis for the forest management.

2.5.2 Estimation of current annual increment (CAI) and mean annual increment (MAI) of the forest crop: Increment of a forest crop is the rate of increase in growing stock per unit area. When taken annually, it is known as CAI and when taken as average over a long period of time, it is known as MAI. Higher increment also means higher carbon sequestration. The increment depends on locality factors such as site quality and composition, structure and stocking of the forest crop. Normal increment is one of the three conditions to be fulfilled to achieve a Normal (ideal) forest. Hence estimation of increment forms the basis in forest management.

2.5.3 Assessment of forest structure: The assessment of forest structure is generally done using age-class/diameter distribution. Maintenance of forest structure is essential for sustainable production of goods and services. The diameter is a proxy for age and the diameter distribution of the principal species, and their associates indicate the presence or absence of different age classes in a forest crop. Presence of all age-classes in even-aged forest and presence of all diameter classes in selection forest indicate the sustainability of a population and the benefits drawn from it.

2.5.4 Estimation of Basal Area (BA) and the number of stems per unit area: Basal area is a function of crop diameter and number of trees per unit area. Basal area along with the number of stems per unit area is a better indicator of a forest crop to sustainably provide the goods and services it renders.

2.5.5 Estimation of Carbon stock of the forests: An estimate of the carbon stock of the forests over a period of time indicates the carbon sequestration potential of the forests thereby the mitigation potential of the forests against climate change.

2.5.6 Area taken up for eco-restoration, rehabilitation and reclamation: The degradation of the forest leads to lower productivity. Analysis of measures taken up for mitigating the effects of the degradation, mining and shifting cultivation etc, especially through eco-restoration, rehabilitation and reclamation will be useful for effective management of forests.

2.5.7 Area taken up for improved productivity through afforestation: The productivity of a forest depends upon the genetic material of the trees also. It is difficult to manipulate the genetic makeup of a natural forests but can be done while raising plantation. The superior quality planting material is essential for increasing the productivity.

2.5.8 Area taken up for subsidiary silviculture operations: The timber, bamboo and NTFP productivity can be enhanced with suitable subsidiary silvicultural operations **(SSOs)** like thinning, tending, cleaning, pruning etc. In addition to these, SSOs to protect water resources and soils, to reduce disturbance and damage to wildlife habitats and ecosystems are also undertaken. Assessment of all SSOs undertaken and area covered indicate the efforts taken up for enhancing the productivity of the forests.

2.5.9 Analysis of Species composition: A forest with mixed species composition provides multiple goods. The object of management determines the species composition and an analysis of the tree diversity of a forest crop indicates the multiple goods a forest could provide.

2.6 Optimization of Forest Resource Utilization

Forests provide multiple goods for the use of the society in the form of timber, fodder, grass, fruits, nuts, gums, resin, tendu leaves, medicinal plants etc. The knowledge of the communities on the conservation, harvesting /collection practices, grading and storage helps in sustainable management of forest resources. Identification of the important forest produce, their demand and sustainable supply and the harvesting pattern will form basis for making sound management prescriptions. The following information may be useful in this regard:

2.6.1 Agriculture customs and requirement of the local people: An estimation of the requirement of the local people for small timber for agricultural and other local community uses on the basis of the socio-economic survey will indicate the dependence of the population on forests.

2.6.2 Listing of important NTFPs along with parts used and harvesting patterns: This listing is required to strengthen and diversify the local economy proportionate to the scale and intensity of management activities.

2.6.3 Extent of non-destructive / sustainable harvesting of resources: Bio resources are harvested and whole plants or different parts are used. If whole plants, underground plant parts or bark are used, this often leads to the death of the plant and is likely to have an adverse effect on its population than a plant whose leaf or seed or flower is used. An analysis of the part used, collection and harvesting practices will help to encourage practice of non-destructive / sustainable harvesting practices that lead to sustainability of NTFPs.

2.6.4 Demand and supply of timber and NTFPs: The socio-economic study and the local market survey will provide an assessment of the dependence of the local people on the forests for timber. This will also include the estimation of import and export of timber. This will enable the assessment of per capita consumption of timber by the people living near the forests.

2.6.5 Low impact harvesting: Assessment of any low impact harvesting technique being followed in the forest division. Harvesting and extraction of forest resources are undertaken in the manner so that merchantable waste is reduced, and damage to other products and services is avoided.

2.6.6 Recorded removal of timber, firewood, grasses, fodder, bamboos, NTFPs etc: Analysis of annual removal over a period of time indicates the trends in sustainability of production. This analysis may help in deciding corrective measures.

2.6.7 Valuation of the forest resources based on market prices: An estimation of the value of all the goods that are extracted from the forests based on the market value gives insight for making decisions for the optimisation of the use of the goods from the forests.

2.6.8 Forest enterprises: Wood based industries and other industries that use raw materials sourced from the forests are important stakeholders in the management of forests. Listing of forest based industries and enterprises in the forest division and outside forest division but sourcing raw material especially NTFPs from the division, not only indicate the forest based employment generation potential but also the contribution of the forests towards the local economy and indicates scope for new forest based enterprises.

2.6.9 **Access and Benefit sharing**: NTFPs are sourced from the forest areas for commercial use by the industry. Proper documentation of traded quantity and sharing of the benefits with the Bio-diversity Management Committees (BMCs) as per the provisions of Bio-diversity Act and ABS guidelines notified there under can help in the conservation and sustainable use of NTFPs on one hand and help communities get commensurate financial benefits.

2.7 Benefits to local people-social and cultural values.

An assessment of the following aspects may help in better understanding of the interface of forests in the social, cultural, economic and ecological aspects of the local people that will provide inputs for making management decisions:

2.7.1 **Details of employment generated**: A calendar of forest activities along with details of employment generated is useful in planning for manpower requirements. It also reflects direct employment generated from forest management activities. For the skill based operations, necessary training/skill up-gradation programmes can be planned for local people. This ensures availability of required work-force locally.

2.7.2 **Use of traditional Knowledge and listing of knowledge holders:** The local health practitioners of indigenous medicinal system are repositories of traditional knowledge which have a close linkage with the forests. This information may also be available in the Peoples' Biodiversity Register (PBR) prepared by the Biodiversity Management Committees. Their knowledge of the distribution of the species, their extent, their diverse use and availability etc shall form the basis for making sound management prescriptions.

2.7.3 **Sacred groves and other cultural values**: Sacred groves are great repositories of biodiversity and have great religious, cultural and conservation significance. Listing of these groves and the practices of their management may provide insight into special management interventions required for adjoining forests.

2.7.4 **Details of social customs on forests and forestry practices:** There are community specific social customs, customary laws on various forestry related activities like collection of NTFPs, their use etc. Identification of the same indicates the close cultural linkage of the communities with the forests which could contribute to making culturally conscious management prescriptions with the active participation of the local communities.

2.7.5 **Ecotourism sites and activities**: Ecotourism is responsible travel that involves interpretation and education about natural areas. Areas inside and adjoining designated forests, which have ecotourism potential to be identified and documented for effective implementation of ecotourism.

2.7.6 **Identification of rights and concessions of the local communities:** The communities living near the forest enjoy rights and concessions from the forests. Documentation of these rights and concessions, other than the rights recognised under FRA as recorded in para 2.1.7, as they have bearing on the management of forests.

2.7.7 **Ecosystem services and benefits**: Wherever possible a framework for identification, quantification and valuation of ecosystem services may be explored and documented.

2.8 Policy, Legal and Institutional Framework

National and State policies on forests, wildlife, water and environment govern the way forests are managed. The Indian Forest Act, 1927, the Forest Conservation Act, 1980, Wildlife (Protection) Act 1972, Environment (Protection) Act, 1986, Biological Diversity Act, 2002, Compensatory Afforestation Fund Act, 2016 and any other state specific law and rules made there under provide legal framework for the conservation and sustainable management of forests, wildlife and the biodiversity that the forests harbour. The Forest Rights Act 2006 and PESA Act also impact the management of the forests in India. An examination of these legal instruments and their implementation, various institutions involved with the forest management and research will indicate the impact of these instruments on forest management. For this aspect examination of the following details (and records thereof) are necessary**:**

2.8.1 **Listing of legal instruments governing the forest management**: This includes state/ locality specific rules, regulations.

2.8.2 **Role of panchayats or any locally elected bodies in the district and council areas in forest management**: Analysis of the village development plan and its focus on forests, wildlife and environment.

2.8.3 **Participatory forest management:** Participatory forest management is implemented on the principle of care-and-share. Listing of the committees constituted for the participatory forest management, extent of forest area under their management, status of preparation and implementation of their micro-plans, and effectiveness of these committees in management of forest is vital for furtherance of participatory forest management.

2.8.4 **Details of BMCs:** BMCs are constituted under the Bio-diversity Act to promote conservation, sustainable use and documentation of biological diversity including preservation of habitats, and chronicling of knowledge relating to biological diversity. The ABS Guidelines 2014 and further amendments specify the process for Access and Benefit sharing of bio-resources. Listing of BMCs, benefit sharing agreements, if any, data on the quantity of traded bio-resources especially NTFPs indicates the benefits derived by the communities from the forest resources.

2.8.5 **Forest, biodiversity and wildlife related offences**: Listing of year wise forest, biodiversity and wildlife related offences and details of conviction, if any, indicate the effectiveness of enforcement of law.

2.8.6 **Financial outlay**: Assessment of expenditure in the forest division on establishment and on developmental activities under different schemes indicates the potential financial outlay that helps the WPO to plan the financial forecast for the WP prescriptions.

2.8.7 **Human Resource**: Adequate and trained man power is essential for effective management of forests. Assessment on the vacancy of personnel against the sanctioned strength, percentage of women officials, requirement of additional human resources, if any, status of mandatory training of the staff as per the relevant State rules governing the same, details of in-service training programme organised etc.

2.8.8 **Gender aspects**: Women are involved in forest based income generation activities as they are the primary collectors of NTFPs and their primary processing. Women are likely

to have knowledge on forestry resources linked with food, health, fodder and firewood. However, their commensurate roles do not reflect in the forest management. Mapping of gender based roles and activities in forestry, assessing the contribution of the women in forestry activities, their role in forest management planning, training and capacity building for women organised by the forest department etc. are essential to understand gender mainstreaming in forest management.

2.8.9 **Labour welfare**: The welfare of the labours involved in forestry operations is of utmost importance. Listing of the different laws governing the labour welfare and analysis of adherence to the same indicate efforts taken for labour welfare.

2.8.10 **Environmental awareness and education**: Assessment of all efforts made to increase environmental awareness and education on forests, the benefits provided by the forests, along with list of the published material.

2.8.11 **Infrastructural support**: Adequate infrastructure in terms of office, residential accommodation of the staff, transportation facilities and communication facilities are necessary for effective forest management. Listing of the entire infrastructure available enables identification of gap, if any, and planning for reducing the gap.

2.8.12 **Research and development**: Research and academic institutes are important stakeholders. Research plots, preservation plots, seed orchards, seed stands/seed production areas etc established by forest department and research institutes are research infrastructures for forest management. Documentation of the efforts of the forest department for the production of quality planting material and focus on native endemic and threatened species, the details of research undertaken, application of results in the field and further identification of problems for research are essential for effective science based forest management.

2.8.13 **Existence of monitoring mechanism**: Monitoring and evaluation are essential tools for effective and adaptive forest management. Analysis of adherence to monitoring protocols like control forms, compartment history etc gives insight into the management of forests.

CHAPTER 3

PREPARATION OF WORKING PLAN

3.1 Organization

3.1.1 At the national level, the organization includes Director General of Forests & Special Secretary (DGF&SS) to the Government of India, Additional Director General of Forests, Inspector General of Forests, Deputy Inspector General of Forests, and Assistant Inspector General of Forests in the Ministry of Environment, Forests and Climate change (MoEF & CC), New Delhi; and it is supported by the Integrated Regional Offices (IRO) headed by DDGF (Central)/IGF (Central).

3.1.2 The Central Government shall ensure that the data collected by the SFDs is in a structure and manner that can be uploaded on the national portal. The National Forest Inventory methodology designed by FSI for NFI shall be the standard procedure for collection of field data as far as possible. The Forest Survey of India (FSI) shall be the nodal agency for hosting data in a dedicated National Database. The FSI shall also build the capacity of the SFDs in this regard. The FSI shall develop additional modules, if any required, for collection of data for the preparation of WP. The detail of data collection is provided in the manual (**Annexure I**)

3.1.3 On the request of SFD, the FSI shall make the geo-spatial data on forest cover, forest type, ToF and others to the SFDs at free of cost. (Ref DST F No SM/25/02/2020 (Part I) dated 15-02-2021)

3.1.4 In the States, there is no uniformity in the constitution of the working plan wing. The States shall have a separate WP wing headed by an officer normally not below the rank of Addl. PCCF supported by a CCF/CF to exclusively look after the data management and updation on a continued basis.

3.1.5 The SFDs are encouraged to take up Continuous Forest Inventory (CFI) for the forest resource assessment as the revision of the WP need not be linked with the field data collection. This shall include NTFP survey, Biodiversity survey, regeneration survey, soil survey, socio-economic survey, wildlife survey and assessment of wildlife habitats, ToF etc. The field surveys and data collection for CFI shall be done by the staff of the territorial wing. The SFDs are encouraged to use hand held instruments for data entry. The SFDs may under special circumstances engage specialised agencies for the purpose of data collection.

3.1.6 The head of WP Wing shall monitor the quality of the data collected. It is advised to go for independent verification of the data by engaging regional offices of FSI, ICFRE institutes, academic and research institutions.

3.1.7 A Working Plan Unit at the field level shall be headed by a Working Plan Officer (WPO) not below the rank of Deputy Conservator of Forests with adequate experience of working in the forest department. The WPO once nominated shall ordinarily be not changed till the completion of the revision of the WP. The SFD, in case of non-availability of suitable officers, may assign the territorial DFO/CF as WPO.

3.1.8 Field Functional unit of WPO should be equipped with experienced Asst. Conservator of Forests (ACF), Range Forest Officers (RFO), Foresters and subject matter experts in

each of the specialized field such as remote sensing and GIS, biodiversity assessment, socio-economic analysis, statistics, taxonomy, ecological dynamics, soil science etc. In case adequate regular staff is not provided, the WPO should be empowered to engage staff on contractual basis.

3.1.9 The Working Plan is to be revised every 10 years and the preparation of working plan of a territorial division should normally take two years' time. The number of working plan units in the State will depend upon the workload i.e., number of territorial divisions for which working plans are to be prepared/ revised for the cycle of minimum 10 years.

3.1.10 The Working Plan Unit should be treated as a functional charge. The WPO or his subordinate may be delegated the powers of a drawing and disbursing officer. A WPO and other supporting officer / staff of the Working Plan Wing should be entitled to special pay equivalent to the best option of such allowance permissible (e.g., 30% of the basic pay as admissible to training faculty at training institutes like IGNFA, CASFOS).

3.1.11 The State shall constitute a Standing Consultative Committee (SCC) under the Chairmanship of PCCF (HoFF) for guidance, deliberation and finalization of PWPR and draft working plan of a forest division. This should have representation of the IRO, Chief Wildlife Warden (CWLW) and heads of other wings of the forest department including other line departments having roles in the forest landscape, concerned CF territorial, DFO (T) and the WPO. The experts from FSI regional centres, ICFRE institutes, IIFM, BSI and ZSI may also be included as special invitees. The head of the working plan wing shall be the member secretary of this standing committee. The SCC shall meet at-least once in every three months and the quorum of the committee shall be 50% of the members.

3.1.12 The nodal officer under FCA of the state government shall submit the draft working plan of a forest division along with the recommendation of the SCC in the online portal for prior approval of the central government as per Rule 10 of the Forest (Conservation) Rules, 2022.

3.1.13 It will be the responsibility of the PCCF (HoFF) to ensure that the working plan wing of the State functions with proper planning for the preparation of all working plans of the State in time. As a mid-course correction, plan period of a few working plans may be extended or reduced for the purpose of staggering the exercise of working plan preparation in the State.

3.1.14 The working plan unit should be equipped with required tools and technologies along with necessary Geo-spatial software, hardware devices like computers, GPS, internet access and other accessories.

3.1.15 It has to be ensured that adequate budget provision for the preparation of working plans is made in time and regulated by the rules and regulations of the Central/State/UT Government. The budgetary provision for preparations of working plans should be made in the respective state Plan/Non-plans. However, the state governments may utilize CAMPA funds/ Forest Grants under Finance Commission in addition to State Plan/Non-plan budget.

3.1.16 The SFD shall plan and organise the capacity building and training at State level for the staff involved in preparation of WP and the data collection.

3.1.17 The Manual for the preparation of working plan and other relevant materials may be translated into the vernacular language.

3.2 Inputs to WPO

3.2.1 Preliminary Working Plan Report (PWPR) forms the basis of Working Plan that looks at the past systems of management and draws a framework for future management prescriptions. The PWPR is to be drafted by the DFO (Territorial). For the purpose of the preparation of the PWPR, the head of the territorial forest circle may obtain relevant information from Social Forestry, Wildlife and other wings and departments working in the area. The PWPR shall enable WPO to make required assessment to undertake forest management planning. However, the SCC may exempt the preparation of PWPR under certain circumstances, especially when the WPO is the CF/DFO territorial.

3.2.2 The PWPR shall be prepared in the prescribed format as provided in the Manual. The PWPR indicates the work that the WPO has to do during the field work. The PWPR also makes clear what information the WPO has to collect and what information is already available, what maps are to be prepared and what maps are already available. It also indicates the kind of vegetation survey and other surveys that are to be undertaken and the kind of studies already done for the area, the type and intensity of enumerations to be done in each working circle and so on.

3.2.3 Further it should document vivid details of management practices adopted along with deviations and achievement of targets during the working plan period. It requires detailed comments and close analysis of the results of the past management for each working circle separately. Successes or failures and the reasons thereof, should be taken note of. As far as possible, attempt should be made to quantify the results and effects of the past prescriptions.

3.2.4 Spatial database of a forest division with different spatial layers as indicated in the Manual will be of immense use in preparation of working plan.

3.3 Preparation of Working Plan and Submission

3.3.1 The head of the WP wing in the State Forest Department shall initiate the process of revision of working plan, at least 28 months prior to the end date of existing Working Plan, by directing the head of the territorial circle to submit a PWPR in the prescribed format plan within three months.

3.3.2 The WP wing shall examine whether the PWPR has been prepared in the prescribed format and all necessary documents are attached. Then the head of the WP wing shall place it before the State Consultative Committee within 30 days on receipt of the draft PWPR. The SCC shall examine the draft PWPR and approve with or without modification.

3.3.3 Immediately on receipt of the approved PWPR the WPO shall begin the preparation of the WP. Care must be taken by the WPO to ensure that the approved PWPR is made the basis for management planning. The WPO shall analyse the data gap in understanding the condition of forests, if any.

3.3.4 The WPO shall organise collation of secondary data, collection of primary data through surveys, verification of data. The WPO shall consult experts on various aspects wherever necessary. He may commission short term studies, if required, on specific topics for the purpose of working plan.

3.3.5 The WPO shall organise a stakeholder consultation for seeking inputs from the stakeholders for finalising the object of management of the forest area. It shall be desirable to involve local civil society organisations, PRIs, representatives of Wood Based Industries, academic and research institutions. The WPO shall present the draft management of objectives and seek specific comments from the public/stakeholders on each of the objectives and record the same. The minutes and the video recording of the stakeholder consultation shall form annexure to the draft WP to be submitted to the SCC.

3.3.6 The WPO shall examine the comments in light of the status of the forest crop, silvicultural principles and extant policy governing forest management and finalise the general objects of management for the forests. The WPO shall present this to the Standing Consultative Committee at the time of presenting the draft WP.

3.3.7 The WPO shall analyse the data and shall write the draft working plan document. The analysis of the data collected and the results thereof are discussed in Part I of the WP document. The WPO shall prepare Part II based on the information provided in Part I. The WP document shall be prepared in the prescribed format as given in the Manual (Annexure I). The numbering of paras/pages shall be done as prescribed in the manual.

3.3.8 The WPO shall prepare maps on GIS as indicated in the PWPR and as required in the prescribed scale.

3.3.9 In order to bring uniformity in the symbols, signs and colour code used in the maps, an indicative list is provided in the Manual. The States, for features not defined in the manual, may develop standard sign and colour code in preparation of maps as per their requirement.

3.3.10 The WPO shall submit the draft plan along with all supporting documents and maps to the head of the WP wing who in turn shall place it before the SCC. The SCC shall examine the draft WP report, and recommend it for approval with or without modifications. The criteria for the examination of the draft working plan are given in the Manual.

3.3.11 The WPO shall incorporate the modifications as observed by the Standing Consultative Committee and submit it to the head of WP wing for seeking the approval of the MoEF & CC.

3.3.12 The head of the WP wing shall submit the draft working plan along with recommendations of the Standing Consultative Committee to the Nodal Officer under FCA for its submission in online portal for prior approval of the central government under Rule 10 of FCA Rules 2022.

3.4 Approval of the Plan and mid-term review

3.4.1 The draft Working Plan submitted to the Central Government shall be examined by the concerned Integrated Regional Office for its conformity with National Working Plan Code, the National Forest Policy, 1988 and the Integrated Regional Office may accord prior approval to the draft Working Plan along with conditions or without conditions or accord 'In-Principle' approval along with modification of the provision contained in the draft Working Plan and for a period as it deems fit, or reject the same by recording the reasons therefore. The criteria for the examination and approval for the draft Working Plan is given in the Manual.

3.4.2 On receiving a draft WP, the IRO shall convene a meeting with the head of the WP Wing and WPO to seek any clarifications, if necessary. If no decision is conveyed by the IRO within 45 days, the WP shall be deemed to have been accorded prior approval. The IRO shall furnish a six-monthly report to MoEF & CC on the deemed approval cases for the period for information.

3.4.3 The State Government or Union territory Administration or its designated officer shall carry out the prescriptions of the Working Plan to which the 'In-Principle' approval has been accorded by the Integrated Regional Office with respect to all or specific provision of the Working Plan and for the period for which the Working Plan has been approved.

3.4.4 The State Government or Union territory Administration shall undertake a mid-term review of the approved Working Plan and submit the review report along with its recommendation to the Integrated Regional Office and the Integrated Regional Office may, after examination, modify the condition of 'In Principle' approval or issue a fresh prior approval by modifying the provision of the previously approved Working Plan for the remaining period or reject the recommendations of mid-term review by recording reasons therefore. On the basis of the mid-term review, the period of the plan may be extended up to 5 years beyond the original plan period. The IRO may accord the extension up to 2 years and MoEF & CC shall accord extension for any period over 2 years and up to five years. The extension will be granted on the existing plan only, with conditions if any, and no separate plan as extension plan will be prepared.

3.4.5 The PCCF, may also seek extension of the existing working plan in order to stagger the preparation of the working plan thereby avoid clustering of the preparation of WPs.

3.4.6 The Integrated Regional Office may also consider and approve eligible Working Schemes, in case submitted by the State Government or Union territory Administration.

3.4.7 However, all proposals involving whole or part of forest land bearing a canopy density of 0.4 or more or proposals involving clear-felling of forest land of size more than twenty hectares in plains and ten hectares in hills irrespective of canopy density, shall be forwarded to the Regional Empowered Committee and the Regional Empowered Committee shall deal in the manner specified in FCA rules, 2022 and while examining the proposal, the Integrated Regional Office shall ensure that the final decision is in conformity with the National Forest Policy and the National Working Plan Code. "Clear-felling of forest land" means removal of all natural vegetations in whatever form occurring, by felling, uprooting or burning them and removing them from the forest land over one hectare in size or more, but other types of felling of trees of specified size or species, including their selection felling or coppice felling shall not be considered as clear felling.

3.4.8 On approval of the WP from the IRO, the head of WP Wing shall get adequate copies of the WP printed and circulated to the officers such as CWLW, Nodal Officer (FCA), CF, DFO concerned, and all ROs of the concerned Forest Division. He will also circulate the pdf version of the WP document to the offices listed in manual.

3.4.9 The head of WP Wing may get the executive summary and the prescriptions translated in the vernacular language for circulation among the field officers.

CHAPTER 4

MONITORING, ASSESSMENT AND REPORTING THE IMPLEMENTATION OF WORKING PLAN

4.1 Control Form is a tool for reporting the implementation of the working plan prescriptions. The WPO shall prepare the control forms in a format in which the performance parameters are to be reported by the DFOs. Indicative list of control forms and formats are given in the Manual. The SFDs/ Central Govt are encouraged to develop an online reporting of the implementation of WP prescriptions, which may form a part of the Compartment History.

4.2 The CF Concerned shall compile/collate the control forms and submit to the head of WP wing annually. Any variation from the yield, regeneration operations, and plantation activities to be undertaken constitutes deviation. Any deviation beyond 30% shall be compiled as a deviation statement with reasons thereof, and shall be placed by the head of the WP Wing before the SCC for consideration and guidance.

4.3 The SFDs may conduct the management effectiveness evaluation on the implementation of the WP prescriptions on the basis of the framework developed by MoEF & CC for the purpose as Indian Forest Management Standard (Annexure II). This framework may lead to national forest certification programme. This framework has a set of Criteria and Indicators along with verifiers for each of indicator.

4.4 To be in tandem with evolving international mechanisms of SFM, the 'Indian Forest Management Standard' would facilitate the state FDs/WPOs/DFOs to measure the effectiveness of the management practices against the prescriptions. The MoEF & CC through IROs shall organise annual workshop for the WPOs and regularly conduct trainings for the officers of the WP wings and the DFOs. The SFD may take the assistance of institutes like IGNFA, FSI, IIFM, ICFRE and training academies of DFE for specialised training for the officers and officials involved in the preparation and implementation of WP.

4.5 The SFD shall organise training for the staff involved in the forest inventory and preparation of WP regularly. The Manual and other relevant material may be translated in the vernacular language.

Annexure - I

MANUAL FOR THE PREPARATION OF WORKING PLAN UNDER NATIONAL WORKING PLAN CODE 2023

Unit 1

INTRODUCTION

1.1 History of forest management planning in India

Working Plan is the main instrument of forest management planning in India since the dawn of scientific forest management. Evaluation of the status of forest crop and its biodiversity, assessment of the past systems of management and prescribing future treatments as per the management objectives are the essential components of a working plan.

The principles of working of forests were first drafted in 1837 by Mr. U. V. Munro, the then Superintendent of Forests in Travancore. Later in 1856, Dr. Dietrich Brandis propounded the fundamental principle that the first-class trees (trees over a prescribed diameter) to be felled in a year should be restricted to the growing stock of the second-class trees that will eventually replace them in that year. Based on this principle of yield control, he prepared the first forest management plan using strip sampling for the Pegu Yoma Forests of Myanmar in the year 1860.

In 1884, Sir Wilhelm D Schlich, Inspector General of Forests, initiated a scientific approach towards the preparation of Working Plans. In 1891, W.E.D'Arcy brought out a treatise "Preparation of Forest Working-Plans in India". In 1906, the Superintendent of Working Plans, Forest Research Institute, Dehradun was entrusted with checking of working plans prepared across the country. The research undertaken by FRI on silvicultural of important tree species and regeneration techniques led to science- based prescriptions of the working plans. With the enactment of Government of India Act, 1935, the management of forests was transferred to the Provincial governments. After independence in 1947, the State forest departments brought substantial areas under scientific forest management by adopting state specific processes for the preparation of the WP as there was no uniform code for the preparation and approval of working plan in the country.

The principal aim of the National Forest Policy, 1988 is ensuring environmental stability and maintenance of ecological balance. The management of forests for derivation of direct economic benefit must be subordinated to this principal aim. The policy also mandates management of forests with approved WP. The Hon'ble Supreme Court of India in its order dated 12-12-1996 in the case titled T. N. Godavarman Thirumalpad Vs Union of India and others ordered that the felling of trees in all forests is to remain suspended except in accordance with the Working Plans of the State Governments, as approved by the Central Government thereby emphasising the primacy of working plan in the sustainable management of forests. The Ministry of Environment, Forest and Climate Change (MoEF&CC), Govt. of India adopted the National Working Plan Code–2004 with standardised procedure for preparation and approval of working plans for management of forests in the Country.

The National Working Plan Code 2014 envisaged among other things uniformity in the preparation of working plans across the country. The revised NWPC visualises a manual for the

preparation of the working plan that describes the principles, inventory methods, analysis of data and writing of the plan.

This manual is prepared by culling out relevant portions of the NWPC 2014 which deals with the procedural part of data collection and writing of the plan. The structures of the manual and the contents have been drawn liberally from the seminal work of W E D'Arcy titled the "Preparation of Forest Working Plans in India" (1910). The sampling design for forest inventory and the data collection are based on the FSI methodology and drawn from the "Manual for field data collection of National Forest Inventory (FSI, 2022)".

1.2. Who the manual is for?

a. *WPO* : The manual for the preparation of working plan as per the revised NWPC is primarily aimed at providing necessary inputs to the WPO on field inventory, analysis of data using illustrations and writing of the working plan document. This also provides brief inputs on the basic principles of sustainable forest management and the analysis of the existing forest crop.

b. *Persons involved with forest inventory*: The units on field inventory and the data forms will be useful for any person who is associated with the forest inventory including students and researchers in forestry.

c. The SFDs and IROs: The SFDs are involved with periodic forest inventory and data collection. They also examine the draft WP prepared by the WPOs. Similarly, the IROs are empowered to approve the draft WP under Rule 10 of FCA Rules, 2022. The examination of draft WP by SCCs/IROs and the annexures to be appended with the WP document are provided in this manual.

1.3 Organisation of the manual

Unit 1 of the manual deals with the introduction to the working plan giving historic perspective with a short glossary of relevant technical terms. Unit 2 deals with the explanation of some of the technical terms, their scope with some illustrations. Unit 3 is on field inventory and data collection. This unit provides the methodology of data collection, data collections forms including the methodology and forms for socio economic survey to assess the dependence of the local community on the forests. The use of secondary relevant data on wildlife and the need to conduct survey where such data is not available is also discussed in this unit.

Unit 4 deals with the analysis of the data, computation and drawing inference from the analysed data especially on the forest crop, its composition, age/dia-class distribution, calculation growing stock, status of regeneration, estimation of carbon stock etc.

Unit 5 deals with the writing of the plan with indicative section titles and the contents to be covered under each. The remaining units deal with the control and implementation of the plan and the processes involved in the approval of PWPR and the draft working plan.

1.4. Definitions:

Biodiversity: means the variability among living organisms from all sources and the ecological complexes of which they are part and includes diversity within species or between species and of eco-systems (The Biological Diversity Act, 2002)

Canopy: The cover of branches and foliage formed by the crowns of trees in a wood (Glossary of technical terms, FRI)

Canopy Density: Percentage of land covered by canopy of trees; It is expressed as a decimal coefficient, taking closed canopy as unity (FSI)

Compartment: A territorial unit of a forest permanently defined for the purposes of administration, description and record. Preferably designated by Arabic numbers (FRI)

Conservation: The management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations (IUCN, 1980)

Coupe: A felling area, usually one of an annual series unless otherwise stated. Preferably numbered with Roman numerals (FRI)

Crown area: It is the area of horizontal projection of a tree crown on the ground (FSI)

DBH: Diameter at breast height (1.37 m from ground level)

Degraded Forest: A degraded forest is a secondary forest that has lost, through human activities, the structure, function, species composition or productivity normally associated with a natural forest type expected on that site'. (CBD)

Ecosystem: A biological assemblage interacting with its associated physical environment and located in a specific place'. It is also defined as 'the system resulting from the integration of all the living and non-living factors of the environment'. (Tansley, 1935)

Forest Crop: The entire collection of trees (including bamboos) growing on a given area; Forest crops may be classified in terms of their stages of development as seedling crops, thickets or sapling crops, pole crops, and tree crops. (FRI)

Felling Cycle: The time which elapses between successive main fellings on the same area (FRI)

Felling Series: A forest area forming the whole or part of a working circle and defined so as to distribute felling and regeneration to suit local conditions and to maintain or create a normal distribution of age classes; the yield is calculated separately for each felling series which should have an independent representation of age classes (FRI)

Forest: An area set aside for the production of timber and other forest produce or maintained under the woody vegetation for certain indirect benefits which it provides e.g. climatic or protective (FRI)

Growing Stock: The sum (by number or volume) of all the trees growing in the forest or a specified part of it (BCFT)

Invasive Alien Species: 'Invasive alien species (IAS) are animals, plants or other organisms that are introduced into places outside their natural range, negatively impacting native biodiversity, ecosystem services or human well-being' (IUCN, 2000).

Trees Outside Forests (ToF): Trees growing outside recorded forests (FSI, 2021)

Wetland: Means an area of marsh, fen, peatland or water; whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters, but does not include river channels, paddy fields, human-made water bodies/tanks specifically constructed for drinking water purposes and structures specifically constructed for aquaculture, salt production, recreation and irrigation purposes (The wetlands (Conservation and Management) Rules, 2017).

Working Plan: A working scheme of the management aiming at continuity of policy and action and controlling the treatment of a forest (BCFT).

Yield: The volume or number of stems that can be removed annually or periodically, or the area over which felling may pass annually or periodically, consistent with the attainment of the object of management (BCFT).

MANUAL FOR THE PREPARATION OF WORKING PLAN UNDER NATIONAL WORKING PLAN CODE 2023

Unit 2

EXPLANATION OF TERMINOLOGY

2.1. Working Plan:

A working plan sets forth the purpose with which a forest should be managed so as to best meet the interests, and therefore the wishes of the owner; and indicates the means by which the purpose may be accomplished. In other words, it is a forest regulation prescribing the application of certain cultural rules, and the execution of certain works, in order to produce a given desired result (D'Arcy).

If a forest is worked on economic principles, the decisions would primarily focussing on the production for regular supply of certain forest produce such as timber, NTFP etc in greatest quantity. A working plan indicates how this can be achieved.

Both the object sought and the means by which that object can be attained depend on a variety of facts relating to the forests and its management; and, in order that the prescriptions contained in the working plan may be fully understood, it is necessary that these facts should be stated and the manner in which the prescriptions have been deduced from them explained. These facts, deductions and prescriptions are recorded in a single report which although usually embodying several separate plans, it generally, for conciseness, called the working plan of the whole area dealt with.

2.2. Sustained Yield:

A sustained yield is a perpetual ("sustained") periodic outturn of timber, fuel, bamboos, etc., resulting from a systematic treatment of the forest crop. When, in addition, the crops are so arranged that regular supplies of produce approximately equal in quantity are obtained year by year (or periodically) the forest is said to produce an equal annual (or periodical) sustained yield.

A healthy, productive and well managed forest will provide sustainable yield of forest produce. A sustained yield will be obtained from a forest which is so worked that it will continuously produce crops of wood: each portion as it is cleared being restocked within a reasonable time and the young woods which spring up being properly tended.

2.3 Desired Forest Crop Structure:

The primary purpose of a working plan is to maintain healthy and productive forest to ensure ecosystem integrity along with fulfilling societal needs of goods and services. The sustained yield of goods or services varies as per the objective of management. If objective is to have productive forest which involves regeneration felling, sustained yield of goods especially timber, then it depends on, among factors, structure of forests. If object of management is to protect, rehabilitate or improve the forest to ensure other ecosystem services (other than timber and fuelwood) like water, biodiversity etc, the desired structure of forest may not be the same as that of a productive forest discussed above. The desired forest crop structure, thus, varies with the object of management. It must be remembered that even when a forest is managed primarily as a healthy productive forest with regeneration felling, it provides ecological services as a by-

product. Similarly, when a forest is primarily managed for ecosystem services, it does provide goods such as timber and firewood as by-products.

