GOVERNMENT OF KERALA

STATE PLANNING BOARD

THIRTEENTH FIVE-YEAR PLAN
2017-2022

WORKING GROUP ON

FORESTRY AND WILDLIFE

REPORT

AGRICULTURE DIVISION
THIRUVANANTHAPURAM
MARCH2017

PREFACE

In Kerala, the process of a Five-Year Plan is an exercise in people's participation. At the end of September 2016, the Kerala State Planning Board began an effort to conduct the widest possible consultations before formulating the Plan. The Planning Board formed 43 Working Groups, with a total of more than 700 members – scholars, administrators, social and political activists and other experts. Although the Reports do not represent the official position of the Government of Kerala, their content will help in the formulation of the Thirteenth Five-Year Plan document.

This document is the report of the Working Group on Forestry and Wildlife. The Chairpersons of the Working Group were Shri P Mara Pandiyan IAS and Dr C T S Nair. The Member of the Planning Board who coordinated the activities of the Working Group was Professor R Ramakumar. The concerned Chief of Division was Dr P Rajasekharan.

Member Secretary

CONTENTS

SUMMARY

Water Security: The Thrust Area

Rapid changes in the social and economic conditions and the increasing vulnerabilities caused by climate change compels us to discard the "business-as-usual" approach to managing forests and tree resources in the State. The precarious situation with regard to water supply which is becoming worse due to climate change related events, warrants that stable supply of clean water becomes the most important function of forestry in the State. Hence "**Water for a Thirsty Kerala"** will be the core theme for forest management during the 13th Five Year Plan. This will require a major paradigm shift in forest management. Forest management will adopt a landscape approach ensuring that the linkage with other land uses – in particular agriculture – is improved and that forest management benefits the adjoining lands. Improving water supply will be accomplished through restoring the health of forest ecosystem which also helps to improve other environmental functions of forests including biodiversity conservation, carbon sequestration and amenity values. Important programmes that will be implemented during the 13th Five Year Plan are indicated below:

Key Programmes

The overall objective of "Water for a thirsty Kerala" will be accomplished through a number of interrelated programmes, enabling the significant improvement of the condition of forests and trees ensuring that their contribution to the livelihood of forest dependent communities also improves significantly. The following will be the main programmes that will be implemented during the 13th Plan.

Management of Natural Forests for Improved Water Yield

The health and resilience of forest ecosystem will be improved enhancing the water absorption and storage capacity of forests and restoration and rehabilitation will be undertaken adopting a watershed approach. The entire forest area will be divided into watersheds based on the current system of watershed classification and the condition of each watershed will be systematically monitored.

Appropriate management practices will be adopted to improve the health of natural forests which will include rehabilitation and restoration and implementation of eco-friendly water and soil conservation practices. A system of regularly monitoring water quality and yield including its seasonal and yearly changes will be put in place.

Biodiversity Conservation and Management of Protected Areas

The forests in Kerala form part of one of the 32 biodiversity hotspots in the world and conservation of the rich biodiversity, especially through the network of protected areas that have already been established will be another key objective of the 13th Plan. Improved biodiversity management will help to reduce long term economic and ecological vulnerabilities, ensuring that the unique plant and animal wealth is sustainably managed for the economic development of the State. Based on detailed scientific studies, the need for wildlife corridors connecting animal habitats will be established through acquisition of land. Further, a voluntary resettlement programme will be implemented relocating settlements from inside the forests to the forest fringes

Support will be provided to Local Self Government institutions to conserve biodiversity, especially through supporting the development and updating of biodiversity registers and conserving unique areas like sacred groves, mangroves, etc.

Sustainable Ecotourism

Considering the rapid socio-economic changes, in particular urbanization, the demand for eco-tourism is expanding rapidly. If managed sustainably ecotourism could become a major source of employment and income, surpassing what can be obtained from managing forests for wood production. A well thought out strategy will be developed and implemented to promote forest-based ecotourism ensuring that a major share of the benefits accrues to local communities. New sites will be developed and managed through local communities, especially tribals.

Management of Human-Wildlife Conflicts

During the 13th Five Year Plan a comprehensive strategy to significantly reduce human-wildlife conflicts will be implemented, which will include long term and short term measures as also prevention and mitigation measures. A government funded insurance scheme will be launched to provide timely compensation for the damage to life and property caused by wildlife.

Rationalisation of Forest Plantation Management to Enhance Productivity

Forest plantation management will be rationalized so that areas with high potential productivity will be subjected to intensive management ensuring that soil conditions and productivity are improved. Taking advantage of the long history of teak plantation management, a system of improving productivity through application of scientific management practices, including the use of through better tools, will be adopted.

Trees Outside Forests Including Home Gardens and Urban Forestry

Although the home gardens and other non-forest areas produce large quantities of wood, much more than what is being produced from the forests, their potential remains far from fully utilised. A programme for improving wood production from the home gardens will be implemented involving the local self-government institutions and taking advantage of expertise from the Kerala Agricultural University and other institutions. Production of seedlings and other planting materials will be improved through active involvement of Kudumbasree units.

A beginning will be made to develop urban green spaces as an integral component of city planning in selected corporations and municipalities.

Livelihood of Forest-Dependent Communities

Considering the close relationship between forest dependent communities and forests, the Department in collaboration with other Departments/ Agencies will implement a programme to improve the livelihood of the forest dwelling tribal communities, fully taking cognizance of their aspirations. Apart from providing a wide array of employment opportunities in forestry, including in improved collection and value addition of non-wood forest products, alternative livelihood improvement opportunities will also be developed. Providing amenities to tribal hamlets, especially education and health care, will be taken up.

Improvement of Governance

Reorienting forestry to provide environmental services, in particular water, will require a thorough reinvention of the governance system. The functions and structure of the Forest Department will have to be adapted to the changing needs of the Kerala society. A comprehensive governance improvement programme will be launched, ensuring that by the end of the 13th Plan Kerala will have a highly modern, efficient forest governance system. The Forest Department will be modernized ensuring that they become efficient managers and facilitators of managing forests and trees.

Rules and regulations relating to forests and wildlife will be reviewed and conflicts and contradictions removed to enable broader public participation in the conservation and management of forests and trees. Regulations that are impeding or creating obstacles in the wider participation of people in conservation will be removed.

A key to the transformation of the Forest Department to a modern science based organization is human resource development, in particular training and orientation of staff. Kerala Forest Academy will be established integrating the present facilities in Arippa and Walayar. Support from institutions like the Kerala Forest Research Institute, Centre for Water Resources Development and Management and the Kerala Agriculture University will be sought to improve the technical capacity of the Forest Department in research, training and extension.

Governance improvement will entail substantial investments in physical infrastructure. This will include completion of demarcation of forest boundaries, establishment of forest stations and enhancement of mobility and communications. Modern systems of fire prevention, detection and suppression will be put in place.

Plan Outlay

A total reorientation of the functioning of the forestry and wildlife sector including the modernization of the Forestry Department will require a significant increase in the plan outlay for the sector. The total outlay proposed to transform the sector to meet the emerging challenges is estimated as about Rs 3,028crores.

CHAPTER1
INTRODUCTION

1. Forests and trees play important economic, social and ecological functions that are critical to the all-round prosperity of Kerala. While their economic importance – especially production of wood and other products - received considerable attention in the past, increasingly their role in the provision of ecological services, in particular watershed protection, biodiversity conservation, carbon sequestration and provision of amenity values, is gaining increased attention. As water scarcity becomes more acute and climate change related extreme events become more frequent, the role of forests in reducing ecological and economic vulnerabilities is becoming all the more critical.

2. The need to protect and sustainably manage environment including forests has been emphasized in the LDF Election Manifesto. It envisages the development of an eco-friendly Kerala adopting a watershed approach to protect water, soil and biodiversity through increased people's participation. Some of the relevant proposals in the LDF Manifesto include the following:
    1. There will be no encroachment on forests. The core areas of forest will be protected as untouched. The local self-government and local communities will be involved in the protection of existing forest areas.
    2. For the requirement of wood, agricultural afforestation will be promoted. The Forest Rights Act will be strictly enforced by protecting the rights of forest dwellers.
    3. Beyond the conservation of forest, effective steps will be taken to protect the mangroves, Naga Workshop Centres (KAVU) and the natural dwelling places of different species. Afforestation and greenery will be promoted in each available public space. A programme for this will be charted out for implementing it on a local self- government basis.
    4. Biodiversity registers will be prepared and kept by all the local bodies. The existing registers will be updated. Time-bound programmes will be conducted for increasing biodiversity.

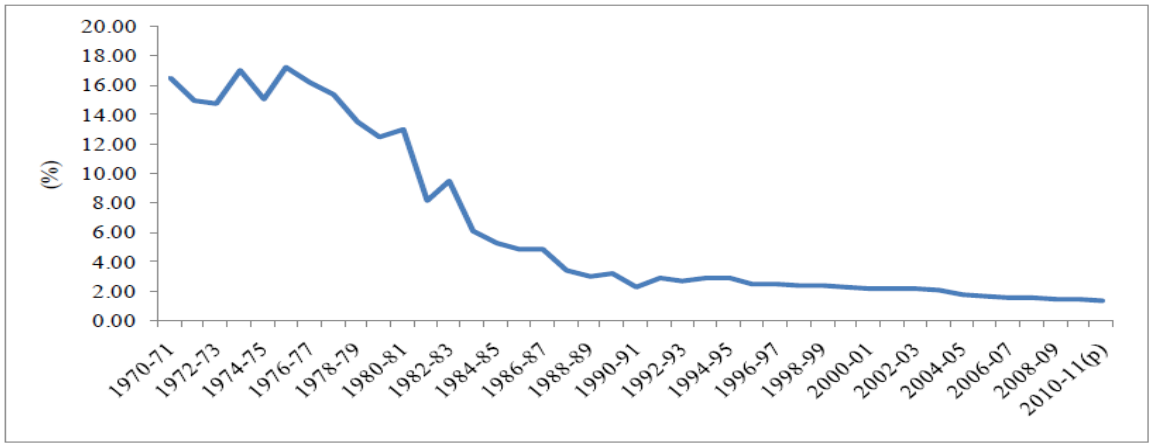
3. There is broad political commitment for forest conservation and there is currently considerable public concern about the need to manage forests for their environmental values. The LDF Manifesto also indicates the need to pursue new initiatives, emphasizing on increased participation of local self-government institutions in the management of forest and tree resources.