2.3.1 Desired forest crop structure for a productive forest:

If the forest is primarily maintained as productive forest which involves regeneration felling, primary forest produce is timber and fuelwood. To obtained sustained yield of timber, for even aged forests structure, it is necessary that the forest should constitute a series of stands with growths of all ages from the seedling to the trees at rotation age that is, of a series of age-gradations corresponding to the rotation age, and one stand having trees of one age only (bell shaped N-D curve for individual stand and inverse J shaped N-D curve for the whole even aged forest). For uneven aged forests structure, for sustained yield it is necessary that every unit of forest area must have all diameter classes represented in it. (Inverse J shaped N-D curve)

A forest, even or uneven aged, with above described forest structure, along with two others conditions namely (1) normal increment, and (2) a normal growing stock will be termed a normal forest.

A normal forest is, an ideal creation, although many forests approach the normal condition when they have been under any particular silvicultural system of organised treatment for a long period. Nevertheless, a correct understanding of the constitution of the growing stock in the normal or ideal forest under each and every method of treatment is essential. To fulfil the objective of maintaining forest as productive unit, the purpose of a working plan may be said to bring the existing forest, as soon as possible, to the normal state, and thereafter in maintaining it in that condition. This understanding is essential for the WPO if primary yield from a forest is timber.

2.3.2 Desired forest crop structure for maintain or improving ecological functions:

If the primary object of management is maintaining or improving the ecological functions of the forest, the structure of the forest crop along with other parameters like growing stock, stocking, increment etc that would provide required services on a sustained manner needs to be decided. If it is considered that the present forest crop is good enough to meet the object of management, then the present crop structure becomes the desired forest structure.

2.4. The Increment:

The increase due to growth, which takes place during any given time in the volume of material in a tree or crop, has received the special name of increment. A distinction is drawn between the annual increment and the average or mean increment.

When the length of the period referred to is one year, the increase is called the annual increment. When the period includes a number of years, the average is obtained by dividing the total increase during the whole length of the period by the number of years. The result is called the mean annual increment or mean increment. The terms annual production and mean annual production are also used.

Illustration: If a tree 100 years old contains 115 cubic meter of wood, and if it is calculated that its increment from the 99th to the 100th year was 1.5 cubic meter, then its annual increment at 100th years will be 1.5 cubic meter, while its average annual increment or mean increment during its life-time at 100th years will be = 115/100=1.15 cubic meter. Ten years later the tree is found to contain 126 cubic meter. Its average increment during that period is 126-115/10 =1.1 cubic meter.

In the case of crops, the increment is necessarily expressed, with reference to the area, as so much per unit area (ha/acre). But this cannot be done for isolated trees, because the area covered is uncertain and changes from year to year. In calculating the average production of crops, the total production during the period, including the material yielded at the passage of thinning, etc., must be reckoned with.

If 10 ha of a 100 years old high seedling forest has provided 500 cubic meter in thinning, and now contain 2500 cubic meter of timber, then the average annual increment at 100^{th} years is (2500 + 500) / (10 x 100) = 3000/ 1000 = 3 cubic meter per ha.

2.5. The rotation or the exploitable age:

A forest like any other undertaking must be managed and worked, with a definite purpose. This purpose may of course be one of a great many and its realization is expressed by the term yield.

To maintain a healthy productive crop, trees above certain age/diameter need to be removed to facilitate regeneration. The age/diameter of the tree when this condition is reached is called harvestable/exploitable age/diameter. The trees in a forest crop must be harvested when they have reached this age/diameter to maintain a productive forest. The time required by new growth in a crop, which is being regenerated, to attain harvestable dimensions is also termed the rotation or exploitable age.

It is usual to classify the various kinds of rotation according to the objects of management. When regeneration felling are done, The chief purpose for which a tree in a forest is harvested, along with regeneration of desired species, to obtain from the land the largest possible average annual or periodic return (a) of material, (b) of money, (c) of interest on the capital invested or, it may be sought to adopt the rotation best suited (d) to natural regeneration, or (e) to some special/technical purpose. Rotations fixed with a view to meet such special requirements are called, respectively, the rotation (a) of the greatest volume production, (b) of the highest income, (c) the financial rotation, (d) the physical, (e) the technical rotation. The age at which trees are felled in properly managed forests is not, however, always the harvestable/exploitable age. Owing to irregularities in the composition of the growing stock it frequently happens that, during a longer or shorter period which may, and strictly speaking ought to be, the same length as the harvestable/exploitable age, trees or crops must be felled before or after they become technically harvestable in order that the correct proportion of age/diameter classes may be secured.

2.6. Yield:

The yield generally refers to extractable timber but it could also refer to other forest produce such as bamboo, cane, firewood, NTFP, fodder, grass etc. The ecological services provided by the forests could also contribute to the yield from a forest. All this would depend on the general object of management of the forests. The determination of yield and reflection of the same in the working plan is generally referred to as possibility/allowable cut/outturn.

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Unit 3

FOREST RESOURCE ASSESSMENT AND DATA COLLECTION

Forest resource assessment is essential requirement for sustainable management of the forests and its biodiversity as enshrined in the National Forest Policy, encompassing the ecological, economic and social dimensions. This understanding drives the information needs for the planning and accordingly surveys are planned to generate desired information with desired level of accuracy and/or precision. Working plan is one such important tool which helps in evaluating the status of forest resources, assessing the impacts of past management practices and deciding about suitable management interventions for the future. This unit provides methodology for assessment of forest resources, dependence of communities on forests & TOF along with data collection formats, processing techniques.

3.1 Field Inventory - Grid based sampling design for NWPC

In the present changing scenario of forest resources management at the global level with regard to biodiversity, climate change and carbon emission/sequestration, it is necessary to have assessment, estimation and monitoring of forest resources on the basis of sound statistically robust sampling design.

Sample design: Forest Inventory is mostly a sampling-based exercise. The purpose of sampling is to select a representative sample which represents characteristics of the population, so that precise inference could be drawn. Determination of sample size is one of the most important steps in constructing a sampling design. A systematic sampling design is recommended as the sampling scheme for forest resource assessment (FAO, 2002). The systematic sampling design which is being proposed for forest areas is a grid-based design and is preferred in areas having natural vegetation to ensure:

- Spatial balance in the design.
- Sufficient distance between two consecutive sampling plots to capture variability.

In technical terms, the systematic sampling is more precise than Simple Random Sampling (SRS) & Stratified Random Sampling with proportional allocation when sampling in natural vegetation areas. But it is marginally less precise than stratified random sampling with optimum allocation. Further, the post-stratification techniques can be used for estimation of parameters, in this design, if required.

3.1.1 Determination of sample size: For area sampling situation, sampling intensity is not very relevant but just indicative (NWPC, 2014). Therefore, the optimum sample size i.e. optimum number of plots to be included in the sample which may provide the estimate of population parameter within prescribed limit of error is more important. Determination of optimum sample size is a crucial decision in any sample survey design. The size of sample depends on the variability of main characteristic in the population (say volume/ha), allowable error in the estimate, time and cost factors. Generally, time and cost is not considered in the calculation. It is the variability of the population parameter (characteristic/attribute) allowable error that decides the sample size. A general formula for calculation of optimum sample size is given as;

$$n = \frac{t_v^2 \left(\frac{CV}{AE}\right)^2}{1 + 1/N\left(\frac{CV}{AE}\right)^2}$$

Where,

n	=	sample size,
CV	=	Coefficient of variation of the main characteristic/attribute (which can be calculated through past WP or pilot study or using correlated variable. In absence of any these it can be asked from FSI from similar nearby area of that forest type)
AE	=	Allowable error (%) to be decided by concerned SFDs
t_v	=	Value of t – statistic with v degree of freedom and 5% significance level
N	=	Total number of plots of optimum size of main characteristic in the population (division/range)

Generally, the N is very-very large in forest resource assessment making denominator approximately one and for that reason and brevity the numerator becomes the formula for sample size calculation. It may kindly be noted that a technical document on optimum sample size "Variability in forests and optimum sample size for estimation of Growing Stock in different districts of the country: a ready reckoner for working plan preparation or any other forest resource assessment exercise" has been published by FSI (Source: FSI Technical Information Series Volume 2, No. 3, 2020). This document provides optimum sample size for different districts of the country for conducting inventory to estimate growing stock. It gives district wise information on coefficient of variation (CV) and sampling intensity of growing stock at different allowable errors.

3.1.2 Determination of grid size: For forest resource assessment by FSI, nationally uniform grids of size 5km X 5km is used to ensure uniformity in sampling design and grid size. For the field inventory for the preparation of working plan, the States/UTs may obtain the grid layers of size 5 km X 5 km from Forest Survey of India, Dehradun. It is pertinent to mention here that this grid layer is made using Alber's projection and WGS 1984 datum.
For preparation of working plan, the States/UTs shall determine the size of grids according to the requirements of sample size and available forest areas in respective forest divisions. The size of each grid may be calculated by using the formula;

$$Size\ of\ Grid = \frac{Recorded\ Forest\ Area\ of\ Division}{Sample\ Size}$$

The length of each side of the square grid may be derived by taking the square root of grid size. It may be noted here that the size of grids, as determined by WPO using above formula, may result in grids that are smaller/larger than 5km X 5km. It is pertinent to mention that States (SFDs) may also consult FSI for determination of optimum sample size (grid size & number of grids) for respective divisions and FSI may work out division-wise sample size and grid size in all the States/UTs of the country, given the digital boundary (shape file & area) of a forest division by States. This system will provide a standard frame for integrating and linking of other source data into a database at the national level.

The grid layer will be overlaid on digital RFA boundaries to ascertain the forested grids (grids having RFA either fully or partially). The intersection of these two layers will provide the general sampling frame for the forest inventory plots. Thereafter, with the help of Geographical Information System (GIS) software, the division will be divided into square grids, as per illustration (B) given below. In these grids, random points may be generated using GIS. These

points will form the plot center of the sample point around which a sub-plot of 8 m will be laid out. Other three sub-plots will be laid as per the plot configuration design.

Data may be collected from all the sample points during working plan preparation or SFDs may also decide data collection spread over a period of time. For this, revisit time for the revisiting the grids (say 5-7 years) may be fixed and accordingly numbering of the grids from 1 to 5 (in case the revisit time is 5 years) or 1 to 7 (in case the revisit time is 7 years) may be given. Following the systematic sampling design, a random start may be followed for laying out of plots for inventory in particular grids in a year. One random number will be chosen from 1 to 5 (if the grids are numbered from 1 to 5) as random start and there after all grids containing that number and forest will be marked for data collection in that particular year. An illustration (A) on selection of grids for forest inventory in a year (with revisit time 5 years) is given below.

Within the selected grid, a random point using GIS software will be marked within digital boundary of RFA. This is the centre of the sample point from where the detailed data will be collected. Thus, a list of all the sample plots to be surveyed will be prepared with information on latitude & longitude and other required information.

Illustration A: FSI, Dehradun has kept a revisit time of 5 years for forest inventory grids. The grid selection for inventory data collection in each year is conducted as follows. SFDs may follow the same selection process in case the revisit time is 5 years.

First Year	Second Year	Third Year	Fourth Year	Fifth Year
Grid having Sl. No. 1	Grid having Sl. No. 3	Grid having Sl. No. 5	Grid having Sl. No. 2	Grid having Sl. No. 4

Illustration B: If FSI's 5 km X 5 km grids are borrowed and made coterminous with working plan grids then following illustration may be useful.
Considering area of forest division is 500 sq km, then according to determined sample size, the requirement of number of grids & grid size is given in the following table. WPO shall ensure one sample plot to be laid out in each grid.

Sl. No.	Grid Size	Possible No. of Grids (minimum)	Sample size
1	5km X 5km	20	1-20
2	2.5km X 2.5km	80	21-80
3	1.25km X 1.25 km	320	81-320
4	1km X 1km	500	321-500
5	0.625km X 0.625 km	1280*	501-1280
6	0.5km X 0.5 km	2000*	1281-2000

** in case of determined sample size greater than 500, WPO may consider two consecutive grids as one gird and lay out sample plot considering them as one grid.*

If the ascertained sample size is 400, then one has to choose 1 km X 1 km grid layer and then for a particular year one has to randomly choose 80 (=400/5) grids out of 100 grids which were marked for that year.

3.1.3 Laying out of grid based circular sample Plot in the field: Having obtained the list of all sample plots to be surveyed with information on latitude & longitude, the survey team will reach plot centre with the help of GPS (after having fixed same projection and datum) and marked the plot centre by thin poles or bamboo of 05 cm diameter and 1.5-meter height. After that, a cluster

of four circular subplots of eight-meter radius in a fixed pattern will be laid out around the plot centre which will be considered as sample plot. The centre of sub-plot 1 will be the plot centre. Sub-plot 2, 3 and 4 are located at 40-meter horizontal at azimuths of 360º, 120º and 240º from the centre of sub-plot 1 respectively. All these centres of sub-plot should be marked by thin poles or bamboos of 5 cm diameter and 1.5 meter in height. A red colour cloth may be tied at the top end of these poles for clear visibility from different spots in the plot. Enumeration will be done in all the sub-plots.

In case of centre of sub-plot 1 is inaccessible or falling in water bodies, efforts should be made by the crew leader to locate the centres of other three subplots approximately using the GPS, the distances and back bearings of the centres of the sub-plots 2, 3 and 4 each at 40 meters and 180º, 300º and 60º respectively from the centre of the sub-plot 1.

a. Layout of other attached Micro-plots

Micro Plot for NTFPs **-** Herb (0.6 m radius); Shrub, Climber, Litter & Regeneration (1.7 m radius); and Stump and Dead Wood (2.8 m radius): Within sub-plots 1, 2, 3 and 4, three concentric micro-plots of 0.6 meter, 1.7 meter and 2.8 meter will be laid out at a distance of 5 meter from the center of all the sub-plot at 90º towards east direction respectively to collect the data on NTFP (herbs, shrubs, climbers), woody litter, regeneration; and stump and dead wood respectively.

A circular plot of 60 m radius around the central sub-plot-1 (plot centre) without actually laying out the plot will be used for recording some qualitative information in plot description form (PDF). The information collected is land use, legal status, crop composition, soil, grazing, fire etc. *It is advisable that the PDF should be filled at the last as by the time surveyed work is completed in all the sub-plots, field crew has a fairly good idea about different parameters which are to be recorded in the PDF.*

Advantages of the proposed design:

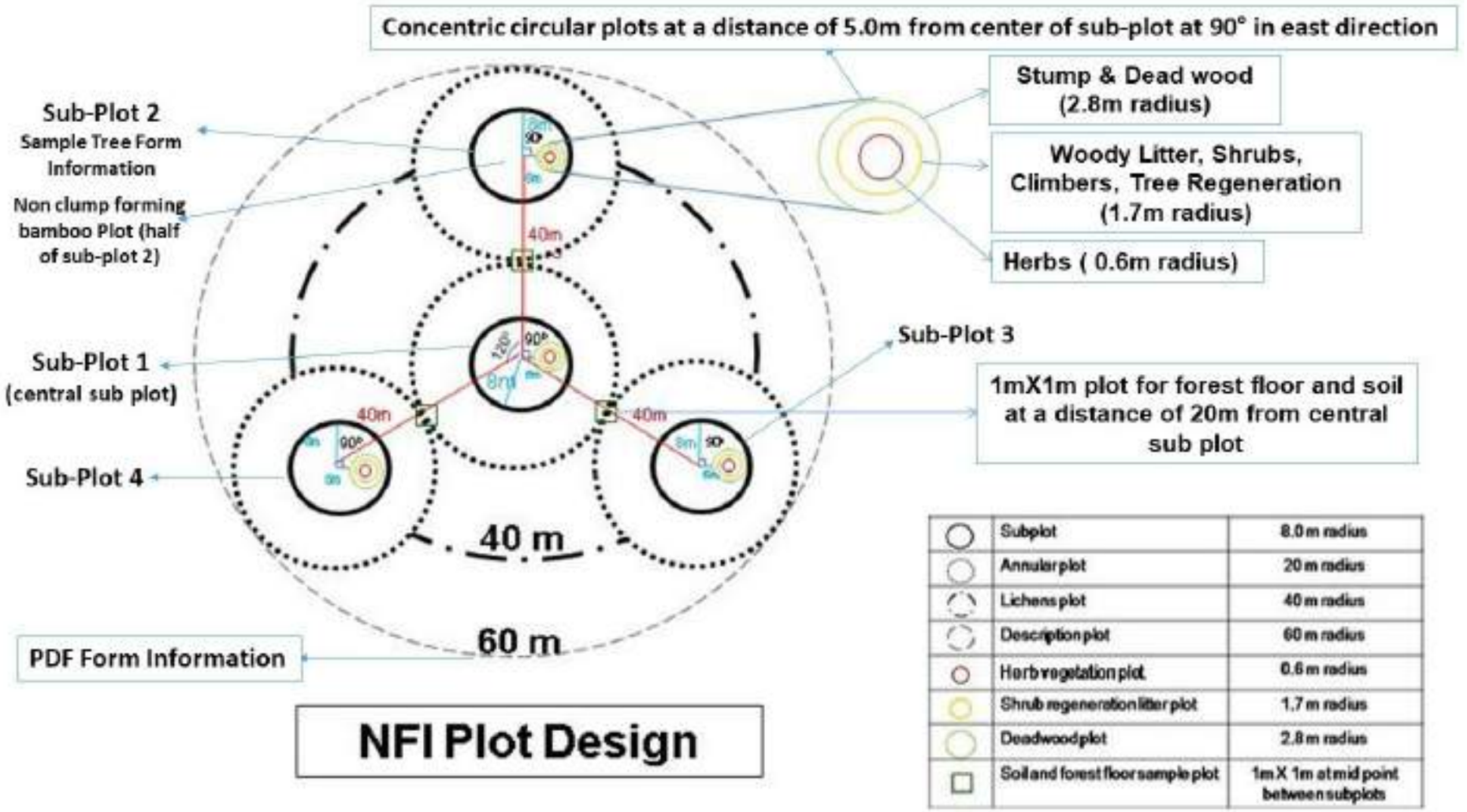
1. The proposed design will enable synchronization in the grid size, projection, datum (at National level) and uniformity in spread of sample plots (across RFAs) within the Division of State/UTs.
2. There will be fixed revisit time/cycle of inventory according to the revisit time fixed by SFDs. Revisit of same plots are known to provide better estimates of changes occurring in RFA.
3. Increased sample size leading to higher precision of estimation.
4. Plot configuration as cluster of circular plots when compared with the square plot captures the local variability efficiently and gives more precise estimates (Scott, 1993).
5. As in the case of circular plots, the perimeter of each plot is smaller than that of square plots of same size, meaning that it has least number of border/confusion trees, as compared to the square design.

Table showing Total Area Sampled for one Sample Plot:

Key	Description	Total Area Sampled
	Tree Enumeration Sub-Plots of 8 m radius (4 Nos.)	804 sq. m.
	Deadwood collection Micro-Plots of 2.8 m radius (4 Nos.)	98.5 sq. m.
	Shrub, Climber, Sapling, Litter collection Micro Plots of 1.7 m radius (4 Nos.)	36.3 sq. m.
	Herb, Grass, Seedling collection Micro Plots of 0.6 m radius (4 Nos.)	4.52 sq. m.
	Soil Sample to be collected from any two square plots and forest floor green biomass from 3 square plots as shown in figure.	3 sq. m.
	Non-clump forming bamboo plot (half circle in Sub-Plot-2)	100.5 sq. m.

Source: Manual for Field data collection of Forest Inventory, National Forest Inventory Programme of India, (Draft) Ver-1.1(Revised on 29.01.2021). FSI, MoEF&CC, Dehradun.

Figure: Plot configuration of circular plot design (main plot and attached sub-plots)



3.1.4 General plot variables to be recorded:

A brief description of the field forms to be used for field data collection is given below.

Form No	Name	Description
i)	**Plot Approach Form**	The information recorded in this field form describes how the plot was approached
ii)	**Plot Description Form**	The information recorded in this field form pertains to the general description of forest on an area of 1.13 ha i.e. 60m radius around the center of the plot. It may be noted that this form should be filled at the end of the entire enumeration in all subplots and other filed forms
iii)	**Plot Enumeration and Sample Tree Form**	**Plot Enumeration Form Parameters** For this, data of trees above 10cm DBH and bamboo clumps will be recorded which are found in 4 sub plots of 8m radius. **Sample Tree Form Parameters** For this, some additional data on dominance of trees of 10cm and above, double bark thickness, tree height and crown width of trees will be recorded from north sub-plot (2^{nd} number) (or from that subplot which is chosen for sample tree form) of 8m radius.
iv)	**Bamboo Clump Analysis Form**	In this form, data of each individual culms occurring in certain selected clumps in the all sub-pots will be recorded.
v)	**Bamboo Enumeration and Analysis Form (non-clump forming)**	In this form, information will be collected for non-clump forming bamboos occurring in the western half of sample sub- plot-2.
vi)	**NTFPs (Herbs, Shrubs and Climbers) and Regeneration Form**	The data is to be collected from all the sub-plots except Forest road, Barren lands and water bodies). Two concentric circular plots of size 0.6 m (**herbs**) and 1.7 m (**Shrubs, Climbers) and Regeneration**) radius at a distance of 5.0 m from center of sub-plot at 90^0 in east direction are to be taken for collection of data on NTFP and tree regeneration.
vii)	**Soil and Forest Floor Carbon Form *(Optional)***	For forest floor data fresh, partially and fully decomposed leaves, twigs and branches are collected from three plots of 1mx1m at a distance of 20m from central sub plot. For collection of soil sample data pits of 30cmx30cmx30cm in the above any two plots are dug out and a composite sample of 200gms is collected for estimating soil carbon.
viii)	**Stump, Dead Wood and Woody Litter Form *(Optional)***	The data is to be collected from all the sub-plots (except Barren lands and water bodies). Two concentric circular plots of size 1.7 m (**woody litter**) and 2.8 m (**Stump and dead wood**) radius at a distance of 5.0 m from center of sub-plot at 90^0 in east direction are to be taken for collection of data on NTFP and tree regeneration.
ix)	**Shrubs, Climbers and Herbs Biomass Form *(Optional)***	The data is to be collected from all the sub-plots (except Barren lands and water bodies). Two concentric circular plots of size 0.6 m (Herbs) and 1.7 m (Shrubs &Climbers) radius at a distance of 5.0 m from center of sub-plot at 90^0 in east direction are to be taken for collection of data on Shrubs, Climbers and herbs.

The detailed instructions to fill up the field forms during the forest inventory are in the document at the link given below:

https://fsi.nic.in/uploads/documents/doc_5753_final-NATIONAL-forest-inventory-manual-new-130922.pdf

In the document, “Field instructions for data collection of National Forest Inventory” (FSI), instructions to collect data in different field forms are in pages from 27-101 of the document. The codes, methodology are in pages 102-129 of the document.

3.1.5 Field Forms (1-10) for forest inventory

Field Form No. 1

PLOT APPROACH FORM (*Note: Col 21 to 28 are optional)*

Job No.	FSI Zone code	Phy. Zone Code	State code	Forest Division Code	District Code	Map sheet No.	Grid Code	Name of Camp	Time (hrs.) at which left the camp/plot (IST Time)		Distance covered by vehicle (km)	Time taken in journey by vehicle (in hours)	Latitude & Longitude of the place upto which journey performed by vehicle	
													Latitude	Longitude
1 (3)	2 (1)	3 (2)	4 (2)	5 (2)	6 (2)	7 (6)	8 (6)	9	10 (4)		11 (2)	12 (4)	13 (8)	14 (8)
	011													

Time(hrs.) at which started on foot to plot centre (IST)	Distance covered on foot upto the plot centre (km upto two decimal place)	Time (hrs.) of arrival at the Plot (IST)	Time (hrs) of departure from the plot (IST)	Time (hrs.) at which returned to the camp (IST)	Compassing/Navigation done by (Name of person)	Plot laid out by (Name of person)	Tree Enumeration done by (Name of person)	Height Measurement taken by(Name of person)	B.T. & other measurements taken by(Name of person)	Bamboo enumeration done by(Name of person)	Bamboo weight taken by (Name of person)
15 (4)	16 (4)	17 (4)	18 (4)	19 (4)	20	21	22	23	24	25	26

Herbs/Shrubs/ Climbers/ Regeneration Data collected by (Name of person)	Soil & Forest Floor data Collected by(Name of person)	Details of the Reference Tree(In case of plot status 1& 5)					Latitude and Longitude of the place upto where crew approached (in case of plot status 2/3/4)		Name of the Crew Leader	Remarks (Upto 50 (Fifty) words)
		Reference Tree Sl. No.	Spp Code	Species Name	Distance from Tree to Plot Centre (in meters upto two decimel)	Bearing from Tree to Plot Centre (in degree)	Latitude	Longitude		
27	28	29	30(4)	31	32(4)	33(3)	34(8)	35(8)	36	37
		1.								

Date: dd /mm /yyyy

Signature of the Crew Leader

Field Form No. 2

PLOT DESCRIPTION FORM

Job No.	Survey code	Form Code	FSI Zone	Phy. Zone	State	District	Forest Division	Mapsheet No.	Grid code	Lat.	Long.	Legal Status	Land Use	Density for LUC 7&14	Wild life protected area
1 (3)	2 (1)	3 (2)	4 (1)	5 (2)	6 (2)	7 (2)	8 (2)	9 (6)	10 (6)	11 (8)	12 (8)	13 (1)	14 (2)	14 (a) (2)	15 (1)
	1	02													

Terrain Data						Soil Data							Crop Data																				Bamboo Data							Degraded Forest				
General Topography	Slope	Position on slope	Altitude	Aspect	Rockiness	Humus	Soil colour	Soil consistency	soil texture	Coarse Fragments	Soil depth	Soil erosion	Origin of stand	Crop composition	Canopy layer or storey	Top height	Size class	Intensity of regeneration	Species under regeneration	Injuries to crop due to Girdling	Injuries to crop due to Illicit felling	Lopping for fodder etc.	Fire incidence	Grazing incidence	Presence of understorey vegetation	Presence of grass	Presence of most occurring invasive species	Presence of second most occurring invasive species	Extent of most occurring invasive species	Extent of second most occurring invasive species	Bamboo density	Bamboo quality	Bamboo flowering	Bamboo regeneration	Plantation potential	Distance from road (km)	Type of water bodies in the vicinity of plot	Distance from river/stream (m)	Plot status	Biotic influence	Natural calamity	Date of survey(dd/mm/yy)	Basel Area (at factor 1.5) by wedge prism (in sq. m upto 5 decimal places)	Canopy Density by using densitometer
16 (1)	17 (3)	18 (1)	19 (4)	20 (1)	21 (1)	22 (1)	23 (1)	24 (1)	25 (1)	26 (1)	27 (1)	28 (1)	29 (1)	30 (2)	31 (1)	32 (2)	33 (1)	34 (1)	35 (4)	36 (1)	37 (1)	38 (1)	39 (1)	40 (1)	41 (1)	42 (1)	43 (2)	44 (2)	45 (1)	46 (1)	47 (1)	48 (1)	49 (1)	50 (1)	51 (1)	52 (1)	53 (1)	54 (1)	55 (1)	56 (1)	57 (1)	58	59 (8)	60 (2)

Signature of the Crew Leader…….

Note:- i) First Number in the row below the field headings represents the column number and the number inside the bracket represents the column width.

ii) For Lat& Long, seconds to be recorded upto two decimal places, no need to put the decimal point.

Field Form No. 3

PLOT ENUMERATION AND SAMPLE TREE FORM

Job No.*	Form Code*	Mapsheet No.*	Grid code*	Sub-plot*	Slope %*	Sub-plot status*	Land use class of Sub-plot*	Sub-plot Selected for STF (Yes/ No)*	Total No. of bamboo clumps*	Total No. of trees*
1 (3)	2 (2)	3 (6)	4 (6)	5 (1)	6 (3)	7 (1)	7a(2)	7 (b)	26 (3)	27 (3)
	03									

y	Plot Enumeration Form Parameters							Sample Tree Form Parameters										
								Crown width (meter)		Height (meter)								
	Species Name*	Species code*	Dia (cm)*	Status of tree (Dead / Alive)*	Cause of death in case of mortality*	Rotten/ missing cull*	Decay class*	CW1*	CW2*	Total height*	Un-compacted Crown Length	Compacted Crown Length	Incidence of Insect*	Incidence of Disease*	DBT (mm)*	Bark Void %	Clear bole height (m)*	Dominance*
8	*8.1*	*9 (4)*	*10 (3)*	*11 (1)*	*12 (1)*	*13 (1)*	*14(1)*	15(2)	16(2)	17(2)	18 (2)	19(2)	20(1)	21(1)	*22(2)*	*23(2)*	*24(2)*	*25(1)*

Date…….. Signature of the Crew Leader…….

Note:- i) First Number in the row below the field headings represents the column number and the number inside the bracket represents the column width

ii) If species is identified but uncoded in the manual, then please mention the botanical/local name of the species.

Field Form No. 4

BAMBOO CLUMP ANALYSIS FORM

Job No.	Form Code	Mapsheet No.	Grid code
1 (3)	2 (2)	3 (6)	4 (6)
	05		

Average culm height (in dcm)		Bamboo quality
Upto 1 cm top dia	Upto 2 cm top dia	
38 (3)	39 (3)	40 (1)

Species		Sub-plot number and Clump Sl.No.	Clump Dia-meter (cm)	Clump size class	Green sound culm									Green damaged culms									Dry sound culms				Dry damaged culms				Deca-yed culms	Total no. of culms
					Current year's	One to two years old				Over two years old				Current year's	One to two years old				Over two years old														
Name	Code					1<2 cm	2<5 cm	5<8 cm	8+ cm	1<2cm	2<5 cm	5<8 cm	8+ cm		1<2 cm	2<5 cm	5<8 cm	8+ cm	1<2cm	2<5 cm	5<8 cm	8+ cm	1<2cm	2<5 cm	5<8 cm	8+ cm	1<2cm	2<5 cm	5<8 cm	8+ cm		
5	6 (4)	7 (3)	8 (3)	9 (1)	10 (2)	11 (2)	12 (2)	13 (2)	14 (2)	15 (2)	16 (2)	17 (2)	18 (2)	19 (2)	20 (2)	21 (2)	22 (2)	23 (2)	24 (2)	25 (2)	26 (2)	27 (2)	28 (2)	29 (2)	30 (2)	31 (2)	32 (2)	33 (2)	34 (2)	35 (2)	36 (2)	37 (3)

Date…….. Signature of the Crew Leader……

Note:- i) First Number in the row below the field headings represents the column number and the number inside the bracket represents the column width

ii) If species is identified but uncoded in the manual, then please mention the botanical/local name of the species.

Field Form No. 5

BAMBOO ENUMERATION AND ANALYSIS FORM (NON CLUMP FORMING)

Job No.	Form Code	Mapsheet No.	Grid code	Sub-plot No.
1 (3)	2 (2)	3 (6)	4 (6)	36 (1)
	06			

Species			Green sound culms								Green damaged culms									Dry sound culms				Dry damaged culms				Deca-yed culms	Average culm height in dcm.	Total no. of culms
Name	Code	Current year	One to two year old				Over two year old				Current year	One to two year old				Over two year old														
			1<2cm	2<5 cm	5<8 cm	8+ cm	1<2cm	2<5 cm	5<8 cm	8+ cm		1<2cm	2<5 cm	5<8 cm	8+ cm	1<2cm	2<5 cm	5<8 cm	8+ cm	1<2cm	2<5 cm	5<8 cm	8+ cm	1<2cm	2<5 cm	5<8 cm	8+ cm			
5	6 (4)	7 (3)	8 (3)	9 (3)	10 (3)	11 (3)	12 (3)	13 (3)	14 (3)	15 (3)	16 (3)	17 (3)	18 (3)	19 (3)	20 (3)	21 (3)	22 (3)	23 (3)	24 (3)	25 (3)	26 (3)	27 (3)	28 (3)	29 (3)	30(3)	31 (3)	32 (3)	33 (3)	34 (3)	35 (4)

Date…….. Signature of the Crew Leader…….

Note :- i) First Number in the row below the field headings represents the column number and the number inside the bracket represents the column width

ii) If species is identified but uncoded in the manual, then please mention the botanical/local name of the species.

Field Form No. 6

NTFP (HERBS, SHRUBS and CLIMBERS) AND REGENERATION FORM

Job No.*	Form Code*	State Code*	Mapsheet No.*	Grid code*	Lat*	Long*
1 (3)	2 (2)	3 (2)	4(6)	5 (6)	6 (8)	7 (8)
	08					

Herb Plot size: 0.6 meter radius
Shrub, Climber & Regeneration Plot size: 1.7 meter radius

Sub-Plot number*	NTFP (herbs, shrubs and climbers)*							Regeneration (Trees)*						
	Species			No. of plants				Species				No. of plants		
	Name	Code	Habit (herbs/shrubs/ climbers)	Collar diameter class (mm for herbs /cm for shrubs & climbers)				Name	Code	Diameter at breast height (cm)	Status of tree (alive/ dead)	Category of regeneration		
												1	2	3
				0-2	2-5	5-8	8+							
8(1)	9	10 (3)	11(1)	12 (3)	13 (3)	14 (3)	15 (3)	16	17(4)	18 (1)	19 (1)	20 (2)	21 (2)	22 (2)

Date…… Signature of the Crew

Leader…….....

Note:- i) First Number in the row below the field headings represents the column number and the number inside the bracket represents the column width

Field Form No. 7 *(Optional)*

SOIL AND FOREST FLOOR CARBON FORM*

Job No.*	Form Code*	Mapsheet No.*	Grid code*	Lat*	Long*	Proportion of*		Forest floor sample No.*	Soil sample No.*
						Gravel	Soil		
1 (3)	2 (2)	3 (6)	4 (6)	5 (8)	6 (8)	7 (3)	8 (3)	9 (4)	10 (4)
	09								

Weight of Forest Floor in gms.*			Volume of soil (Not to be collected from field)	Weight of soil (gms)*
Plot 1 (360^0 north)	Plot 2 120^0 azimuth from sub-plot 1	Plot 3 240^0 azimuth from sub-plot 1)		
11 (5)	12 (5)	13 (5)		14 (4)

Date…… Signature of Crew Leader…...……

Note:- i) First Number in the row below the field headings represents the column number and the number inside the bracket represents the column width

SOIL AND FOREST FLOOR SAMPLE CARD* ***(Optional)***

(To be read with Field Form 7)

1. Map sheet No.*

   _____

2. Grid Code*

   _____

3. Lat. and Long.*

   _____

4. Sample No.*

   _____

5. Date of Collection*

   _____

Signature_____

Field Form No. 8 *(Optional)*

STUMP, DEAD WOOD AND WOODY LITTER FORM

Job No.	Form Code	Mapsheet No.*	Grid code*	Lat*	Long *	Presence of Dead Wood information*
1 (3)	2 (2)	3(6)	4 (6)	5 (8)	6 (8)	17(1)
	10					

Stump and Dead wood: circular plot of size 2.8 m radius
Woody litter: circular plot of size 1.7 m radius

Sub-plot number*	Stump Information*				Dead wood information*			Woody litter (branch less than 5 cm)*	
	Species code	Status of stump (alive/ dead)	Dia in cm.	Height in cm.	Species code	DBH/ Dia (cm)	Length of the Log (cm)	Sub-plot number	Weight (in kg up to two decimal places)
7(1)	8 (4)	9(1)	10(3)	11(3)	12 (4)	13(3)	14 (3)	15(1)	16(4)
								1	
								2	
								3	
								4	

Date…….

Signature of the Crew

Leader…….....

Note:- i) First Number in the row below the field headings represents the column number and the number inside the bracket represents the column width

Field Form No. 9 *(Optional)*

Shrubs, Climbers and Herbs Biomass Form

JobNo.	Form Code	State Code*	Mapsheet No.*	Grid code*	Latitude*	Longitude*	Sub-plot number*	Shrubs & Climbers: circular plot of size 1.7 m radius*
1 (3)	2 (2)	3(2)	4 (6)	5(6)	6(8)	7(8)	8 (1)	
	11							Herbs: circular plot of size 0.6 m radius

Shrubs*					Climbers*					Herbs*			Remarks*
Species name	Weight				Species name	Weight				Species Name	weight		
	Woody part		Non Woody part			Woody part		Non Woody part					
	Green wt. (kg. upto two decimal places)	Dry wt. (%)	Green wt. (kg. upto two decimal places)	Dry wt. (%)		Green wt. (kg. upto two decimal places)	Dry wt. (%)	Green wt. (kg. upto two decimal places)	Dry wt. (%)		Green wt. (gms)	Dry wt. (%)	
9	10(4)	11 (2)	12(4)	13 (2)	14	15 (4)	16 (2)	17 (4)	18 (2)	19	20(4)	21 (2)	22

Date: …..