4. It is in this context that the State Planning Board constituted a Working Group on Forestry and Wildlife to develop the forestry and wildlife component of the 13th Five Year Plan. Annex I provides the composition and the terms of reference of the Working Group.

Importance of the Forest Sector to Kerala Economy

5. The importance of forests and trees in the well-being of people in Kerala is well recognized. Historically forest management gave priority to production of timber and other products and to generate revenue to government. Accordingly conventional measures of income estimation has focused on the direct monetary contribution of forests. As in the case of all primary sector activities, the share of forestry in the state domestic product has registered a significant decline (see Figure 1). To a large extent this decline is part of the overall decline in the share of the primary sector, largely stemming from the structural changes in the economy, characterized by stagnation of agriculture and the rapid growth of the services sector. Most of the environmental functions of forests, which are vital to all other sectors – agriculture, industries and services -remains unaccounted in the estimation of the state domestic produced primarily due to methodological problems in the quantification and valuation of the public goods functions.

Figure 1 *Share of forestry in the state domestic product (in per cent), 1970-71 to 2010-11*



6. However there is widespread realization of the importance of environmental functions of forests in making Kerala a livable place. Negative impacts of climate change – in particular increasing frequency of extreme climatic events like the unprecedented drought – is pointing out to the need for increased emphasis on the unquantified, yet critical environmental functions of forests. As agreed in the Paris Agreement every country is making efforts to reduce carbon emissions and to improve sequestration and improved forest management is an integral component of the Nationally Determined Contribution (NDC). All these require a major shift in the approach to forestry and wildlife, and the 13th Five Year Plan provides a unique opportunity to bring about a directional shift in the management of forests, giving priority to ecological functions, in particular supply of clean water ensuring that Kerala remains a livable place.

Forest and Tree Resources

7. Forests and tree resources in the State can be broadly grouped into (a) those that are categorized as forests primarily under government ownership and management and (b) trees outside forests, including patches of wooded land primarily under private ownership. Most of the resource assessments hitherto have largely focused on what is defined as forests and yet it is difficult to say that we have accurate information on a wide array of parameters enabling a proper assessment as to whether we are managing our forests sustainably. The current state of information on forests and trees outside forests is summarized below:

Forest Resources

8. The recorded area of reserved forests in the State is 11,309 km^2 or about 29.1 percent of the state's geographical area. However, the actual forest area including those outside the reserved forests and trees outside forests is much more. As per the 2015 assessment made by the Forest Survey of India, the total area under forests including plantations is 19239 km^2. However, the extent of very dense forests is only 1523 km^2, or just about 8 percent of the forest cover. On the other hand open forests account for 8415 km^2 or 44 percent of the forest cover. A comparison with the previous assessment in 2013 indicates a significant increase in the extent of open forests and a decline in the area under dense and moderately dense forests. Such decline is a cause of concern considering that this negatively affects many of the important forest functions, including watershed protection, biodiversity conservation and carbon sequestration.

9. Considering just the percentage of area under forests, Kerala is in a relatively comfortable situation. However, considering the very high population density, forest resources available on a per capita basis is very unsatisfactory in comparison with the overall situation in the country.

Trees Outside Forests

10. The ecological conditions in Kerala are highly favourable for tree growth and tree growing has been an integral component of land use in the State. Trees outside forests cover very diverse land uses including agricultural plantation crops, home gardens, farm forestry, sacred groves, urban green spaces a significant share of which is in private lands. The home gardens have become an important source of wood and other products. Further a large quantity of wood is produced from rubber plantations. The extent of trees outside forests is estimated as about 11,073 km^2 (see Table 1).

Figure 2 *Forest map of Kerala*

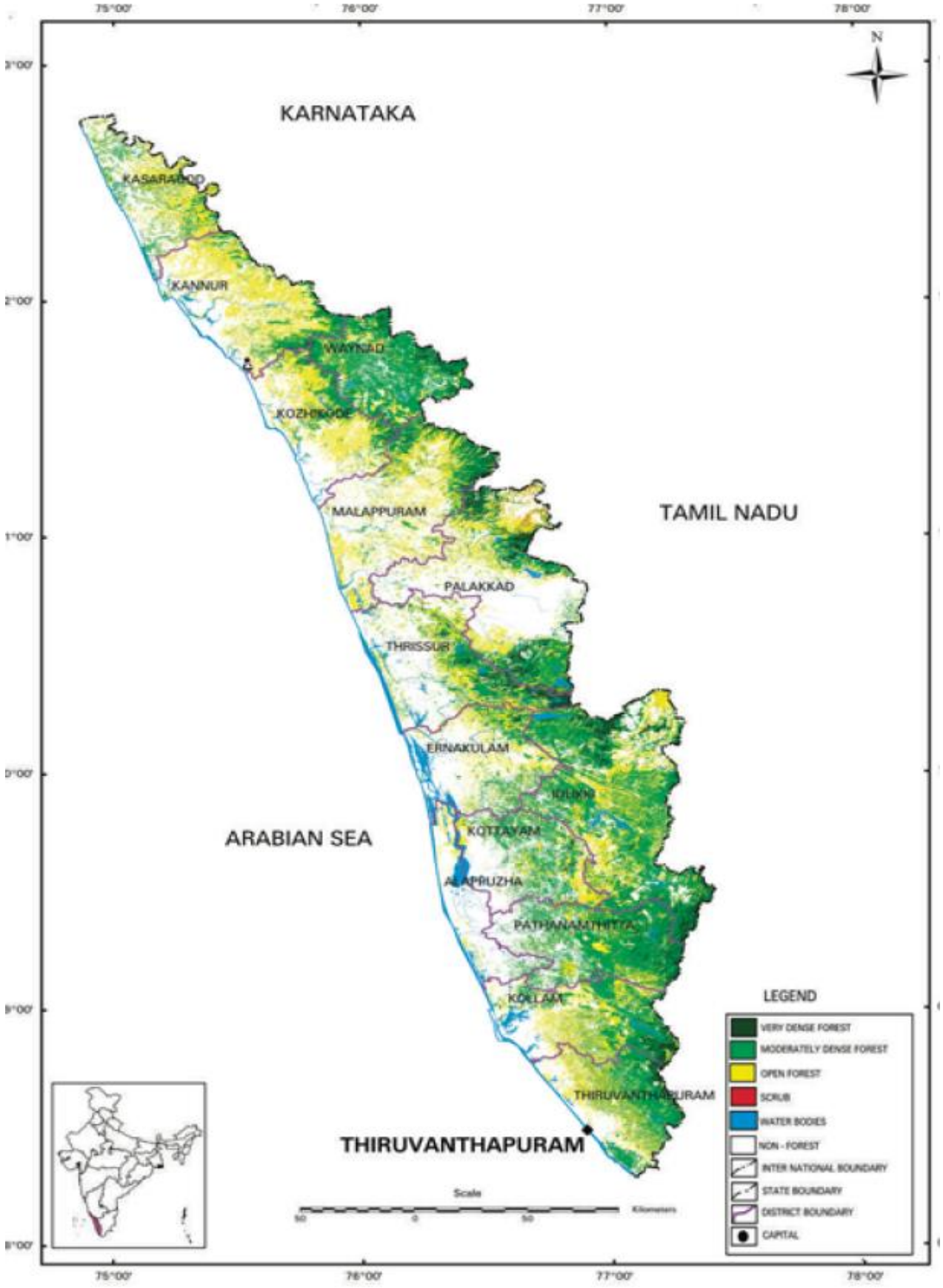


Table 1 *Forest cover outside recorded forest area (TOF)* in sq. km

Type of forest	**Area**
Very dense forest	249
Moderately dense forest	4,744
Open forest	6,080
Sub Total	**11,073**
	(28.49%)
Tree cover	2,950
Forest cover + tree cover	**14023**

11. Home gardens are unique in many respects and have been an integral part of the land use and culture of Kerala. Trees constitute the dominant component of home gardens fulfilling a wide array of functions. Home gardens along-with rubber plantations have become the most important source of wood supply in the State, which is estimated to account for 82% of wood supply (46.6 percent of wood supply is accounted by rubber estates and 35.3 percent by home gardens. Forests account for only 1.6 percent of the state's wood supply.

12. Several factors have negatively impacted the supply of wood from sources outside the forests. Home gardens are undergoing major changes on account of fragmentation and the rapid growth of the real estate sector, resulting in removal of trees, thus undermining long term wood supplies. However with appropriate interventions – especially removing the policy and legal disincentives for growing trees– there is enormous scope for increasing wood supply from home gardens. As some of the traditional agricultural crops become less profitable, a number of tree crops could become more attractive as a source of income. In fact the share of home gardens in wood production could be increased significantly and to that extent management of public forests could be much more geared to provision of ecological services.

CHAPTER 2
THE TWELFTH FIVE YEAR PLAN

Report of the Working Group

13. The Twelfth Five Year Plan provided a comprehensive approach to the development of the State's forestry sector, outlining a clear vision of how forests are to be managed. In particular the Working Group on the sector emphasized the following:
    1. The immense value of the forests as a store house of biodiversity requiring the highest degree of protection from further degradation. Commercial interventions are to be minimized especially through promoting production of forest products outside the forest areas.
    2. In the context of increasing decentralization in governance, the Forest and Wildlife administration needs to fine-tune its strategies and approaches to encourage greater public participation.
    3. The tangible benefits from forests alone should not be the criteria for valuing the forest resources. Instead intangible or ecosystem services provided by these resources should be taken into account while computing revenue generated from them. Such a perspective would call for new and innovative methodologies for valuation of forests and wildlife.
    4. The Working Group pointed out that the most inalienable and extensive common property resource in Kerala is forests. They are essential for the physical continuity of the State. The forest eco system functions are more important than the raw materials obtained from them.