Signature of Crew Leader…...……

Name of Crew Leader.....

Note:- i) First Number in the row below the field headings represents the column number and the number inside the bracket represents the column width

FORM: 10 ***(Not a field form)***

To be prepare correlating the grid code described in the manual with the details of the range, block, beat and compartment of the division

Grid Code	Range	Bock	Beat	Compartment

Note: Field data collection for formats (Field form 7, 8, 9) is optional.

3.2 Assessment of wildlife habitats and species

The WPO is not required to undertake an estimation of faunal populations. Advantage should be taken of ongoing efforts such as estimation of predators, co predators and prey in India carried out by the National Tiger Conservation Authority (NTCA) in collaboration with the Wildlife Institute of India and the State Forest Department. The WPO should identify flagship species including mammals, birds, reptiles, amphibians, plants etc. which may be significant for the area. The WPO should identify suitable habitats and micro habitats for such key wildlife species and appropriate measures needed to conserve and improve the same. Special attention should be given to forest areas in proximity to protected areas which also serve as extended habitats for many rare and endangered species. The maintenance and restoration of grasslands, wetlands, wildlife corridors and water points must be identified. Threats, such as habitat loss and/or fragmentation, illegal trade, road and rail networks etc. should be identified and appropriate corrective measures should be suggested for implementation. Similarly, areas of man animal conflict deserve special attention for amelioration.

Furthermore, for the non-Tiger range states/divisions, a blueprint will be developed on lines similar to that of AITE. The blueprint shall be developed for the same by a senior scientist in charge of the Tiger cell of the NTCA. Field staff of territorial divisions of the non-tiger range states/divisions will be imparted hands-on training either directly through the Tiger cell or through the master trainers with any tiger reserve/division where AITE has been carried out. This shall enable non-tiger range states/divisions to collect data on similar lines as that of the tiger range states/divisions (collected through AITE). This shall lead to data collection in a uniform way throughout the country. The WII shall develop a data base for the storage and retrieval of the data for use of non-tiger range states/divisions.

3.3. Socio-Economic Study of Forest Dependence and Estimation of TOF for Preparation of Working Plan

Forests play a major and an important role in the socio-economic and cultural lives of the people in general and the communities residing in and around the forest fringe areas in particular. The rural communities interact closely with forests for meeting their basic needs for food, water, health, fuelwood, fodder and supporting their livelihood from a variety of forest resources. These forest resources are available with free access; therefore, it assumes greater importance and priority in their livelihood.

Forest ecosystem is a dynamic natural resource which is greatly influenced by forest-people interaction. Removal of forest produce (fuelwood, fodder, timber, bamboo, NTFPs etc.) from forests by the inhabitants of the villages close to forests as usual dependence practices is believed to cause considerable stress on the forest resources. The increasing population and purchasing power coupled with preference for natural products has accelerated the rate of extraction of many of the forest resources. These removals of forest produce are largely unrecorded and the extraction methods are unscientific and over-exploitative. Therefore, quantified assessment of such removal from forests along with extraction methods in practice, through socio-economic surveys, is essential for appropriate management interventions. The information on socio-economic and ecological impacts of such removals is helpful in bridging the information gaps and assessing the possible impairment of forest productivity due to such unrecorded and exploitative removals from forests.

Therefore, socio-economic surveys of villagers to assess their forest resource dependence shall form an integral part of working plan preparation. These villages may be termed as Forest Fringe

Villages (FFVs), which are situated inside the Recorded Forest Areas (RFA) and upto within a certain distance (say 3 km from RFA) from the boundaries of RFA.

3.3.1 Sampling Methodology:

Socio-economic survey shall entail collecting information on socio-economic status of the people living in and around the forest and their dependence on the forests for their livelihood needs. The villages and towns situated within the forest division will be considered for the assessment of their socio-economic dependence/livelihood.

Sample Design: A multi stage stratified random sampling design will be adopted for the study. The first stage units (FSU) will be villages/Towns within the forest division areas and the second stage units (SSU) will be households (Above Poverty Line/ Below Poverty Line or any other category) in the villages/Urban Frame Survey Blocks (UFS Blocks as prepared by National Statistical Office of all the towns in the country).

The dependence of people living in villages will be quite different than that of the people living in urban areas. These sub-populations may be termed as Rural and Urban sector consisting of different sampling units and may demand different sampling procedure. This study can be undertaken periodically by the SFD and need not be done by the WPO at the time of revision of the WP exercise. Whenever such studies have been done by the SFD the WPO may use the results of such study for the purpose of revision of WP. The SFDs may engage specialised organisation for the purpose of this survey.

3.3.2 Sampling for Rural Sector:

3.3.2.1 Stratification: To study the dependence of inhabitants of villages on nearby forests, the villages situated within and outside forests (but within forest division) will be segregated into three strata on the basis of their distance from forests, forming the first stage sampling units as follows:

Strata -1: Villages inside the RFA boundary;
Strata -2: Villages outside RFA and within a distance of 3 km from RFA boundary;
Strata -3: Villages beyond 3 km distance from RFA boundary.

Similarly, for selection of households within villages (FFVs), the households were segregated into two sub-strata namely APL households and BPL households. This forms the sampling frame at the second stage.

It may be noted here that the information on total number of villages along with number of households in village, in each Strata should be collated/compiled and made known to the WPO/surveyor beforehand. The objectives of this socio-economic study include assessment of Trees outside Forest (TOF). The TOF areas will refer to areas outside the recorded forest but within the forest division. These are broadly classified according to land use such as trees in urban area, and rural areas.

3.3.2.2 Determination of sample size (optimum no. of villages): A general formula for calculation of optimum sample size (optimum no. of villages) is to be determined as;

$$n = \frac{t_v^2 \left(\frac{CV}{AE}\right)^2}{1 + 1/N \left(\frac{CV}{AE}\right)^2}$$

Where

n	=	Sample size
CV	=	Coefficient of variation of the main characteristic/attribute (which can be calculated through past WP or pilot study or using correlated variable. In absence of any of these it can be asked from IIFM/ICFRE/FSI from similar nearby area of that forest type)
AE	=	Allowable error (%) to be decided by concerned SFDs
t_v	=	Value of t – statistics with v degree of freedom and 5% significance level
N	=	Total number of villages in the population (division/range)

3.3.2.3 Selection of villages: Once the sample size (no. of villages to be sample in each division) is determined, the villages will be distributed proportionately among each strata. Accordingly, a representative sample of villages will be selected randomly from each of the strata. It shall be ensured by the WPO that at least 5 villages are to be selected from each of the strata. In case, if the total number of villages in a strata is less than or equal to four, then all the villages are to be selected in the sample from that strata.

3.3.2.4 Selection of households: As the economic status of a household has bearing on its dependence on forests, the poverty line or land holding or any such criterion may be considered as stratification variable for second stage stratification. Therefore, within each selected village, 30 households including 15 households each from sub-strata viz above poverty line (APL) and below poverty line (BPL) strata will be selected using simple random sampling.

3.3.2.5 Identification of households as APL and BPL: This may be ascertained through online list, available on the website of Ministry of Rural Development or District Administration being provided at the website of local administrative authorities of respective State Governments. However, the offices of Gram Pradhan, Panchayat, Aanganwadi Centre or Joint Forest Management Committee may also be contacted for such information.

Once the list is available, the households may be segregated into two sub strata of APL households and BPL households. A running serial number may be assigned to all the households in each sub strata This list of households formed the second stage sampling units for that sub strata. A total of 15 households can be selected randomly from each sub strata (using random number tables approach). In case of shortfall in number of households in one sub strata i.e. if number of households in any sub strata could not come to 15, the shortfall in one sub strata (APL or BPL) may be compensated from same sub strata household of other selected village. Further categorization /stratification may be considered as per the needs of a division such as specific communities engaged in collection of some important forest resource and hence their inclusion in survey with some minimum numbers may be desirable.

The information on some important determinants of consumption of fuelwood, fodder, timber, bamboo, NTFPs, other livelihood aspects etc. shall be collected in the field form given at para 3.3.4.

3.3.2.6 Data collection: The methodology would involve following steps:

1. Listing of the villages as Forest Fringe Villages, falling within the forest division.
2. Stratification of villages into Strata -1 (Villages inside the RFA boundary), Strata -2 (Villages outside RFA and within a distance of 3 km from RFA boundary), Strata -3 (Villages beyond 3 km distance from RFA boundary).
3. Calculation of optimum sample size of first stage sampling units i.e, villages and its proportional distribution among strata.
4. villages will be selected randomly from each of the strata.
5. Listing of households in the selected villages in each Strata and Selection of the required number of households from sub strata (APL/BPL) from each sample village using simple random sampling.
6. Data collection from the selected households (APL/BPL) in the selected village in each Strata.
7. Analysis of the data and making useful inferences / interpretation on dependence of people on the nearby forests.
8. Suggestions for the management interventions on key resources for their conservation and sustainable use (sustainable management and harvesting protocol).
9. For the purpose of complete assessment of Rural TOF, all the trees available on non-private land would be enumerated in separate format.

3.3.3 Sample for Urban Sector: The scope of this sector would be restricted to all cities and towns which are listed by the office of Directorate of Census Operations (DCO) of respective States/UTs and falling within concerned forest division boundaries. Sampling frame for urban areas (above mentioned cities and towns) has been continuously prepared at five years cycle by Field Operation Division, National Statistical Office (FOD, NSO) (under the Ministry of Statistics and Programme Implementation, Government of India) located in all states/UTs. This organization conducts surveys by the name of 'Urban Frame Survey' (UFS). They divide all urban centers of a district in blocks called 'UFS blocks'. These blocks are having well defined boundaries, and are formed on the basis of 600-800 population or 120-160 households; they cover the whole area within the geographical boundary of a town including vacant lands. The UFS blocks may be considered as the sampling units. WPO can identify the names of cities and towns falling within his Division from the list of towns available from the concerned DCO. The list of UFS blocks of such towns can be obtained from the concerned Office of FOD, NSO.

Figure:UFS Block

3.3.3.1 Selection of urban towns (FSU): For identification of urban areas for the socio-economic survey, list of urban towns and cities as per latest Census (Census, 2011) will be used. The area of all such towns/cities and corresponding population is known from the census data. Within a forest division, atleast 5 of the urban towns are to be selected in the first stage using simple random sampling (SRS) method. All urban towns are to be selected, in case of less than 5 urban towns. In each of the selected urban town, atleast four UFS blocks are to be selected randomly as second stage sampling units.

3.3.3.2 Selection of UFS blocks: The complete list of UFS blocks in the selected towns will form frame for third stage sampling units (TSU). The list of UFS blocks may be obtained from the regional offices of FOD, NSO. From this, four blocks in each selected urban towns will be selected randomly. Thereafter, 30 households from each UFS Block will be selected using random number table for the survey. The inventory is to be done in the selected households in each UFS block and all trees above 10 cm diameter are to be recorded in the Field Form 2(A): Particulars of Households and Field Form 2(F): Annual Availability of Timber in TOF. For the purpose of complete assessment of urban TOF, all the trees available on non-private land within selected UFS blocks would be enumerated in separate format.

3.3.3.3 Data collection: The methodology would involve similar steps as mentioned in above paragraphs for rural sector at para 3.3.2.6.

3.3.4 Field forms

A total of five field forms are suggested for collection of data on consumption of fuelwood, fodder, small timber and bamboo from FFVs. The description of field forms is given below along with instructions to fill these forms are given.

However these are suggested forms. The WPO in consultation with an expert agency may add more forms or revise these forms as per the requirement of the division.

1. Form 1 : Village Information Form
2. Form 1A : Assessment of ToF in non-private area
3. Form 2(A) : Particulars of Households
4. Form 2(B) : Small Timber & Bamboo Consumption
5. Form 2(C) : Annual Fuel Consumption
6. Form 2(D) : Annual Fodder Consumption
7. Form 2(E) : NTFP (including MADPs Collection)
8. Form 2(F) : Availability of Timber in Tree Outside Forest (TOF)

Forms for socio economic survey (1, 1A, 2A, 2B, 2C, 2D, 2E and 2F)

Socio Economic Survey to assess dependence of consumption of fuelwood, fodder & Small Timber

Field Form 1: Village Information Form (one for each sample village separately)

(For each village allotted, please collect the following information. Please use separate format for each village.)

1. **Name of Village/ IV unit and UFS Block No** –

2. **Buffer/Stratum** -

Code	Description
1.	Within recorded forest area boundary
2.	Within 3 km buffer from the recorded forest area boundary
3.	Beyond 3 km buffer from the recorded forest area boundary

3. **Name of Tehsil/ Town** -
4. **Name of Gram Panchayat** –
5. **Name of Revenue Block** –
6. **Forest Range with Division** –
7. **Forest Block** –
8. **Population**
   - **a.** Male –
   - **b.** Female –
   - **c.** Children (below 15 years of age) –
   - **d.** Total –

9. **Category of Households**
   - **a.** Number of Households in BPL category -
   - **b.** Number of Households in APL category -
   - **c.** Any additional households in new category (please define the category)

10. **Household size & Occupation**
    - **a.** Total number of Households –
    - **b.** Average household size –
    - **c.** Number of households with occupation

S. No.	Primary Occupation*	Number of households
i.	Agriculture	
ii.	Service	
iii.	Ex-servicemen/retired	
iv.	Wage labour	
v.	Business	
vi.	Any other* (please specify)	
Total**		

Occupation for a HH, where from > 50% income is received.

***** Total should tally with total number of HHs.***

11. Land use, land holding, rights &concessions.

a. Area of village - _____ha.

S. No.	Type of Land	Area (ha)
i.	Agriculture (Irrigated)	
ii.	Agriculture (Unirrigated)	
iii.	Horticulture	
iv.	Barren agriculture	
v.	Civil settlement	
vi.	Van Panchayat	
vii.	Forest land	
viii.	Any other (specify)	
Total		

b. Land holding

S. No.	Land category	No of Households
i.	Landless	
ii.	Upto 0.5 ha/(25 nalis)	
iii.	>.5 ha-1ha/(26-50 nalis)	
iv.	>1ha to 2ha/(51-100 nalis)	
v.	> 2 ha (100 nalis)	

Rights on forest land & extent of rights.

1. Individual Right (No. & Extent) -
2. Community Rights (no. & Extent) -
3. Development Rights (No. & Extent) -

(1 to 3 are to be obtained from FRA records)

S. No.		Number of households
i.	Grazing (number of cattle to be indicated with total number of households)	
ii.	Lopping (number of trees along with household to be indicated)	
iii.	Grass Collection	
iv.	Fuelwood	
v.	Timber	
vi.	NTFP	
vii.	Boulders & sand	
viii.	Other rights over forest resources (way, water, etc.) please specify	
ix.	Others (not specified in above categories)	
Total**		

12. Village water sources & dependence-

a. Drinking water

S. No.	Source	Dependence of Households
i.	Tap water	
ii.	Hand pump	
iii.	Well	
iv.	Spring/Pond/Tank	
v.	Other (specify)	
Total		

b. Irrigation

S. No.	Source	Households
i.	River/stream/canal	
ii.	Tank/Pond	
iii.	Water harvesting structure (Lift Irrigation, Check Dams & others)	
iv.	Pump set	
v.	(Any other specify)	
Total		

Natural sources of water

i. Water streams :

Name of water Stream/ River	Duration of water available Flow (months)	Past Trend (5-10 yrs) (increased/ decreased/ unchanged)	Distance from village

ii. Water level in the ponds or other water bodies in the vicinity

Extent of pond (ha)	Duration of water available Flow (months)	Depth of water (m)	Past trend (5-10 years) (increased/ decreased/ unchanged)	Distance from village

iii. Water level in the wells in the vicinity

Water level (m)	Duration of water available Flow (months)	Depth of well (m)	Past trend (5-10 years) (increased/ decreased/ unchanged)	Distance from village

13. Livelihood opportunities from forests. If yes, (in % of village HHs)

a. Employment _____
b. Ecotourism _____
c. Extraction & selling of fuelwood _____
d. Other NTFP (Extraction, processing & selling) _____

14. Information provider details:

a. Name of Informant
b. Type of Informant
   i. Gram Pradhan
   ii. Sarpanch
   iii. Aaganwadi Sevika
   iv. Asha Behanji
   v. Others, Please specify
c. Gender
d. Age
e. Occupation
f. Education

Remarks, if any:

Name of interviewer ...…… Designation…….
Name of group members **Designation…….**

Signature…….. **Date: …….**

Socio Economic Survey to assess dependence of consumption of fuelwood, fodder & Small Timber

Field form 1A: Village Information: Trees on Non-Private land

(For each village allotted, please collect the following information. Please use separate format for each village.)

1. Name of Village/ IV unit and UFS Block No –

2. Buffer/Stratum -

Code	Description
1.	Within recorded forest area boundary
2.	Within 3 km buffer from the recorded forest area boundary
3.	Beyond 3 km buffer from the recorded forest area boundary

3. Name of Tehsil/ Town -

4. Name of Gram Panchayat –

5. Name of Revenue Block –

6. Forest Range with Division –

7. Forest Block -

8. Enumeration of TOF

S No	Species name	code	DBH (OB) cm	Crown diameter M (0.0)	ownership	Category of Plantation

Code Ownership

a) Forest Department
b) Other Government Department
c) Panchayat Land
d) Institutions (Govt.)
e) Others (specify)

Code Category of plantation/tree

a) **Village Woodlots:** Naturally growing trees/planted trees on community land etc.
b) Road side plantations: For trees planted along the roadside
c) **Ponds side plantation:** For trees planted around water ponds.
d) **Railway side plantation:** For trees planted along the railway lines.
e) Canals side plantation: Trees planted along the canals.
f) **Others:** Trees not falling in any of the above categories

9. Area of UFS block surveyed -

(It refers to the area surveyed by the team for enumeration of trees in UFS block/non-private land. To be measured using GPS)

2 (A): Particulars of Household

1	Village Name/ Town Name	
2.	IV unit and UFS Block No	
3.	House No.	

4.	Name of the Head of the Household	
5.	Number of Males in family	
6.	Number of Females in family	
7.	Number of Children in family	
8.	Total number of persons living in the household	
9.	Type of building actually visited	
10. (1)	Status of household	
11. (1)	Highest education level in household	
12. (1)	Social group code	
13. (1)	Means of livelihood code of the household	
14. (1)	Size of land holding (in ha)	
15. (1)	Ownership of the household	
16. (1)	Types of Land	
17. (1)	If irrigated, Source of irrigation	
18.	Monthly Income (Rs.)	

2 (B): Annual Small Timber Consumption

1	Village Name	
2	House No.	

3(1) Do you collect small timber from forests? (Yes-1/ No-2)

4.	**1 - Small Timber**				**2 - Bamboo**				
Small Timber Code 1	**Item Code**	**Sub-Code**	**Size Class**	**Number**	**Bamboo Code 2**	**Item Code**	**Sub-Code**	**Size Class**	**Number**
5(1)	6(1)	7(1)	8(1)	9(3)	5(1)	6(1)	7(1)	8(1)	9(3)

2 (C): ANNUAL FUEL CONSUMPTION

1	Village Name	
2	House No.	

3 (1) Do you collect fuel wood from forest (Yes-1/No-2)

Period code	**Fuel usage code**	**Fuel wood (kgs.)**	**Agri. Waste (kgs)**	**Cow dung (kgs.)**	**Char coal (kgs.)**	**Coal (kgs.)**	**Gas (kgs.)**	**Kerosene (Ltr.)**	**Electri-city unit (Kwh.)**	**Source code for fuel wood**	**Remarks**
4(1)	**5(1)**	**6(4)**	**7(4)**	**8(4)**	**9(4)**	**10(4)**	**11(3)**	**12(3)**	**13(3)**	**14(1)**	**15**

2 (D): ANNUAL FODDER CONSUMPTION

1	Village Name	
2	House No.	

1. Do you get livestock feed/fodder under any Government scheme (Yes-1/No-2)

If Yes,

3.1 Name of the Scheme

3.2 Quantity of fodder provided (in Kgs)

3.3 Frequency (per month)

2. Do you get fodder seed under Govt. scheme for plantation in your farm (Yes- 1/No-2)

If Yes,

4.1 Name of the Scheme

4.2 Quantity of fodder so obtained (in Kgs)

4.3 Frequency (per month)

3. If Grazing is being done in own farm/agri. Land (Outside Forest), then

5.1 How much land is owned by the HHs (in local units)

5.2 Whether Fodder is being produced along with other crops in the farm owned by HHs (yes-1/no-2)

4. Whether cattle owned by HH are being sent for grazing in forest (Yes-1/No-2)

6.1 If no, reason for the same is to be recorded

7. Do you collect fodder from forest (Yes-1/No-2) | |

(If yes, then give the detailed information in the table given below)

Period Code	*Animal code*	*Total Number*	*Number*		*Stall feeding*	*Loping*	*Grazing*	*Remarks*
			Big	*Small*				
8(1)	**9(2)**	**10(3)**	**11(3)**	**12(3)**	**13(2)**	**14(1)**	**15(1)**	**16**

2 (E): NTFP (including MADPs) Collection:

1	Village Name	
2	House No.	

MADP – Medicinal, Aromatic, and Dye Plants

3 (1) Do you collect NTFP from forest (Yes-1/No-2) | |

Species	**Part collected**	*Period Code*	**Mode of collection (through contractors, Cooperative or Self)**	**Estimated annual collection (give unit) (in KG)**	**Utilized for personal use (%)**	**For sale (%)**	**Whether harvesting levels sustainable (Yes/No)**
4	5	6	7	8	9	10	11

(Remark: NTFP Harvesting levels will be sustainable only if at least 25% of canopy is left unharvested/ untouched/ no felling/ lopping; no premature harvesting)

2(F): Availability of Timber in Tree Outside Forest (TOF)

1	Tehsil Name/ Town Name:		
2	Village name/ IV unit and UFS Block No.		
3	House No.		
4.	Whether the household is owner of timber species (Yes-1/No-2)		

S. No.	Species code	Species Name	Diameter at Breast (1.37 m) Height in cm	Purpose of Cutting	Permission is required for cutting or exempted	Remarks
	5 (4)	6	7(3)	8 (1)	9 (1)	10

Instructions to fill up forms for socio-economic survey

Form 2 (A): Particulars of Household

Coding Instructions:

1. Village Name/ Town Name	In case of rural area the name of village is to be filled up and in urban areas the name of Town is to be filled up as mentioned in the records
2. IV unit and UFS Block No	In case of urban areas only the number of UFS block along with Investigator Unit (IV) is to be filled up as mentioned in the records.
3. Household No.	As mentioned in the records
4. Name of the Head of household	As mentioned by the house owner
5. Numbers of Males in family	As mentioned by the house owner
6. Numbers of Females in family	As mentioned by the house owner
7. Numbers of Children in family	As mentioned by the house owner
8. Total number of persons living in the household	Number of person living in the household and taking food from same kitchen will be recorded here. It is to be recorded in two digits.
9. Type of Building actually visited	It will be recorded as under **Code** **Type of building** 1 Kachcha 2 Pucca
10. Status of Household	It will be recorded as under **Code** **Description** 1 APL 2 BPL
11. Highest Education level in hhs.	Education of the member of the hhs. having highest education will be given in codes as under: **Code** **Education level** 1 Primary 2 Middle 3 10th Standard 4 10+2 Standard 5 Graduate 6 Post graduate 7 Others (professional qualification, diploma, degree etc.) 8 Illiterate
12. Social group code	It will be recorded as under **Code** **Social Group** 1 Schedule Caste 2 Schedule Tribe 3 Other Backward Class 4 Others

13. Means of livelihood code of household	It will be recorded as under **Code** **Description** 1 Self employed 2 Regular wage/salary 3 Casual labour 4 Others
14. Size of land holding (in ha)	As mentioned by the house owner
15. Ownership of the household	It will be recorded as under **Code** **Description** 1. Leased in 2. Leased Out 3. Owner 4. Owner and Leased out
16. Type of Land	It will be recorded as under **Code** **Description** 1. Irrigated 2. Non-irrigated
17. If irrigated, Source of irrigation	It will be recorded as under **Code** **Description** 1. River/stream/canal 2. Tank/Pond 3. Water harvesting structure 4. Pump set 5. (Any other specify)

2(B): Small Timber & Bamboo Consumption

Small timber is defined as raw wood in the form of pole/ballies/or any other form which is not more than 8 foot in length and 4 inches in width collected by villagers for different purpose such as ballies, pole for support, making furniture, agricultural implements etc. Small timber should not be confused with sawn and big timber used in the house for different purposes. The purpose of this exercise is to estimates, the quantity of small timber being extracted by the villagers.

Coding Instructions:

1. Village Name	As mentioned in the records
2. Household No.	As mentioned in the records
3. Do you collect small timber from forest?	It will be recorded as under **Code Description** 1 Yes 2 No
4. Small timber/ bamboo	It will be recorded as under **Code Description** 1 Small timber 2 Bamboo

5. Code	Item name	6. Sub Code	7. Size Class
1	Roof (Small timber/ Bamboo)	1. Ballies	1. 4' length x 4" width 2. 6' length x 4" width 3. 8' or more length x 4" width
2	Furniture (Small timber/ Bamboo)	1. Stool/Table	1. height up to 2' 2. height above 2'
		2. Bench	1. height up to 2' and length 4' 2. height above 2' and length above 4'
		3. Chauki	1. 1' X 1' Complete wooden 2. 1' X 1' with top other than wood 3. Others
3.	Fencing of house (Small timber/ Bamboo)	1. Pole	1. Length up to 4' 2. Length above 4'
		2. Bamboo culm	1. Length up to 8'
4	Agriculture Implements (Small timber/ Bamboo)	1. Plough (Hul) 2. Leveler 3. Harrow (Henga) 4. Others 0. Not applicable	

2(C): Annual Fuel Consumption

Coding Instruction

1. Village Name	As mentioned in the records
2. Household No.	As mentioned in the records
3. Do you collect fuel wood from forest	It will be recorded as under **Code** **Collection from forest** 1 Yes 2 No
4. Period code	The fuel consumption is to be recorded on period basis as per given period for whole of the year **Code** **Period** 1 April-June 2 July- Sept 3 Oct- Dec 4 Jan-March
5. Fuel usage name & code	Single digit code for usage of fuel will be recorded as under: **Code** **Fuel usage** **1. Cooking** 2. Heating 3. Lighting 4. Others (includes funeral) **Note**: Annual fuel consumption is to be calculated (at Hqs.) against cooking, heating, lighting and others for the category of fuel given in the schedule. To calculate annual fuel consumption, quarterly consumption is to be recorded as per the given Proforma
6. Fuelwood (kgs.)	The consumption of fuelwood for cooking, heating and others is to be recorded quarterly against appropriate item in kgs. If it is in local unit converted quantity in kgs. is to be given.
7. Agri. Waste (kgs.)	This item is generally used for cooking, heating and other purposes. Its consumption will be recorded quarterly in kgs. only.
8. Cow dung (kgs.)	This item is generally used for cooking, heating and other purposes. Its consumption will be recorded quarterly in kgs. only.
9. Charcoal (kgs.)	This item is generally used for cooking, heating and other purposes. Its consumption will be recorded quarterly in kgs. only.
10. Coal (kgs)	This item is generally used for cooking, heating and other purposes. Its consumption will be recorded quarterly in kgs. only.

11. Gas/LPG (kgs.)	The consumption of gas for cooking, heating, lighting and other purposes is to be recorded quarterly against appropriate item in kgs.
12. Kerosene (Ltr.)	The consumption of kerosene for cooking, heating, lighting and other purposes is to be recorded quarterly against appropriate item in ltrs.
13. Electricity (kWh)	The consumption of electricity for cooking, heating, lighting and others is to be recorded quarterly against appropriate item in kWh (1 unit of electricity consumed).
14. Source code for fuelwood	Source code will be recorded in case of fuel wood only. **Code Source** **1 Purchased from market/forest department** 2 Received due to rights and concession 3 Own farm land 4 Free collection from forest 5 Free collection from other sources 6 Not applicable
15. Remarks	

2(D): Annual Fodder Consumption

Coding instruction

1. Village Name	As mentioned in the records
2. Household No.	As mentioned in the records
3. Do you get livestock feed/ fodder under any government scheme?	It will be recorded as under **Code** **Description** 1 Yes 2 NO
4. Do you get fodder seed under Govt. scheme for plantation in your farm?	It will be recorded as under **Code** **Description** 1 Yes 2 NO
5. Grazing is being done in own farm/agri. Land (Outside Forest), then	**As mentioned by the house owner**
6. Whether cattle owned by HH are being sent for grazing in forest?	It will be recorded as under **Code** **Description** 1 Yes 2 NO
7. Do you collect fodder from forest ?	It will be recorded as under **Code** **Collection from forest** 1 Yes 2 No
8. Period Code	The fodder consumption is to be recorded on quarterly basis as per given period for whole of the year **Code** **Period** 1. April-June 2. July- Sept. 3. Oct.-Dec. 4. Jan-March

9. Animal Code	The code of the animal will be recorded as follows: (The animal should be fodder consuming) **Code Animal** 01 Cow 02 Bull 03 Buffalo 04 Horse 05 Camel 06 Mule 07 Donkey 08 Other big animal 09 Goat 10 Sheep 11 Other small animals
10. Total Number	Number of the animals is to be recorded in 3 digits.
11. Big/ 12. Small	Sum of big and small animals will make total number given in 7
13. Stall feeding	Code will be recorded as follows: **Code Description** 01 Full from market 02 75 % from Market and 25 % from own farm 03 50 % from Market and 50 % from own farm 04 25 % from Market and 75 % from own farm 05 0% from Market and 100 % from own farm 06 75 % Market and 25 % from forest 07 50 % Market and 50 % from forest 08 25 % Market and 75 % from forest 09 0% Market and 100 % from forest 10 75 % own farm and 25 % from forest 11 50 % own farm and 50 % from forest 12 25 % own farm and 75 % from forest
14. Lopping	If lopping is being done, code will be recorded for fodder through lopping as follows: **Code Description** 1. Full 2. 75 -100 % 3. 50-75 % 4. 25-50 % 5. Upto 25 % 6. Not Applicable
15. Grazing	Code will be recorded as follows: **Code Description** 1. Full from Outside Forest (OF) 2. 75 % from OF and 25 % from forest 3. 50 % from OF and 50 % from forest 4. 25 % from OF and 75 % from forest 5. 0% from OF and 100 % from forest
16. Remarks	

2 (E): NTFP (including MADPs) Collection:

Coding instruction

1. Village Name	As mentioned in the records
2. Household No.	As mentioned in the records
3. Do you collect NTFP from forest?	It will be recorded as under **Code** **Description** 1 Yes 2 NO
4. Species	Give the name of the species as mentioned by house owner
5. Part collected	Give the information which part of NTFP is collected as mentioned by house owner
6. Period Code	The NTFP collection is to be recorded on quarterly basis as per given period for whole of the year **Code** **Period** 1. April-June 2. July- Sept. 3. Oct.-Dec. 4. Jan-March
7. Mode of collection	It will be recorded as under **Code** **Description** 1 Through Contractors 2 Through Cooperative 3 Self
8. Estimated collection	Please provide the information on quarterly basis in kg as mentioned by house owner
9. Utilized for personal use	Please provide the information in % as mentioned by house owner
10. For sale	Please provide the information in % as mentioned by house owner
11. Whether harvesting levels sustainable	It will be recorded as under **Code** **Description** 1 Yes (only if at least 25% of canopy is left unharvested/ untouched/ no felling/ lopping; no premature harvesting) 2 No (if any one of the above condition is not satisfied. Please mention the condition/s.)

2(F): Annual Timber Consumption in Tree Outside Forest (TOF)

Coding instruction

1. Teshil Name/ Town Name:	In case of rural area the name of Tehsil is to be filled up and in urban areas the name of Town is to be filled up as mentioned in the records
2. Village name/ IV unit and UFS Block No.	In case of rural area the name of village is to be filled up and in urban areas the number of UFS block along with Investigator Unit (IV) is to be filled up as mentioned in the records
3. House No.	As mentioned in the records
4. Whether the household is owner of timber species	It will be recorded as under **Code** **Description** 1 Yes 2 No
5. Species Code	For this FSI National Forest Inventory Manual may be referred for 4 digit species code .
6. Species Name	Local or botanical name of the species is to be filled up
7. Diameter	The diameter in cm at breast height over bark will be recorded in three digits (1.37 m from ground level on uphill side of tree)
8. Purpose of cutting	It will be recorded as under **Code** **Description** 1 Self use 2 Fuel 3 Construction 4 Sawn wood 5 Plywood & Veneers 6 Fibre boards 7 Pulp Papers 8 Synthetic Textiles 9 Others (specify)
9. Permission is required for cutting or exempted	It will be recorded as under **Code** **Description** 1 Felling and transit permission is required 2 Only transit permission is required 3 No permission is required
10. Remark	

3.4 Stakeholder Consultation

The NWPC envisages in para 3.3.5, consultation with the local stakeholders to seek their inputs on the management of forests especially in setting up the objectives of management. It shall be desirable to involve local civil society organisations, PRIs, representatives of Wood Based Industries, academic and research institutions. The WPO shall present the draft management of objectives and seek specific comments from the public/stakeholders on each of the objectives and record the same. The minutes and the video recording of the stakeholder consultation shall form annexure to the draft WP to be submitted to the SCC. The WPO is encouraged to organise these events at the range headquarters to ensure maximum participation of the stakeholders. The WPO shall consider all the inputs while framing the general objects of management and special objects of management for the WP. Any inputs which the WPO is unable to include may be clearly mentioned with justification while submitting the draft WP for examination by the SCC.

MANUAL FOR THE PREPARATION OF WORKING PLAN UNDER NATIONAL WORKING PLAN CODE 2023

Unit 4

ANALYSIS OF DATA, DESCRIPTION AND MANAGEMENT OPTIONS

4.1 Data Processing Estimation Procedure for Working Plan Preparation

4.1.1 Introduction:

The data has been captured from Recorded Forest Area (RFA) and from outside the RFA of the Division. The purpose of data collection from RFA is to describe the status of forest with the help of various parameters. One set of parameters provides forest enabling conditions viz. soil depth, humus, soil organic carbon, presence of grasses and undergrowth (as indicator of moisture regime) etc; second set provides information about Forest vegetation viz, origin of stand, regeneration status, diameter distribution, crop composition, canopy layers, basal area etc.; and the third set provides information about disturbances to forests viz. damage by wind, grazing or browsing by wild animals etc. or anthropogenic e.g. forest fire, grazing, logging, lopping, girdling, development activities, invasive species etc.

The purpose of data collection from outside RFA is to ascertain the influence of people on forests through socio-economic survey. Survey will provide the consumption level of small timber, fuel-wood, fodder, grasses, bamboo and other NTFPs as well as their trading by households. It will also provide information about tree resources available outside RFA.

4.1.2 Data processing for forest inventory

For processing of inventory data, in the working plan division, per plot area may be calculated on the basis of inventoried plots in RFA and total area (in hectare) of RFA. Then they can be grouped into two broad classes; vegetated (very dense forest, moderately dense forest and open forest) and less vegetated (canopy cover less than 10% viz. scrub, shifting cultivation areas, etc). These plots can be further classified into different crop composition. The areas under these classes can be calculated using corresponding area factors. The plots corresponding to vegetated area, post-stratified according to crop composition (stratum) based on dominant species appearing in a particular division. Plot volume may be calculated with the help of volume equations developed by FSI/ state forest department for each tree species found in the plot. All sample plots may be grouped according to crop composition to estimate growing stock for the working plan division. Before processing the data, it should be cleaned after reconciliation of discrepancies if any during the collection of data. The main processing steps involved in data processing and outcomes which can be generated are given in the following paragraphs.