14. The Working Group specifically highlighted the importance of forests in providing stable supply of clean water and noted that:

> "Water is the most important product of the forests having great significance in the daily-life of the people. The quality and quantity of water downstream is determined by the health of forest resources upstream. Catchment protection is a pre-requisite for most of the developmental activities in sectors like agriculture, power, irrigation, inland fisheries, soil conservation, etc.…The forestry sector has the opportunity to attract resources from these sectors and it should be obligatory to include catchment treatment as part of the sectoral plans and projects of other sectors. A pro-active approach in protecting catchments would save spending of scarce resources in other sectors.

15. In particular the Working Group emphasized on the following:
    1. Adoption of new approaches to the management of biological resources.
    2. Need for landscape level planning; and
    3. Modernization of the Kerala Forest Department.

Major Schemes and Outlay

16. During the 12th Plan the total outlay for the sector was Rs 1408.6 crores. Table 2 lists the important schemes and programmes and the outlay for each. Although the outlay proposed was Rs 1408.61 crores, the approved outlay was only Rs 1,008.8 crores and as of August 2016 the expenditure has been Rs 581.36 crores as indicated in Table 3.

Table 2 *Important schemes/programmes and resource outlay*

Sl. No.	Schemes/ Programmes	Outlay proposed (Rs in lakhs)
1.	Management of Natural Forests	33,474.50
2.	Biodiversity Conservation and Management of Protected Areas	8,861.50
3.	Management of Plantations	16,875.00
4.	Non-wood Forest Products	2,675.00
5.	Infrastructure	19,870.00
6.	Eco-tourism	1,560.00
7.	Resource Planning and Research	4,212.50
8.	Human Resource Development	3,810.00
9.	Extension Forestry, Private Forestry & Participatory Habitat Management	5,285.00
10.	NABARD-RIDF	6,000.00
11.	IFM State Share	1,134.38
State Total		**103,757.88**
Centrally Sponsored Schemes		
12.	50% CSS	9,625.00
13.	IFM Central Share	3,403.13
14.	100% CSS	20,280.00
15.	ACA	1,250.00
16.	XII & XIII FCA	2,545.00
CSS Total		**37,103.13**
Grand Total		**140,861.00**

Table 3 *Year-wise outlay and expenditure*

Year	Outlay proposed by the department in the Draft XII FYP	Approved Outlay in Annual Plan	Expenditure	Percentage
	(Rs in lakhs)			
2012-13	28178.20	15222.04	12747.59	83.7
2013-14	28344.20	17025.01	11668.45	68.5
2014-15	28313.20	20632.18	14381.28	69.7
2015-16	28133.20	19853.02	14426.40	72.7
2016-17 (up to 31st August 2016)	27892.20	28150.00	4912.81	17.4
Total	**140861.00**	**100882.25**	**58136.53**	

17. The Department implemented the following Central Sector Schemes:
    1. Management of Protected Areas (Sanctuaries & National Parks) implemented by the Wildlife Wing of the Department.
    2. Wetland Conservation implemented by the Social Forestry Wing of the Department.
    3. Intensification of Forest Management Scheme intended mainly for activities relating to Forest Protection, and implemented by the Development Wing of the Department.
    4. Schemes under the National Afforestation Programme implemented by the Eco-development and Tribal Welfare Wing of the Department.

18. An over view of the performance in the implementation of central sector schemes is as follows:

Table 4 *Outlay, allocation and expenditure of CSS*

Year	Central assistance provision in the XII FYP	Actual central assistance received	Expenditure
		(Rs in lakhs)	
2012-13	37,103.15	4985.525	3840.13
2013-14		1793.45	1860.67
2014-15		3081.69	2918.17
2015-16		2375.66	2309.80
2016-17 (up to 31st August 2016)		987.727	36.60
Total	**37,103.15**	**13224.052**	**10965.37**

Implementation of NABARD RIDF Schemes

19. The Department has also implemented a number of schemes under the NABARD RIDF (Rural Infrastructure Development Fund) as indicated in Table 5:

Table 5 *NABARD – RIDF Schemes implemented*

Year	Provision in the XII FYP proposal	Budget Provision	Release through LoC/GO	Expenditure
		(Rs in lakhs)		
2012-13	6000.00	600.00	349.99	349.99
2013-14		1600.00	705.017	693.96
2014-15		2500.00	897.915	812.57
2015-16		2500.00	789.783	789.78
2016-17 (up to 31st August 2016)		4200.00	1545.48	1545.48
Total	**6000.00**	**11400.00**	**4288.185**	**4191.78**

20. The NABRD-RIDF included forest road works, construction of forest stations, establishment of forest station complexes, wildlife tourism information centre and wildlife interpretation centre, strengthening of existing forest stations, solar fencing, construction of boundary walls etc.

21. In implementing the 12th Plan a number of problems or gaps have been identified as indicated below:
    1. Late release of funds in respect of the central sector schemes;
    2. Delays on account of the insistence of ways and means clearances by the Finance Department;
    3. Delay in the release of LOC.

22. Insufficiency of funds under the appropriate budget heads is another important difficulty in the implementation of different schemes/ programmes. Despite the recommendations of the subject committee no action is taken to provide additional funds.

23. The Working Group was unable to make any proper assessment of the outputs and outcomes partly due to the limited time and the fact that the system of monitoring and evaluation is far from satisfactory. On the whole, notwithstanding the forward looking proposals in the 12th Plan, the state of the forestry sector remains unsatisfactory and a wide array of challenges are faced in meeting the needs of people in the State.

CHAPTER 3
SWOT ANALYSIS OF THE SECTOR

24. It was in this context that the Working Group made an effort to undertake a very preliminary SWOT analysis of the sector during its first meeting held on 26 October 2016.Some of the important issues that came out of the SWOT analysis are synthesized below:

Table 6 *SWOT Analysis of forestry sector in Kerala*

Strengths	**Weaknesses**
1. Sound legal framework for forest protection. 2. Qualified personnel 3. Very diverse forests that could fulfill a wide array of functions 4. Reduced pressure on forests for timber extraction, especially in the context of better income earning opportunities. 5. Trees outside forests a major source of wood supply	1. Institutional deficiencies that prevent the development of a learning organization capable of meeting the changing needs of an evolving society. 2. Outdated legislation that negatively affects people's involvement in forest resource management. 3. Low and declining productivity of plantations. 4. Inability to replicate success models. 5. Forest degradation and increase in the proportion of open forests affecting many critical forest functions. 6. Poor monitoring and evaluation. 7. Increasing incidence of human-wildlife conflicts. 8. Failure to carry out timely operations largely due to acute shortage of labour. 9. Poor linkage between research and research application. Many of the field practices are outdated.
Opportunities	**Threats**
1. Growing public concern about forest conservation, especially in the context of water scarcity. 2. Commitment to address climate change and forestry being recognized as an important component in climate change mitigation and adaptation strategy. 3. Potential for resource mobilization taking advantage of CSR requirements. 4. Long tradition of tree growing in the State. 5. Experience in participatory approaches to forest management. 6. Well established Panchayati Raj institutions and the capacity for local level resource management. 7. Increasing importance of amenity values and the rapid growth of ecotourism 8. Technological developments reducing costs and improving monitoring and assessment.	1. Acute resource scarcity implying that long term conservation needs are given low priority in the context of short term priorities. 2. Difficulties in balancing conservation and development priorities. 3. Worsening human-animal conflicts is creating antagonism against conservation and sustainable management of resources. 4. Costs and benefits are assessed from narrow perspectives accentuating conflicts. 5. Increasing frequency and severity of fires, partly accentuated by climate change and partly due to increased human interventions.

25. As indicated earlier, the 12th Five Year Plan had envisaged a number of forward looking initiatives. However there were several disconnects between the broader objectives and the programmes and schemes, which led to the pursuit of a "business-as-usual" approach. More fundamental is the inability to bring about substantial institutional innovations, especially in the Forest Department, in

line with the changes in functions and priorities. A shift towards giving priority to the provision of ecological services would entail that the programmes and schemes are recast and necessary changes are brought about in the structure focusing on timely and efficient delivery of the services ensuring wider stakeholder participation.

A Vision for the Future

26. Several factors are collectively bringing about changes in Kerala and society-forest interaction is undergoing significant changes. The demand for ecological services, especially water, is bound to increase significantly. Kerala's economic and ecological vulnerabilities are expected to increase especially in the context of climate change. As one of the most important land uses, the management of forests needs to be reoriented to enhance ecological services, in particular water, so that Kerala continues to be a livable place.

27. Historically forests have been managed focusing on wood production and the State has a long history of scientific management. Timber was considered as strategic commodity and forest policies, institutions and legislation have been largely geared to produce timber as also to increase the revenue to government. There has also been significant diversion of forests to meet the needs of other sectors. Provision of environmental services – especially watershed protection - were largely accomplished incidentally and not based on any systematic and focused interventions.

28. All over the world there is increased recognition of the importance of forests in providing a stable supply of clean water. Forests act as giant sponges, soaking up rainfall during the rainy season and releasing it during the dry months. Several studies have proved the critical role of forests in water conservation. About 75 percent of the usable water supply in the world comes from the forests. Although forests in Kerala account for only 29 % of the land area, the very fact that these are located in the Western Ghats and on the steep slopes, they are vital to ensure regular water supply to the entire state. Almost all the irrigation, drinking water and hydel projects in Kerala are dependent on water originating from forests. Any reduction in water flow, especially during the summer months tend to have severe negative impacts. It is in this context that management of forests will focus on producing a stable yield of clean water.

"Water for a Thirsty Kerala" – The Focal Theme for the 13th Five Year Plan

29. Considering the precarious situation confronting the State as regards availability of water and the fact that forested catchments are the most important sources of supply of clean water, it is time that the forestry sector focuses on this critical role forests. The 13th Five Year Plan will hence adopt the theme, "**WATER FOR A THIRSTY KERALA**" as the main thrust area. By the end of the 13th Five Year Plan, Kerala will have the best scientifically managed forests ensuring a stable supply of clean water to its people. In the process it will also fulfill other important ecological functions, especially biodiversity conservation, carbon sequestration and amenity values.

Adoption of a Landscape Approach

30. In the pursuit of providing clean water for the people of Kerala, forest management will pursue a landscape approach, ensuring that various forestry practices are integrated with other land uses such that they are mutually complementary. Forest management will adopt a watershed approach and each watershed will be managed to provide the optimum yield of water and other ecological services. Local bodies will play a key role in facilitating the adoption of a landscape approach especially as

watershed approach is widely adopted in areas outside forests. There are several initiatives by local bodies to adopt a watershed approach and every effort will be made to ensure that what is done in forests is integrated with outside forests.

Key Programmes

31. While water security will remain the focal theme of the 13th Five Year Plan, it is important to ensure that forests also fulfill other important social, economic and ecological functions. Forests under government control will be managed primarily for their public goods functions – water security, biodiversity conservation and amenity values as also to fulfill social objectives like improving the livelihood of forest dependent communities. The following are the key programmes proposed for implementation during the 13th Five Year Plan.

    Programme 1: Management of natural forests for improved water yield and quality.
    Programme 2: Biodiversity conservation and management of protected areas.
    Programme 3: Sustainable ecotourism.
    Programme 4: Management of human-wildlife conflicts.
    Programme 5: Rationalisation of management of forest plantations.
    Programme 6: Trees outside forests including home gardens and urban forestry.
    Programme 7: Improvement of livelihood of forest dependent communities.
    Programme 8: Improvement of forest governance.

32. The first three programmes will focus on the provision of ecological services. Enhancing wood production and improved carbon sequestration will be addressed through programmes 5 and 6. Of course improving ecosystem health as envisaged under programmes 1 and 2 will also have a direct positive impact on carbon sequestration helping Kerala to contribute to the NDCs as per the Paris Agreement. Programme 4 has been specifically designed to address the worsening human-wildlife conflicts in the State. Livelihood aspects, especially of forest dependent communities will be addressed by programme 7. Implementation of other programmes will also help in improvement of livelihood of forest dependent and forest-fringe communities, especially by enhancing employment opportunities. The governance improvement programme will be a an over-arching programme focusing on improvements in the policy and legal framework, strengthening the institutional arrangements including participatory forest management approaches, increased involvement of local self-government institutions in forest and tree resource management, strengthening the human capital and improvements in the physical capital including infrastructure, communications, etc. A broad indication of what is proposed under each programme and indication of the outlay required is provided below:

Programme 1: Management of natural forests for improved water yield and quality

33. It is an accepted fact that forested watersheds enhance the stability and quality of water supply. Forests absorb water like a huge sponge, enhances percolation and recharge of ground water, releasing it slowly over a longer period enhancing the base flow during the summer months. Almost all the water required for irrigation, domestic use, power generation and industrial use in Kerala are entirely coming from forested areas. Several studies elsewhere in the world suggest that the "green infrastructure" in the form of forests are more cost effective in providing clean water than the "grey infrastructure" like water treatment plants. Unless the green infrastructure is improved, the life of the grey infrastructure like dams, canals and pipe lines will be significantly reduced on account of siltation. Given the unique climatic and geo-morphological conditions, the role of forests are

particularly important to conserve water and soil. Under this programme a watershed based approach to manage forest resources will be implemented ensuring that the objective of assured supply of clean water to all the people of Kerala is given primacy. The following will be the main approach that will be pursued:

1. All the watersheds within forests will be identified and classified adopting any of the existing to existing systems of watershed classification. The Green India Mission is already pursuing a three-tier approach identifying landscapes, sub-landscapes and micro-landscapes and this will be mainstreamed into Programme 1.
2. A system for assessment of each watershed as regards their ability to improve water quality and yield will be developed and a range of management protocols will be developed for adoption starting with the most critical watersheds.
3. Restoration and rehabilitation will be undertaken in degraded forest areas.
4. Environmentally appropriate water retention structures – especially check dams - will be built to enhance percolation and water storage.
5. Riparian forests will be demarcated and specific efforts will be made to protect them to enhance their ability to improve river/ stream bank stability.
6. Fire protection to prevent watershed degradation: Fire protection will cover the entire forests in the State and this will include mapping vulnerability to fires, and effective preventive and control measures.

34. This programme will primarily focus on open and degraded watershed forests (whose extent is estimated as about 6080 km2) and during the 13th plan it is proposed to cover about 1000 km^2 (1,000,00 ha.) or annually 20,000 ha. Depending on acquisition of skills and expertise and funding, the programme will be scaled up to cover a much larger area. Every effort will be made to ensure forest watershed management is linked to watershed management in the adjoining land outside forests through establishing strong coordination arrangements with other agencies, especially by the Panchayats and other institutions.

35. Appropriate management practices will be adopted to improve the health of natural forests which will include rehabilitation and restoration and implementation of eco-friendly water and soil conservation practices. A system of regularly monitoring water quality and yield including seasonal and yearly changes will be put in place.

36. The total cost of the programme 1 during the plan period is estimated as Rs 1015 crores as indicated in Table 7.

Table 7 *Indicative outlay for implementing Programme 1*

Sl. No.	PROGRAMME/ SUB PROGRAMME	Projected Outlay (in crores)					
		2017-18	2018-19	2019-20	2020-21	2021-22	Total
I	**Management of natural forests for improved water yield and quality**						
1.1	Watershed classification, mapping and assessment	20	35	45	30	20	150
1.2	Restoration and rehabilitation of watersheds (Green India Mission 60:40)	30	80	100	100	100	410
1.3	Water retention improvement structures	30	50	60	60	50	250
1.4	Riparian forest protection and improvement	15	20	20	25	20	100
1.5	Forest fire protection	10	20	25	25	25	105

Sub-total	**105**	**205**	**250**	**240**	**215**	**1015**

Programme2: Biodiversity Conservation and Management of Protected Areas

37. The forests in Kerala form part of one of the 32 biodiversity hotspots in the world and conservation of the rich biodiversity, especially through the network of protected areas that have already been established, will be another key objective of the 13th Five Year Plan. Improved biodiversity management will help to reduce long term economic and ecological vulnerabilities, ensuring that the unique plant and animal wealth are sustainably managed for the economic development of the State. The State has a well-established system of protected areas (consisting of 15 sanctuaries, 5 national parks and one community reserve (see Box 1) with a long history of management. Efforts during the 13th Plan will focus on the following:

Box 1: List of protected areas

Wildlife sanctuaries

1. Neyyar wildlife sanctuary
2. Wayanad wildlife sanctuary
3. Idukki wildlife sanctuary
4. Peechi- Vazhani wildlife sanctuary
5. Peppara wildlife sanctuary
6. Shendurney wildlife sanctuary
7. Chimmony wildlife sanctuary
8. Aralam wildlife sanctuary
9. Chiinnar wildlife sanctuary
10. Thattekkad bird sanctuary
11. Mangalavanam bird sanctuary
12. Kurinjimala sanctuary
13. Chulannur Peacock sanctuary
14. Malabar wildlife sanctuary
15. Kottiyoor wildlife sanctuary

National parks

16. Eravikulam national park
17. Silent Valley national park
18. Anamudi Shola national park
19. Mathikettan Shola national park
20. Pambadum Shola national park

Community Reserve

21. Kadalundi-Vallikkunnu community reserve

38. *Habitat improvement.* Habitat improvement will be the thrust are of interventions and will focus on continuation of on-going programmes in particular water conservation, weed control to enhance fodder availability for wild animals and fire protection.

39. *Strengthening anti-poaching efforts.* Anti-poaching efforts will be strengthened which will include improvement of communication and transport facilities.

40. *Management of special ecosystems.* Kerala forests support a number of unique ecosystems which needs special protection. Shola forests represent a unique ecosystem in which the prominent destructive element is fire. Effective protection measures are necessary to preserve this ecosystem. Similarly the

sandal areas in Marayuras also in Attappadyneeds special efforts for conservation as these represent unique natural population of a very valuable species. There are other important ecosystems like wetlands, myristicaswamps and forest patches supporting regeneration of rare species like ebony, Gluta, etc.

41. *Special programme for RET species.* There are a number of Rare, Endangered and Threatened (RET) species of flora and fauna like NilgiriTahr, Lion Tailed Macaque, Grizzled Giant Squirrel, etc., found within and outside the protected areas. It is necessary to have special programmes, which will help in enhancing their population. As also it is necessary to develop a marine

42. National park at convenient location and also to establish a butterfly park.

43. *Acquisition of areas for corridors and voluntary relocation of villages from core areas.* There are many ecologically important areas under private ownership such as Pachakanam (PTR), KP Estates (Silent Valley NP) and Bonaccord Estate (Peppara) which need to be acquired for providing corridors to migrant fauna. Such acquisition is essential for ensuring territorial continuity and migrating corridors.

44. Further it is also proposed to undertake voluntary relocation of villages in the core zone of protected areas to forest fringes ensuring that this actually helps in the improvement of livelihood of forest dependent communities. Government of India has already approved funds to the tune of Rs.80 crores for voluntary relocation of 14 settlements in Wayanad sanctuary. Relocating villages to the forest fringes helps to reduce human animal conflicts and to improve access to various facilities, including education, health care, transport, etc. which are not available while people are living inside forests. The pros and cons of such relocation will be examined fully involving the concerned people and the programme will be implemented only if this is seen as beneficial to the communities. The relocated settlements will be provided all the amenities and the area vacated will be restored.

45. *Improved management of biosphere reserves.* Biosphere reserves help to integrate conservation with sustainable use at the landscape level so that the complementarities are fully tapped and conflicts minimized. Kerala has two biosphere reserves that harbor exceptional biodiversity, namely (a) Agasthyamalai Biosphere Reserve and (b) Nilgiri Biosphere Reserve. Every effort will be made to ensure that conservation and livelihood of people living in the areas adjoining are integrated and the development aspirations of local communities are accommodated in conservation efforts.

    1. *Agasthyamalai biosphere reserve.* Agasthyamala Biosphere Reserve was notified by Government of India in 12th November 2001, under UNESCO's Man and Biosphere programme. Total area of the ABR is 3500 km^2 which falls in the states of Kerala, Tamil Nadu & Karnataka. The area of Kerala Part of ABR is 1828 km^2. The area within the ABR includes the following: Neyyar, Peppara, Shendurney wildlife sanctuaries, Achenkovil, Thenmala, Konni, Punalur and Thiruvananthapuram territorial divisions and Agasthyavanam Biological Park Range.