Generally, stratification is used to address the heterogeneity available in the sampling units (say in case of forest type/density classes in a forest). By segregating the sampling units into homogeneous sub-groups (strata), a gain in precision of estimation can be achieved. As we all know that the natural populations (say forest resources) have peculiarities of spatial auto-correlation and spatial heterogeneity. Therefore, for forest resource assessment of large forest areas like a division, systematic sampling gives quite precise estimates of population parameters (NWPC, 2014). It is pertinent to mention here that precision of estimates may further be improved using Post-Stratification technique.

Post-stratification may be carried out using field survey or using GIS tools or using GIS tools in conjunction with classified maps based on remotely sensed satellite data. For example; the carbon stored in the vegetation largely depends upon canopy density and forest type. Therefore, these two layers/stratums can be used as stratification variables. Canopy density wise spatial information can be obtained from the latest 'forest cover mapping'. This is supplemented with the forest type wise information generated under the national forest type mapping project carried out by FSI. Overlaying the forest cover layer (three canopy density classes) and forest type groups will result into several number of strata. The area statistics for each stratum (after overlaying) may be generated using GIS tools. This may be used for further analysis/estimation of parameters. The SFDs may utilise such data layers developed by FSI based on forest type, density, land use using GIS for increasing the precision of the estimates.

4.1.3 Estimation of growing stock: The estimation procedure for preparation of growing stock tables is described below:

A) Distribution of area of different parameters of the Plot Description Form (PDF) and calculation of per plot area:

The area of working plan division will be distributed on basis on Land Uses class (as recorded in PDF) to know extent of area under each class. For example: the working plan division area is 'x' and the total number of plots 'y', then the per plot area will be x/y.

Firstly, land use wise number of plots will be arranged and then multiplied by per plot area to the total number of plots falling in that class which will give total area under that land use, as given in the table below:

Say

Forest Division area	=	5000 sq km
Total number of plots in the division	=	200
Per plot area	=	5000/200=25 sq km

Distribution of Forest Area (in sq km) by Land Use Classes

Sl. No.	Description of Land Use classes	Number of plots	Area (No. of plots X per plot area)	Percentage
1	Closed forest	15	375	7.50
2	Dense forest	20	500	10.00
3	Open forest	35	875	17.50
4	Scrub	25	625	12.50
5	Bamboo Brakes	10	250	5.00
6	Shifting cultivation	20	500	10.00
7	Young crop plantations of forestry species	15	375	7.50
8	Trees in line	5	125	2.50
9	Forest roads	2	50	1.00
10	Govt. grass lands	1	25	0.50
11	Barren lands	10	250	5.00
12	Agricultural land without trees in surround	10	250	5.00
13	Agricultural land with trees in surround	5	125	2.50

14	Non forestry plantations	15	375	7.50
15	Habitation	10	250	5.00
16	Water bodies	2	50	1.00
	Total	200	5000	100.00

This way tables can be created on different parameters as per requirement for all the parameters in PDF as well as other field forms by linking with PDF.

B) *Distribution of total inventory area into vegetated area, less vegetated area and area not supporting vegetation: -*

The forest division area may further be segregated in to different classes i.e. vegetated area, less vegetated area and area not supporting vegetation. For example:

a) Vegetated Area can be obtained by summing areas under Closed forest, Dense forest, Open forest, Young plantation of forestry species and Non-forestry Plantations (Sl. No. 1-3, 7 & 14)**.**

b) Less Vegetated area: Vegetated Areas in the forest division having canopy density less than 10% (inferior growth). Such land class included Scrub land, Trees in line, agriculture land with trees in surround, habitation, shifting cultivation etc. (Sl. No. 4, 6, 8-10, 12, 13, 15).

c) Area not supporting vegetation: Area in the forest division which does not support any vegetation such as barren lands, water bodies etc. (Sl. No. 11, 16).

C) Calculation of per plot volume:

The Plot volume can be calculated with the help of volume equations for each tree species found in the Plot Enumeration Form (PEF). Aggregating the volume of each tree in a sampled plot will give volume of the plot. For example, there are n numbers of trees in a plot, first of all volume of each tree calculated using the respective species volume equations and by adding the volume of each tree will give volume of that plot. An example of plot having plot volume 16.08 m^3 is given below:-

Spp Code	Botanical name	dia_cm	Volume Equation	Dia (Meter)	Tree Volume (Cum)
0001	*Abies densa*	65	√V= -0.084305+3.060072*D	0.65	3.63
0003	*Picea smithiana*	33	V=11.770869*D^2+0.163269-2.232068*D+1.06041*D^3	0.33	0.75
0001	*Abies densa*	70	√V= -0.084305+3.060072*D	0.70	4.23
0001	*Abies densa*	42	√V= -0.084305+3.060072*D	0.42	1.44
0001	*Abies densa*	26	√V= -0.084305+3.060072*D	0.26	0.51
0001	*Abies densa*	52	√V= -0.084305+3.060072*D	0.52	2.27
0001	*Abies densa*	40	√V= -0.084305+3.060072*D	0.40	1.30
0001	*Abies densa*	26	√V= -0.084305+3.060072*D	0.26	0.51
0001	*Abies densa*	42	√V= -0.084305+3.060072*D	0.42	1.44

D) Estimation of per ha trees (stems) and their volume

The vegetated area may be post-stratified according to density class/ crop composition/ forest type. For a particular stratum so formed, all the enumerated trees in all the sample plots will be aggregated in a tabular form having species wise distribution of number of trees. The number of trees in this table, when divided by total area of all enumerated plots provides estimated number of trees per hectare. Similarly, in the case of volume, similarly, if volume of trees is arranged instead of number of trees in the above table, information can be generated for volume of trees in the plots, which may further be classified according to species & diameter class distribution. An example is given below for total sampled area of 2.5 ha:

i) Enumerated trees by species and diameter class

Spp. Code	Species	Dia class in cm			
		10-30	30-60	60 and above	Total
929	*Pinus roxburghii*	125	68	2	195
1014	*Quercus leucotrichophora*	157	25	0	182
Total		282	93	2	377

ii) Trees per ha by species and diameter class

Spp. Code	Species	Dia class in cm			
		10-30	30-60	60 and above	Total
929	*Pinus roxburghii*	50	27.2	0.8	78
1014	*Quercus leucotrichophora*	62.8	10	0	72.8
Total		112.8	37.2	0.8	150.8

iii) Enumerated volume in cum by species and diameter class

Spp. Code	Species	Dia class in cm			
		10-30	30-60	60 and above	Total
929	*Pinus roxburghii*	32.131	61.114	8.857	102.102
1014	*Quercus leucotrichophora*	31.11	11.074	0	42.184
Total		63.241	72.188	8.857	144.286

iv) Volume per ha by species and diameter class

Spp. Code	Species	Dia class in cm			
		10-30	30-60	60 and above	Total
929	*Pinus roxburghii*	12.85	24.45	3.54	40.84
1014	*Quercus leucotrichophora*	12.44	4.43	0.00	16.87
Total		25.30	28.88	3.54	57.71

g) Estimation of the total growing stock for working plan division level

For estimation at division level**,** all sampled plots are grouped according to working circle or crop composition as per requirement to estimate the growing stock. By multiplying the working circle area (Vegetated/ less vegetated area) from the per ha volume or trees i.e. multiplying factor will give total growing stock of that circle and adding these figures will result in total growing stock.

H) Standard Error calculation:

The precision of estimates generated through sampling method is very necessary for any estimation procedure to be complete. It helps in understanding the error contained in the generated estimates. For a particular stratum, the standard error is calculated by dividing the standard deviation of the statistic (say Volume per hectare) by the sample size's square root i.e. standard error of sample mean depends on both the standard deviation and the sample size, by the simple relation SE = SD/√ (sample size).

Standard error is an implication of the expected precision of the sample statistic (say volume/ha in a plot) as compared with the population parameter. The bigger the value of standard error, the more the spread and likelihood that any sample means are not close to the population's mean. A high standard error shows that sample means are widely spread around the population mean (i.e. the sample is not closely representing the population). A small standard error is thus a good attribute.

4.1.4 Volume Equations:

Volume of trees can be obtained using volume equations. In case, volume equations are not available with SFD, then it may be borrowed from FSI. FSI has developed about 800 volume equations, both Local Volume Equations & General Volume Equations, of around 200 tree species of India, which can be used. In Local Volume Equation (LVE), volume (under bark) is a function of DBH (over bark): V=f (D) and in General Volume Equations (GVE), volume (under bark) is a function of DBH (over bark): and height of tree: V= f (D, H).

For example, for *Shorea robusta* (Sal)

G.V.E is $V/D^2H = 0.0041834/ D^2 H+0.37802$ and

L.V.E is $V/ D^2 = 0.022585/ D^2 - 0.70158/D+8.714$

4.2 Estimation of biomass and carbon stock in different pools

4.2.1 *Above Ground Biomass (AGB) of trees having dbh ≥ 10 cm*

For calculation of biomass of trees having at each sample plot, all trees of diameter 10 cm and above are to be measured. The woody volumes of trees for each sample plot are to be calculated using volume equations. The volume equation provides above ground woody volume i.e. above ground volume, which includes volume of main stem measured upto 10 cm diameter and volume of all branches having diameter 5 cm or more. Volume of wood so obtained can be converted to biomass by multiplying by specific gravity/ wood density. Data of specific gravity and percentage carbon content of most of the tree species may be obtained from different published literature. Using carbon content percent of that species, carbon stored in wood will be estimated.

For estimating volume of the bark, the double bark thickness (DBT) of trees is to be measured during field inventory and volume equations of trees are to be used. Using species - volume equation once with dbh and again with DBH+DBT, two volumes are obtained. The difference will provide the gross bark volume which is to be adjusted for 'bark void factor' (measured

during data collection) to estimate the bark volume of the tree. With the help of the specific gravity of bark, the volume will be converted into biomass. Using carbon content percent of wood, carbon stored in bark will be estimated.

4.2.2 *Above ground biomass of trees having dbh < 10 cm*

Using the plot level regeneration data from working plan of a division i.e. recruits, un-established, established and all trees having dbh between 5 to 10 cm, biomass and carbon content at plot level is to be calculated.Biomass equations developed by FSI may be used for the calculation.

4.2.3 *Above Ground Biomass of branches, foliage of trees having dbh ≥ 10 cm*

FSI developed biomass equations for small wood (wood in main stem of less than 10 cm and branches less than 5 cm) and foliage for the trees having DBH ≥10 cm published in "Carbon Stocks in India's Forests". The plot level data collected during working plan survey with biomass equations developed by FSI will provide biomass which will be multiplied by species wise carbon content to calculate, carbon at plot level for branches and foliage etc.

4.2.4 *Dead Organic Matter (DOM: dead wood and litter)*

For collection of data within a subplot, two concentric plots of size 1.7m and 2.8m radius are to be laid out and data on dead wood & (woody) litter are to be collected. In 2.8m radius plot, all dead wood (standing or lying on ground) above 5 cm diameter are to be collected, weighed and recorded. In 1.7m radius plot, all woody litter i.e. all branches below 5 cm diameter are to be collected, weighed and recorded. Dry biomass will be converted to carbon stock.

4.2.5 *Organic matter in Soil and Forest Floor*

The data on forest floor (non-woody litter and humus) and soil carbon is also to be collected from each sample plot. For data collection on humus and soil carbon, two sub-plots of size 1m x 1m are to be laid out within the main plot. The forest floor from both the plots is to be first swept and material so collected is to be weighed and a portion of the same is to be kept for carbon analysis. Further, at the center of these two sub-plots, a pit of 30cm x 30cm x 30cm is to be dug and a composite sample of soil of 200 gm is to be kept for organic carbon analysis. Samples of soil and humus are to be analysed from the standard soil labs and are to be used for the calculation and estimation.

4.2.6 *Below ground biomass*

The most difficult pool to measure and is generally not measured in forest inventory by FSI. It is to be estimated using a relationship, root-to-shoot ratio which gives a relationship between aboveground biomass (AGB) to the below ground biomass (BGB) which have been established by various researchers. IPCC - GPG, 2003 also provides default values of root-to-shoot ratios for six major global forest types.

4.2.7 *Use of FSI data of Carbon estimation by WPO*

SFDs may note that FSI provides estimates of 'Carbon Stock in India's Forest' for different carbon pools under different forest types and density, in its ISFR, following methodology given by UNFCCC. In addition, the per hectare value of carbon stock for different carbon pools (for each forest type and density) is also generated by FSI that can be used by SFDs for assessment of available carbon stock in respective forest divisions. SFDs may use such information on carbon stock in different pools, from ISFR, for the working plan preparation. They are advised to consult FSI for this information.

(Remark:- The estimates of forest carbon are derived by FSI, following a post sampling stratification approach in which data of sample plots of NFI used along with forest cover and forest type layers. The sample plots of inventory are overlaid on different strata and biomass for each pool is determined.)

4.3 Estimation Procedure of Bamboo

The processing of Bamboo data mainly involves following steps:

- Distribution of bamboo area by density class.
- Distribution of bamboo area by quality class.
- Distribution of bamboo clumps by quality and size class.
- Distribution of bamboo clumps per ha by bamboo quality and size class.
- Distribution of bamboo bearing area by quality and density class.
- Distribution of bamboo culms /clumps by age, quality and size class.
- Mean number of bamboo culms /clumps by age, soundness of culms, quality and size class.
- Mean number of bamboo culms per ha by age, soundness of culms, quality and size class.
- Total no. of bamboo culms in the bamboo area by quality and size class.
- Estimation of green bamboo stock by soundness of culms quality and size class.
- Estimation of dry bamboo stock by soundness of culms quality and size class.
- Carbon estimates are generated by multiplying dry bamboo stock by carbon content percentage.

4.3.1 *Bamboo Clump Analysis for Clump forming Bamboos*

The data regarding total number of bamboo clumps and their respective diameters occurring in each sub-plot is to be recorded in the Plot Enumeration Form. The data is also to be collated in a separate field form called as Bamboo Clump Analysis Form in which data of each individual culm, occurring in certain selected clumps in each subplot is to be recorded. For carrying out this analysis, it is first to be determined whether a culm is green sound, green damaged, dry or dry damaged; these are then further classified as current years' culms, one to two-year-old culms and over two years old culms. In case of dry and decayed culms (both sound as well as damaged), however, the age classification is not necessary. The culms, other than that of current year and decayed culms, both green and dry, are to be further grouped under different diameter classes i.e. 1 cm to under 2 cm, 2 cm to under 5 cm, 5 cm to under 8 cm and 8 cm and above.

All culms occurring in the clump selected for analysis are to be enumerated and each enumerated culm is to be recorded by 'dot-dash' method (*dots represents counts from 1 to 4, lines 5 to 8, and diagonal lines 9 and 10)* under its appropriate class. The total number of culms found under each class is to be recorded in two digits.

4.3.2 *Bamboo Enumeration and Analysis for Non-Clump Forming Bamboo*

The data is to be collected for non-clump forming bamboos occurring in the sample subplot 2 i.e. western half of the subplot 2. For the purpose of counting the culms, the subplot 2 is to be dissected by taking a bearing of 360 from the center of subplot. A rope is to be put on this bearing upto the point where this bearing crosses the subplot circumference in North and South direction. All culms falling in western half of north subplot are to be counted and categorized in five classes viz. Green Sound, Green Damaged, Dry Sound, Dry Damaged & Decayed.

These are to be further classified as current year's culms, one to two-year-old culms, over two-year-old culms. In case of dry (both sound as well as damaged) and decayed culms, the age classification is not necessary. The culm, other than the current years and decayed culm, both green and dry are further grouped under diameter at breast height classes, 1 cm to under 2 cm, 2 cm to under 5 cm, 5 cm to under 8 and 8 cm and over.

4.3.3 *Bamboo Weight*

For determining correlation between green and dry weights for utilizable bamboo culm length, data is to be collected in 'Bamboo Weight form'. This form is, however, to be filled up for plots, in which bamboo has actually been found in an area of 60 m radius from the center of subplot 1. One mature bamboo culm from each culm diameter class 1 cm to 2 cm, 2 cm to 5 cm, 5 cm to 8 cm, and 8 cm and over, is to be selected for felling from the first clump enumerated in the plot. If, however, the required number of culms of any diameter class is not available in the first clump, the shortfall is to be made good from the clump next in the serial order of enumeration. Further, if the necessary numbers of culms are not available from any other clump of the plot, the required number of culms is to be obtained from the area in the immediate vicinity of the plot. This estimation of bamboo weight has to be done species wise.

4.4 *Estimation Procedure for Socio-economic survey*

4.4.1 The multipliers (weights) are used with the responses from the sampling units division level estimates are to be generated. The multipliers are generated at sub-stratum level (APL & BPL) within each stratum (1, 2 & 3). For this, district (division) wise projected population of the survey year may be acquired from the Directorate of Census Operations of the respective states/UTs.

4.4.2*Multipliers (weight):* The multipliers at stratum and sub-stratum (BPL/APL household) level are formed by multiplying proportion of enumerated population (BPL or APL) observed from the study with projected population of the Division (at stratum 1, 2, 3). The various formulae for multipliers at stratum and sub-stratum level are given below.

a) Projected population of HHs of BPL or APL for survey year (at stratum 1, 2, 3) = total enumerated population (BPL or APL) (at stratum 1, 2, 3) / total enumerated population (BPL + APL) (at stratum 1, 2, 3) x projected population of the Division (at stratum 1, 2, 3), where

Projected population of the survey year of the Division (at stratum 1, 2, 3) = Enumerated FFV's population (at stratum 1, 2, 3)/2011 census population x projected population of the survey year

b) For Adult Cattle Unit (ACU), Ratio (at stratum 1, 2, 3) = total enumerated ACUs population (BPL or APL) (at stratum 1, 2, 3) / total enumerated ACUs population (BPL + APL) (at stratum 1, 2, 3) x projected population of the survey year

c) Projected total number of HHs of BPL or APL for survey year (at stratum 1, 2, 3) = total enumerated household (BPL or APL) (at stratum level 1, 2, 3) / total enumerated household (BPL + APL) (at stratum 1, 2, 3) x projected households of the Division (at stratum 1, 2, 3), where

Projected households of the Division (at stratum 1, 2, 3) = 2011 census households/2011 census population x projected population of the survey year of the Division (at stratum 1, 2, 3)

d) Projected total area of landholdings of HHs of BPL or APL for survey year (at stratum 1, 2, 3) = total enumerated landholdings of household (BPL or APL) (at stratum level 1, 2, 3) / total enumerated landholdings of household (BPL + APL) (at stratum 1, 2, 3) x landholdings of households of the Division (at stratum 1, 2, 3), where

4.4.3 ***Estimation of Energy consumption***: For processing of data on consumption of energy sources in FFVs, the Fuel Consumption (Form 2(C)) information of households was merged with stratum code (Form 1: Village Information Form) and household status (Form 2A: Particulars of Households). The estimates were generated for sub stratum of household (APL and BPL) within each stratum (1, 2 and 3). Detailed estimation steps are described below (If FFVs data is used, the estimates would be for Rural Sector and If UFS data is used then the estimates would be for Urban Sector and summation will provide complete estimate for the Division):

a) Quarterly consumption of energy sources of all the HHs in a particular FFV/UFS blocks is enumerated.

b) Based on summation of quarterly data, household's annual consumption is calculated for each energy source.

c) The consumption of various energy sources for different fuel usages categories (cooking, heating, lighting and other purposes) are computed separately for each sub-stratum (APL and BPL) in each Stratum (1, 2 and 3).

d) Per capita consumption of a particular energy source for each sub-stratum (APL and BPL) in each Stratum (1, 2 and 3) is obtained by dividing its total consumption by total number of persons (population) in the surveyed villages/UFS blocks.

e) Thereafter, ratio factors (refer 2.2 a) were applied to per capita consumption values to generate energy consumption estimates for each sub-stratum (APL and BPL) in each Stratum (0, 1, 2 and 3).

f) Division level estimated energy consumption is obtained by adding the energy consumption estimates for each sub-stratum (APL and BPL) in each Stratum (1, 2 and 3).

4.4.4*Estimation of fodder consumption*: In the study, information on occurrence of fodder consuming animals and sources of livestock feed at household level in FFVs are recorded. Major categories of fodder consuming livestock namely cow, bull, buffalo, horse, camel, mule, donkey, goat, sheep other big and small animals are recorded for each household. Thereafter, the source of collection of livestock feed such as grazing (forest, outside forest), stall feeding (market, own farm, forest) and lopping are recorded for each selected household.

For processing of information on numbers of livestock and its dependence on forest for feed, the Fodder Consumption information (Form 2(D)) is considered with stratum code (Form 1: Village Information Form) and household status (Form 2: Particulars of Households). The estimates on number of livestock, adult cattle unit (ACU) and quantity consumption of fodder are generated for sub-stratum (APL and BPL) within each Stratum (1, 2 and 3). Detailed estimation procedure is described below (If FFVs data is used, the estimates would be for Rural Sector and If UFS data is used then the estimates would be for Urban Sector and summation will provide complete estimate for the Division.):

a) At the household level, total enumerated animals are converted into adult cattle units (ACUs). A detailed methodology of conversion of animals to ACU is given below:

Livestock (Conversion factors)

Factors for converting different livestock into Adult Cattle Units

Animal Code	Animal	Big Animal Equivalence to ACU	Small Animal Equivalence to ACU
01	Cow	1.00	0.33
02	Bull	1.50	0.50
03	Buffalo	1.375	0.46
04	Horse	1.25	0.42
05	Camel	1.375	0.46
06	Mule	1.25	0.42
07	Donkey	1.25	0.42
08	Other big animal	1.50	0.50
09	Goat	0.125	0.04
10	Sheep	0.125	0.04
11	Other small animals	0.0625	0.02

Source: Assessment of dependence of inhabitants of forest fringe villages (FFVs) on forests for fuel wood, fodder, small timber and bamboo (FSI, 2020)

b) Based on studies from the region, how much Kgs of green fodder is sufficient for an ACU may be used to estimate the quarterly fodder consumption from estimated number of ACUs dependent on forest.

c) Based on summation of quarterly data, household's annual consumption was calculated for each house in FFVs/ UFS Blocks.

d) Thereafter, annual quantities of fodder consumption at household level are distributed according to sources of fodder collection (grazing, stall feeding) reported by households. This was further used to work out quantitative dependence of ACU on forest, market and farm.

e) The above quantities were computed for sub stratum (APL and BPL) within each Stratum (1, 2 and 3).

f) Per capita (ACU) fodder consumption for sub stratum (APL and BPL) in each Stratum (1, 2 and 3) is obtained by dividing its total consumption of fodder by total number of ACUs.

g) Thereafter, ratio factors (refer 2.2 b) were applied to per capita fodder consumption values to generate fodder consumption estimates for sub stratum (APL and BPL) in each Stratum (1, 2 and 3).

h) Division level estimated fodder consumption is obtained by adding the above estimates for each sub stratum (APL and BPL) in each Stratum (1, 2 and 3).

4.4.5 ***Estimation of Small Timber***: To estimate volume of small timber consumed in FFVs/UFS Blocks, the information on items used in construction of houses, furniture, agriculture implements and fencing were recorded for each household in FFVs/UFS Blocks,. The items used in the house construction were ballies, furnitures, chauki, fencing and other agricultural implements (plough, leveller, harrow and others). Enumeration of above items is carried out for each selected household.

For processing of information on consumption of small timber (vol. in cum), the Small Timber Consumption information (Form 2(B)) was merged with stratum code (Form 1: Village Information Form) and household status (Form 2: Particulars of Households). The estimates on volume of small timber available in households in FFVs/UFS Blocks were generated for sub-stratum (APL and BPL) within each Stratum (1, 2 and 3). Detailed estimation procedure is described below (If FFVs data is used, the estimates would be for Rural Sector and If UFS data is used then the estimates would be for Urban Sector and summation will provide complete estimate for the Division.):

a) Count of various small timber items used for house construction, furniture, fencing and other agricultural implements, present in the selected households in FFVs/UFS Blocks, is enumerated for each household.

b) Volume (cum) of various items of small timber (described above) was already worked out for fixed dimensions.

c) Thereafter, the count of various items observed in households were is multiplied by their individual volumes thereby giving total volume of small timber used in that household.

d) Addition of the volumes, obtained above constituted total volume of small timber items at household level. These quantities were computed for sub stratum (APL and BPL) within each stratum (1, 2 and 3).

e) Consumption of small timber (in cum) per household for sub stratum (APL and BPL) within each stratum (1, 2 and 3) is determined by dividing total volume of consumed small timber by total number of households.

f) Accordingly, ratio factors (refer 2.2 c) were applied to consumption of small timer per household to generate consumption estimates for small timber for sub stratum (APL and BPL) within each stratum (1, 2 and 3).

g) Addition of these estimates yielded Division level consumption of small timber.

h) For conversions of these consumptions into annual consumption, it was presumed that lifespan of small timber is 7 years. Therefore, the estimated small timber divided by 7 yielded the annual consumption of small timber.

4.4.6 ***Estimation of Bamboo Consumption***: To estimate the quantity of bamboo consumed by the inhabitants of fringe areas, information of bamboo is collected only for items used in construction of the houses, furniture, agricultural implements and fencing of the houses. The items used in the house construction are ballies furniture; fencing and other agricultural implements are recorded at selected HHs. (If FFVs data is used, the estimates would be for Rural Sector and If UFS data is used then the estimates would be for Urban Sector and summation will provide complete estimate for the Division.)

The number of different items used (made of bamboo) was collected from sampled HHs.

a) Dry weight (kg) of each of above-mentioned items were calculated mathematically as per pre-decided sizes of the items given in the manual. Dry weight of bamboo culms of different sizes were recorded and compiled from Range office,

b) Number of items multiplied by their calculated individual dry weight yielded total dry weight of bamboo items.

c) The summation of dry weight of all the bamboo items constituted the total dry weight of bamboo items.

d) The average bamboo per capita consumption at HH level is determined by dividing total dry weight of Bamboo consumed by total number of HHs using these items respectively.

e) Estimates were obtained by using ratio factor (refer 2.2 c) with the average bamboo calculated at per capita level as mentioned above.

f) Addition of these estimates yielded state level consumption.

For conversion of these consumptions into annual consumption, lifespan of bamboo is to be assumed as 'X' years and therefore the estimated dry bamboo weight divided by 'X' provides the annual consumption of Bamboo.

4.4.7 ***Estimation of NTFP (including MADPs):*** To estimate quantity of NTFPs collected/consumed/traded in FFVs/UFS Blocks, the information on all collected NTFPs are recorded for each household of selected FFVs/UFS Blocks.

For processing of information so recorded in (Form 2(E)) is merged with stratum code (Form 1: Village Information Form) and household status (Form 2: Particulars of Households). The estimates on quantity of NTFPs collected/consumed/traded in households in FFVs/UFS Blocks are generated for sub-stratum (APL and BPL) within each Stratum (1, 2 and 3). Detailed estimation procedure is described below (If FFVs data is used, the estimates would be for Rural Sector and If UFS data is used then the estimates would be for Urban Sector and summation will provide complete estimate for the Division.):

a) Quantity of NTFPs collected/consumed/traded in the selected households in FFVs/UFS Blocks, is enumerated for each household.

b) Addition of the quantity of NTFPs collected/consumed/traded, obtained above constituted total of respective NTFPs quantities are computed for sub stratum (APL and BPL) within each stratum (1, 2 and 3).

c) Quantity of NTFPs collected/consumed/traded per household for sub stratum (APL and BPL) within each stratum (1, 2 and 3) is determined by dividing total quantity of respective NTFPs by total number of selected households.

d) Accordingly, Projected number of HHs (refer 2.2 c) is multiplied by the quantity of NTFPs collected/consumed/traded per household to generate estimates at sub stratum (APL and BPL) within each Stratum (1, 2 and 3).

e) Addition of these estimates yielded Division level estimates of total quantity of NTFPs collected/consumed/traded.

4.4.8 ***Estimation of Availability of Timber from TOF from HHs***: To estimate availability of timber from TOF data on trees available with HHs in FFVs/UFS Blocks, are recorded for each selected household of FFVs/UFS Blocks. For processing of information so recorded in (Form 2(F)) is merged with stratum code (Form 1: Village Information Form) and household status (Form 2: Particulars of Households). The estimates are generated for sub-stratum (APL and BPL) within each Stratum (1, 2 and 3). Detailed estimation procedure is described below (If FFVs data is used, the estimates would be for Rural Sector and If UFS data is used then the estimates would be for Urban Sector and summation will provide complete estimate for the Division.):

a) The desired data of all trees available on the land of selected households in FFVs/UFS Blocks, is enumerated for each household.

b) The number of trees, species and diameter-class wise data is tabulated by adding data of all the selected households in selected FFVs/UFS Blocks for sub stratum (APL and BPL) within each Stratum (1, 2 and 3).

c) Enumerated number of species and diameter-class wise trees per hectare is calculated by dividing the above information by the total land possessed by all the selected households in selected FFVs/UFS Blocks for sub stratum (APL and BPL) within each Stratum (1, 2 and 3).

d) The estimates of TOF are computed by multiplying the information generated in c) above with Projected area of landholdings of HHs (refer 2.2 d, which is based on total private land holdings available from land-use statistics of villages) for sub stratum (APL and BPL) within each stratum (1, 2 and 3).

e) Addition of these estimates yielded Division level estimates of total trees available in households of TOF area of The Division.

f) Using this information with Von Mantel's Formula (Annual Availability =2 GS/R, Here GS is growing stock of particular species and R is rotation period of that species) annual availability of timber is calculated.

4.4.9 ***Estimation of TOF from Non-Private lands***: To estimate the tree resources available in Public land outside RFA, data on trees available in FFVs/UFS Blocks, are recorded for each selected FFVs/UFS Blocks,

For processing of information so recorded in (Form 1(A)) is merged with stratum code (Form 1: Village Information Form). The estimates are generated for each Stratum (1, 2 and 3). Detailed estimation procedure is described below (If FFVs data is used, the estimates would be for Rural Sector and If UFS data is used then the estimates would be for Urban Sector and summation will provide complete estimate for the Division.):

a) The desired data of all trees available on the land of selected FFVs/UFS Blocks, is enumerated.

b) The number of trees, species and diameter-class wise data is tabulated by adding data of all the selected FFVs/UFS Blocks for each Stratum (1, 2 and 3).

c) Enumerated number of species and diameter-class wise trees per hectare is calculated by dividing the above information by the total public land outside RFA in selected FFVs/UFS Blocks for each Stratum (1, 2 and 3).

d) The estimates of TOF are computed by multiplying the information generated in c) above with total public land outside RFA for each Stratum (1, 2 and 3).

e) Addition of these estimates provides Division level estimates of total trees available in public area outside RFA of The Division.

4.5 Analysis of the forest crop

A compartment is the basic unit of management which is uniform with regards to the crop composition and as far as possible homogenous as regards soil, species composition and age of the forest crop. If the growing stock and quality of the site varies significantly, sub-compartments are formed.

The composition of the standing crop must be examined and recorded in detail. This is done during the field inventory exercise (Form 2). The composition of the species, their relative proportion, age, canopy density, status of regeneration, presence and absence of weed, origin of the forest (seedling/coppice) are analysed. Based on this the WPO may assess the treatment for which the forest may best respond to.

a. ***Composition of the crop***: The species found in a compartment must be described as principal species (when there is a predominant economically/ecologically important species), associates, and their relative proportion in terms of (pure/mixed/miscellaneous). The presence of the associate may be described as abundant/rare.
b. ***Age of the crop***: If the crop is composed of two or more distinct classes, the respective ages of each should be given. If the crop is uneven aged, the dominant age is to be given. In case of uneven-aged forests, the data on the dia class in Col 33 of Form 2 may be used to obtain the relative age of the crop.
c. ***Canopy Density***: The canopy may be described as very dense (>70%), moderately dense (40-70%) and open forests (10-40%).

4.5.1 Stock maps: Detailed descriptions of a forest crop are tedious to write and at times bulky. Stock maps are tools that can be used by the working plan officer along with the area statement of working circles to determine the method of treatment. It is possible to capture various parameters as explained above and stock maps can be prepared using GIS. Stock map data has been captured in Plot Description Form (field form no. 2).

GIS should be used to prepare these stock maps. Different layers of the compartment viz relative age of the crop, composition of the crop, canopy density, presence and absence of regeneration, presence of invasive alien species, site quality (wherever applicable) etc. Besides, the WPO may also use other layers such as slope, erodibility, aspect etc while making decisions.

The stock maps are tools to visualise the status of a forest crop and is used by WPO to decide about the future management of the forests. Once decided, these along with the n-D curves, assist the WPO to decide about the option of forest management (even aged/uneven aged). If the chosen option is even aged under shelter wood system of management, these tools are helpful to assign compartments to different periodic blocks depending on their relative age, presence and absence of regeneration etc.

Composition of species may be classified as pure, mixed or miscellaneous depending upon the proportion of the principal species and their associates. Generally, a crop with more than 75 % of principal species is termed as pure and 50% to 75% as mixed. If none of the species constitutes 50%, then the crop is termed as miscellaneous. However, the States may fix their own percentage of the main species for classification of the composition of species as Pure, Mixed and Miscellaneous.

The presence or absence of regeneration is required to be captured in the stock maps. The classification to be adopted is:

- Regeneration Adequate (a total of 9 established individuals in all the regeneration sub-plots put together)
- Regeneration Non-adequate (a total of 1-8 established individuals in all the regeneration sub-plots put together)
- Regeneration absent (Nil)

4.6 Method of treatment

An understanding of the forest, its growth and its response to disturbances is essential for forest management. The trees that constitute a forest grow continuously, change over time and ultimately die. The open spaces created by the death of the trees are taken over by new vegetation. The change in the structure of the forest crop is the primary factor which alters the goods and services provided by the forests. The forest crop changes over time, though not perceived by naked eyes. This understanding of the dynamic nature of the forest crop and the goods and services provided by the forests guides the forester in setting the management objectives.

Since all benefits cannot be maximised, there are trade-offs that are to be decided considering societal needs. A young forest crop with relatively open canopy may provide more grass compared to a matured, old aged forest, forms a habitat of a particular kind of fauna, and grows fast resulting in a higher sequestration of carbon per unit area. A matured forest with multi layered crop structure provides clear water and it acts as a habitat for a certain other kind of fauna where the volume increment of the forest crop may be comparatively low and thus a comparatively less carbon sequestration. A monocrop or a forest crop with a gregarious species provides one particular kind of good but a forest crop with multiple species composition is more diverse and is expected to give more ecosystem services and multiple goods especially in the form of NTFPs.

The prescription for the management of a forest crop depends on the management objective and the condition of the forest crop. If the management of the forest crop is for maintaining healthy productive crop and entails regeneration felling to ensure proper regeneration, it will result in production of timber and other forest produce such as firewood, NTFP, grass etc then, the standard silvicultural treatments with local modifications will apply. For areas where the primary objective is the ecological services viz hydrological functions, preserving biodiversity etc., then the treatments would vary accordingly.
A systematic approach is to be drawn for achieving the agreed trade-offs in forest management planning. For this purpose, the forester shall identify various management objectives which will result in different goods and services that the forest crop could provide and the trade-offs among them.

4.6.1 *Management of forests for maintaining a healthy productive crop:*

Obtaining regeneration of the principal species and their associates is one of the main objectives of forest management. The opening of the canopy, either on account of natural disturbances or through management interventions, provide suitable condition for obtaining the natural regeneration. When forests are primarily managed for maintaining healthy productive crop and entails regeneration felling to ensure proper regeneration, it will result in production of timber as yield and other goods, NTFPs or grass for the locals and the wild herbivores, then the working circle shall be required to be based on standard silvicultural systems such as selection system, shelter wood system or coppice system with their local modifications. The sustainable yield of such regeneration felling in all such cases can be controlled by area, volume or both.
Any plan aimed at sustained yield cannot be achieved without considering a desired forest crop structure. For maintaining sustainable yield, the principles of normal forests shall apply. For this purpose, the existing forest crop shall be assessed and prescriptions shall be aimed at bringing it to the normal form as far as possible. In India, most of the forests are irregularly arranged which has been aggravated with suspension of silvicultural operations in most of the natural forests in the past few decades which warrants necessary remedial interventions.