    2. *Nilgiri biosphere reserve.* Nilgiri Biosphere Reserve was notified by Government of India in 1986. Total area of the NBR is 5520.4 km^2 which falls in the states of Kerala, Tamil Nadu & Karnataka. The area of Kerala Part of NBR is 1455.4 km^2. The forest Divisions coming under Nilgiri Biosphere Reserve are; Wayanad Wildlife Sanctuary, Silent valley National Park, Nilambur South (New Amarambalam, Karimpuzha), Mannarkkad (Attappady), Palakkad (Siruvani Reserved Forests), Nilambur North, (Chakkikuzhy, Kozhipara, Punchakolly, Ex.Karulai Range (NilamburKovilakom), Kozhikode (kuttyadi, Thamarassery, Vested Forests) andWayanad South (Kalpetta).

46. *Flagship species programmes.*

1. *Project tiger.* There are two Tiger Reserves, which receive financial assistance under the scheme. Main activities proposed in tiger reserves, in addition to regular habitat improvement activities and wildlife management activities would include special eco development programmes, tiger monitoring programmes etc.

2. *Project elephant.* Project Elephant Scheme intends to protect the elephant population and improve its habitat. It was introduced in the State from 1990-91 as a Centrally Sponsored Scheme. For the purpose of implementing the scheme, four Elephant Reserves (Wayanad Elephant Reserve, Nilambur Elephant Reserve, Anamudy Elephant Reserve and Periyar Elephant Reserve), have been created. Better protection and improvement of habitat of elephants and protection of people and their crops from elephant attacks are the objectives of the scheme. The major activities under taken through the Project Elephant scheme are the following:
    1. Better protection and improvement of habitat of elephants, acquisition of elephant corridors, establishing & maintenance of anti-poaching camp sheds, clearing protection paths;
    2. Improvement of support services including Monitoring Research and Training in connection with preparation of elephant related database, conducting nature camps, elephant day celebration, training mahouts, training to staff etc.;
    3. Captive elephant management and welfare activities.

47. *Wetland conservation.* Under this programme both mangrove and coral reef conservation and management is envisaged. The activities as regards mangroves, include survey, planting of mangroves, procurement of equipment and accessories required for management purpose, extension and awareness activities, entry point activities like sanitation, waste disposal mechanism and family health care activities, promotion of agro-forestry, removal of pollutants, alternate and supplementary livelihood, habitat improvement etc. In the case of coral reef conservation, activities will include survey of coral reef, creation of artificial reef, awareness programmes, infrastructure support, scientific studies, and documentation reporting and monitoring.

48. *Support to local self government institutions for biodiversity conservation.* Pioneering efforts have been made in Kerala to develop biodiversity registers at the Panchayat level and to promote biodiversity conservation at the local level. This needs to be supported and sustained so that biodiversity conservation becomes an integral component of the local development agenda ensuring that unique ecosystems and species outside the forests are conserved. Particular attention will be given to manage sacred groves, mangroves and wetlands.

Table 8 *Indicative outlay for implementing Programme 2*

Sl. No.	PROGRAMME/ SUB PROGRAMME	Projected Outlay (incrores)					
		2017-18	2018-19	2019-20	2020-21	2021-22	Total
2	**BIODIVERSITY CONSERVATION AND MANAGEMENT OF PROTECTED AREAS**						
2.1	Habitat improvement of protected areas	30	40	40	50	50	210
2.2	Strengthening anti-poaching efforts	8	10	10	10	12	50
2.3	Management of special ecosystems	10	10	10	10	10	50
2.4	Special programme for RET species	5	5	8	10	12	40
2.5	Acquisition of areas for corridors and voluntary relocation of villages from core zones	30	30	40	50	50	200
2.6	Improvement of management of biosphere reserves (60:40 CCS)	8	8	10	12	12	50
2.7	Flagship species programme (60:40 CSS)	5	5	8	10	12	40
2.8	Wetland conservation (100% CSS)	4	4	4	4	4	20
2.9	Zoological Park, Puthur and Wildlife Protection and Research Centre	6	8	8	5	3	30
2.10	Support to Local Self Government Institutions for biodiversity conservation	2	2	2	2	2	10
	Sub-total	**108**	**122**	**140**	**163**	**167**	**700**

Programme 3: Sustainable Ecotourism

49. Ecotourism is one of the rapidly growing sub-sector within the larger tourism sector and there is considerable scope for managing it sustainably ensuring that benefits from ecotourism primarily accrue to local communities. Ecotourism is a purposeful travel to natural areas to understand the cultural and natural history of environment, taking care not to alter the integrity of the ecosystem and providing economic opportunities that make conservation of natural resources beneficial to the local people. Ecotourism contributes to the conservation of natural areas by providing economic gains to the local people and revenues for the Government to preserve and manage natural areas. It utilises natural resources without undermining their ecological values. In several countries amenity values of forests, in the form of ecotourism, have become the major source of income to the forest departments as also to the local communities and forest management has been completely reoriented focusing primarily on ecotourism. As urbanization accelerates the quest to be closer with nature will become more providing a unique opportunity for the Department and this being a non-consumptive use can be easily integrated with the provision of other ecological services like watershed protection and biodiversity conservation. In fact ecotourism could become the major source of revenue supporting conservation of forests and enhancement of livelihood of local communities.

50. To take advantage of the potential of ecotourism a very systematic approach needs to be developed and a clear strategy need to be worked out. It is important to clarify the "Dos and Don'ts" so that

there are no opportunities for misinterpretation and the pursuit of ad-hoc approaches. In general the following will be the general principles that will be adopted:

1. Community based ecotourism will be practiced with economic benefits to the local communities.
2. Visitor security will be given top priority through trained community volunteers.
3. Environmental education will be an integral part of ecotourism activities.
4. Carrying capacity studies and environment impact assessment will be carried out scientifically.
5. Traditional building materials and green technologies will be employed in all the construction activities in connection with ecotourism.

51. *Development of new locations.* Locations of scenic beauty in forest areas will be identified and developed taking into their long term potential giving due consideration to nearness to urban centres, accessibility and more importantly the specific features of the site. In all these areas local communities will be involved in managing ecotourism sites. .Location specific strategies will be developed through seminars, workshops and by hiring of consultant/technical services. The Department will act as a facilitator helping local communities to develop and manage ecotourism sites.

52. *Marketing ecotourism products.* In marketing ecotourism products, the help of Tourism Department and various agencies operating in tourism sector will be utilised. Publicity materials will be developed utilizing the plan fund.

53. *Training of tribals in ecotourism management.* Kerala Forest Department has made substantial achievement in weaning away tribals and non-tribals from illicit activities and utilizing them for various conservation and management activities. For example, earlier offenders are now working in popular tourist places as guides, watchers, salesmen, entertainers, etc. This has been a major success story in Kerala at Periyar Wildlife Sanctuary, Vazhachal, Palaruvi, etc. This activity can be strengthened and broadened further in future. Capacity building of local youths will hence be a key action area for the Forest Department.

54. *Development of ecotourism circuits.* Environmental education is an essential element of ecotourism. Often visitors, especially from other countries visit many locations. For this purpose it is proposed to develop 10 ecotourism circuits during the XIII plan period. Basic facilities for stay, transportation and food would be provided as part of the programme.

55. *Promotion of local crafts.* Craft of tribal people is well known. They can make handicrafts out of bamboo and reeds and other local eco-friendly materials. Craft training centers, work places and eco-shops will be set up for the marketing of souvenirs. Substantial employment and income are expected out of this activity.

Table 9 *Indicative outlay for implementing Programme3*

Sl. No.	PROGRAMME/ SUB PROGRAMME	Projected Outlay (incrores)					
		2017-18	2018-19	2019-20	2020-21	2021-22	Total
3	**SUSTAINABLE ECOTOURISM**						
3.1	Development of a strategy and guidelines for ecotourism development in forest areas	0.5	0.8	0.7	-	-	2
3.2	Development of new ecotourism sites and linking them through ecotourism circuits)	5.0	6.0	7.0	8.0	8.0	34
3.3	Marketing of ecotourism products	1.0	1.0	1.0	1.0	1.0	5
3.4	Training of tribals in ecotourism management	0.5	0.5	O.5	0.5	-	2
3.5	Promotion of local crafts	0.6	0.8	1.0	1.0	0.6	4
	Sub-total	**7.6**	**9.1**	**10.2**	**10.5**	**9.6**	**47**

Programme 4: Management of Human – Wildlife Conflicts

56. Over the years there has been a significant increase in human-wildlife conflicts and this has led to a negative perception about conservation. Overlap of human and wildlife habitats especially during periods when food and water availability is low exacerbates the problem causing loss of life and property. Most of the conflicts are caused by a few species, especially elephants, wild boar, monkeys, giant squirrel, porcupine, etc. There is also an increase in crop damage attributed to peacocks. Although conflicts attributed to tiger are much less frequent, the flagship status of the species attracts a lot of attention.

57. A number of steps have been taken up to reduce human-wildlife conflicts. Most of this is focused on prevention, installing physical barriers – electric fences, stone walls, trenches, etc. – and to drive away animals when they intrude to human habitations and agricultural lands. Also a system of compensating those who have suffered damage to property and injury and death to people. However the increasing incidence of conflicts brings out the limitations of the present approach, which in a way amounts to "treating the symptom" and not addressing the more fundamental issues.

58. During the 13th Five Year Plan a long term strategy will be formulated and implemented focusing on the fundamental causes of human-wildlife conflicts. In particular the strategy will focus on:

59. *Improvement of wildlife habitats.*
    1. Assessment of the carrying capacity of habitats and how scientific management of animal habitats, giving due attention to the behavior of different species, could minimize conflicts.
    2. Identifying and classifying forest fringe areas into different vulnerability zones taking into account habitat conditions and population of conflict related species. For each of the vulnerability zone a package of practices will be developed and implemented.