The silviculture systems prescribing sustainable yield dependupon the increment of the forest crop, nature of the principal species (light demander/ shade bearer etc) status of the forest crop, frequency of felling, etc.

4.6.2 Management of forests for their ecological functions:

Forest management provides goods and services as by-products of management. Even when forests are managed primarily for maintaining healthy productive forest crop as discussed above, they provide ecological functions viz hydrological functions, conservation of biodiversity etc., in addition to sustainable yield of timber. However, when forests are managed primarily for the ecological functions that they provide, the prescriptions vary considerably. Under those circumstances, sustainable yield of timber and others goods will not be the by-products of the treatment proposed though there may be yield of tangible forest produce to maintain a particular canopy/crop density for maintaining ecological functions of the forest at the optimum level.

4.7 Constitution of Working Circle and calculation of yield of goods or services or both

Based on the object of management, the forest area is divided into different zones where different management prescriptions would be made. The principles on the zonation have been discussed above. Once it is decided and zonation completed for the forest area, working circles are constituted according to the management objective. The management of such forests would depend upon the nature of the crop, condition of the crop among other things.

Once decided on the approach to the forest management, the possible yield in the form of goods and services are to be ascertained using standard methodologies. For the estimation of yield of forest produce especially for timber, standard management principles and methodologies have been evolved. For regulating the yield of timber, generally the control is effected by area, volume or with both. The WPO shall choose appropriate standard method or adopt it to the suitability of the situation.

After deciding on the possible yield, the WPO shall make prescription for the management of the forests so that the goods and services so decided are obtained from the patch of the forest in a sustained manner. The possible yield of goods and services is dependent on the present condition of the forest especially its composition, both species and age. In order to obtain the goods and services in a sustained manner, the WPO shall aim at a desired forest crop structure and all the prescriptions shall be aimed at achieving that structure. If a forest is managed primarily for timber production, it is comparatively easier to aim at a desired forest crop structure and making prescriptions. The standards or the ideal state of the future forest crop which is generally referred to Normal Forests for timber production can be worked out using Yield Tables, where ever available or using data from the permanent preservation plots etc.

In case, the forest crop is primarily managed for ecosystem function and its services, even then determining the desired forest crop structure and prescribing treatments to achieve the same are equally important. In the absence of any standard, if the WPO desires to keep the present forest crop structure as the desired forest crop structure, the prescriptions are to be in such a way that the stand remains in its present form. As discussed earlier, forest stands grow and change all the time and so to maintain them in any form, proper silvicultural interventions is necessary. Any stand which is left to itself without any intervention slowly changes to a new structure, thus shifting from the desired stand forest structure. Thus, if unattended, the forest will not be able to provide the goods or services or both in future.

One of the tools available with the forester to manipulate the forest crop to achieve the desired forest crop structure is through periodic removal of trees based on silvicultural principles. For

this, the WPO shall indicate the duration of felling, area where felling is to be done, nature of felling etc. By nature of felling, it is referred to whether the felling is done successively as in the case of shelter wood system or at one time or regularly/ periodically as in selection system. This would include the interval between two subsequent felling in the area and rules for the material to be removed etc.

Supplementary provisions: The method of treatments proposed above may involve other supplementary activities in the form of thinning, cleaning etc. Regulation of grazing, removal of forest produce especially the dead and fallen material by the local communities under their rights, sowing and planting to augment regeneration, protection from fire are such operations that the WPO may prescribe under a working circle so that the object of management is obtained.

a. Thinning and cleaning
b. ANR through sowing and planting
c. Regulation of grazing
d. Regulation of rights of the local communities
e. Other cultural operations
f. Fire management
g. Riparian zone management
h. Soil and water conservation
i. Management of invasive alien species

4.8 Constitution of overlapping WC:
Overlapping working circles are constituted to meet specific objectives over forest areas that are primarily managed for certain other purposes as discussed above. This is aimed at multiple use forest management. These working circles are also constituted for the management of understorey crop like bamboo and rattans, and other special habitats. As per the requirement of the crop and management objectives, the WPO is at liberty to constitute one or many of the overlapping working circles to prescribe management prescriptions which are in addition to the primary prescriptions given in the WC of the previous section.

4.9 Management of Wetlands within forests:
Forest landscapes include wetlands as important ecosystems. Most of these wetlands are pristine and need little or no management interventions. However, periodic assessment of the wetlands, especially water quality testing among other things may indicate the health of the wetlands. The WPO may prepare a document on each of the wetlands on their status, need for any active management interventions etc based on the wise use principle.

4.10 Biodiversity Conservation:
Forests provide habitat for many plant and faunal species. 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 co-existence 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 plant and faunal species and their periodic monitoring can be helpful in formulating strategies for conservation, maintenance and enhancement of overall biodiversity through sustainable management and use practices. The BD indices estimated using the field data are to be assessed, and management prescriptions provided to meet the objective.

However, the prescriptions in the management plans of protected areas, eco-sensitive zones/areas, biodiversity heritage sites and wetlands of significance that are in or near the forests are to be harmonized while making prescriptions.

4.11 Forest fires and protection

Forest fires are as old as the forests themselves. They sometime pose a serious threat to the biodiversity and ecology. Forest fires have environmental impact in terms of tropical biomass burning, which produce large amounts of trace gases, aerosol particles, and play a pivotal role in tropospheric chemistry and climate aberrations. Thus, 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/near real time for effective response on the other. Real time monitoring of forest fires is being carried out by FSI or other national/state agencies. The processed signals on forest hot-spots are being transmitted to state forest departments on regular basis during fire season. Hence real time monitoring of forest fires is a process now in operation to curtail fire severity and sensitize SFDs at operational level to prevent normal fires in getting converted into wild fires. The online feedbacks on forest fires which are a part of this system could help estimate the actual loss of forest strata as well as the loss caused to top-soil. The WPO may propose an overlapping WC wherever fire is a major feature in the forest management. The assessment of damage by fire, fire frequency, burnt area mapping, fire vulnerability mapping etc will be used to prescribe management interventions.

4.12 Carbon Sequestration

Forests and wood products can effectively reduce the process of climate change in several ways. Growing trees absorb carbon dioxide from the atmosphere and store the carbon so efficiently that about half the dry weight of a tree is carbon. This carbon remains locked up in the form of wood and wood products. Sustainably grown and harvested wood (and other biomass) also provides a renewable alternative to fossil fuels and enhance carbon storage. Enhanced carbon sequestration through recognised and innovative silvicultural practices, eco-restoration of degraded/mined out forestlands, improved biomass productivity; etc results in improving forest health and vitality. Forest soil must be kept healthy and fertile. When carbon sequestration is the primary objective to manage a particular patch of forest, then it would be in the fitness of things to keep the forest in the actively growing stage with a high proportion of young and middle-aged crop. In such situations, the growth of forest crops must be kept vigorous to attain the most desirable level of biomass production within an optimal time scale.

4.13 Trees outside forests (TOF) and Forest Enterprises

Trees Outside Forests (TOF) are located on land other than forests, including agricultural land (e.g. agro-forestry systems, hedgerows, woodlots), built-up areas such as settlements and infrastructure (e.g. street trees, parks and other urban tree systems), and bare land (e.g. dunes, both abandoned and accomplished mining sites) forming part of the forest landscape. They contribute nearly one fourth of the total growing stock of the country. So there is a need to describe and comprehend the dynamics of trees and shrubs on rural and urban land, and their interaction with forest ecosystems. This will lead to a better understanding of off-forest tree management and towards integrated and sustainable management of forests as natural resources. The focus of forestry outside forest areas is on production forestry, revitalization of rural economy and expanding economic opportunities through innovations. This requires inter-sector synergy and convergence. WPO may therefore prepare a separate strategy as a new chapter, not being part of general prescription of working plan to address the concepts and issues related to TOF and forest enterprises.

MANUAL FOR THE PREPARATION OF WORKING PLAN UNDER NATIONAL WORKING PLAN CODE 2023

Unit 5

WRITING OF THE WORKING PLAN

5.1 Writing of PWPR:

The PWPR forms the basis for providing inputs to the WPO to initiate the process of revision of the WP. The head of WP wing shall initiate the process by asking the Officer in charge of the concerned territorial forest circle to prepare the PWPR in the prescribed format. The PWPR is a review of the implementation of the WP with a brief comment on various prescriptions of the WP under review. The relevant information from Social Forestry, Wildlife and other wings of forest department shall provide inputs for the writing of the PWPR. The PWPR will include any studies to be undertaken by the WPO and suggestions to the WPO. The PWPR shall include all relevant information on the management of the forests as annexure. An indicative list of annexures and maps to be provided are also given below.

PWPR Format

I Basic facts

Forest Division	
Period of current working plan	
Period of proposed working plan	
Previous working plan periods (All the previous plans)	
Reference to the approval of the current working plan	

II A Division area statement

Sl No	Name of the range	Forest area (Ha)	Remarks

II B Forest Area statement

Sl. No.	Range	Forest Block/Name of the forest	Legal status of forest	Area (Ha) as per the plan under review	Area (Ha) in the proposed plan	Diff in area (Ha)	Reasons, if there is any difference

III Details of working circle and implementation of working plan under revision (Current Working Plan)

Sl No	Name of the working circle	Area (Ha)

IV Critical analysis of the prescriptions of the working plan under revision (One table for each WC)

Sl No	Name of the working circle	Details of prescriptions	Qualitative assessment on the implementation of the prescriptions (Good/Satisfactory/Poor)	Quantitative assessment	Comments
		(One row per prescription)			

V Important strategies suggested based on the analysis of prescriptions of the WP under review

(List the suggestions)

VI Suggestion for changes in the existing prescriptions with reasons

Sl No	Prescription in the plan under review (with para number)	Proposed changes	Reason

VII Any special study or survey to be taken up by the WPO (Not more than 250 words)

VIII Any other suggestion to the WPO (Not more than 250 words)

IX Annexures

i. Statement on change in the category of Forest Cover

ii. Statement on the forest land diverted under FCA 1980 for non-forestry purposes

iii. Statement on forest land where rights are recognised under FRA, 2006

iv. Statement on ToF

v. Statement on forest land under encroachment

vi. Statement on forest land with clearly demarcated boundary

vii. Statement on forest affected by jhum cultivation/mining etc (Wherever applicable)

viii. Statement on the CA area afforested against the forest land diverted and the balance area pending

ix. Statement on the areas taken up for plantation/afforestation during the plan period under review

x. Details of adjoining PAs under WLPA, eco-sensitive zones/areas, CZR, BHS, Ramsar cites. Etc with notification

xi. Details of any species recovery programme undertaken

xii. Statement on the incidence of forest fire for the last 10 years

xiii. Statement on the incidence of grazing

xiv. Details of soil and moisture conservation work undertaken during the last 10 years

xv. Statement on the recorded removal of forest produce from the forests (Timber/firewood/grasses/fodder/NTFPs/Bamboos)

xvi. List of wood-based industries and furniture units operational in the Forest Division

xvii. Statement on employment generated in mandays

xviii. List of acts/rules/regulations governing forest, wildlife and biodiversity

xix. Details of JFMC/VSS registered in the forest division

xx. Details of BMCs established in the forest division

xxi. Statement on forest/wildlife offence during the last 10 years

xxii. Statement on expenditure (Plan/Non-plan/CAMPA/CSS/EAP etc) of the forest division for the last 10 years

xxiii. Statement on staff position including vacancy details

xxiv. List of applicable labour laws

xxv. Details of awareness and capacity building programmes organised by the Forest Division

xxvi. Details of buildings in the forest division including check posts, watch towers etc

xxvii. Details of vehicles and other communication facilities available

xxviii. Details of research plots, seed orchards, seed stands/seed production areas, permanent preservation plots etc

xxix. Compiled Compartment History Forms

xxx. GIS Layers on forest cover, forest types, forest fire, wetlands, land diverted under FCA, rights recognised under FRA, forest plantations etc

5.2 Writing of Working Plan:

The working plan under NWPC is written in the standard format prescribed herein. The WP is written in two parts. Part I of the plan forms the basis for the proposals that are provided for the management of the forests in the second part. A detailed analysis of different parameters, their change over a period of time and its reflection on the status of the forest crop and impact on the forest management are to be brought out clearly which must lead to make clear management decisions. The Part II deals with the future management prescribed including the objects of management. Besides these two parts, a set of appendices are also appended with the WP document.

Format of the Working Plan (To be written by WPO)

The standard working plan headings are reproduced in the table given below:

Executive summary along with a brief outline of management prescriptions.	
a. Glossary of terms b. List of flora c. List of fauna d. Other life forms	
Part I Summary of facts on which proposals are made	
Chapter 1	Tract dealt with
Chapter 2	Extent and Condition of Forests and tree cover
Chapter 3	Maintenance and enhancement of forest health and vitality
Chapter 4	Maintenance, Conservation and enhancement of forest biodiversity
Chapter 5	Conservation and maintenance of soil and water resources
Chapter 6	Maintenance and enhancement of forest resource productivity
Chapter 7	Optimisation of forest resource utilisation
Chapter 8	Benefits to local people
Chapter 9	Policy, legal and institutional framework
Chapter 10	Past system of management
Chapter 11	Statistics of growth and yield

Part II Future Management	
Chapter 1	**Basis of proposals** a. Objective of management b. Method of treatment to be adopted c. Constitution of working circles d. Period of working plan and necessity for intermediate revision
Chapter 2 – N	Exclusive/territorial Working Circles (The total area of these working circles should be equal to the total forest area of the division)
Chapter N1 - Nn	Overlapping Working Circles
Chapter Nn+1	General financial forecast and financial plan of operation
Chapter Nn+2	Miscellaneous regulations Petty felling and extraction Rights and concession
Chapter Nn+3	Science and research Preservation plots Sample plots Regeneration plots NTFP Plots Other research and experiment plots
Chapter Nn+4	Summary of prescriptions
Chapter Nn+5	Trees outside forests (ToF)
Appendices (Indicative)	I) Divisional area statement II A) Enumeration and its results II B) Biodiversity assessment II C) Regeneration survey II D) Socio-economic survey II E) NTFP Survey III) Research plots IV) Rights and concession V) Lease of land VI) FCA land diversions, Status of afforestation of CA land and their notification VII) Range, block and beat (with area and HQ) VIII) Buildings IX) Divisional Forest Officers

	X) JFMC/BMC XI) Fire incidences XII) Forest Offences (Range/Compt wise) XIII A) Statement of individual/community rights given under FRA XIII B) Statement on community forest resources rights given under FRA XIII C) Statement on forest lands diverted under Section 3(2) of the FRA XIV) Statement on the WBI in the division XV) List of forest blocks/reserve forest with notification – register of reserves XVI) Register of boundary pillars XVII) Statement on the free grants given to the beneficiaries
Maps (List of indicative maps)	a. Administration map b. Drainage map c. Map of recorded forest/ forest blocks d. Stock maps e. Forest cover map f. Forest types g. Map on forest plantations h. Research plots i. Fire incidence and vulnerability j. Grazing incidence and vulnerability k. Incidence of illegal felling and vulnerability l. Areas infested with invasive alien species m. Forest encroachment n. Incidence of pests and diseases o. Maps of forest area where individual/community rights given under FRA p. Maps of community forest rights given under FRA q. Map of forest area diverted under Section 3(2) of FRA r. Maps of forest area diverted under FCA s. Map of eco-sensitive zone t. Map of waterbodies within the forest area

5.2.1 Part I: Summary of facts on which the proposals are based

The standard headings and the details to be covered in each of the chapters are given below:

Executive Summary:

It should also include
a) Vision statement,
b) Goals & Objectives of Management
c) SWOT analysis for prescription of strategies for achieving the goals and objectives.
d) Expected outcome

Chapter 1 Tract dealt with:

Extent and Condition of Forests and tree cover: Forest boundaries in India are legally defined and activities to be done within the forests are regulated. The diversion of forests for non-forest use is governed by the Forest Conservation Act 1980. The increase in forest cover is primarily achieved in India through the trees outside the forests. The changes in the legal status and the extent of forest area reflect whether the forest tree cover is maintained or increased or reduced. An analysis of the change in extent and the status of the forests are indicators on the extent and condition of forest and tree cover in the forest division as described below:

PART- I Summary of facts on which proposals are made		
1	**The Tract Dealt with**	
1.1	Name and situation	Name of the division and its geographical location, demographic and administrative details. (Details regarding ranges, beats, their headquarters and area; list of rest houses, other forest building, forest roads, fire lines etc. are to be provided in the appendix).
1.2	Configuration of the ground	It may be categorized as flat, gently rolling, hilly, very hilly, undulating foothills, gullied including description of slope, aspect etc.
1.3	Geology, rock and soil	Describe the geological and rock formation, soil types in particular along with Geological Survey of India (GSI) references. As far as possible, GIS maps may be provided**.**
1.4	Climatic Parameters	Data on rainfall and temperature: yearly and month-wise maximum, minimum, and average temperature for a few representative stations; this information can be obtained from Meteorological Department. Relevant GIS maps along with historical data may be provided**.**

Chapter 2 **Extent and Condition of Forests and tree cover:**

Forest boundaries in India are legally defined and activities to be done within the forests are regulated. The diversion of forests for non-forest use is governed by the Forest (Conservation) Act 1980. The increase in forest cover is primarily achieved in India through the trees outside the forests. The changes in the legal status and the extent of forest area reflect whether the forest tree cover is maintained or increased or reduced. The change in extent and the status of forest has a bearing on the quality of the forest and its management which is indicated below:

2.2.1 Area of forests under different legal status (Reserved Forests/Protected Forests/Village Forests/Unclassed and any other forests): Forests in India are legally classified as reserved forest, protected forests, village forests and unclassed forests under IFA 1927 with State specific amendments and State specific Forest Acts and the orders of Hon'ble SC dated 12-12-1996 in

the case titled T.N. Godavarman Thirumalpad Vs Union of India and others. The WPO shall analyze the different categories of forests and their change in extent since the last revision of the working plan. The details of forests where the final notification is issued and where the settlement is under process shall also be indicated. The list of forests with their notification details shall be appended in the annexures in the prescribed format. Any increase or decrease in area of forests must be analysed and probable reasons indicated.

2.2.2 Area of different forest types: Forest type is a unit of vegetation which possesses characteristics in physiognomy and structure sufficiently pronounced to permit the differentiation from other such units. Description of natural forests into distinct forest types and their extent provide scientific basis for their management. The assessment in the change in the extent overtime is a reflection of alteration in productivity, and status of the forest crop which will assist in the choice of silvicultural principles to be followed for the suitable management practices.

2.2.3 Change in the category of forest cover: The FSI categorises the forest cover based on canopy density into very dense, moderately dense, open and scrub. Change in forest cover over a period of time reflects the actual changes of forest on ground. The positive changes could be, among other things, attributed to better forest protection and related conservation measures whereas negative changes could be attributed to change of land use on account of developmental projects, excessive degradation due to anthropogenic pressures, harvesting of short rotation crop etc.

***2.2.4 Area of different working circles*:** The forest is divided into different management zones as working circles based on the object of management. The working circles indicate the application of different set of silvicultural prescriptions and management practices in that area. A change in the area of working circle is often a reflection of change in the object of management and/or change in the status of vegetation.

2.2.5 Area of the Trees Outside Forests: ToF contributes significantly to increase in the forest and tree cover of a forest division. Periodic monitoring of the change in area of ToF reflects the overall change in the forest and tree cover of the forest division.

2.2.6 Details of area of forests diverted under FCA: Forest lands diverted for non-forestry purposes under FCA impacts the extent and the integrity of forests besides the quality of the forests. Linear projects sometimes have greater impact by fragmentation of the forests. Hydro-electric projects and large-scale mining projects also have major impact on the extent of forests. The details of area diverted under FCA shall be appended as Annexure in the prescribed format. The details of plantations raised under Compensatory Afforestation shall be appended at Annexure to the WP document. An analysis of the compliance of the conditions laid down in the orders and implementation of mitigation measures are important to determine the impact.

2.2.7 Details of forest land where rights are given under the FRA: The FRA recognises specified forest rights in favour of forest dwelling scheduled tribes and other traditional forest dwellers and their communities. The nature and extent of individual forest rights recognised under FRA, the nature and extent/quantum of forest resources on which the community forest rights have been recognised and the management practices prevalent to be indicated. The details of the forest area where the rights are recognized is appended in the annexures.

2.2.8 Details of forest land under encroachments: Forest encroachment often leads to change in land use and has an impact on the integrity of the forest estate and the condition of the forests. Encroachments could also lead to honeycombing of the forest leading to habitat fragmentation and affecting the condition of forests. The change in area of encroachment and eviction gives an

indication of the protection measures taken up by the division and its impact on the extent of forest cover. The list of encroachment in the forest division shall be compiled and appended as annexure.

2.2.9 Details of any other factors affecting the existence of forests such as shifting cultivation, illegal mining etc: There could be other factors affecting the extent of forests like jhum cultivation, mining etc. The WPO shall compile these information in the following format and an analysis of the same shall indicate the reasons for the reduction in the extent of the forest and tree cover, if any, in the forest division during this period.

2.2.10 Demarcation of boundaries: Area of forests with clear demarcation of boundary with boundary pillars, trenches and other measures enables protection of forest areas and analysis of all the measures taken up for protection of forest areas. The details of the boundary pillars, trenches and other such measures are to be given in Appendix**.** The WPO shall also prioritise the areas prone for encroachment based on the information on encroachments and attempt to encroachment in the forest division and propose erection of BPs in the appropriate chapter in Part II.

Chapter 3. Maintenance, Conservation and enhancement of forest biodiversity

The forests offer diverse habitats for plants, animals and microorganisms. Forest biodiversity encompasses not only the trees but also the multitude of plants, animals and microorganisms that inhabits the forest ecosystem and their genetic diversity. Higher the diversity, more stable the ecosystem and it offers better livelihood opportunities to the local peoples and tribals who are dependent on the forests. At the same time, loss of biodiversity makes it difficult for the ecosystem to recover from disturbances and adversely affecting the forest dependent communities. Different approaches are adopted in India for biodiversity conservation such as area-based conservation measures by establishing protected areas, species recovery programmes of threatened species and in-situ and ex-situ conservation programmes etc. These are indicated by the following:

2.3.1 ***Adjoining Protected Areas***: Details of adjoining protected areas under Wildlife Protection Act, 1972 (National Parks/Wildlife Sanctuaries/Conservation Reserves and Community Reserves), Environment Protection Act, 1986 (Eco-sensitive zones/areas, Coastal Zone Regulation, Wetlands notified under Wetland Rules) Biological Diversity Act 2002. The management of these areas which adjoins the forests has an impact on the management of the forests. The WPO will analyse whether the forest division acts as a buffer or a corridor for wildlife in the adjoining protected areas.

2.3.2 ***Species diversity***: Diversity indices such as Shannon-Wiener Diversity Index, Simpson Diversity Index and Importance Value Index indicate the abundance and richness of species in a locality. Evaluation of these indices in light of the management prescriptions provides insight into management options. Biodiversity richness could be a proxy for the productivity of a forest ecosystem.

2.3.3 ***Details of any species-specific conservation programmes***: The presence of endemic, endangered species and actions taken up for their conservation, the progress and their impact. The WPO shall list the species specific conservation programme under implementation and will harmonise the objective of these schemes with the overall management prescriptions of the relevant working circles.

2.3.4 ***Details of species prone for over exploitation***: Some species are more vulnerable to over exploitation than others especially those who have a narrow ecological niche, and those

produce a smaller number of their individuals. Identification of such species and their distribution and extent provide insight into need for management interventions. The WPO may prioritise certain species based on the part used, purposes for which used and the quantum to take up necessary management interventions. For example, species whose underground parts, bark or whole plant is used have a higher threat than species whose leaf or fruit is used. Similarly, if a species has more than one use or used for treating more than one disease, then the utility of the species increases and thus needs a focussed conservation effort.

2.3.5 Details of unique/special habitats and high conservation value areas: Identification and mapping of these ecosystem forms basis for special management interventions, if any. The maintenance of the integrity of these ecosystems is essential for the long-term ecological security and conservation of the species dependent on these ecosystems. The WPO shall recognise their importance and prescribe such measures as deemed necessary for their conservation in the relevant working circle.

2.3.6 Details of diverse ecosystems such as grasslands, wetlands, mangroves, deserts etc: Identification and mapping of these ecosystem forms basis for special management interventions, if any. Identification of these ecosystems and their change in extent or quality over time will indicate the management interventions required. A map may also be prepared indicating different ecosystems on GIS.

2.3.7 Details of threats and challenges to vulnerable flora and fauna: Habitat fragmentation, illegal trade are serious threats that affect the population of flora and fauna. An analysis of various threats will help in formulating mitigation strategies. The WPO shall make necessary prescriptions to mitigate the threats and to aid the conservation of these species.

Chapter 4 Maintenance and Enhancement of Forest Health and Vitality

Natural forests are affected by various anthropogenic factors such as grazing, encroachment, forest fire, invasive alien species etc. Forests are also affected by natural phenomenon like flood, landslides, windstorms, pests and diseases etc. Presence or absence of regeneration is a better indicator on the health of a forest ecosystem. If the forest is poor or inadequate in regeneration, then it indicates that the health of the forest is poor and compels the manager to take immediate action to obtain the regeneration by appropriate silvicultural interventions and by removing the factors that inhibit the regeneration and their establishment. Forest vitality is the ability of the forest ecosystem to survive external disturbances and unfavourable conditions. A forest ecosystem that has low vitality has a limited capability to recover from any unfavourable condition or natural disturbance. Low vitality is normally caused due to repeated disturbances with little time to recuperate and it must draw the attention of the manager to take immediate steps to remove or mitigate the impacts of those disturbances. There are various factors that influence the forest health and its vitality as indicated below:

2.4.1 Status of regeneration of the principal species and its associates: The status of forest regeneration is estimated during the field survey. The regeneration status could be adequate, moderate or poor. In case the regeneration is inadequate or nil, then the factors that inhibit regeneration must be analysed and brought out clearly to enable suitable silvicultural/management interventions.

2.4.2 Details of areas affected by forest fire: Forest fire is one of the agents that has a direct impact on the regeneration and vitality of the forest ecosystem. Uncontrolled fire has a deleterious effect on the regeneration. Repeated fire impacts the capacity of the forest to recover from its impact on the ecosystem and thus reduces the vitality of the ecosystem. Fire frequency mapping and preparation of fire vulnerability maps help in effective forest fire management. The use of real time monitoring tools is potential mechanism for effective fire management.

2.4.3 Area affected by natural factors such as flood, landslides and windstorms etc: Documentation and assessment of all incidences of natural calamities and their impact on biodiversity and ecosystems will lead to the planning for disaster management. Potential negative impacts of natural hazards proportionate to scale, intensity and risk on infrastructure, forest resources and communities will lead to identification of proactive management activities to mitigate these impacts.

2.4.4 Area affected by and protected from grazing: Uncontrolled livestock grazing in forest areas is detrimental to forest health and ecosystem vitality. It is one of the most critical factors degrading the forest ecosystem. It affects the forest crop composition and adversely impacts natural regeneration, causes soil compaction and consequently diminishes the infiltration capacity of the soil. Ascertaining the livestock population from secondary sources like Animal Husbandry departments and determination of carrying capacity for grazing in forest areas based on the availability of palatable species shall provide inputs to the Working Plan Officer (WPO) for prescribing regulation of grazing. This data could also be obtained from the socio-economic survey. A grazing vulnerability may also be assessed and prescriptions included to mitigate the negative impact of grazing on regeneration and the quality of forests and on biodiversity conservation.

2.4.5 Area infested with invasive alien species: Invasive alien species is a major threat to the forest ecosystem vitality and its health in terms of biodiversity. They affect the regeneration and also impact the growth of the native species. Effective steps taken for the control of invasive species positively impacts the natural regeneration of native species in forest areas. The area infested with invasives and their severity to be recorded here. The WPO shall prescribe effective management of the invasive alien species in light of the object of management.

2.4.6 Details of incidence of pest and diseases: Pest and diseases affect the health and vitality of a forest ecosystem. Mapping of the extent of area affected and the frequency of such events will be useful for effective management. Adaptation of suitable silvicultural practices, use of healthy planting material, reducing the injury to the forest crop is some means to prevent incidence of disease in a forest crop. An analysis of the incidences of pest and diseases and the adaptation of different preventive measures will lead to better understanding of drivers of degradation leading to effective management prescriptions.

2.4.7 Forest degradation due to pollution: Incidence and extent of forest degradation due to pollution (soil, water, and in some cases air), and the mitigation measures.

2.4.8 Other drivers of forest degradation: There are other drivers of forest degradation and deforestation and barriers to reforestation. Identification of these with inputs from stakeholders will be useful for identifying better management prescriptions.

Chapter 5 Conservation and Management of Soil and Water Resources

Forests continually interact with water through canopy interceptions and storage, evapotranspiration and infiltration. Sub-soil moisture is affected by the infiltration and transpiration under the forests. The forest management prescriptions and the external impact on the forest such as excessive grazing and the resultant compaction of the forest floor also affect the infiltration rate and the water yield. The soil and moisture availability in turn also directly impact the productivity of a forest. Forest and water are mutually dependent. The water yield from a forested ecosystem directly depends on the various vegetative parameters like species, canopy density, fire history, grazing and silvicultural interventions like logging, thinning, weeding, pruning etc. However, there is a trade-off between water quality and quantity from any forested watershed. Thus the different water and soil conservation measures, the silvicultural practices adopted and other external factors have varied impact on the forested ecosystem which can be analysed as indicated below:

2.5.1 ***Inventory of water bodies and sources***: The waterbodies inside the forests improve the water regime of a forested watershed. Over exploitation of the ground water resources results in declining ground water levels; there is an urgent need to augment the ground water resources through suitable management interventions. Mapping of all water resources in the forests including springs shall form the basis for conservation and management of soil and water resources.

2.5.2 ***Area treated under soil and water conservation measures***: The soil and water conservation measures reduce the surface flow and aid in infiltration and also reduce the soil erosion. However, soil and water conservation structures needs to take into account total rainfall in the catchment. The Soil and Water conservation structures are highly recommended in high rainfall areas, however the same has to be very carefully and judiciously incorporated in low rainfall zones as it may adversely affect the water availability in downstream areas.

2.5.3 ***Monitoring of ground water***: Periodical recording of water level in open wells during dry and wet seasons to determine the ground water level. It will help in the assessment of the impact of interventions taken in the catchment on the groundwater. This information may be sourced as a secondary data from Central Ground Water Commission/Central Ground Water Board reports.

2.5.4 ***Identification of areas vulnerable for erosion and prescription for suitable treatment***: Identifying areas vulnerable for erosion and planting of local grasses in such areas are very effective for immediate control of soil erosion. It may be followed by tree plantation which takes time to establish. Forest soils must be kept as healthy and fertile as possible while maintaining the hydrological services.

2.5.5 ***Mapping of riparian zones for special management prescriptions***: Riparian zones act as discharge zones and with appropriate vegetation helps in lowering of water temperature, better dissolved oxygen, less turbidity and maintenance of channel shape. In areas with low rainfall, riverine plantations are likely to have a negative impact on the stream flow. Therefore, riverine plantation should be rainfall specific.

2.5.6 ***Monitoring of streams, lakes, wetlands, ponds and other waterbodies in forested catchments***: Eco-restoration, natural regeneration, tree/shrub/grass planting, soil and water conservation structures as per locally suitable designs protect streams, lakes, wetlands, ponds and other water bodies and sea shores. The important forested catchments need to be equipped with the monitoring stations over selected streams to assess the discharge and silt load. The data shall help in developing a long term understanding on the impact of various vegetative parameters and the management practices on the stream discharge and silt load.

Chapter 6. Maintenance and Enhancement of Forest Resource Productivity

The plants capture solar energy through the process of photosynthesis and convert Carbon dioxide to sugar and release oxygen. The net primary productivity (NPP) is the total energy accumulated by the plants during photosynthesis. The NPP of the forests in the tropical area which receive more sun light throughout the year is higher in comparison to temperate and alpine zones. Thus NPP of a forest is an indicator of how much it can produce in terms of timber, fodder, grass, Non-timber Forest Produce etc. The productivity of all these can't be maximised simultaneously for a patch of forest at a given point of time and there is a trade-off involved depending on the object of management. The estimation of growing stock of timber is not the complete reflection of the productivity of a forest. Some forests by their open nature such as dry deciduous forests have low timber volume in terms of growing stock but compensate it by higher grass yield. This productivity is impacted by anthropogenic factors which leads to degradation of the forest especially loss of top soil. By adapting appropriate silvicultural practices and mitigating the effects of the degradation, the productivity of forests can be maintained and even enhanced. Emphasis on plantation with improved quality of planting material aimed at improved productivity is essential to meet the societal needs of timber. The productivity of forests depends on the species composition, growing stock, increment and distribution of dia-class/age-class. Information on growing stock and its growth is necessary for efficient planning and management of the forests. The forest inventory, survey and mapping provide this important input. An assessment and the analysis as described in Unit 4 of the following parameters indicate the status of the forests and the management interventions required:

2.6.1 ***Estimation of growing stock****:* Growing stock is the standing volume of a forest crop. Higher the growing stock more the standing volume i.e usable timber and thus higher carbon stock as well.

2.6.2 ***Estimation of current annual increment and mean annual increment of the forest crop***: Increment is the increase in volume of growing stock over a period of time. Higher increment of Growing Stock also means higher carbon sequestration.

2.6.3 ***Estimation of Diameter distribution*****:** The diameter is a proxy for age and the diameter distribution of the principal species, and their associates indicate the presence or absence of different age class in a forest crop using n-D curve.

2.6.4 ***Estimation of Basal Area (BA) and the number of stems per unit area****:* Basal area is a function of crop diameter and number of trees per unit area. Basal area along with the number of stems per unit area is a better indicator of a forest crop to sustainably provide the goods and services it renders.

2.6.5 ***Estimation of Carbon stock of the forests*****:** An estimate of the carbon stock of the forests over a period of time indicates the carbon sequestration potential of the forests thereby the mitigation potential of the forests against climate change. The estimation of Carbon stock is determined by the summation of the 5 pools. The SFDs may do the estimation of all the pools for which field forms are provided (Forms 7, 8 and 9). Alternatively, the WPO may use the data from the ISFR reports by FSI.

2.6.6 ***Area for eco-restoration, rehabilitation and reclamation****:* The degradation of the forest leads to lower productivity. Analysis of measures taken up for mitigating the effects of the degradation, mining and shifting cultivation etc, especially through eco-restoration, rehabilitation and reclamation will be useful for estimation of area available for eco-restoration, rehabilitation and reclamation effective management of forests, duly supported by GIS layer wherever possible.

2.6.7 ***Area for improved productivity through afforestation***: The productivity of a forest depends upon the genetic material of the trees also. It is difficult to manipulate the

genetic makeup of a natural forests but can be done while raising plantation. The superior quality planting material is essential for increasing the productivity. An analysis of the plantation of superior quality saplings taken up and the identification of areas for such additional plantations and appropriate measures will indicate the efforts for improving the productivity of the forests.

2.6.8 ***Area taken up for tending operation and other operations****:* The timber, bamboo and NTFP productivity can be enhanced with suitable silvicultural treatments like thinning, cleaning, and pruning. Assessment of other silviculture practices undertaken to protect water resources and soils, reduce disturbance and damage to habitats, ecosystems, landscape and environmental values. Areas taken up for these operations indicate the efforts taken up for enhancing the productivity of the forests.

Chapter 7. Optimization of Forest Resource Utilization

Forests provide multiple goods for the use of the society in the form of timber, fodder, grass, fruits, nuts, gums, resin, tendu leaves, medicinal plants etc. The knowledge of the communities on the conservation, harvesting/collection practices, grading and storage helps in sustainable management of forest resources. Identification of the important forest produce, their demand and sustainable supply and the harvesting pattern will form basis for making sound management prescriptions as indicated below:

2.7.1 ***Agriculture customs and requirement of the local people:*** An estimation of the requirement of the local people for small timber for agricultural purposes on the basis of the socio-economic survey will indicate the dependence of the population on forests.

2.7.2 ***Listing of important NTFPs***: It is expedient to identify, produce, or enable the productions of diversified products such as NTFPs, their use, part used, based on the range of resources without jeopardizing the flow of ecosystem services in order to strengthen and diversify the local economy proportionate to the scale and intensity of management activities. This information may also be compiled from the socio-economic survey conducted.

2.7.3 ***Details of non-destructive/sustainable harvesting of resources****:* Bio resources are harvested and whole plants or different parts are used. If whole plants, underground plant parts or bark are used, this often leads to the death of the plant and is likely to have an adverse effect on its population than a plant whose leaf or seed or flower is used. An analysis of the part used, collection and harvesting practices shall indicate the sustainability of NTFPs. The WPO may refer to any specific study undertaken and the results on the non-destructive/sustainable harvesting of resources besides the inputs from the socio-economic survey.

2.7.4 ***Demand and supply of timber and NTFPs***: The socio-economic study and the local market survey will provide an assessment of the dependence of the local people on the forests for timber, firewood, fodder and other NTFPs. This will also include the estimation of import and export of timber/NTFPs from other States and Countries. This will enable the assessment of per capita consumption of timber and firewood by the people living near the forests. This information can be partly compiled from the socio-economic survey conducted. Other secondary sources on the market supply and demand may also be referred.

2.7.5 ***Low impact harvesting***: Assessment of low impact harvesting techniques being followed in the forest division. Harvesting and extraction of forest resources are undertaken in the manner so that merchantable waste is reduced, and damage to other products and services is avoided.

2.7.6 ***Recorded removal of timber, firewood, grasses, fodder, bamboos, other NTFPs***: Analysis of annual removal over a period of time indicates the sustainability of a species. The socio-economic survey also provides information on the use of the NTFPs by the communities. An analysis of the recorded removal and the use of timber, firewood, grasses, fodder, bamboos, other NTFPs from SE survey shall form basis for making appropriate interventions. Any reduction or excess extraction over the sustainable yield/average extraction during a period of time warrants immediate action for its rehabilitation or augmentation of natural population.

2.7.7 ***Valuation of the forest resources***: An estimation of the value of all the goods that are extracted from the forests based on the market value gives an insight about the contribution of forest resources to local/national economy and for making decisions for the optimisation of the use of the goods from the forests.

2.7.8 ***Forest enterprises***: Wood based industries and other industries that use raw materials sourced from the forests are important stakeholders for the management of forests. Listing of forest based industries and enterprises in the forest division and outside forest division which source raw material especially NTFPs from the division, not only indicate the forest based employment generation but also the contribution of the forests towards the local economy and indicates scope for new forest based enterprises. The WPO may consult the State Biodiversity Board on the use of the bio-resources by enterprises outside the forest division.

2.7.9 ***Access and Benefit sharing***: NTFPs are sourced from the forest areas for commercial use by the industry. Proper documentation of traded quantity and sharing of the benefits with the BMCs as per the provisions of BD Act and ABS guidelines notified thereunder can help in the conservation and sustainable use of NTFPs.

Chapter 8. Benefits to local people

The social and cultural values of forests aside from their ecological and economic benefits and optimization of forests and their products are intrinsically connected with local stakeholders. Traditionally, they form a significant part of the life of the local people with many patches of forests across the country protected as sacred groves. Several floral and faunal species of religious and cultural significance also exist. Hence, such cultural and social sentiments are of great importance in acting as motivational drivers behind their conservation ethos. The assessment of the role of forests on the social, cultural, economic and ecological aspects of the local people will provide inputs for making management decisions as indicated below:

2.8.1 ***Details of employment generated***: The activities of the forest department generate livelihood and an analysis of the same provides insight into the employment generation potential of the forest sector and the dependence of the local community on forests for employment. The details of trainings and capacity building programmes organised towards employment generation helps in identifying the potential human resource available for different activities including guides for ecotourism related activities.

2.8.2 ***Use of traditional Knowledge and listing of knowledge holders:***The local vaids/hakeems and practitioners of indigenous medicinal system are repositories of traditional knowledge who have a close linkage with the forests. This information may also be available in the Peoples' Biodiversity Register prepared by the Biodiversity

Management Committees. Their knowledge on the distribution of the species, their extent, its diverse use and availability etc shall form the basis for making sound management prescriptions.

2.8.3 ***Extent of sacred groves***: Sacred groves are great repositories of biodiversity with religious, cultural and conservation significance. They may also provide insight into good management practices. Listing of these groves shall provide insight into necessary special management interventions required. This list may include trees, forest patch, ponds/lakes etc.

2.8.4 ***Details of social customs on forests and forestry practices*:** There are community specific social customs, customary laws on various forestry related activities like collection of NTFPs, their use etc. Identification of the same indicates the close cultural linkage of the communities with the forests which could contribute to making culturally conscious management prescriptions with the active participation of the local communities.

2.8.5 ***Ecotourism sites and activities***: Ecotourism is responsible travel to natural areas for conserving the environment, sustaining the well-being of the local people, and involving interpretation and education especially to the visitor. Education is meant to be inclusive of both staff and visitor. Areas inside and adjoining designated forests, which have ecotourism potential to be identified and documented for effective implementation of ecotourism. Listing of the capacity building programmes undertaken for the staff and the community and identification of gaps if any for further training in future.

2.8.6 ***Identification of rights and concessions of the local communities:*** The communities living near the forest enjoy rights and concessions from the forests. Documentation of these rights and concessions including that of the migratory graziers, their extent, nature, etc., has a direct link with the management of forests.

2.8.7 ***Valuation of ecosystem services***: The WPO shall use the results of valuation of ecosystem services study undertaken by the state or any other institution. In the absence of any specific study, the valuation done at para 7.7 may form the basis for initial evaluation.

Chapter 9. Policy, Legal and Institutional Framework

National and State policies on forests, wildlife, water and environment governs the way forests are managed. The Indian Forest Act, 1927, the Forest Conservation Act, 1980, Wildlife (Protection) Act 1972, Environment (Protection) Act, 1986, Biological Diversity Act, 2002, Compensatory Afforestation Fund Act, 2016 and any other state specific law and rules made thereunder provide legal framework for the conservation and sustainable management of forests, wildlife and the biodiversity that the forests harbours. The Forest Rights Act 2006 and PESA Act also impact the management of the forests in India. An analysis of these legal instruments and their implementation, various institutions involved with the forest management and research will indicate the impact of these instruments on forest management as indicated below:

2.9.1 ***Listing of legal instruments governing the forest management***: This includes state/ locality specific rules, regulations on tree preservation etc

2.9.2 ***Role of panchayats or any local body in the district and council areas in forest management***: Analysis of the village development plan and its focus on forests, wildlife and environment.

2.9.3 ***Participatory forest management*****:** The listing of the committees constituted for the participatory forest management are mandated to protect and conserve the forests and the biodiversity thereof. Micro-plans are prepared in congruence with working plan prescriptions. Analysis of the functioning of these committees and implementation of the micro-plans prepared through Participatory Rural Appraisal is an indication of the participation of the stakeholders in forest management for sustainable management of forests.

2.9.4 ***Details of BMCs*****:** BMCs are constituted under the BD Act for the purpose of promoting conservation, sustainable use and documentation of biological diversity including preservation of habitats, and chronicling of knowledge relating to biological diversity. The ABS Guidelines further specifies the process for Access and Benefit sharing of bio-resources. Listing of BMCs, benefit sharing agreements, if any, data on the quantity of traded bioresources especially NTFPs indicates the benefits derived by the communities from the forest resources.

2.9.5 ***Forest, biodiversity and wildlife related offences*****:** Listing of year wise offences and details of conviction, if any, indicates the effectiveness of enforcement of law.

2.9.6 ***Financial outlay*****:**: Assessment of expenditure in the forest division on establishment and on developmental activities under different schemes indicates the budgetary support.

2.9.7 ***Human Resource***: Adequate and trained man power is essential for effective management of forests. Assessment on the vacancy of personnel against the sanctioned strength, percentage of women officials, requirement of additional human resources, if any, status of mandatory training of the staff as per the relevant State rules governing the same, details of in-service training programme organised etc.

2.9.8 ***Gender aspects***: Women are involved in forest-based income generation activities as they are the primary collectors of NTFPs and their primary processing. The women are likely to have knowledge on forestry resources linked with food, health, fodder and firewood. However, their commensurate roles do not reflect in the forest management. Mapping of gender-based roles and activities in forestry, assessing the contribution of the women in forestry activities, their role in forest management planning, training and capacity building for women organised by the forest department etc are essential to understand gender mainstreaming in forest management.

2.9.9 ***Labour welfare***: The welfare of the labours involved in forestry operations is of utmost importance. Listing of the different laws governing the labour welfare and analysis of adherence to the same indicate efforts taken for labour welfare.

2.9.10 ***Environmental awareness and education***: Assessment of all efforts made to increase public awareness and education on forests, the benefits provided by the forests, along with list of the published material.

2.9.11 ***Infrastructure support***: Adequate infrastructure in terms of office, residential accommodation of the staff, transportation and communication facilities are necessary for effective forest management. Listing of the entire infrastructure available enables identification of gap, if any, and planning for reducing the gap.

2.9.12 ***Research and development***: Research and academic institutes are important stakeholders. Research plots, preservation plots, seed orchards, seed stands/seed production areas etc established by forest department and research institutes are research infrastructures for forest management. Documentation of the efforts of the forest department for the production of quality planting material and focus on native endemic and threatened species, the details of research undertaken, application of results in the field and further identification of problems for research are essential for effective science-based forest management.

2.9.13 ***Existence of monitoring mechanism***: Monitoring and evaluation are essential tools for effective and adaptive forest management. Analysis of adherence to monitoring protocols like control forms, compartment history etc gives insight into the management of forests.

Chapter 10 Past System of management

In this chapter, a detailed comment and analysis of the results of the past management for each working circle are presented separately. Success or failure and reasons thereof, if known, are taken note of, the impact of the past working plan and the extent of harvesting are reviewed. In this chapter on "Past Systems of Management", critical analysis of deviations /failures in the implementation of the past prescriptions is given in detail. As far as possible, attempt should be made to quantify the results and effects of the past prescriptions.

Chapter 11 Statistics of growth and yield

WPO has to assess the availability of volume/ yield tables for the main timber species, which have been prescribed for felling in the various working circles for calculation of yield. If such tables are not available, then the possibility of stem and stump analysis for such species may be examined and implemented, if possible, for preparation of local volume table. In case, this is also not feasible, then non-destructive method for preparation of local volume may be adopted. Help of research institutes may be undertaken, if necessary. Site quality wise local volume table must be developed and applied. The WPOs are encouraged to refer to the species volume equations developed by FSI to estimate the volume of trees.

5.2 Part II Future Management Discussed and Prescribed: This part deals with the framing of general objects of management based on past practices, inputs received from the stakeholders, condition of the forest crop; constitution of working circles for different objects of management; supplementary prescriptions; financial forecast etc.

Chapter 1 Basis for proposals:

This chapter includes general objects of management, constitution of working circles to meet the different objectives, period of working plan etc. While drafting the general objects of management, the WPO must consider the PWPR, stakeholder consultation, national forest policy, policies of the States etc. The condition of the forest crop and its response to earlier management as discussed in the past history of management will also aid the WPO in drafting

the general objects of management. These shall form the basis for making management prescriptions under different working circles.

After framing the general objects of management, the forest zonation is done for different treatments to meet different objectives. Some of these are constituted under exclusive working circles and others are done through overlapping working circles.

Chapter 2 to 'n' – Name of the working Circle: (CHAPTERS ON (TERITORIAL/EXCLUSIVE/ MGT OBJECTIVE) WC)

The total area (Forest Estate) for which the WP is being prepared must be divided into different zones (Working Circles) based on the objects of management of forests. This may include WC constituted primarily for obtaining regeneration of the principal specie(s) and their associates, or for managing forests primarily for hydrological purposes or for managing forests primarily as wildlife habitat or for rehabilitation of degraded forests etc. The total area of these different zones (WC) must be equal to the total estate area. (Area under overlapping working circles should not be considered for this purpose)

2.1 ***General constitution of working circle***:

Mapping and summarization of working circle area statement by ranges, blocks, and compartments included in the working circle indicating gross area and showing forest type and density classes (as adopted by FSI). If there is any change in the area of a particular WC proposed, from the WP under revision, reasons for the same to be given in detail.

2.2 ***Special objectives of management***:

This flows from the general object of management for which this WC is proposed to be constituted. Those broad objectives must be divided into sub-points with management perspective. These are to be enlisted in order of priority. Whether the forest is being managed for maintaining healthy productive crop by ensuring regeneration felling or managed primarily for their ecological functions, should be clearly spelt out. The trade-offs in choosing a particular set of management objectives should also be described clearly.

2.3 ***Analysis of the crop:***

This is the most important part of the Chapter. Analysis will be done in three parts:

a) Analysis of existing crop: The existing crop must be analysed, for its structure (age/diameter class distribution (n-D curves)), growing stock, stocking of the principal species, status of regeneration, biodiversity status, carbon stock status, water regime in the WC area, assessment of NTFP bearing species, etc.
b) Comparison with past available data: A comparison with previous working plan data or from any other reliable sources such as report of the pre-investment survey and other such inventory of forest resources available at FSI website, and special features, if any, are to be described. Based on this comparison, the trend in the change in 1. forest crop (structure, growing stock, stocking etc.); 2. biodiversity status; 3. carbon stock status; 4. Water regime; also must be brought out. Reasons for the change also must be noted.
c) Desired forest crop: What is the desired forest crop to meet the objectives defined above must be brought out clearly here. If the present forest crop as analysed in para a is the desired forest crop according to the management objective, proposed prescriptions will be such that forest crop maintains its present form. This warrants silvicultural interventions simply for the reason that the forest crop keeps changing all the time as it is

a living system. (Forests are living systems and they keep changing slowly even though we may not be able to perceive those continuous changes)

2.4 Silvicultural system:

There are standard silviculture systems to adopt a kind of regeneration felling for maintaining healthy productive forest crop. But there is no standard silviculture system to adopt for maintaining sustainability of eco-system services from the forest. So when regeneration felling is proposed, reasons for choosing of a particular standard silviculture system along with defining the system must be presented. When no standard silviculture system is available to fulfil the object of management, silviculture principles which will be adopted to maintain/ generate a particular forest crop form in terms of structure, growing stock, stocking, regeneration etc. by modifying any of the standard existing silvicultural system or otherwise, the proposed treatments should be described in detail justifying the same.

2.5 ***Rotation period*** (For even aged system of management with regeneration felling):

If regeneration felling is a requirement as per the selection of Silvicultural System above, the growth and other data on which the rotation is based are to be discussed here. Adequate reasons shall also be given for adopting a particular rotation, other than that of the greatest volume production. In the context of climate change, for enhancing mitigation effects, carbon sequestration becomes one of the primary objectives of the management of forests. In such a case, to maintain a vigorously growing population a rotation that allows maximum volume production is to be adopted. If there is a change from the previous plan, then the possible effect on age class distribution must be analyzed.

(OR)

Harvestable diameters and Felling Cycle (For uneven-aged system of management with regeneration felling): Harvestable diameters- These are to be prescribed species wise according to their site quality and correspond to maximum volume/ growth production i.e., the average rate of growth or volume increment reaches a maximum. These would be different in case of technical rotation.

2.6.***Felling Cycle***- Wherever applicable, it is fixed and reasons given. In the diffused systems it generally corresponds to the period of the plan, i.e., 10 years. Longer the felling cycle, higher the intensity of felling. The WPO shall decide on the intensity of felling and the felling cycle as per the management objectives, type of crop and the condition of site etc.

2.7 Treatment cycle:

The treatments prescribed may include other silvicultural activities including those indicated under the subsidiary silvicultural operations. For such operations, the WPO shall indicate the period during which the entire forest would be covered. For example, management of invasive alien species or rehabilitation of degraded forests, the WPO shall determine the treatments and also indicate the number of years in which the entire WC shall be gone over. While deciding on this cycle, the requirement of the forests, availability of resources both financial and technical and other relevant parameters shall be considered by the WPO. This cycle shall ordinarily be less than the expected life of the principal species.

2.8 ***Determination of Increment:***

The increment put on by the crop must be determined using standard methodology. Adopting a particular method and its suitability in the instant case is reasoned here. While estimating the annual yield, the equi-productive area based on reducing factors on site quality and crop density is resorted to, wherever applicable.

If regeneration felling is proposed, the yield calculation method adopted for sustainable harvesting should be indicated. There must be provision for adjustment of extra ordinary felling against future yields to ensure vitality and regenerative capacity of the forests for enhanced carbon sequestration.

Where regeneration felling is not proposed, determination of annual increment must be done. Knowledge of increment is necessary to judge the best possible silviculture treatment.

2.9 ***Table of felling***: A tabular statement showing felling of trees, year-wise by ranges, blocks, compartments, and sub-compartments for each felling series.

2.10 ***Method of execution of felling***: These are guiding principles for felling of trees and are known as general marking rules. It should be simple to understand and implement.

2.11 ***Subsidiary silvicultural operations***: Good practice guide for silvicultural operations including thinning and its grades etc. should be given. The activities proposed could be:

a. Thinning and cleaning

b. ANR through sowing and planting: Methods of assisted natural regeneration based on status of natural regeneration may be prescribed. Keeping in view the objective of multiple use forestry a multitier canopy is encouraged while prescribing silvicultural and follow up cultural activities. Artificial Regeneration must be resorted to only after giving adequate opportunity for NR to come up.

c. Regulation of grazing

d. Regulation of rights of the local communities

e. Other cultural operations

f. Fire management

g. Riparian zone management

h. Soil and water conservation

i. Management of invasive alien species

2.12 ***Regeneration:*** Measures to be taken up to augment natural regeneration including aided natural regeneration, artificial regeneration etc are discussed here.

2.13 ***Associated regulations and measures***: May include any specific measure which is not captured anywhere else including the overlapping working circles be listed here.

Chapter -- : Working Circle: Constitution of overlapping WC based on the object of management – management of special habitats like wetlands; WL Corridors:

Overlapping working circles are constituted to meet specific objectives over forest areas that are primarily managed for certain other purposes as discussed in the earlier chapters. This is aimed at multiple use forest management. These working circles are also constituted for the management of understorey crop like bamboo and rattans, and other special habitats. As per the requirement of the crop and management objectives, the WPO is at liberty to constitute one or many of the overlapping working circles to prescribe management prescriptions which are in addition to the primary prescriptions given in the WC of the previous section.

It is suggested to keep the number of overlapping WC to an absolute minimum as per actual requirement. General prescriptions such as protection of forests against illicit felling, involvement of locals through the principles of JFM etc may be covered under the miscellaneous regulations.

There will be a separate chapter for each working circle. The numerical number shall continue sequentially after the territorial/exclusive WC. Special management interventions like management of lower canopy species like management of special habitats, management for ecotourism, general prescriptions for biodiversity conservation etc can be discussed here. This could also include management of CFR.

The general format given for the exclusive working circle in the above section must be followed while writing the overlapping WC. The general constitution of the WC, special objects of management, silvicultural system proposed (wherever applicable), the treatment cycle are to be covered. The WPO is advised to give specific treatments with clear timelines for easy understanding and better implementation in the field.

Chapter – General financial forecast and financial plan of operation:

The cost of implementation of the plan shall be worked out by the WPO based on the extant schedule of rates adopted in the State. For this the WPO, in consultation with the DFO, shall work out the cost of implementation for the prescriptions and compile the same for each of the working circles. WPO to consider the existing budgetary provisions and dovetailing from other schemes of the government/funds availability from any other source including externally aided projects, while making prescriptions.

The treatment cycle of various operations such as rehabilitation of degraded forests, raising of plantations, protection of forests, consolidation of forest boundaries, etc shall commensurate with the existing institutional support and the potential financial resources expected to the division. However, the regeneration operations in areas where regeneration felling has been executed must be taken up as per the prescriptions in the respective WC and financial forecast shall be estimated accordingly. WPO may identify additional financial sources as well for the implementation of the prescriptions of the WP.

Chapter -- Miscellaneous regulations: Petty Felling and extraction for research and training needs are discussed here. Removal on account of rights and concessions and special grants if any may be discussed in this chapter.

Chapter – Science and Research: The WPO may identify the gaps in research and indicate the same. The status of research sample plots, permanent preservation plots, regeneration plots, NTFP plots, seed orchards, seed stands etc, their management are to be discussed in this chapter.

Permanent Sample/Observational plots provide information which is essential to understand natural ecological processes. They provide direct insights into forest development. This information leads to the idea about how forests change over time and respond to various atrocities like climate change, biotic invasions, and land management.

Permanent plots are a robust approach for measuring detailed changes in the forest conditions, structure, species richness and diversity. Monitoring of such plots helps detecting significant change in vegetation. Further, since observational plots will be specially selected permanent plots, models of tree growth, mortality, forest yield can be developed on the basis of repeated measurements taken at a fixed interval of time. Along with these Permanent Observation Plots (POP) will also feed with data on amount of carbon soaked, carbon in dead trees. Being the long term field studies in the forest eco-system, these plots will also provide decay rate.

SFDs are encouraged to establish one Permanent Sample Plots (PSP) (with protection) and one POP (without protection) of one hectare each for every forest type. Objective of establishing permanent observational plots along with Forest Resource Assessment is to provide unbiased forest statistics of areas, growing stand and stock, changes in land-use, biodiversity status and dynamics, carbon stock estimation etc. In this context, uses of permanent plots may be defined as:

i. Models of forest dynamics can be developed.
ii. Measurement of diameter of individual tree at periodic interval will help in developing growth model, CAI and MAI.
iii. Morality/decay rate will also be assessed from these plots.
iv. As knowledge of basal area increment of a forest species is of paramount importance in forest management, annual basal area increment can produce forest yield.
v. Soil richness in micronutrients (iron, copper, zinc etc.) can be measured as forest dynamics variables. (being a important component of soil, it has not been touched by FSI so far)
vi. Carbon stored can be measured to estimate changes in stock contained in live biomass. Climate change/global warming being a global issue can be addressed by reporting the net estimation of carbon (removal as well as released carbon by forests).
vii. Factors showing damage (mechanical) due to pests/ diseases showing health of forests can be estimated.
viii. Since plots are maintained and data would be reliable which may support sound forest management.
ix. Invasive spp, spreading faster, can be monitored and be managed.
x. Lichens biodiversity or monitoring lichens communities as indicators of ecosystem functions (forest health, air quality, local climatic conditions, soil fertility etc.) can be studied.

Chapter – Organisation of the forest division: The WPO may propose the most suitable organisation structure for the implementation of the plan. The proposal should compare the existing and the proposed structure with adequate justification. This should be based on the analysis done in para 2.9.7 and the gaps identified thereof.

Chapter – Summary of prescription: The WPO shall prepare a brief resume of prescriptions and suggestions as per working circles. This helps for ready reference. It shall be in a tabular form for each of the working circle separately.

Name of the WC	**Prescription in brief**	**Ref para number in the WP document**

Chapter – Trees Outside Forests (ToF): This chapter **i**ncludes the present scenario of trees outside the forests in the division, potential areas for ToF and efforts required to increase TOF.

Annexures to be appended with the WP

I Divisional area statement

II A Enumeration and its results

II B Biodiversity assessment

II C Regeneration survey

II D Socio-economic survey

II D NTFP Survey

III Research plots

IV Rights and concession

V Lease of land

VI FCA land diversions

VII Range, block and beat (with area and HQ)

VIII Buildings

IX Divisional Forest Officers

X JFMC/BMC

XI Fire incidences

XII Forest Offences (Range/Compt wise)

XIII A Statement of individual/community rights given under FRA

XIII B Statement on community forest resources rights given under FRA

XIII C Statement on forest lands diverted under Section 3(2) of the FRA

XIV Statement on the WBI in the division

XV List of forest blocks/reserve forest with notification – register of reserves

XVI Register of boundary pillars

XVII Statement on the free grants given to the beneficiaries

XVIII Maps (List of indicative maps)

a. Administration map
b. Drainage map
c. Map of recorded forest/ forest blocks
d. Stock maps
e. Forest cover map

f. Forest types
g. Map on forest plantations
h. Research plots
i. Fire incidence and vulnerability
j. Grazing incidence and vulnerability
k. Incidence of illegal felling and vulnerability
l. Areas infested with invasive alien species
m. Forest encroachment
n. Incidence of pests and diseases
o. Maps of forest area where individual/community rights given under FRA
p. Maps of community forest rights given under FRA
q. Map of forest area diverted under Section 3(2) of FRA
r. Maps of forest area diverted under FCA
s. Map of eco-sensitive zone
t. Map of waterbodies within the forest area

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Unit 6

CONTROL OF THE EXECUTION OF THE WORKING PLAN

General prescriptions of the working plan should be written in such a way that it is quite clear as to what constitutes a performance norm and the Control forms provide for performance parameters/targets/ annotations/norms for all prescriptions/suggestions for every working circle to be monitored, assessed and reported on annual basis during the period of the working plan. Control forms should be prepared to include each of these prescriptions, as well as all definite suggestions regarding other operations left at the discretion of the territorial staff.

The WPO should prepare a draft set of control forms to control all the important operations prescribed and suggested in his working plan such as different types of felling, thinning, plantation works, subsidiary silvicultural operations, rotational lopping, soil and water conservation works, control grazing, fire protection, NTFP harvesting, bamboo harvesting, boundary pillars, spring recharge, lantana eradication, reducing degradation, removal of firewood etc., These forms will then be submitted to the CCF/APCCF (WP) for approval and preparation of final sets. There shall be separate set of control forms for each working circle. In this regard, help may be taken from suggested reporting formats for sustainable management of forests.

Three permanent sets of these control forms will be prepared in the office of the Working Plan Officer and one set each is distributed to CCF/APCCF (WP), head, territorial circle, and the DFO territorial.

The DFO territorial will annually make entries in his copy of the control forms and send them together with the deviation statement in triplicate to the Working Plan Officer through the Head, territorial circle. After the entries have been checked and approved, the WPO will first get his copy completed and then send the DFO's copy to the Head territorial circle. The later will then complete his copy and finally return the DFO's set for deposit in the latter's office till next year. The WPO will send four copies of deviation statement with appropriate justification to the PCCF (HoFF) for sanction. After the sanction, one copy each will be sent to the WPO; Head, territorial circle and the DFO territorial for their record and the CCF/ APCCF (WP) as the case may be, will retain the fourth copy for his set of control forms. The control forms should be submitted by the DFO territorial to the Head, territorial circle on or before December 1st and the latter should send them to the WPO concerned on or before January each year.

FORMATS OF CONTROL FORMS

a. **COUPE CONTROL FORM:** The format of coupe control form is as under

Working Circle- Periodic Block-		Felling- Series- Cutting- Section	Localities prescribed Localities suggested As carried out				COUPE CONTROL FORM Coupe No. Excess(+)or Deficit (-)		Page
Prescription in brief	W.P. para	Year due	Year	Block/ Compt.	Area	Volume	Area	Volume	Remarks & Sanction
1	2	3	4	5	6	7	8	9	10

b. FELLING CONTROL FORM: The format of felling control form is as under:

Working Circle- Periodic Block-		Felling Series- Cutting Section-		Localities prescribed Localities suggested (With Areas)				COUPE CONTROL FORM Coupe No.	Page
Range wise	Area	Species	Diameter class	Trees marked	Unit Factor	Volume marked	Trees retained	% Trees retained	Remarks
1	2	3	4	5	6	7	8	9	10

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Unit 7

APPROVAL OF THE PWPR AND THE WORKING PLAN

7.1 Approval of PWPR/WP by SCC

The Standing Consultative Committee (SCC) is constituted under the Chairmanship of PCCF (HoFF) for guidance, deliberation and finalization of PWPR and draft working plan of a forest division with the representation of the IRO, Chief Wildlife Warden (CWLW) and heads of other wings of the forest department including other line departments having roles in the forest landscape, concerned head of the territorial circle, DFO (T) and the WPO. The experts from FSI regional centres, ICFRE institutes, IIFM, representatives of the regional offices of BSI and ZSI may also be included as special invitees. The head of the working plan wing shall be the member secretary of this standing committee. The SCC shall meet atleast once in every three months on a determined date as per the mutually agreed calendar drawn by the PCCF (HoFF).

PCCF (HoFF) shall only chair the meeting. The head of the IRO or his duly authorised representative, preferably, an officer at the rank of IGF/DIGF/AIGF, shall attend the meetings of the SCC. The Quorum of the committee shall be 50% of the members. The proceedings of the meetings of the SCC shall be issued under the signature of the Chairman of the SCC. The procedure to be followed by the SCC while scrutinising the PWPR and draft WP document are given below:

a. Examination of the PWPR by the Standing Consultative Committee

1. The member secretary of the SCC shall convene the meeting of the Committee within 30 days of receiving the PWPR from the head of the territorial forest circle.
2. The head of the territorial circle shall present the PWPR before the committee
3. The SCC may suggest certain studies/survey or any observation to the WPO
4. The minutes of the meeting shall be finalised and circulated within 15 days of the meeting.

b. Examination of draft WP by the Standing Consultative Committee

1. SCC is the apex technical body to evaluate the draft WP. All the members including IRO are encouraged to flag all the technical matters in the SCC.
2. The member secretary shall convene the SCC within 45 days of receipt of the draft WP from the WPO with the approval of the Chairman, SCC.
3. If the SCC feels necessary, the meeting may be convened one more time to discuss the unresolved issues. The second meeting will be convened within 45 days of the first meeting.
4. The WPO shall present the salient feature of the draft WP, general and special objects of management and the gist of the stakeholder consultation before the SCC. In case there is a gap between the expiry of the previous WP and the present plan, then the WPO shall also present along with the draft WP, all the activities undertaken in the forest division that would fall within the prescriptions of different Working Circles of the earlier WP. He may also request the deemed extension of the earlier plan till the time the present plan is approved.
5. The SCC shall check whether the draft WP is prepared as per the approved PWPR. If there are some deviations from the PWPR, the WPO shall submit the reasons for the same before the SCC for its approval.

6. Examine the general object of management and special object of management for each of the WC that they are in consonance with the policy of the State and is in consonance with the societal need and finalise the same.

7. **Check the area statement**:

   i. The SCC shall compare the estate area given in the draft WP with the WP under revision. If there is any difference, it must be justified by the WPO. If not satisfied, during the meeting with the WPO, this must be resolved.
   ii. Total area of the estate should be divided into management zones (Working Circles) exclusively for specific object of management. (This will not include the area of overlapping WC).

8. **Examination of the objects of management to its conformity to the forest policy**: The SCC will examine the general objects of management and special objects of management to its conformity to the NFP and India's global commitment. If the SCC feels that there are any contraventions, then, this shall be discussed in the meeting with the head of the WP wing. The SCC may modify, amend or delete any object of management at the time of approval providing the reasons for doing so in writing.

   i. Is there any objective in the draft WP that contravenes the basic objective of the NFP?
   ii. Is there any objective violates or contravenes the essentials of the forest management given in the forest policy and in the NWPC?

9. Examine the organisational structure proposed and approve a suitable structure for the implementation of the plan considering the financial implications if any.
10. Financial forecast for the implementation of the plan: The SCC shall examine whether the financial forecast is prepared considering the current schedule of rates. They shall also check whether all the prescriptions are included in the forecast.
11. The SCC shall examine whether the public consultation has been convened and the suggestions considered by the WPO. If any of the suggestions are not considered by the WPO, the same should be brought out clearly.
12. Check whether the silvicultural principles prescribed are sound and will ensure meeting the desired management objectives.
13. Check and confirm that none of the prescriptions are in contravention of the NFP, Orders of Hon'ble SC on the matter etc.
14. Check the data computation and certify the correctness of the same while submitting to the IRO for approval.
15. Check the maps and confirm that they have been appended as per the NWPC 2023.
16. Check whether all the annexures as given in the NWPC 2023 are appended.
17. Ensuring that the draft is prepared as per the format prescribed in the NWPC 2023.
18. Wherever "deemed extension" of the expired WP is involved, enclose the details of activities undertaken by the SFD during the intervening period. No extension plan shall be prepared.

19. **Check list while sending the draft WP to IRO in PARIVESH for approval**:

    a. Certificate to the effect that the inputs from PWPR has been duly considered and incorporated appropriately in the draft WP
    b. Certificate to the effect that the GS estimation and all computation have been checked and found right
    c. Certificate to the effect that the silvicultural prescriptions are appropriate to meet the management objectives
    d. Certificate to the effect that the objectives and the prescriptions are in consonance with the Policies of the State Govt.
    e. If there is change in area, justification for the same
    f. All appendices as per the NWPC included
    g. All maps prepared and checked
    h. Draft WP document

7.2 Approval of WP by IRO

The IRO is advised to raise all the technical matter before the SCC. SCC is the technical body to evaluate the WP document. On receipt of the draft WP along with the certificates from a State, the IRO shall examine the document for the points below. If there is any clarification required, the IRO shall call for a meeting with the head of the WP wing and the WPO.

1. **The observations of SCC are incorporated**: The IRO will check whether the observations of SCC are appropriately incorporated in the draft report. If not, the same to be done during the meeting with the head of WP wing. If the IRO is not satisfied with the reply with regards to the area of the plan, in principle approval may be conveyed with his observation on the variation in this aspect on the area of the plan for its correction. Prior approval shall be accorded after resolving the area difference.
2. **Examination of the processes involved while preparing the WP**: If the WP is not prepared by the officer as provided in the code, the draft WP is liable for rejection.

3. **Midterm review and extension**: The IRO on the recommendation of the SCC shall accord the extension of the existing plan upto two years. While according the extension, the IRO shall indicate that WPO shall be appointed within 45 days of the order of extension. If the extension is recommended for more than 2 years, then the same shall be sent to MoEF&CC for the period beyond two years.

4. **Deemed extension of expired WP**:

There are instances when there is a gap between the expiry of the earlier WP and the approval of the new WP. There is a lack of clarity how to treat the intervening period, it is therefore recommended that

    a. In case there is no felling of trees done during the intervening plan period, on the basis of the recommendation of the SCC, the IRO shall accord “Deemed Extension” of the previous plan till the date the new plan becomes effective.
    b. In case where felling of trees is continued as per the expired WP during the intervening period, the case may be placed before the Regional Empowered

Committee for examination. Based on the observations of the REC, "Deemed Extension" shall be accorded by the IRO.

5. Every approval for the WP shall be prospective for a period of 10 years from the date of approval.
6. There are number of forest divisions in which the WP are not operational. A status report on the same may be obtained from the States in a prescribed format below.

Status Report on the Working Plans as on …… (Date of approval/ implementation of the New WP Code-2023)

Name of the State / UT…….

Sl. No.	Name of the Territorial Division	1. Does the Division have an Approved working Plan (Yes/No) 2. If Yes, the Period of this WP	If there is no approved WP, mention the period of the last approved Working Plan	Has the exercise for New WP initiated	Status of PWPR (1) Not ready (2) Prepared (3) Approved (4) Shared with IRO	Status of New WP (1) Incomplete but exercise on (2) Draft ready (3) Draft submitted to IRO	Indicate the dates against column 6 (1) When likely to be completed (2) when likely to be submitted (3) when submitted	Remarks
	1	**2**	**3**	**4**	**5**	**6**	**7**	
1.								
2.								