60. *Preventive measures including physical barriers.* Cost effective and environmentally appropriate preventive measures will be deployed to reduce animal incursions to human habitations and agricultural areas. Considering that many of the infrastructure installed to prevent animal incursions fall into disrepair and becomes ineffective within a short time, a proper protocol for maintenance is institutionalized.

61. As such most of the preventive measures are focused on putting in place barriers against animal incursions. The overall strategy should adopt a broader perspective which may include:
    1. Minimize the overlap of animal and human habitats.
    2. Ensure that human habitations are not encroaching into animal habitats.
    3. Voluntary relocation of villages inside forests/ protected areas.
    4. More realistic determination of boundaries of protected areas.
    5. Establishing connectivity and corridors to enable easy movement of animals.

62. *Strengthening the Rapid Response Teams (RRT).* Currently Rapid Response Teams are operating in 8 locations. The Rapid Response Teams (RRT) will be strengthened by providing improved communication and transport facilities so that they are able to respond effectively and quickly in the event of any conflict.

63. *People's participation and early warning system.* It is proposed to constitute "Janakiya Jagratha Samithis" at the Panchayat level in areas more prone to human-animal conflicts. A system of tracking problem individuals as also species will be put in place and a system of SMS alert will be installed.

64. *A publically funded insurance scheme.* Every year the Forest Department is paying a huge compensation for wild-life inflicted damages. There is a need to ensure that adequate compensation is paid expeditiously to those who are affected by wildlife. Giving due consideration to economic viability, the feasibility of a publically funded insurance scheme will be assessed launched to provide timely compensation for loss of life and property to the affected people. Every individual/ household in the area vulnerable to wildlife damage is to be covered under the insurance scheme.

65. *Amendments to wildlife legislation.* There is an urgent need to review wildlife legislation and to bring about appropriate amendments for culling problem animals/ species that are causing widespread damage (for example wild boar). As such the legislation and its implementation are very rigid and give very little scope for science based interventions.

Table 10 *Indicative outlay for implementing Programme4*

Sl. No.	PROGRAMME/ SUB PROGRAMME	Projected Outlay (in crores)					
		2017-18	2018-19	2019-20	2020-21	2021-22	Total
4	**MANAGEMENT OF HUMAN WILDLIFE CONFLICTS**						
4.1	Improvement of wildlife habitats	3	3	4	5	5	20
4.2	Con63flict prevention measures	8	10	12	15	15	60
4.3	Strengthening of Rapid Response Teams	3	3	4	5	5	20
4.4	Development of early warning system with people's participation	2	2	3	4	4	15
4.5	Publically funded insurance scheme	15	20	20	20	25	100
4.6	Amendments to wildlife legislation	0.4	0.6	-	-	-	1
	Sub-total	**31.4**	**39.6**	**43**	**49**	**54**	**216**

Programme 5: Rationalisation of Management of Forest Plantations

66. Kerala has a very long history of establishment and management of plantations starting in the 1850s and the State boasts the existence of the oldest teak plantation in the world. Much of the early plantation efforts were focused on teak, aimed to ensure sustainable timber supply to the ship building industry. Because of its versatility and superior properties, teak has remained the most favoured species. Rapid increase in the demand for industrial raw material, especially pulp wood led to large scale forest clearance for establishing pulpwood yielding plantations, in particular eucalyptus.

67. Notwithstanding the long history and the enormous wealth of technical knowledge, there is a growing concern about the effectiveness of plantations on account of their very low productivity. Currently the extent of forest plantations in the State is 1477 km2.Rigidities in management are impairing the pursuit of intensive forest management and consequently the productivity is extremely very low. The Plantations raised under the World Bank aided Forestry Project have demonstrated that improved technologies and intensive management are capable of increasing the productivity

68. It is proposed to implement a comprehensive strategy for improving productivity of forest plantations particularly focusing on the most important species in the State, namely teak. Some of the thrust areas for the 13th Five Year Plan under this programme will include the following:
    1. The present area under forest plantations will be rationalized that poorly stocked plantations with very limited scope for productivity improvement will be reverted as natural forests.
    2. Intensive management practices will be adopted as regards plantations in good sites adopting appropriate silvicultural practices.
    3. Considering the potential for high value realisation plantations in good sites will be managed on longer rotations for production of large sized timber.
    4. Pulp industry oriented plantations will be re looked in to taking in to account the likely demand fall in the pulp industry.

69. *Improved management of plantations to enhance productivity.* The productivity of plantations will be improved by adopting modern technologies. Harvesting of plantations will be limited to the extent that could be successfully regenerated with appropriate site-specific species mix. The management of plantations will be gradually developed as an enterprise activity. Improved planting stock raised in root trainers and teak stumps obtained after culling will be used for planting. Special tending operations in older plantations will also be undertaken. During the XII Plan period, a number of planting stock improvement programmes was undertaken. These include raising Clonal Multiplication Areas (CMAs), Clonal Seed Orchards, Seedling Seed Orchards, Seed Production Areas and improved seed collection. A seed lab and certification unit is being maintained in collaboration with Kerala Forest Research Institute. It is proposed to continue these planting stock improvement programmes. Some of the activities proposed are:
    1. Raising and maintenance of teak and other hardwood plantations.
    2. Special tending operations of older teak plantations.
    3. Scheme for promotion of valuable hardwood timber species like Vellakil, Kambakom, Irul, Chadachietc.
    4. Soil and moisture conservation in Teak Plantations in younger years.
    5. Preparation and Implementation of Comprehensive Labour Management Plan for each Division.

70. *Indigenous fast growing species.* During the previous plans, emphasis was given to cultivate exotic pulpwood species like Eucalyptus and Acacias. It is proposed to cultivate indigenous pulpwood species with multiple uses also during this Plan period. Cane also be planted in natural forests.

71. *Industrial raw material.* Eucalyptus and Acacias are the main industrial raw material species planted. For better productivity clonal technology will be used. Acacia plantations will be managed for wood production for longer rotation after thinning. Eucalyptus for veneering also will be tried.

72. *Improved logging practices and marketing.* Present logging practices result in wastage of timber and other produce. During the previous plan period, proposals were included for improved harvesting and post harvesting methods, utilisation of waste and scientific logging and modernisation of timber industries. However, these activities could not be implemented. It is proposed to implement these activities during this plan period. Conventional method of auction sale has been changed to e-bidding and the approach followed in the case of hardwood will be adopted for industrial wood also. Depot infrastructure is proposed to be suitably modernised.

73. *Labour welfare and mechanization.* Forestry sector is increasingly experiencing labour shortages hampering field operations which are mostly seasonal in nature. Mechanization of forestry operations thus becomes inevitable. Remoteness, hard and rugged nature of the work area, coupled with insufficient wage rates, have contributed to even the traditional labourers deserting forest works. After a lapse of nearly 9 years, the wage rates have been revised with effect from 2011. Even then the general dearth of labourers continued with more severity in the 12th Plan period. In order to tackle this situation, labour management and welfare plans, and mechanisation for silvicultural works, logging etc. will have to be implemented. Mechanisation would call for maintenance of a skilled labour force even during off-seasons, with adequate provision for training.

Table 11 *Indicative outlay for implementing Programme 5*

Sl. No.	PROGRAMME/ SUB PROGRAMME	Projected Outlay (In Crores)					
		2017-18	2018-19	2019-20	2020-21	2021-22	Total
5	**RATIONALIZATION OF MANAGEMENT OF FOREST PLANTATIONS**						
5.1	Improved management of plantations to enhance productivity	10	15	20	25	30	100
5.2	Indigenous fast growing species	2	3	3	3	4	15
5.3	Industrial raw material plantations	2	3	3	3	4	15
5.4	Improved logging practices and marketing	2	2	2	2	2	10
5.5	Labour welfare and mechanization	3	3	4	5	5	20
	Sub-total	**19**	**26**	**32**	**38**	**45**	**160**

Programme 6: Trees Outside Forests Including Home Gardens and Urban Forestry

74. Trees make the most versatile renewable asset through their contribution to the social and economic well-being of the society and to the environmental and ecological stability. Tree based food sources such as fruits, leaves, spices, medicinal products offer livelihood and nutritional security especially to the small and marginal farmers of the state. Diverse kinds of non-timber tree products such as gums, resins, latex, fibers, essential oils, biofuels, fodder and medicinal products provide excellent economic leverage to tree farming. Quite often their ecological role outweighs the direct economic benefits. This is particularly true when the larger role of trees in the mitigation and adaptation of climate change is considered. The renewed awareness on the ecological and economic benefits from trees and their potential role in the provision of quality water and improvement of soil productivity calls for their large scale expansion.

75. *Trees outside forests*. By virtue of the prevailing congenial agro climatic conditions, Kerala is endowed with rich tree wealth. The major share of TOF is confined to the traditional home gardens of Kerala. These unique-self-reliant systems were rich in diverse tree species along with large number of non woody components. These unique land use systems were formed as result of generation of crop intensification. Trees constituted the dominant component of the home gardens with high functional diversity. Timber trees, fruit trees, fodder trees, medicinal trees, fuel wood trees were common in almost all the home gardens.

76. The recent FSI reports (2015) suggest 11073 sq. km area under TOF which is about 28.49 % of the state's geographical area. Interestingly this figure is more than the tree cover under the recorded forest area in the state (8166 sq. km; 21%).However there exists good scope for further expansion of tree cover in this sector. This can only be achieved by promoting the potential of tree cultivation as profitable land use option.

77. There has been considerable shift in the priority of tree species in the TOF sector. Studies by the Kerala Agricultural University have shown that the species preferences are in the order rubber, jack, teak, anjili, mahogany, nutmeg and matti. Bamboo is another preferred species in Kerala.

78. Major deterrent in the promotion of tree cultivation in the state is the lack awareness on the economic potential of tree cultivation and more importantly the absence of better understanding of the forestry value chains. With the exception of a few species, most tree growing in Kerala is incidental which grows naturally in the context of low intensity land use. Also tree growth outside forests is not managed sustainably and the rapid growth of construction has led to a significant decline of tree growth as they are removed to make space for buildings and other infrastructure. Regulations intended to prevent illegal logging from government forests have inadvertently created disincentives especially as the formalities for obtaining necessary approval imposes very high transaction costs.