Summary

Total Number of Divisions	No. of Divisions with approved WP	No. of Divisions without an approved WP	No. of Divisions where WP exercise is on going	No. of Divisions where WP exercise is not yet initiated	No. of Division with No working Plans ever	Remarks if any
1	**2**	**3 = (1-2)**	**4**	**5 = (3-4)**	**6**	

(Sign and seal of the officer heading the Working Plan Wing in the State/UT)

7. The States shall get the PWPR approved for all those divisions for which the WP have already expired, by 31st December, 2023.
8. The States may be encouraged to complete the WP process for all such divisions on priority. Considering the infrastructural and financial constraints, the States may be asked to complete the process by December 2025.
9. In the event that States fail to meet these above-mentioned deadlines, the Ministry may consider with-holding CSS funding w.e.f. 2025-26. Similarly, NPV component under CAMPA may also be not considered for utilisation in the forest divisions without approved WP beyond 2025-26.
10. There is a procedure to issue approval for annual felling by MoEF&CC through IROs. As annual fellings are part of the approved WP, the regular approval requirement for annual felling may be dispensed with.

11. For the forest division with forest area less than 1000 ha, management plans/working schemes may be prepared for a time period of 10 years.

12. Approval of the WP may be accorded in the following format.

Order (For prior approval of WP)

In exercise of power under clause c of Rule 10 of FCA Rules 2022, on the recommendations of the SCC vide reference – dated--, prior approval for the WP for – division for the period – to – is hereby accorded.

Signature of head of IRO

Copy to

1. PCCF (HoFF) concerned. A copy of the approved WP be submitted to this office within 30 days be email at – for record.
2. IGF, MoEFCC for information

Order (For in principle approval of WP)

In exercise of power under clause c of Rule 10 of FCA Rules 2022, on the recommendations of the SCC vide reference – dated--, in principle approval for the WP for – division for the period – to – is hereby accorded. The approval is subject to the following conditions:

1. ---
2. ---
3. ---
4. Nth

Signature of head of IRO

Copy to

1. PCCF (HoFF) concerned. A copy of the approved WP be submitted to this office within 30 days be email at – for record.
2. IGF, MoEFCC for information

Order (For extension of WP)

In exercise of power under clause c of Rule 10 of FCA Rules 2022, on the recommendations of the SCC constituted vide – dated--, extension is accorded to the WP for – division (from – to--) for 1 year /2 years i.e upto ----. This approval is subject to the following conditions: (Wherever necessary)

1. The WPO officer shall be nominated within 45 days of receipt of the approval for the revision of the WP. The approval shall be deemed to be withdrawn *ab initio*, if the WPO is not appointed within the stipulated time.
2. Nth

Copy to

1. PCCF (HoFF) concerned. A copy of the approved WP be submitted to this office within 30 days be email at – for record.
2. IGF, MoEFCC for information

Order (For deemed extension of WP)

In exercise of power under clause c of Rule 10 of FCA Rules 2022, on the recommendations of the SCC constituted vide – dated--, extension is accorded to the WP for – division (from – to--) i.e upto ----.

Copy to

1. PCCF (HoFF) concerned.
2. IGF, MoEF&CC for information

13. The pdf format of the working plan as approved by MoEF&CC shall be uploaded on the website of the concerned State Forest Department. This shall also be shared with the following offices:

a) IRO Concerned, MoEF&CC
b) PCCF (HoFF) offices of all States/UTs
c) ICFRE Institutes and centres
d) National forestry library and Information centre, FRI
e) Wildlife Institute of India (WII), Dehradun
f) National Tiger Conservation Authority (NTCA)
g) Forest Survey of India (FSI), Dehradun and its regional centre
h) Indian Institute of Forest Management (IIFM), Bhopal
i) Indira Gandhi National Forest Academy Library
J) Central Academies for State Forest Service
k) National/State Biodiversity Board

14. **Criteria for approval of Working Plan by IROs**

1. The Observations of SCC are duly incorporated in the draft WP.
2. Examine the Objects of management
   a. In conformity to National Forest Policy
   b. In conformity to India's global commitment
   c. Does not violate the orders of SC on the matter
3. Examine whether the processes involved while preparing the WP are adhered to.
4. Examine the Financial forecast for the implementation of the plan
5. Conformity to the NWPC with reference to the format.

Annexure-II

Indian Forest Management Standard

1. Introduction

The National Working Plan Code 2023 (NWPC 2023) envisions achievement of Sustainable Forest Management (SFM) in the country. Sustainable Forest Management offers a holistic approach to ensure forest activities deliver social, environmental, and economic benefits, balance competing needs and maintain and enhance forest functions now and in the future. Thus, the NWPC 2023 visualizes that the state forest departments (SFDs) conduct the management effectiveness evaluation on the implementation of the working plan prescriptions based on the framework developed by Ministry of Environment, Forests & Climate Change for the purpose as Indian Forest Management Standard.

This standard for sustainable management of forests is primarily derived from the rich heritage of scientific forest management in India. It is also in sync with internationally evolving system of criteria and indicators for SFM. This Standard has been developed from the Bhopal-India process as National set of Criteria and Indicators for Sustainable Management of Natural Forests in India.

The Standard is a basis for monitoring which sets guidelines for sustainable forest management in terms of broad framework of Criteria, Indicators, and Verifiers that recognizes that forests have environmental, economic and social objectives. Criteria are categories of conditions or processes by which SFM can be assessed, and each criterion is characterized by a set of indicators that can be monitored to assess change over time. Each indicator is accompanied by verifiers which are the data or information for assessing its status or change over time. State Forest Department / Working Plan Officers can adapt these indicators and verifiers according to the specific situation and local needs ofthe Forest Division.

The SFDs may consider engaging specialized agency for supplementing data for evaluation ofprogress against set indicators.

1. Definitions

1.1 Defining Criteria

A criterion is defined as an aspect of forest management that is considered important and by which sustainable forest management may be assessed. A criterion is accompanied by a set of related indicators that describe a state or situation, which should be met to comply with sustainable forest management.

This standard includes eight criteria as specified in NWPC 2023

1. Maintenance/increase in the extent and condition of forest and tree cover.
2. Maintenance, conservation and enhancement of biodiversity including wildlife.
3. Maintenance and enhancement of forest health and vitality together with establishment ofregeneration.
4. Soil and water conservation.
5. Maintenance and enhancement of forest resource productivity.

6. Optimisation of forest resource utilisation.
7. Maintenance and enhancement of social, economic, cultural benefits, and
8. Adequacy of Policy, legal and institutional framework.

The order of presentation of the criteria does not indicate priority or relative importance.

1.2 Defining Indicators

An indicator is defined as a quantitative, qualitative or descriptive attribute that, when measured or monitored periodically, indicates the direction of change in a criterion. Indicators identify the information needed for assessing and monitoring change, both in the forest itself (outcome indicators) and as part of the environmental and forest management systems used (input and process indicators). A time series of the values of any measurable or clearly descriptive indicator can provide information on the direction of change, either towards or away from SFM. However, the indicators cannot by themselves establish the sustainability of forest; rather require an assessment through a set of verifiers.

1.3 Defining Verifiers

Verifiers are the data or information needed for assessing an Indicator. They define the specific details that would show whether an indicator is establishing sustainability of forest. The verifiers are checked against a baseline, average value, published standard value, or collective wisdom of stakeholders.

1.3.1 Baseline

Baseline or benchmark is the reference point from which the trend or change is projected. With respect to SFM, this baseline describes the status of the indicators at the time of data collection. The first set of data collection undertaken in a forest division at the time of working plan preparation will constitute the baseline for the subsequent data collection. Future direction of change and progress towards sustainability can be assessed against this reference year/data.

1.3.2 Average value

The indicators for which it's difficult to reach on the fixed norm due to lack of defined benchmark, the data of previous 3-5 years can be used to find out the average value.

1.3.3 Published Standard values

The published values and data available from authentic sources can be used as a norm/standard. Comparison of the yearly values of the indicators can be done with the national/world average to reach on the acceptable standard value.

1.3.4 Collective wisdom of stakeholders

In some case it's difficult to reach on a concluding norm/standard value. In such cases the norm can be decided though discussion among different stakeholders.

1.4 Intended situation: The intended situation describes expected outcome with respect to the particular indicator in the context of the forest division.

1.5 Periodicity: Periodicity is a time interval between two successive data / information. It is suggested in manual as data collection interval at the indicator level and periodicity of verifiers changes as per prescription and situation.

2. Criteria, Indicators and Verifiers:

The following set of criteria, indicators, verifiers and periodicity of data collection may be used for assessing each of indicators within the eight criteria of this standard.

Criterion 1: Extent and Condition of Forest and tree cover

Forest boundaries in India are legally defined and activities to be done within the forests are regulated. The diversion of forests for non-forest use is governed by the Forest Conservation Act 1980. The increase in forest cover is primarily achieved in India through the trees outside the forests. The changes in the legal status and the extent of forest area reflect whether the cover is maintained or increased or reduced. The change in extent and the status of the forests are indicatedby the following:

Indicator 2.1.1: Area of forests under different legal status (Reserved Forests/Protected Forests/Un-classed Forests /Village Forests and any other forests)
Indicator 2.1.2: Area of different forest types
Indicator 2.1.3: Change in the category of forest cover
Indicator 2.1.4: Area of different working circles
Indicator 2.1.5: Area of the Trees Outside Forests (ToF)
Indicator 2.1.6: Details of area of forests diverted under FCA
Indicator 2.1.7: Details of forest land where rights are given under the FRA
Indicator 2.1.8: Details of forest land under encroachments
Indicator 2.1.9: Demarcation of boundaries
Indicator 2.1.10: Details of any other factors affecting the existence of forests such as illegalmining, dumping of mining waste etc.

Indicator 2.1.1: Area of forests under different legal status (Reserved Forests/Protected Forests/ Un-classed Forests / Village Forests and any other forests)

Forests in India are legally classified as reserved forest, protected forests, village forests and un- classed forests under IFA 1927 with State specific amendments and State Specific Forest Acts and the orders of Hon'ble SC dated 12-12-1996 in the case titled TN Godavarman Thirumalpad Vs Union of India and others. There are other categories of forests as well and a compilation of the legal categories of the forests and their change, if any, over a period of time reflects on the maintenance and extent of forests of a forest division.

Intended situation: Entire forest area of the forest division is notified or recognized under different legal categories such as reserve forest, protected forests, un-classed forests, village forests, community forests, deemed forests etc.

Verifiers:

1. Updated registries of area statistics, digitised maps as per legal status.
2. Compilation of Gazette notification with number and date issued for different legal status of theforest and their change under IFA-1927 or state acts.
3. Status of digitization of forest boundaries in Geo-Coordinates boundary
4. Recognition of area as forests under revenue records, community practices or under the orders of Honourable Supreme court of India.
5. Status of mutation of Forest area in Revenue Records.

6. Notification of Diverted land under FCA.
7. Extent of Area awaiting forest settlement or final notification under IFA, 1927 or State Acts.
8. Records of various forest settlements or leases.

Periodicity: Every year

Indicator 2.1.2: Area of different forest types

Forest type is a unit of vegetation which possess characteristics in physiognomy and structure sufficiently pronounced to permit the differentiation from other such units. Description of natural forests into distinct forest types and their extent provide scientific basis for their management. The assessment in the change in the extent overtime is a reflection of alteration in productivity, and status of the forest crop which will assist in the choice of silvicultural principles to be followed for the suitable management practices.

Intended situation: Maintenance of different forest types and species composition.

Verifiers:

1. The base year status of forest types along with *Digital /* GIS map and subsequent mappingis available in the division for any change or shift analysis.
2. Inventory of change in major species composition and attribution studies (anthropogenic,natural or climatic) for the changes.
3. Action Plan if any, for mitigating the change.

Periodicity: 10 years

Indicator 2.1.3: Change in the category of forest cover

The FSI categories the forest cover based on canopy density into very dense, moderately dense, open and scrub. Change in forest cover over a period of time reflects the actual changes of forest on ground. The positive changes could be, among other things, attributed to better forest protection and related conservation measures, including compensatory afforestation, whereas negative changes could be attributed to change of land use on account of developmental projects, excessive degradation due to anthropogenic pressures, harvesting of short rotation crop etc.

Intended situation: Improvement in forest cover as per the objective of management.

Verifiers:

1. Base year data on forest cover and map is available in the division.
2. Multi-dated satellite images from FSI or state agencies are used for change analysis andpreparing change matrix.
3. Assessment of change in upward movement and downward movement of forest canopy classes. Assessment of change in open forests to moderately dense; and moderately dense forests to very dense forests, scrubs to open forests show upward movement.
4. Assessment of forest degradation in each forest type (soil erosion, species regeneration,fire affected area, area affected by grazing).
5. Actions for reducing forest degradation and enhancement of forest cover.

Periodicity: 2 years

Indicator 2.1.4: Area of different working circles

The forest is divided into different management zones as working circles based on the object of management. The working circles indicate the application of different set of silvicultural prescriptions and management practices in that area. A change in the area of working circle is often a reflection of change in the object of management and/or change in the status of vegetation.

Intended situation: Range, beat, compartments/village wise, entire forest area shall be covered in different working circles with clearly defined objectives of and prescriptions for management.

Verifier:

1. Details of area under different working circles available in the working plan with clearly defined objectives and prescriptions along with digitised maps.
2. Documentation of the change in the extent of areas prescribed in different working circles as compared to previous working plan along with critical analysis and justifications.
3. Records of annual deviation from the prescriptions in the current plan.

Periodicity: 10 years

Indicator 2.1.5: Area of the Trees Outside Forests (ToF)

Trees Outside Forests (ToF) contributes significantly to increase in the forest and tree cover of a forest division. Periodic monitoring of the change in area of ToF reflects the overall change in the forest and tree cover of the forest division.

Intended situation: Trees outside the forest should be encouraged as alternate tree source. Periodic assessment of the growing stock may be undertaken and the potential area for extension of forestry outside forests explored for sustainable land use management and sustainable supply of raw material to the industries.

Verifiers:

1. Identification of target tree species & documentation of associated agro-forestry models/ practices for ToF in the division.
2. Estimation of growing stock of ToFs.
3. Strategies to enhance the ToFs.
4. Increase in the extent of ToFs and agriculture areas brought under agroforestry.
5. Assessment of demand on Agro-forestry for different industries.

Periodicity: 5 years

Indicator 2.1.6: Details of area of forests diverted under FCA

Approvals of diversion of forest lands allowed under the Forest (Conservation) Act envisage certain mandatory conditions for mitigating the impacts of such diversions. An analysis of the compliance of these conditions and progress in notification of the Compensatory Afforestation areas as RF/PF are, therefore, important.

Intended situation: Conditions envisaged in the diversion orders are complied with and CA areas are notified as RF/PF.

Verifiers:

1. Year-wise cumulative area diverted for different non-forestry purposes.
2. Progress in creating CA and success rate of CA is assessed.
3. Compliance to Environmental management plan; Catchment area treatment plan for hydro-electric projects; reclamation plan for mining projects etc.
4. Analysis of any other impacts related to diversions.
5. Progress in notification of all CA lands as RF/PF under IFA-1927 and all state acts.

Periodicity: Every year

Indicator 2.1.7: Details of forest land where rights are given under the FRA

The FRA recognises specified forest rights in favour of forest dwelling scheduled tribes and other traditional forest dwellers and their communities. The nature and extent of individual forest rights recognised under FRA, the nature and extent/quantum of forest resources on which the community forest rights and community forest resource rights have been recognised and the management practices prevalent to be indicated.

Intended situation: Updated knowledge on the status of registration of all the claims and settlement of the genuine claims along with list of individuals and communities to whom forest area is allotted, geo-referencing of rights on the forest map, status of forest management of areas given to right- holders and its impact on sustainability of eco-system services.

Verifiers:

1. Maintaining updated records of all FRA cases (Individual Forest rights, Community forestrights, Community forest resource rights) in the division.
2. Digitised maps of all rights recognised in the entire forest division.
3. Area given under FRA is clearly demarcated on ground.
4. Best practices on Sustainable Forest Management under FRA

Periodicity: Every year

Indicator 2.1.8 Details of forest land under encroachments

Forest encroachment often leads to change in land use and has an impact on the integrity and quality of the forest. Encroachments could also lead to honeycombing of the forest leading to intense habit at fragmentation adversely affecting wildlife.

Intended situation: The forest to be free from encroachments to maintain ecosystem integrity. If encroachment is detected, appropriate measures taken as per existing law.

Verifiers:

1. Survey, identification & mapping of extent of encroachments in forest areas in the division.
2. Efforts made for eviction of encroachment.

3. Area freed from encroachment.
4. Effectiveness of JFM/PFM and participation of local public representatives in prevention of encroachments or in eviction operations.

Periodicity: Every year

Indicator 2.1.9: Demarcation of boundaries

Area of forests with clear demarcation of boundary with boundary pillars, trenches and other measures enables protection of forest areas and analysis of all the measures taken up for protection of forest areas.

Intended situation: Demarcation of forest area shall be well defined and secured. The forest boundaries to be clearly marked in the field and geo-referenced.

Verifiers:

1. Locations of the boundary pillars are shown on the map with latitude/longitude on villagemap or such other map of convenient scale.
2. Extent of digitisation of forest boundaries and pillars.
3. Extent of perimeter is duly noted and updated during Working Plan (WP) revisions.
4. Percentage of forest area with secured boundaries including the number of boundary pillars constructed/maintained and recorded with unique registration/identification numbers, forwardand reverse bearings, GPS readings.
5. Allocation of budget for construction/maintenance of boundaries pillars.
6. Capacity building on survey and demarcation to the staff to independently demarcate boundary as per gazette record to avoid dependence on revenue surveyors for primary survey. Creating survey cell in each division.

Periodicity: Every year

Indicator 2.1.10 Details of any other factors affecting the existence of forests such as illegal mining, dumping of mining waste etc.

Illegal mining, dumping of mining waste and other such factors have adverse impact on the existence of the forest. All measures must be taken up to stop illegal mining and appropriate mitigation efforts to rehabilitate the area.

Intended situation: Illegal mining and dumping of mining waste is stopped and mitigation measures are in place.

Verifier

1. Area affected by illegal mining, dumping of mining waste and such other practices.
2. Identification of past mined out abandoned areas and reclamation measures.

Periodicity: Every year

Criteria 2: Maintenance, Conservation and Enhancement of Biodiversity

The forests offer diverse habitats for plants, animals and microorganisms. Forest biodiversity encompasses not only the trees but also the multitude of plants, animals and microorganisms that inhabits the forest ecosystem and their genetic diversity. Higher the diversity, higher is the climate resilience and it offers better livelihood opportunities to the local communities and tribals who are dependent on the forests. At the same time, loss of biodiversity makes it difficult for the ecosystem to recover from disturbances and adversely affecting the forest dependent communities. Analysis of the impact of climate change and other factors including existing forest management may provide insight to take suitable adaptive and corrective measure for conservation of biodiversity. Different approaches are adopted in India for biodiversity conservation such as area-based conservation measures by establishing protected areas, species recovery programmes of threatened species and *in-situ* and *ex-situ* conservation programmes etc. These are indicated by the following:

Indicator 2.2.1: Adjoining Protected Areas
Indicator 2.2.2: Species diversity
Indicator 2.2.3: Details of any species-specific conservation programmes
Indicator 2.2.4: Details of species prone to over exploitation
Indicator 2.2.5: Details of unique/special habitats and high conservation value areas
Indicator 2.2.6: Details of diverse ecosystems such as grasslands, meadows, wetlands, mangroves, marine, deserts etc.
Indicator 2.2.7: Details of threats and challenges to vulnerable flora and fauna

Indicator 2.2.1 Adjoining Protected Areas

Details of adjoining Protected Areas under Wildlife Protection Act, 1972 (National Parks /Wildlife Sanctuaries / Conservation Reserves and Community Reserves/Tiger Reserves), Biosphere Reserves, Environment Protection Act, 1986 (Eco-sensitive zones/areas, Coastal Zone Regulation, Wetlands (notified under Wetland Rules) Biological Diversity Act 2002. The management of these areas which adjoins the forests has an impact on the management of the forests and the role of the forest as corridors for wildlife.

Intended situation: Prescriptions of working plans shall be harmonized with the management plans of adjoining protected areas.

Verifier:

1. List of adjoining Protected Areas (National Parks/Wildlife Sanctuaries/Conservation Reserves and Community Reserves/Tiger Reserves), Biosphere Reserves, Environment Protection Act, 1986 (Eco-sensitive zones/areas, Coastal Zone Regulation, Wetlands notified under Wetland Rules), Biological Diversity Act 2002, wildlife corridors along with digitised maps.
2. Distribution of flora & fauna and abundance in the area of the forest division adjoining the PAs.
3. Prescriptions of working plan to be in consonance to the objective of management plans of the adjoining protected areas.

Periodicity: 5 years

Indicator 2.2.2 Species Diversity

Diversity indices indicate the abundance and richness of species in a locality. Evaluation of these indices considering the management prescriptions provides insight into management options. Biodiversity richness is a proxy for the health of forest ecosystem.

Intended situation: Base year documented species diversity is maintained or enhanced under sustainable management of forests. Effectiveness of actions implemented to conserve and/or restore the species diversity of the forest area as per natural undisturbed forests of the same type, to ensure sustained livelihood of communities as an incentive to communities to participate.

Verifiers:

1. Biodiversity assessment in terms of density, frequency, total basal cover, dominance, Importance Value Index, Shannon Weiner Diversity Index and Simpsons' Similarity index etc. is done at the level of compartments/villages, beats, ranges & division level. Efforts should be made to make a base year documentation of species, habitat and genetic diversity (Taking the help of experts – SFRI/ICFRE/Local university colleges or knowledgeable individuals/ forest officers) status for future reference using GIS tools for change detections.

2. Document on vegetation structure and species heterogeneity, unique species identified in accordance to different forest types.

3. Action plan or management prescriptions for maintaining and enhancing species, habitat and genetic diversity.

Periodicity: 5 years

Indicator 2.2.3: Details of any species-specific conservation programmes

The presence of endemic, endangered species and actions taken up for their conservation, the progress and their impact.

Intended situation: Suitable action plan for conservation of endemic, endangered species is drawnand implemented.

Verifiers:

1. Approved policy and biodiversity plan and its sustainable use
2. List of species categorised as per IUCN Red List/ CAMP workshop results with IUCN participation, if available on red listing, CITES, etc.
3. *In-situ* and *ex-situ* conservation strategies in place including performance review of on-going species recovery programs.
4. Budget allocated and utilised for biodiversity conservation.
5. Regular capacity building of BMCs for conservation, sustainable management of endemic,endangered species and use of bio-resources.
6. People's biodiversity register is prepared and updated.

Periodicity: 5 years

Indicator 2.2.4: Details of species prone for over exploitation

Some species are more vulnerable to over exploitation than others especially those who have a narrow ecological niche, and those which produce a smaller number of progeny. Identification of such species and their distribution and extent provide insight into need for management interventions.

Intended situation: Sustainable harvest protocols for overexploited species to be developed, standardized and implemented across the working plan area.

Verifiers:

1. List of species prone to over exploitation in the area.
2. Development of sustainable harvesting protocols for important NTFP / Medicinal plant species and awareness creation thereof.
3. Special focus on endangered species.

Periodicity: 5 years

Indicator 2.2.5: Details of unique/special habitats and high conservation value areas

Identification and mapping of the unique / special habitat and high conservation value ecosystem forms basis for special management interventions, if any, which may include inviolate areas.

Intended situation: All unique habitats and high conservation value areas identified along with their conservation plans approved and implemented.

Verifiers:

1. Documentation of high conservation values associated with unique/special habitats including in violate areas and their mapping.
2. Management strategies specifically in place for unique habitat.

Periodicity: 10 years

Indicator 2.2.6: Details of diverse ecosystems such as grasslands, meadows, wetlands, mangroves, marine, deserts etc.

Identification and mapping of the ecosystems such as grasslands, meadows, wetlands, mangroves, marine, deserts etc. and their change overtime forms basis for sustainable management interventions.

Intended situation: Appropriate strategies for management of diverse ecosystems such as grasslands, meadows, wetlands, mangroves, marine, deserts etc. are in place.

Verifiers:

1. Identification & mapping of diverse ecosystems such as grasslands, meadows, wetlands, mangroves, marine, deserts etc. with base year for detecting change therein over time.

2. Assessment of ecological conditions of these diverse ecosystems.
3. Formulation of strategies for the maintenance and improvement of their ecosystem functions.

Periodicity: 5 years

Indicator 2.2.7: Details of threats and challenges to vulnerable flora and fauna

Habitat fragmentation and unsustainable extraction and trade are serious threats that affect the population of flora and fauna. An analysis of various threats will help in formulating mitigation strategies.

Intended situation: Threat and challenges to vulnerable flora and fauna on account of anthropogenic disturbances such as habitat fragmentation, unsustainable extraction and trade together with impact of climate change if any, are assessed and mitigation strategies are in place.

Verifiers:

1. Listing of changes in direct and indirect drivers of disturbances.
2. Analysis of any fresh threats to vulnerable flora & fauna.
3. Formulation of adaptive mitigation strategies for the changes.
4. Implementation of mitigation strategies.

Periodicity: 5 years

Criteria 3: Maintenance and Enhancement of Forest Health and Vitality

Natural forests are affected by various anthropogenic factors such as grazing, encroachment, forest fire, invasive alien species etc. Forest area is also affected by natural phenomenon like flood, landslides, windstorms, pests and diseases etc. Presence or absence of regeneration is a better indicator on the health of a forest ecosystem. If the forest is poor or inadequate in regeneration, then it indicates that the health of the forest is poor and compels the manager to take immediate action to obtain the regeneration by appropriate silvicultural interventions and by removing the factors that inhibit the regeneration and their establishment. Forest vitality is the ability of the forest ecosystem to survive external disturbances and unfavorable conditions. A forest ecosystem that has low vitality has a limited capability to recover from any unfavorable condition or natural disturbance. Low vitality is normally caused due to repeated disturbances with little time to recuperate and it must draw the attention of the manager to take immediate steps to remove or mitigate the impacts of those disturbances.

There are various factors that influence the forest health and its vitality as indicated below:

Indicator 2.3.1: Status of regeneration of the principal species and its associates
Indicator 2.3.2: Details of areas affected by forest fire
Indicator 2.3.3: Area affected by natural factors such as flood, landslides and windstorms etc.
Indicator 2.3.4: Area affected by and protected from grazing
Indicator 2.3.5: Area infested with invasive alien species

Indicator 2.3.6: Details of incidence of pest and diseases
Indicator 2.3.7: Forest degradation due to pollution
Indicator 2.3.8: Other drivers of forest degradation

Indicator 2.3.1 Status of regeneration of the principal species and its associates

The status of forest regeneration is estimated during the field survey. The regeneration status could be adequate, moderate, or poor. In case the regeneration is inadequate or poor, then the factors that inhibit regeneration must be analysed and brought out clearly to enable suitable silvicultural/ management interventions.

Intended situation: Adequate measures are taken to assess and ensure the regeneration of principal species and associates.
Verifiers:

4. Assessment and categorisation of regeneration status in to adequate, moderate, and poor ofprincipal species and associates.
5. Factors that inhibit regeneration are documented and analysed.
6. Suitable silvicultural /management interventions are prescribed and implemented.
7. Assessment of the efforts made for successful assisted natural regeneration or artificial regeneration.

Periodicity: 5 years

Indicator 2.3.2 Details of areas affected by forest fire

Forest fire is one of the agents that has a direct impact on the regeneration and vitality of the forest ecosystem. Uncontrolled fire has a deleterious effect on the regeneration. Repeated fire impacts the capacity of the forest to recover from its impact on the ecosystem and thus reduces the vitality of the ecosystem. Fire frequency mapping and preparation of fire vulnerability maps help ineffective forest fire management. The use of real time monitoring tools is potential mechanism for effective fire management

Intended situation: Adequate measures are in place to prevent forest fire**.** In case of occurrence of Forest fire incidences, they are timely detected and controlled while adequately reported along with their identified causes and impacts.

Verifiers:

1. Field staff enabled for utilisation of real time fire alert system of FSI or any other informationsystem for timely reporting of forest fires.
2. Forest fire prevention plan is prepared and implemented.
3. Forest fire management plan is prepared and implemented.
4. Impact of forest fires on the ecosystem functionality needs to be monitored on regular basis.
5. Description of forest fire response teams and their achievements.
6. Budget allocations and their expenditure.

Periodicity: Every year.

Indicator 2.3.3: Area affected by natural factors such as flood, landslides and windstorms etc.

Documentation and assessment of all incidences of natural calamities and their impact on biodiversity and ecosystems will lead to the planning for disaster management. Potential negative impacts of natural hazards proportionate to scale, intensity and risk on infrastructure, forest resources and communities will lead to identification of proactive management activities to mitigate these impacts.

Intended situation: Role of forest division in case of natural calamities such as flood, landslides,and windstorms etc. are included in the Disaster Management Plan.

Verifiers:

1. Areas prone to natural hazards are mapped.
2. Documentation of disaster occurrences and their damage caused to ecosystems and biodiversity and planning of proactive management measures into a contingency plan including constitutionof disaster response teams.
3. Budget allocations and their expenditure.

Periodicity: Every year.

Indicator 2.3.4: Area affected by and protected from grazing

Uncontrolled livestock grazing in forest areas is detrimental to forest health and ecosystem vitality. It is known to be one of the most important factors degrading the forest ecosystem. The National Forest Policy (1988) and other documents recognise that uncontrolled grazing in the forest is incompatible with sustainable forest management. Unregulated grazing affects crop (vegetation) composition and adversely impacts natural regeneration, causes soil compaction and consequently diminishes the infiltration capacity of the soil. Working Plan Officers (WPOs) may ascertain livestock numbers from Animal Husbandry departments and take the assistance of Grazing Settlement Officers to determine carrying capacity for grazing in forest areas.

Intended situation: Grazing is within the limits set by the carrying capacity of forest areas.

Verifiers:

1. Assessment of carrying capacity &impacts of grazing.
2. Implementation of measures to discourage uncontrolled grazing in the forests.
3. Reduction in the number of livestock unit dependent on forest areas for grazing.
4. Awareness creation among communities about carrying capacity and sustainable grazing.
5. Regular patrolling for preventing overgrazing.

Periodicity: 5 years

Indicator 2.3.5: Area infested with invasive alien species

Invasive alien species is a major threat to the forest ecosystem vitality and its health in terms of biodiversity. They affect the regeneration and also impact the growth of the native species. Effective steps taken for the control of invasive species positively impacts the natural regeneration of native species in forest areas.

Intended situation: Extent of the area under invasive species should be less than the baseline year. Native species are preferred over alien or exotics in aided natural regeneration (ANR), eco- restoration, re-habitation, and reforestation activities.

Verifiers:

1. Extent of area infested with invasive alien species and mapping.
2. Action plan & strategy to control invasive weeds (e.g. Lantana, Eupatorium, Parthenium etc.).
3. Implementation of appropriate techniques/protocols for weed control including plantation/ regeneration activities and/or their replacement with native species (eg: Lantana replaced by bamboo) and/or bio-natural measures against invasive species.
4. Allocated budget and their utilisation for weed control.
5. List of species used in aided natural regeneration (ANR), eco-restoration, re-habitation, and reforestation activities.

Periodicity: 2 years

Indicator 2.3.6: Details of incidence of pest and diseases

Pest and diseases affect the health and vitality of a forest ecosystem. Mapping of the extent of area affected and the frequency of such events will be useful for effective management. Adaptations of suitable silvicultural practices, use of healthy planting material, reducing the injury to the forest crop are some means to prevent incidence of disease in a forest crop. An analysis of the incidences of pest and diseases and the adaptation of different preventive measures will lead to better understanding of drivers of degradation leading to effective management prescriptions.

Intended situation: Timely reporting of disease and pest outbreaks and impact assessment of treatment measures implemented.

Verifiers:

1. Documentation of disease and pest outbreaks, their physiological and morphological impacts on native species.
2. Mapping of the extent of area affected and the frequency of such events.
3. Enumeration of infected/affected species and reporting of severity of affected health.
4. An analysis of the incidences of pest and diseases and the adaptation of different preventive measures.
5. Treatment measures undertaken directly, or in consultations with research institutions.

Periodicity: 5 years

Indicator 2.3.7: Forest degradation due to pollution

Incidence and extent of forest degradation due to pollution (soil, water, and in some cases air), andthe mitigation measures taken and the impacts thereof**.**

Intended situation: Forest degradation due to pollution are prevented in the first place and sufficient mitigation measures are undertaken in case of degradation due to pollution.

Verifier:

1. Identification of probable points of pollution for taking preventive measures.
2. Incidence and extent of forest degradation due to pollution.
3. Seasonal records of Air / Water Quality Index.
4. Research based conclusions.
5. Appropriate treatment measures.

Periodicity: Every year

Indicator 2.3.8: Other drivers of forest degradation (REDD+ initiatives)
There are other drivers of forest degradation and deforestation and barriers to reforestation. Identification of these with inputs from stakeholders shall provide further insights for better management prescriptions.

Intended situation: Specific action plan on REDD+ shall be helpful in identification as well as addressing the drivers of degradation and barriers for enhancement of forest carbon stock specific to the forest division.

Verifiers:

1. Identification & mapping of direct drivers or barriers and underlying causes or indirect drivers through stake holder consultation exercises.
2. Selection of priority drivers and enhancement activities through stake holders and expert'sconsultation.
3. Action plan for addressing the impact of drivers.

Periodicity: 5 years

Criteria 4: Conservation and Maintenance of Soil and Water Resources

Comprises of indicators of water and soil quality under influence of forests. Criterion addresses an area treated under soil and water conservation measures; duration of water flow in seasonal streams; status of wetlands in forest areas and groundwater levels from nearby wells (up to 5 km of forest area).

Indicator 2.4.1: Inventory of water bodies and sources
Indicator 2.4.2: Area treated under soil and water conservation measures
Indicator 2.4.3: Monitoring of ground water
Indicator 2.4.4: Identification of areas vulnerable for erosion and prescription for suitable treatment
Indicator 2.4.5: Mapping of riparian zones for special management prescriptions
Indicator 2.4.6: Monitoring of streams, lakes, wetlands, ponds and other waterbodies in forested catchments

Indicator 2.4.1: Inventory of water bodies and sources

The water bodies inside the forests improve the water regime of a forested watershed. Over exploitation of the ground water resources results in declining ground water levels; there is an urgent need to augment the ground water resources through suitable management interventions. Mapping of all water resources in the forests including aquifers shall form the basis for conservation and management of soil and water resources.
Intended situation: Identification and digital mapping of all water bodies and sources in the

division are done as baseline for future monitoring. Suitable management interventions are taken to augment the water bodies and resources.

Verifiers:

1. List of all water bodies and sources in the division.
2. Extent and categorisation of waterbodies are documented and digitally mapped as baseline andfuture monitoring.
3. Efforts or management interventions to augment water bodies and resources.

Periodicity: 2 years

Indicator 2.4.2: Area treated under soil and water conservation measures

The soil and water conservation measures reduce the surface flow and aid in infiltration and reduce the soil erosion. However, soil and water conservation structures need to consider total rainfall in the catchment. The Soil and Water conservation structures are highly recommended in high rainfall areas, however the same must be very carefully and judiciously incorporated in low rainfall zones as it may adversely affect the water availability in downstream areas. Water conservation in dry areas is of paramount importance considering that the country has 76% dry forests.

Intended situation: Documentation & mapping of all areas treated under soil and water conservation measures are done. Biological and bioengineering methods included in WP on watershed management principles.

Verifiers:

1. Year wise area treated under minor soil and water conservation measures (Contour trenches,gully plugging, biological & bioengineering methods etc.).
2. List & mapping of major soil and water conservation structures created (Check dams, percolation tanks etc.)
3. Present status & maintenance of structures created.

Periodicity: 5 years

Indicator 2.4.3: Monitoring of ground water

Periodical recording of water level in open wells during dry and wet seasons to determine the ground water level. It will help in the assessment of the impact of interventions taken in the catchment on thegroundwater.

Intended situation: Monitoring protocol for groundwater level assessment is in place in the vicinity of forest area.

Verifiers:

1. Periodic (Pre-& post monsoon) monitoring mechanism of water level of open wells in the 5 km vicinity of forest area with respect to annual rainfall is in place.
2. Monitoring the status of select aquifers present in the forest landscape.
3. Annual quality check of water samples.

Periodicity: Every year

Indicator 2.4.4: Identification of areas vulnerable for erosion and prescription for treatment

Identifying areas vulnerable for erosion and planting of local grasses in such areas are very effective for immediate control of soil erosion. It may be followed by tree plantation which takes time to establish. Forest soils must be kept as healthy and fertile as possible while maintaining the hydrological services.

Intended situation: Soil erosion vulnerability assessment, mapping and interventions are done. Highly vulnerable areas should be prioritised for treatment. Ideally no erosion prone areas remain untreated.

Verifiers:

1. Soil erosion baseline data and improvements in tons/Ha to be recorded.
2. Soil erosion vulnerability assessment and mapping using any of the standard methods (e.g.: Revised universal soil loss equation (RUSLE) using the parameters of Rainfall, soil, topography, crop cover, conservation practices factor) along with map for the division is done.
3. Based on assessment suitable soil and water conservation measures are planned and implemented.
4. Budgetary support.

Periodicity: 5 years

Indicator 2.4.5: Mapping of riparian zones for special management prescriptions

Riparian zones act as discharge zones and with appropriate vegetation helps in lowering of water temperature, better dissolved oxygen, less turbidity and maintenance of channel shape. In areas with low rainfall, riverine plantations are likely to have a negative impact on the stream flow. Therefore, riverine plantation should be rainfall specific.

Intended situation: Riparian zones and their status must be maintained and improved w.r.t base year. Negative impacts of silvicultural interventions on the quality and quantity of water resources shall be reduced, soil and water erosion shall be controlled and severe damage to catchment within the forest shall be avoided.

Verifiers:

1. Identification, documentation and mapping of riparian zones within the buffer area of 5 kms onboth sides of major rivers, 2 kms for tributaries and up to 500 mts for streams and around otherwater bodies.
2. Conservation plan for such buffer areas is prepared and implemented by using silvicultural or other means.
3. Riparian zones result in clean and continuous E-flow (Environmental flow) in rivers and streams.

Periodicity: 5 years

Indicator 2.4.6: Monitoring of streams, lakes, wetlands, ponds, and other water bodies in forested catchments

Eco-restoration, natural regeneration, tree/shrub/grass planting, soil, and water conservation structures as per locally suitable designs protect streams, lakes, wetlands, ponds and other water bodies and sea shores. The important forested catchments need to be equipped with the monitoring stations over selected streams to assess the discharge and silt load. The data shall help in developing a long-term understanding on the impact of various vegetative parameters and the management practices on the stream discharge and silt load.

Intended situation: Monitoring protocol in place for surface water bodies such as streams, lakes, wetlands, ponds and other water bodies in forested catchments.
Verifier:

1. Periodic monitoring of waterbodies with parameters like water temperature, colour, odour, pH, Turbidity, TDS (Total Dissolved solids), DO (Dissolved oxygen), BOD (Biological Oxygen Demand), COD (Chemical Oxygen Demand), bank erosion etc.

Periodicity: Every year

Criteria 5: Maintenance and Enhancement of Forest Resource Productivity

Criterion deals with economic evaluation of forest functions in terms of wood and non-wood forestproducts. It aims to maintain/increase the productivity of forest resources.

Indicator 2.5.1: Estimation of growing stock of wood
Indicator 2.5.2: Estimation of current annual increment and mean annual increment of the forest crop
Indicator 2.5.3: Assessment of forest structure
Indicator 2.5.4: Estimation of Basal Area (BA) and the number of stems per unit area
Indicator 2.5.5: Estimation of Carbon stock of the forests
Indicator 2.5.6: Area taken up for eco-restoration, rehabilitation and reclamation
Indicator 2.5.7: Area taken up for improved productivity through forest plantation
Indicator 2.5.8: Area taken up for tending operation and other operations
Indicator 2.5.9: Analysis of Species composition

Indicator 2.5.1: Estimation of growing stock

Growing stock is the standing volume of a forest crop. Higher the growing stock more the standing volume i.e., usable timber and thus higher carbon stock as well. Estimation of growing stock thus forms the basis for the forest management.

Intended situation: Maintenance and enhancement of growing stock w.r.t to base year. Forest crops must be maintained as vigorous as possible to produce as rapidly as they can till the biomass production attains its most desirable level including contributing to intangible benefits.

Verifiers:

1. Regular monitoring of growing stocks in sample plots.
2. Strategies to improve and enhance growing stock included in WP.
3. Assessment of extraction of timber (recorded and unrecorded extraction).

Periodicity: 5 years

Indicator 2.5.2: Estimation of current annual increment and mean annual increment of the forest crop

Increment is the increase in volume of growing stock over a period. Higher increment of Growing Stock also means higher carbon sequestration. The rate of increment depends on many locality factors including the growth of the forest crop, which will form the basis for decision making in forest management.

Intended situation: MAI/CAI is either maintained or improved w.r.t base year.
Verifiers:

1. Sample plots that analyse MAI/CAI for important species.
2. Implementation of strategies to improve and enhance MAI as per the WP.
3. Trend analysis in production of timber and fuel wood in successive working plans in past 20years.

Periodicity: 5 Years

Indicator 2.5.3: Assessment of forest structure

The assessment of forest structure is generally done using age-class/diameter distribution. Maintenance of forest structure is essential for sustainable production of goods and services. The diameter is a proxy for age and the diameter distribution of the principal species, and their associates indicate the presence or absence of different age class in a forest crop. Presence of all age-classes in even-aged forest and presence of all diameter classes in selection forest indicate the sustainability ofa population and the benefits drawn from it.

Intended situation: Generally silvicultural and management practices in natural forests shouldsupport right distribution of age classes / diameter classes.

Verifiers:

1. Assessment of age classes / diameter distribution of identified species.

Periodicity: 5 years

Indicator 2.5.4: Estimation of Basal Area (BA) and the number of stems per unit area
Basal area is a function of crop diameter and number of trees per unit area. Basal area along with the number of stems per unit area is a better indicator of a forest crop to sustainably provide the goods and services it renders.

Intended situation: Maintenance of optimal basal area and number of stems per unit area as per themanagement objective.

Verifiers:

1. Assessment of basal area of identified species.

Periodicity: 5 years

Indicator 2.5.5: Estimation of Carbon stock of the forests

An estimate of the carbon stock of the forests over a period of time indicates the carbon sequestration potential of the forests thereby the mitigation potential of the forests against climate change.

Intended situation: Maintenance and enhancement of Carbon stock.

Verifiers:

1. Periodic estimation of total carbon sequestered against base year.

Indicator 2.5.6: Area taken up for eco-restoration, rehabilitation, and reclamation

The degradation of the forest leads to lower productivity. Analysis of measures taken up for mitigating the effects of the degradation, mining and shifting cultivation etc., especially through eco- restoration, rehabilitation and reclamation will be useful for effective management of forests.

Intended situation: Based on the identification and mapping of degraded forest areas, eco-restoration, rehabilitation and reclamation efforts are undertaken using native species of herbs, shrubs, and trees.

Verifiers:

1. Total area treated under different schemes for Eco-restoration of degraded forest area.
2. Total area treated under different schemes for rehabilitation for areas affected with shiftingcultivation or forest area freed from encroachment.
3. Total area treated under different schemes for reclamation of mined out areas.
4. Budgetary allocation for the Eco-restoration, rehabilitation, and reclamation.

Periodicity: Every year

Indicator 2.5.7: Area taken up for improved productivity through forest plantation

The productivity of a forest depends upon the genetic material of the trees also. It is difficult to manipulate the genetic makeup of a natural forests but can be done while raising plantation. The superior quality planting material is essential for increasing the productivity.

Intended situation: Production from forests is augmented through forest plantations of timber species having maximum demand in the market. Productivity of forest plantations is improved with high quality planting materials and suitable management practices.

Verifiers:

1. Percentage of area of the forest division under forest plantations and areas under differenttimber species.
2. Sources of quality seeds and clonal planting material for improved productivity of targetedspecies.
3. Production of high-quality planting materials in forest nurseries.
4. Details of plantations carried out year-wise.
5. Percentage of area under plantation with improved planting materials/clonal plantation and/orintensive management practices.
6. Details of production from the plantations.
7. Improvement in productivity from improved plantations.

Periodicity: Every year

Indicator 2.5.8: Area taken up for tending and other operations

The timber, bamboo and NTFP productivity can be enhanced with suitable silvicultural treatments like thinning, cleaning, and pruning. Assessment of other silviculture practices undertaken to protect water resources and soils, reduce disturbance and damage to habitats, ecosystems, landscape, and environmental values. Areas taken up for these operations indicate the efforts taken up for enhancingthe productivity of the forests.

Intended situation: Productivity of forest area is enhanced through tending and other operations.

Verifiers:

1. Plan of operation for enhancement of productivity of timber, bamboo and NTFP.
2. Area under different silvicultural treatments such as thinning, cleaning and pruning.
3. Area under other silviculture practices undertaken to protect water resources and soils.
4. Area under specific habitat management and enhancement of ecosystems, landscape and environmental values.

Periodicity: Every year

Indicator 2.5.9 Analysis of Species composition

A forest with mixed species composition provides multiple goods. The object of management determines the species composition and an analysis of the tree diversity of a forest crop indicates the multiple goods a forest could provide.

Intended situation: Forest composition should include optimum number of associates apart from main species. The species composition should include fruit bearing and other NTFP species to provide various ecosystem services including wildlife habitat. Species composition is assessed and mixed species composition is enhanced in the forest area of the division.

Verifiers:

1. Percentage of species composition in forest area with regard to main species, associates, fruitbearing and other NTFP species is calculated.
2. Improvement in the species composition.

Periodicity: Every year

Criteria 6: Optimisation of Forest Resource Utilisation

Forests provide multiple goods for the use of the society in the form of timber, fodder, grass, fruits, nuts, gums, resin, tendu leaves, medicinal plants etc. The knowledge of the communities on the conservation, harvesting/collection practices, grading and storage helps in sustainable management of forest resources. Identification of the important forest produce, their demand and sustainable supply and the harvesting pattern will form basis for making sound management prescriptions as indicated below:

Indicator 2.6.1: Agriculture customs and requirement of the local people
Indicator 2.6.2: Listing of important Non-Timber Forest Produce (NTFPs)
Indicator 2.6.3: Details of non-destructive/sustainable harvesting of resources
Indicator 2.6.4: Demand and supply of timber and NTFPs
Indicator 2.6.5: Low impact harvesting
Indicator 2.6.6: Recorded removal of timber, firewood, grasses, fodder, bamboos, NTFPs etc.
Indicator 2.6.7: Valuation of the forest resources
Indicator 2.6.8: Forest enterprises
Indicator 2.6.9: Access and Benefit sharing

Indicator 2.6.1: Agriculture customs and requirement of the local people

An estimation of the requirement of the local people for small timber for agricultural and other local community uses on the basis of the socio-economic survey will indicate the dependence of the population on forests.

Intended situation: Understanding of the gap between demand and supply of the small timber to meet the requirement of local people and artisans.

Verifiers:

1. Assessment of the estimation of requirement of small timber for agriculture, handicraft andother local community uses on the basis of socio-economic survey.
2. Estimation of the supply of small timber to local people.
3. Demand and supply gap if any and strategy to meet the gap.

Periodicity: 5 years

Indicator 2.6.2: Listing of important NTFPs

It is expedient to identify, produce, or enable the productions of diversified products such as NTFPs, their use, parts used, based on the range of resources without jeopardising the flow of ecosystem services in order to strengthen and diversify the local economy proportionate to the scale and intensity of management activities.

Intended situation: All the species of important NTFPs must be recorded along with their marketability.

Verifiers:

1. Documenting all NTFPs including herbs and shrubs which diversify the local economy.
2. Assessment of demand & supply of NTFPs.
3. Market value of NTFPs/ Medicinal and Aromatic Plants (MAPs) (value should increase inconsonance with market forces, transportation and value addition.).

Periodicity: 5 years

Indicator 2.6.3: Extent of non-destructive/sustainable harvesting of resources

Bio resources are harvested and whole plants or different parts are used. If whole plants, underground plant parts or bark are used, this often leads to the death of the plant and is likely to have an adverse effect on its population than a plant whose leaf or seed or

flower is used. An analysis of the parts used, collection and harvesting practices shall indicate the sustainability of NTFPs.

Intended situation: Evolution and implementation of a mechanism to ensure the harvest is within sustainable limits for the species of important NTFPs including herbs and shrubs.

Verifiers:

1. Protocols for non-destructive/sustainable harvesting and collection of important NTFPsincluding herbs and shrubs.
2. Fixing annual extraction limits for major NTFPs/MAPs.
3. Creating awareness and promoting good collection practices.
4. Capacity building of local community on sustainable harvesting practices.
5. Assessment of adoptability of sustainable harvesting techniques.

Periodicity: 5 years

Indicator 2.6.4: Demand and supply of timber

The socio-economic study and the local market survey will provide an assessment of the dependence of the local people on the forests for timber. This will also include the estimation of import and export of timber/ from other States and Country. This will enable the assessment of per capita consumption of timber and by the people living near the forests.

Intended situation: Assessment of the dependence of the local people on the forests for timber.

Verifiers:

1. Estimation of local consumption, production, import and export of timbers.
2. Timber requirement of industries and other stakeholders.
3. Regular documentation of timber production and harvest.
4. Supply and demand gap and strategy to meet the gap.

Periodicity: 5 years

Indicator 2.6.5: Low impact harvesting of timber.

Assessment of any low impact harvesting technique being followed in the forest division. Harvesting and extraction of forest resources are undertaken in the manner so that merchantable waste is reduced, and damage to other products and services is avoided.

Intended situation: Progressive implementation of low impact harvesting techniques in forestry operations.

Verifiers:

1. Document of low impact harvesting techniques for forestry operations.
2. Assessment of damage in various forestry operations.
3. Creating awareness and promoting low impact harvesting techniques.
4. Use of modern machinery, tools and technology for low impact harvesting.

Periodicity: 5 years

Indicator 2.6.6: Recorded removal of timber, firewood, grasses, fodder, bamboos, NTFPs etc.

Analysis of annual removal over a period of time indicates the sustainability of a species. Any reduction or excess extraction over the average extraction during a period of time warrants immediate action for its rehabilitation or augmentation of natural population.
Intended situation: All timber, firewood, grasses, fodder, bamboos, NTFPs etc. removals should be recorded and extraction should be within permissible limits.
Verifiers:

1. Details of all removals of timber except for petty felling as per the control forms. Harvestshould not exceed the accretion (Growing Stock/ MAI).
2. Information on all removals of fuel wood based on socio-economic survey and assessment is provided. Evolving mechanism for quantified data on recorded removals and sharing with the community is explored and highlighted.
3. Assessment of bamboo/rattans and mechanism for generating quantified data on their removal and sharing with the community is provided.
4. Description of cattle rearing community of forest dwellers with regard to removal of fodderand availability of palatable species and pasture land etc.
5. Record of forest produce removal by the community.
6. Analysis of annual removal of timber, firewood, grasses, fodder, bamboos, NTFPs etc over a period of time.
7. Measures taken to meet the energy demands of local communities using alternatives such as biogas stoves, solar powered stoves, etc. and improve fuel wood quality (wood gasifier).

Periodicity: 5 years

Indicator 2.6.7: Valuation of the forest resources

An estimation of the value of all the goods that are extracted from the forests based on the market value gives insight for making decisions for the optimisation of the use of the goods from the forests.

Intended situation: Valuation of tangible benefits derived from the forest

Verifiers:

1. Recorded forest produce removal by forest department, community, others and their valuation on market price.
2. Change in valuation of forest resources if any.

Periodicity: 5 years

Indicator 2.6.8: Forest enterprises

Wood based industries and other industries that use raw materials sourced from the forests are important stakeholders. Listing of forest-based industries and enterprises in the forest division and outside forest division but sourcing raw material especially NTFPs from the division, not only indicate the forest-based employment generation but also the contribution of the forests towards the local economy and indicates scope for new forest-based enterprises.

Intended situation: All wood-based and forest produce-based industries operating in the forest division are listed and their raw material demand and consumption is assessed.

Verifiers:

1. Listing of all wood-based and forest produce-based industries operating in the forest divisionand their annual requirement.
2. Listing of all wood-based and forest produce-based industries operating outside forest divisionbut sourcing raw material especially NTFPs from the division and their annual requirement.
3. Recorded forest produce removed and used within the division.
4. Recorded forest produce removed and supplied outside division.

Periodicity: 5 years

Indicator 2.6.9: Access and Benefit sharing

NTFPs are sourced from the forest areas for commercial use by the industry. Proper documentation of traded quantity and sharing of the benefits with the BMCs as per the provisions of BD Act and Access to Biological resources and associated knowledge and benefit sharing regulations (ABS guidelines) 2014 notified there-under can help in the conservation and sustainable use of NTFPs.

Intended situation: The forest bio-resources are accessed for commercial use as per the ABS guidelines.

Verifiers:

1. List of registered traders/manufacturers and their annual requirement.
2. Sharing of levy/fee with the BMC for the conservation, management and benefit sharing as perABS regulations.

Periodicity: 2 years

Criteria 7: Benefits to local people - social, and cultural values

The social and cultural values of forests aside from their ecological and economic benefits and optimisation of forests and their products are intrinsically connected with local stakeholders. Traditionally, they form a significant part of the life of the local people with many patches of forests across the country protected as sacred groves. Several floral and faunal species of religious and cultural significance also exist. Hence, such cultural and social sentiments are of great importance as motivational drivers behind their conservation ethos. The assessment of the role of forests on the social, cultural, economic and ecological aspects of the local people will provide inputs for making management decisions as indicated below:

Indicator 2.7.1: Details of employment generated
Indicator 2.7.2: Use of traditional Knowledge and listing of knowledge holders
Indicator 2.7.3: Sacred groves and other cultural values
Indicator 2.7.4: Details of social customs on forests and forestry practices
Indicator 2.7.5: Ecotourism sites and activities

Indicator 2.7.6: Identification of rights and concessions of the local communities (other than FRA)
Indicator 2.7.7: Ecosystem services and benefits

Indicator 2.7.1: Details of employment generated

The activities of the forest department generate livelihood and an analysis of the same provides insight into the employment generation potential of the forest sector and the dependence of the local community on forests for employment. The details of trainings and capacity building programmes organised towards employment generation helps in identifying the potential human resource available for different activities including guides for ecotourism related activities.
Intended situation: The human resource undertaking forest-based activities is sufficiently trained.

Verifiers:

1. Details of the capacity building for the local community.
2. Status-Job card and employment generation activities.
3. Analysis of employment generation in terms of man-days.

Periodicity: Every year

Indicator 2.7.2: Use of traditional Knowledge and listing of knowledge holders

The local traditional health practitioners and indigenous medicinal systems are repositories of traditional knowledge which have a close linkage with the forests. This information may also be available in the Peoples' Biodiversity Register (PBR) prepared by the Biodiversity Management Committees (BMCs). Their knowledge on the distribution of the species, their extent, its diverse use and availability etc shall form the basis for making sound management prescriptions.

Intended situation: Utilisation of information from PBR and TKDL (Traditional Knowledge Digital Library) for conservation, management and utilisation of forest resources and incorporation of the same in the micro-plans and WP.

Verifiers:

1. Availability of Peoples' Biodiversity Register prepared by the Biodiversity Management Committees.
2. Identification of different communities living in and around forest having different types of indigenous knowledge.
3. Indigenous knowledge on forest management is incorporated in micro-plans and WP.

Periodicity: 2 years

Indicator 2.7.3: Sacred groves and other cultural values

Sacred groves are great repositories of biodiversity with religious, cultural and conservation significance. Listing of these groves such as trees, forest patch, ponds/lakes etc. shall provide insight into necessary special management interventions required.

Intended situation: Details of sacred groves, their significance and management interventions.

Verifiers:

1. Sacred groves are identified, mapped and protected in consultation with local stakeholders.
2. Assessment of ecological services from sacred groves.
3. Conservation plan for sacred groves.
4. Good management practices borrowed from sacred groves are incorporated in micro plans andWP.

Periodicity: 5 years

Indicator 2.7.4: Details of social customs on forests and forestry practices

There are community specific social customs, customary laws on various forestry related activities like collection of NTFPs, their use etc. Identification of the same indicates the close cultural linkage of the communities with the forests which could contribute to making culturally conscious management prescriptions with the active participation of the local communities.

Intended situation: Social customs relevant to the forests and forestry practices are respected while making management prescriptions in the WP.

Verifiers:

1. Documentation and incorporation into micro plans and WP of the social customs on various forestry related activities for conservation, management of bio-resources and benefit-sharing.

Periodicity: 5 years

Indicator 2.7.5: Ecotourism sites and activities

Ecotourism is responsible travel that involves interpretation and education about natural areas. Areas inside and adjoining designated forests, which have ecotourism potential shall be identified and documented for effective implementation of ecotourism principles.

Intended situation: Potential sites in the forest division identified and encouraged for eco-tourism activities.

Verifiers:

1. Areas inside and adjoining designated forests, which have ecotourism potential, are identified and listed (Such as landscape, waterscape, wildlife and also the human-scape).
2. Ecotourism development plan is prepared and implemented in the division within the carryingcapacity.
3. Capacity building of eco-guides.
4. Records of tourist inflow to eco-tourism sites and commensurate benefits to the local community.

Periodicity: Every year

Indicator 2.7.6: Identification of rights and concessions to the local communities (other than FRA)

The communities living near the forest enjoy certain rights and concessions from the forests. Documentation of these rights and concessions, other than the rights recognised under FRA as considered in indicator 2.1.7, as they have bearing on the management of forests.

Intended situation: Documentation of Rights and concessions to the communities and their exercisewithin the management prescriptions.

Verifiers:

1. Document on rights and concessions of the local communities on forests.
2. Extent of exercise of rights and concessions and their bearing on the sustainable managementof forests.

Periodicity: Every year

Indicator 2.7.7: Ecosystem services and benefits

The local community derives benefits from the forest ecosystem services which have bearing on the quality of life of the community and the forest. Wherever possible a framework for quantification and valuation of ecosystem services may be explored and documented.

Intended situation: Quantification and valuation of ecosystem services and documenting the benefits to the community.

Verifiers:

1. Identification of the ecosystem services and benefits to the community in the division.
2. Preparation of a plan to build capacities and infrastructure for quantification of ecosystemservices through existing technical expertise from Government institutions.
3. Budgetary provisions for quantification and valuation of ecosystems and capacity building.

Periodicity: 5 years

Criteria 8: Policy, Legal and Institutional Framework

National and State policies on forests, wildlife, water and environment govern the way forests are managed. The Indian Forest Act, 1927, the Forest Conservation Act, 1980, Wildlife (Protection) Act 1972, Environment (Protection) Act, 1986, Biological Diversity Act, 2002, Compensatory Afforestation Fund Act, 2016 and any other state specific law and rules made there under provide legal framework for the conservation and sustainable management of forests, wildlife and the biodiversity that the forests harbours. The Forest Rights Act 2006 and PESA Act also impact the management of the forests in India. An analysis of these legal instruments and their implementation, various institutions involved with the forest management and research will indicate the impact of these instruments on forest management as indicated below:

Indicator 2.8.1: Existing policy and legal instruments governing the forest management
Indicator 2.8.2: Role of panchayats or any locally elected bodies in the district / council areas inforest management
Indicator 2.8.3: Participatory forest management
Indicator 2.8.4: Details of Biodiversity Management Committees (BMCs)
Indicator 2.8.5: Forest, biodiversity and wildlife related offences
Indicator 2.8.6: Financial outlay
Indicator 2.8.7: Human resource
Indicator 2.8.8: Gender aspects
Indicator 2.8.9: Labour welfare
Indicator 2.8.10: Environmental awareness and education
Indicator 2.8.11: Infrastructural support
Indicator 2.8.12: Research and development
Indicator 2.8.13: Existence of monitoring mechanism

Indicator 2.8.1: Existing policy and legal instruments governing the forest management

This includes all national /state/ locality specific rules, regulations existing that govern forest management.

Intended situation:

Existence of legal framework at national, state and local level on environment, forest, tree preservation, wildlife, biodiversity, forest-dwellers and others related to forest management.

Verifiers:

1. Awareness amongst the forest personnel and local communities about the existing legal provisions for safeguarding environment, forests, wildlife, biodiversity and rights of the forests dwellers.
2. Availability of important legal provisions in local languages with field staff and local organisations (JFMCs/EDCs/ BMCs and SHGs)
3. Awareness programmes conducted on legal issues

Periodicity: 5 years

Indicator 2.8.2: Role of panchayats or any locally elected bodies in the district / council areas in forest management

Analysis of the village / local body development plan and its focus on forests, wildlife and environment.

Intended situation: Development plan with focus on forests, wildlife and environment by involvement of division staff with panchayats or any locally elected bodies in the district /council areas for preparation of village development plans.
Verifiers:

1. Status of inclusion of management aspects of forest, wildlife and environment conservation invillage / local body development plan.

Periodicity: 5 years

Indicator 2.8.3: Participatory forest management

The listing of the committees constituted for the participatory forest management which are mandated to protect and conserve the forests and the biodiversity thereof. Micro-plans are prepared in congruence with working plan prescriptions. Analysis of the functioning of these committees and implementation of the micro-plans prepared through Participatory Rural Appraisal is an indication of the participation of the stakeholders in forest management for sustainable management of forests.

Intended situation: Participation of stakeholders in sustainable management of forest

Verifiers:

1. Listing of the committees constituted for the participatory forest management.
2. Mapping of forest areas covered under participatory forest management.
3. Participatory Rural Appraisals and involvement of local community in preparation of micro-plan.
4. Number of micro-plans prepared.
5. Mapping of the areas covered under Micro-plans.
6. Analysis of the functioning of these committees and implementation of the micro-plans.

Periodicity: 5 Years

Indicator 2.8.4: Details of Biodiversity Management Committees (BMCs)

BMCs are constituted under the BD Act for the purpose of promoting conservation, sustainable use and documentation of biological diversity including preservation of habitats, and chronicling of knowledge relating to biological diversity. The Access and Benefit sharing (ABS) Guidelines specify the process for Access and Benefit sharing of bio-resources. Listing of BMCs, benefit sharing agreements, if any, data on the quantity and valuation of traded bio-resources including NTFPs indicate the benefits derived by the communities.

Intended situation: Duly constituted and functional BMCs

Verifiers:

1. Constitution of BMCs.
2. Details of periodical meetings of BMCs.
3. PBR (People's Biodiversity Register) available with the BMC.
4. BMCs have management plans for sustainable use of their biological resources.
5. Records of NTFP harvesting/extraction and traded quantity and prices by the BMCs.
6. Records of Levy charges received by BMCs.
7. Records of ABS implemented.

Periodicity: 5 years

Indicator 2.8.5: Forest, biodiversity and wildlife related offences

Listing of year wise forest, wildlife and biodiversity related offences; details of conviction and compounding under various legal instruments governing the same indicate the effectiveness of enforcement of law.

Intended situation: All offence cases are registered, investigated and concluded as per law.

Verifiers:

1. Maintenance of offences registers.
2. Use of IT in offence monitoring.
3. Higher rate of convictions of cases.
4. Capacity building of frontline forest staff to handle offence cases.

Periodicity: Every year

Indicator 2.8.6: Financial outlay
Requirement of funds as per the working plan vis-à-vis allocation of funds in the previous planperiod and expenditure.

Intended situation: Finances available match the annual plan of operations drawn from the workingplan.

Verifiers:

1. Trend analysis of allocation vis-à-vis plan prescriptions and expenditure and inflow of finances from other sources.
2. Outcome-based budget analysis.

Periodicity: Every year

Indicator 2.8.7: Human resource

Adequate and trained man power is essential for effective management of forests. Regular recruitments, promotions, induction and refresher trainings, skill up-gradation trainings are necessaryfor bringing efficiency in forest management.

Intended situation: Adequate and trained manpower available at all levels in the division. In servicetraining done periodically.

Verifiers:

1. Number of posts sanctioned and positioned to assess the adequacy of the manpower.
2. Assessment of the requirement of daily wage/contractual man power.
3. HRD plan in place with regular Training Need Assessment (TNA)for meeting the emerging challenges.
4. Trainings imparted at all levels.
5. Enforcement of Environment, Health and Safety (EHS) measures.

Periodicity: 2 years
Indicator 2.8.8: Gender aspects

Women are involved in forest-based income generation activities as they are the primary collectors of NTFPs and their primary processing. The women are likely to have knowledge on forestry resources linked with food, health, fodder and firewood. However, their commensurate roles do not reflect in the forest management. Mapping of gender-based roles and activities in forestry, assessing the contribution of the women in forestry activities, their role in forest management planning, training and capacity building for women organised by the forest department etc. are essential to understand gender mainstreaming in forest management.

Intended situation: Forest management with adequate gender participation and enabling working conditions.

Verifier:

1. Mapping of gender-based roles and activities in forestry operations.
2. Records of gender participation.
3. Capacity building for women community and frontline staff.
4. Adequate working conditions for all genders.
5. Enabling access to government schemes for child and women development.

Periodicity: 5 years

Indicator 2.8.9: Labour welfare

The welfare of the labour involved in forestry operations is of utmost importance. Listing of the applicable laws governing the labour welfare and analysis of adherence to the same indicate efforts taken for labour welfare.

Intended situation: Compliance to all applicable laws, rules and schemes governing the labour welfare.

Verifiers:

1. Listing of the applicable laws, rules and schemes governing the labour welfare.
2. Adherence to the wages rates as applicable.
3. No engagement of child labour.
4. Direct payments to the beneficiary account.
5. Implementation of applicable government welfare schemes (life insurance, health insuranceetc.).

Periodicity: 5 years

Indicator 2.8.10: Environmental awareness and education

Assessment of all efforts made to increase public awareness and education on environment, forests,the benefits provided by the forests, along with list of the published material.

Intended situation: People are well aware of the tangible and intangible benefits of the forests andimportance of sustainable forest management.

Verifiers:

1. Communication strategy for public awareness on the importance of and the benefits provided by forests and sustainable management of forest.
2. List of the published material such as brochures, pamphlets, leaflets, posters, etc for publicawareness.
3. Extent of use of social media handles.
4. Public participation & celebration of important events like Van Mahotsav, Wildlife week, Earthday, World environment day, International day of forests etc.
5. Number of meetings with the general public to inform them of the benefits provided by forests to society
6. Details of forestry/environmental awareness and education programmes conducted for studentssuch as Prakriti etc.

Periodicity: 2 years

Indicator 2.8.11: Infrastructure support

Adequate infrastructure in terms of office, residential accommodation of the staff, transportation facilities and communication facilities are necessary for effective forest management. Listing of the entire infrastructure available enables identification of gap, if any, and planning for reducing the gap.

Intended situation: Adequate infrastructure for effective forest management.

Verifiers:

1. Listing of office, residential accommodation of the staff, transportation facilities andcommunication facilities.
2. Assessment of requirement of infrastructure
3. Infrastructure planning for reducing the gap

Periodicity: 2 years

Indicator 2.8.12: Research and development

Research and academic institutes are important stakeholders. Research plots, preservation plots, seed orchards, seed stands/seed production areas etc. established by forest department and research institutes, are important for research and development in the forestry sector. Documentation of the efforts of the forest department, the details of research undertaken, application of results in the field and further identification of problems for research are essential for effective science-based forest management.

Intended situation: Long-term research and development plan in place.

Verifiers:

1. Listing of research plots, preservation plots, seed orchards, seed stands/seed production areasetc. established by forest department and research institutes and their status.
2. Number of research problems identified and referred to the research wing / research institution.
3. Utilisation/Implementation of research findings and transfer of knowledge and technology.

Periodicity: 5 years

Indicator 2.8.13: Existence of monitoring mechanism

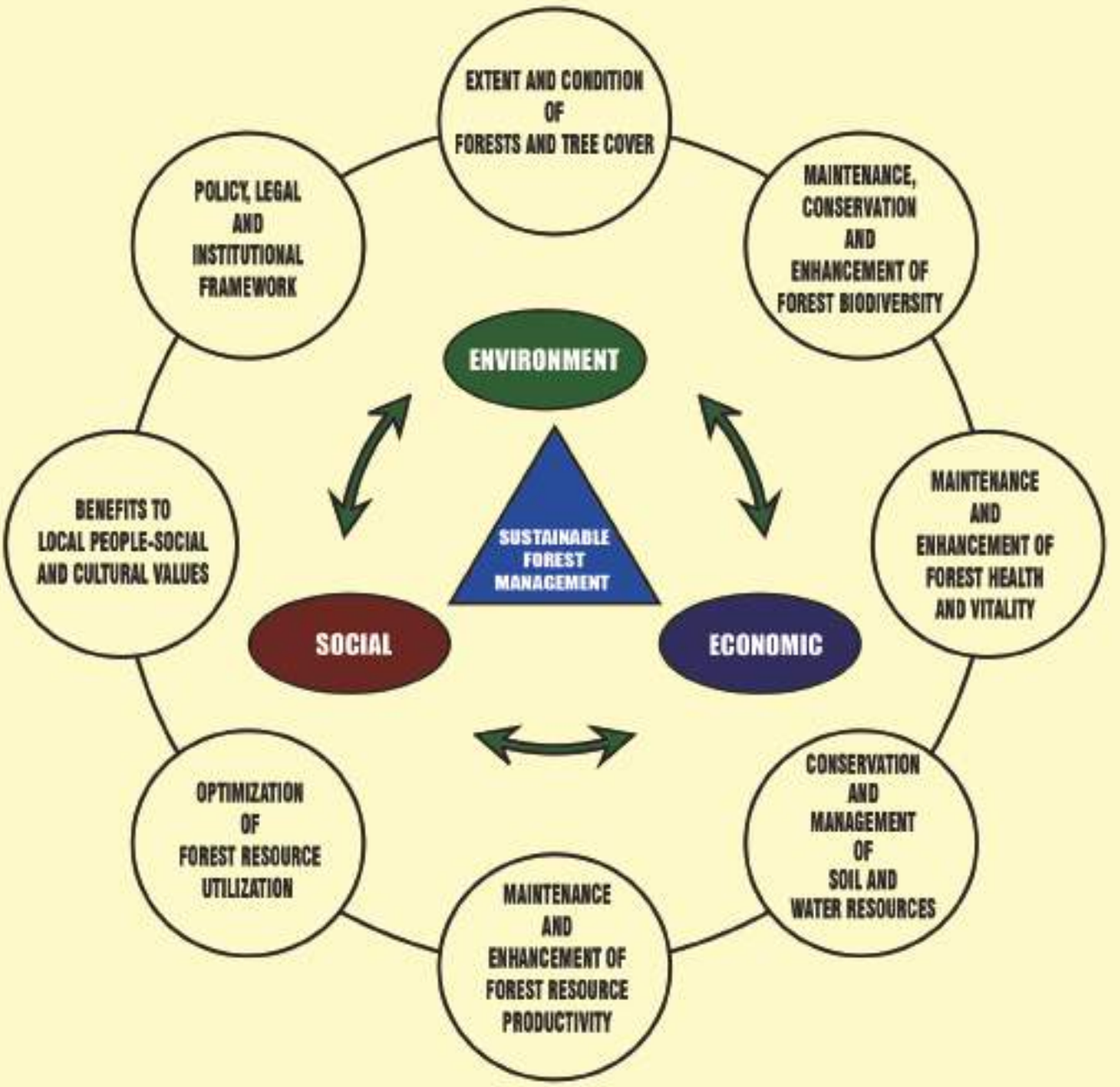
Periodic monitoring and evaluation are essential tools for effective and adaptive forest management. Analysis of adherence to monitoring protocols like control forms, compartment history etc. gives insight into the management of forests.

Intended situation: Regular monitoring of management effectiveness.

Verifiers:

1. Regular monitoring and evaluation mechanism is in place.

Periodicity: Every year



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