79. Need of the time is to identify potential area of tree planting, prioritization of tree species, planting design, management of planted trees etc. Some of the priority considerations for the promotion of TOF sector in the State are listed below:
    1. Development of policy frameworks and operation guidelines for implementing National Agro forestry Policy, 2014 with particular reference to TOF:
    2. Establishment of tree grower's associations/ cooperatives, especially to improve marketing of timber and for implementation of certification programme.
    3. Simplifying tree cutting and transit rules:
    4. Development of farmer transferable agro forestry models:
    5. Improving farmers' access to quality planting material:
    6. Strengthening extension facilities:
    7. Development of facilities for the value addition of tree/tree products at regional level.
    8. Providing institutional credit and insurance cover to promote tree cultivation
    9. Applied and adaptive research support on various aspects for the expansion of TOF.

80. Although the home gardens and other non-forest areas produce large quantities of wood, much more than what is being produced from the forests, the potential remains far from fully utilized. A programme for improving wood production from the home gardens will be implemented involving the local self-government institutions and taking advantage of expertise from the Kerala Agricultural University and other institutions. Production of seedlings and other planting materials will be improved through active involvement of Kudumbasree units.

81. *Urban forestry*. As urbanization accelerates and more and more people start living in cities and towns, the need for providing green spaces for recreation and other amenities will increase significantly. Although green spaces are available within the corporation and municipality limits, no systematic efforts are being made to improve their condition and to enhance their amenity values. In the absence of any long term plan to develop and maintain urban green spaces, even what little is available is destroyed through unplanned urban expansion. Increasingly most of the urban centres are becoming "heat islands" having temperatures much higher than the surrounding areas. Heat islands tend to have a number of negative impacts, in particular increasing the energy demand and heat related illness and mortality.

82. Urban forestry is well developed in many countries helping to create very favourable living conditions reducing air and noise pollution and providing recreational opportunities. There are several examples of urban forestry development providing an indication of the best practices that may be adopted. During the 13th Five Year Plan the following activities will be undertaken as a joint effort involving selected Corporations/Municipalities.
    1. A master plan will be developed for urban forestry/ green space management in selected corporations/ municipalities taking into account the long term plan for the development of the corporation/ municipality.
    2. A guide for best practices appropriate to the conditions in Kerala will be developed outlining the technical, economic, social and ecological aspects of urban green space management.
    3. Selected Residents Associations will be provided technical and financial support to create urban green spaces in their neighborhood.

83. *Haritha Keralam Programme*. This is an umbrella programme marking the massive tree planting activity in connection with World Environment Day every year with the active participation of School children, college students, youth organizations, religious organizations , trade unions, journalists , Residents Associations, Panchayathi raj Institutions etc. Seedlings are produced and distributed by the Forest department. This programme will be continued in the XIII plan also.

84. *Kudambasree tree nurseries*. Kudambasree units will be given the necessary technical and financial support to establish and manage nurseries to supply the seedlings for all the planting needs. Those involved will be given the necessary training in all aspects of management of modern nurseries.

Table 12 *Indicative outlay for implementing Programme 6*

Sl. No.	PROGRAMME/ SUB PROGRAMME	Projected Outlay (in crores)					
		2017-18	2018-19	2019-20	2020-21	2021-22	Total
6	**TREES OUTSIDE FORESTS INCLUDING HOME GARDENS AND URBAN FORESTRY**						
6.1	Support for improvement of trees outside forests	5	7	8	9	11	40
6.2	Urban forestry	6	9	12	15	18	60
6.3	Haritha keralam programme	2	2	2	2	2	10
6.4	Kudumbasree nurseries	1	2	2	2	3	10
	Sub-total	**14**	**20**	**24**	**28**	**34**	**120**

Programme 7: Improvement of Livelihood of Forest Dependent Communities

85. Improvement of the welfare and livelihood security of forest-dependent communities is at the core of any programme for sustainable forest management. The extreme poverty conditions of the tribal

communities warrant that the Forest Department take the full responsibility for their all-round development, fully ensuring that their rights to land and forests are safeguarded. The following will be the main thrust of this programme:

1. Livelihood issues will be addressed with a view to reduce dependence on forests.
2. Non Wood Forest Products will be sustainable managed to provide employment and economic return to the tribal community.
3. Community Forest Resource Committees under the Forest Rights Act will be strengthened for efficient management of MFP.
4. Special skill up gradation and career guidance opportunities will be provided to the communities.
5. Drinking water needs of forest fringe villages will be fully met from the water sources in forests.

86. Key sub-programmes proposed to be taken up under this are as follows:

87. *Participatory Forest Management (PFM).* Although tribal population are highly dependent on forests for their livelihood and have an intimate knowledge about forests, this has not been fully taken to advantage to improve forest management helping to improve their livelihood. It is only during the last couple of decades that the strong symbiotic relationship between forests and forest dependent communities has been recognized. A healthy forest ecosystem is vital to the well-being of tribals as also a healthy tribal community is vital to better management of the forests. Over the years, several factors have altered the nature of forest- tribal community relationship. For a long time the Forest Department had taken the full responsibility for the welfare of tribals and this enabled the tribals to have a strong link with forest resources. However, once the responsibility for tribal development was assigned to specific departments (for example Tribal Department), the umbilical linkage became extremely weak, adversely affecting the tribal communities as also the forests.

88. Several efforts are underway to strengthen the people-resource linkages so that the livelihood of people are improved at the same time ensuring that the resources are managed sustainably and improved. The Forest Rights Act is a major step in this direction and there is an urgent need to ensure that rights of the local communities are restored. Increased involvement of tribals in forest management – including in restoration and rehabilitation, watershed improvement, plantation management, management of ecotourism, etc. provides immense opportunities to enhance their livelihoods. During the 13th Plan every effort will be made to ensure that tribal communities are fully involved in forest management and welfare of tribal people living within forests will be the primary responsibility of the Forest Department.

89. Participatory forest management will be made the norm wherever this is feasible. Previous three plans had emphasized PFM as a forest management strategy. Hitherto 390 VSS and 200 EDCs have been constituted. State Forest Development Agency, Kerala (SFDA) has 36 Forest development Agencies (FDA) as its members. Efforts will be made to involve VSS in forest plantation management, ensuring that a fair share of the benefits will go the VSS. Selected VSSs will be assigned plantation management and depending on the outcome of such pilot efforts, the coverage will be expanded.

90. *Eco-development Programmes.* Eco-development programme addresses People-PA interface issues through participative planning and implementation support to foster alternative livelihood and resource uses. This programme aims to generate greater cooperation of people for the conservation

of the PA by the delivery of well-targeted interventions through a process of site-specific micro planning and benefit sharing arrangements.

91. The Department is already implementing eco-development programmes in the Periyar Tiger Reserve; Chinnar, Neyyar and Parambikkulam Sanctuaries. It is proposed to continue the programme in the above sanctuaries and to extend the programme to the other the Pas and non-PAs.

92. *Hamlet development plan and appointment of Oorumithras.* A comprehensive socio-economic survey has been carried out in all the 725 tribal hamlets in the forest. Based on the survey a hamlet development plan will be developed taking in to account infrastructural needs and putting in to use the assets not in proper use. XIII plan will pool resources to fund the hamlet development plan.

93. Oorumithra is a trained tribal watcher or Beat Forest Officer specially trained to act as coordinator/ focal point for the hamlet development plan. The activities of different departments will be coordinated by Oorumithras. The plan will provide resources to support these officials.

94. Development and adoption of modern technologies of NWFP collection, value addition and marketing these activities are already being done by the tribals in forest areas. However, their contribution in terms of extent of involvement of tribal population and degrees of success varies a great deal in different parts of the state. This is largely due to dependency on Government schemes run by other departments, make foresters less enthusiastic in their efforts to involve tribals for their betterment through forest management practices. Through Community Forest Resource Management Committees NWFP management will be streamlined during the plan.

Table 13 *Indicative outlay for implementation of programme 7*

Sl. No.	PROGRAMME/ SUB PROGRAMME	Projected Outlay (InCrores)					
		2017-18	2018-19	2019-20	2020-21	2021-22	Total
7	**IMPROVEMENT OF LIVELIHOOD OF RURAL COMMUNITIES**						
7.1	Participatory forest management and enhanced involvement of tribals in forest management	8	10	10	10	12	50
7.2	Eco development programmes	3	4	5	6	7	25
7.3	Hamlet development programme and Oorumithra	15	15	20	25	25	100
7.4	NWFP collection, value addition and marketing	10	10	15	20	20	75
7.5	Medicinal plant nurseries	2	2	2	2	2	10
7.6	Farm forestry and support for environment friendly farming practices	5	7	10	10	8	40
7.7	Employment in specialized activities	2	2	2	2	2	10
	Sub-total	**45**	**50**	**64**	**75**	**76**	**310**

95. Most often the current practices of NWFP collection are unsustainable and destructive. Consequently several valuable medicinal plants have either become threatened, rare or endangered. This has resulted in increased imports of medicinal plants or the use of spurious ones that are ineffective. The sub-programme will create necessary awareness on this and impart training and other skills in sustainably managing the NWFP resources, especially medicinal plants, including collection and storage and value addition.

96. A beginning has been made to market NWFPs collected by tribals and VSS Committees after value addition through distribution centres called 'Vanasrees. Yet much work is needed to strengthen this activity. Lack of knowledge and support for marketing of various NWFPs collected by them cause substantial reduction in earnings. This is proposed to be addressed through capacity building of tribals to undertake marketing of various NWFPs.

97. *Raising of nursery of medicinal plants.* Many traditional tribal communities are aware of medicinal values of herbs, shrubs and trees of forests. It is therefore in the fitness of thing that tribals specially the ladies may be trained on raising nurseries of medicinal plants as also other natural species to be planted in forest areas for improving the degraded forest.

98. *Farm Forestry and support for environment-friendly farming.* Tribals are in possession of nearly 40000 acres of forest land for self-cultivation. Farming of valuable trees like teak, mahagony, etc. can be raised on field margins. By a system of providing annual payments based on tree credit card system, tree farming could be encouraged, providing income and at the same time helping to sequester carbon. A fund for this is proposed to be constituted under the 13th Five Year Plan. Agricultural practices adopted by many of the tribal communities are environment friendly with very limited use of external inputs as also fully taking advantage of local biodiversity. With appropriate training and technical support there is scope for improving productivity and to enhance resilience of farming systems. The scope for organic farming in tribal hamlets will be explored and necessary support in terms of marketing certified products from such farming needs to be explored.

99. *Employment in specialized activities.* Due to their knowledge and understanding of issues regularly confronted by Forest Department, the forest dependent communities can be engaged in a number of specialized activities as indicated below:
    1. Creation of elephant Scaring Squad,
    2. Maintenance of existing solar power fences.
    3. Rescue and rehabilitation of wild animals

Programme8: Improvement of Forest Governance

100. The Forest Governance improvement programme will be a cross-cutting programme aimed to support all the other programmes. Reorienting forestry to provide environmental services, in particular water, will require a thorough reinvention of the governance system. The structure of the Forest Department will have to be adapted to the new priorities which require very different technical and managerial skills. A comprehensive governance improvement programme will be launched, ensuring that by the end of the 13th Plan Kerala will have a highly modern, efficient forest governance system. The Forest Department will be modernized ensuring that they become efficient managers and facilitators in sustainably managing forests and trees, particularly focusing on the provision of ecological services, especially water. Some of the thrust areas of intervention will be as follows:

101. *Review and restructuring of the Forest Department.* Although there have been a number of changes in the functions and structure of the Department, to a large extent it has retained the colonial administrative framework. Many of the problems faced in managing forests sustainably stems from the inability of the structure to take up new functions in a changing socio-political and economic condition. The Report of the Expert Committee on the Modernisation of the Forest Department submitted in 2011 has listed 125 recommendations dealing with a wide range of issues. However it did not adequately address the need for basic structural changes required to transform the Forest

Department into a more modern technical organization. A high power committee will be appointed to assess the functional and structural changes required to make the Forest Department an efficient technical organization capable of meeting the emerging challenges in managing forests sustainably, especially for the provision of ecological services.

102. *Increased involvement of LSG institutions in forest management.* As the Panchayati Raj system plays an increasing role in socio-economic development, there is a need to have forestry decentralized and some of the responsibilities of forest management transferred to Local Self Government institutions. Appropriate guidelines and institutional arrangements need to be worked out and a pilot scale effort is made in this regard in selected Panchayats adjoining forests. As already indicated nursery management can be contracted out to Kudumbasree units. Already Panchayats are taking the lead in developing biodiversity registers. Most of the social forestry activities can be made the responsibility of grama panchayats. To enhance the involvement of grama panchayats in forestry it is proposed to attach an Environment Officer with each of the Panchayats.

103. *Consolidation of forests.* Consolidation of the forest areas and permanent demarcation of the forest boundaries are essential for effective management of the forests of the state. Kerala Forest Department has more than 13,000 KMs of forest boundary adjoining to habitations and other non-forest lands. Nearly 3500 KMs of forest boundary are yet to be surveyed and demarcated. It is proposed construct 35000 permanent cairns during the 13thplan to complete the boundary consolidation. For facilitating speedy survey which is a bottleneck in the boundary consolidation works, forest officers are being trained as "surveyors" as per the Kerala Survey and Boundary Rules.

104. *Review of rules and regulations*. Forest legislation in Kerala (and the rest of India) is still based on the colonial rules and regulations, largely focused on the principles of exclusion. Many of the rules – for example timber transit rules – are formulated with the objective of safeguarding forest resources under government management. However, these rules and regulations have undermined the interests of farmers and communities in planting trees. Also application of wild life protection rules in a blanket manner has led to an increase in the population of species like wild boar accentuating human-wild life conflicts. A more balanced approach is required ensuring that regulations are adapted to local specificities.

105. *Human resource development.* A key to the transformation of the Forest Department to a modern science based organization is human resource development, in particular training and orientation of staff. Timely training to the work force seldom happens. Trainings are often outdated. Application of science and technology is rarely fulfilled. The department has to take up many activities beyond the core competency of the staff. Technical support is lacking in executing engineering works and information technology related activities. Managing forests to improve water yield will require knowledge and skills very different from what the staff at all levels have now. Continuous up gradation of technical skills is lacking and research findings are seldom put in to practice.

106. The following measures are proposed to strengthen the human resources in the forest sector:
    1. *Establishment of the Kerala Forest Academy.* Kerala Forest Academy will be established integrating the present facilities in Arippa and Walayar and it will form a key centre of knowledge generation and capacity development in forestry in the State. The Academy will bring together the wide range of knowledge, integrating them to provide a strong foundation for discourse on a wide range of issues relating to technical, social and economic aspects of forestry. It will draw expertise from a wide range of disciplines and institutions including the Kerala Forest Research Institute, Centre for Water Resources Development and Management and the

Kerala Agriculture University. It will also become a centre for debate and discussion on policy issues relating to land use and forestry bringing together the views of different stakeholders. When fully developed, the Kerala Forest Academy will help in the fundamental transformation of the forestry and wildlife sector in the State.

2. *Accelerated training programme of Forest Department staff*. Already indicated the shift in the objective of forest management from the traditional functions to improving watershed values will require a total reorientation of all staff, in particular those at the field level. During the 13th Plan a programme of reorientation training programme will be organized to ensure that within the five year period all the staff are reoriented to the new tasks they have to fulfill. Key features of the programme are:
    1. Approximately 5000 staff, at all levels (in particular forest watchers, beat forest officers, section forest officers, deputy rangers, rangers, divisional forest officers) will undergo reorientation training, during the 5 years of the 13th Plan. This means that every year 1000 officials will be given the training.
    2. The duration of the training will be one month and every year 8 to 10 course will be organized, with separate custom-designed programmes catering to the specific needs of those at different levels.
    3. The course structure and contents will be designed and developed taking into account the duties and responsibilities of staff at different levels and the training will be imparted using the latest available pedagogical technology. The training will include principles and approaches to watershed management, interventions to improve water quality, conflict resolution approaches, communication skills, etc.
    4. The Kerala Forest Academy will take the full responsibility for organizing the training and the post-training of the training participants.
    5. Regular training programmes (at the beginning of the career and also in-service) will be organized by the Kerala Forest Academy to continuously upgrade knowledge and skills of all staff.

3. *Grant-in-Aid to Kerala Agricultural University to support the training and extension needs of KFD*.
    1. The Ministry of Agriculture, Government of India has identified the Kerala Agricultural University as one of the Institutions to start forestry education programme and accordingly, the College of Forestry was established in this University in 1986. Since then, the College of Forestry was functioning as a constituent college of the Faculty of Agriculture till 2012. However, considering the importance of forestry education, a separate Faculty of Forestry was constituted in 2012. The College presently is under this faculty.
    2. To cater to this requirement of trained man power in forestry sector, a four year B. Sc. (Forestry) degree programme was started in 1986 and a master's programme just preceded that. The college, over the years, has made steady progress on the academic and research fronts and has emerged as one of the leading forestry colleges in India. It has won several national level recognitions. Examples include the many ICAR-junior research fellowships awarded to the students of this college and a total of 31 of its alumni have been inducted into the Indian Forest Service/Indian Administrative service and many have been awarded prestigious international scholarships (e.g., Erasmus Mundus fellowship of the European Union). Our faculties also have been getting many national and international awards and recognitions.
    3. The college celebrated the silver jubilee of its founding in 2010-11. It is envisaged to transform the college into an international centre of excellence in tropical forest sciences in the ensuing years. In the backdrop of the above mentioned reasons, there is

a pertinent need to provide grant-in-aid to the College of Forestry under the Kerala Agricultural University as is being done by the line departments of Agriculture, Animal Husbandry, Fisheries etc. As a token provision, it is proposed to provide Rs 50 Lakhs annually during the 13thFive Year Plan.

107. *Improvement of infrastructure and communications*. Governance improvement will entail substantial investments in physical infrastructure. This will include completion of demarcation of forest boundaries, establishment of forest stations and enhancement of mobility and communications. Modern systems of fire prevention, detection and suppression will be put in place. Some of the activities proposed under this are as follows:
    1. *Forest stations*: The policy of the government envisages to cover the entire forest are under forest stations in the next five years. At present there are 114 forest stations and another 116 are proposed to be constructed during the next 5 years.
    2. *Mobility of staff*: The mobility of department staff is most important as far as protection of forests is concerned. The fleet size of forest department which includes jeeps and cars in additional to motor cycles, boats etc. is approximately 600. Of this, the number of jeeps and cars which are normally used for protection purposes is approximately 400. The vehicles need replacement in every fifth year because of the difficult terrain in which the vehicles run. Even by the existing stipulation of Government, a yearly replacement of 75 vehicles is needed to maintain the existing fleet strength in healthy condition.
    3. *Roads and buildings*. Infrastructure facilities like roads and buildings are important components for ensuring the success of the programmes. Presently the Department has 3015 buildings and approximately 4626.54 Kms of roads. Rather than forming new roads, the emphasis will be on maintaining the existing roads in good condition. Katcha roads will be converted to all weather roads by metalling and black topping wherever permissible. In the case of buildings also the emphasis will be on taking up special repairs to the existing ones and maintaining them in good condition. Housing colonies for staff and special forest townships are proposed to be taken up. Construction of forest station complex involving forest station as well as accommodation for staff, strengthening of forest stations by constructing picket stations and camp sheds in deep forests etc. shall be undertaken under the plan.
    4. *Communication facilities*.
        1. The existing wireless network in the KFD is not adequate enough to tackle the field requirements. Hence it is proposed to extend the existing wireless network by revamping the old wireless systems, getting new ones and also procuring sufficient wireless main sets, walkie talkies and other essential accessories.
        2. Old and existing wireless stations mentioned above are to be renovated. Wireless repeater units are to be installed in these stations to enhance the coverage. Necessary building renovation/construction is needed to develop these stations as control units. Additional repeater sets, power units, main antenna, towers etc. are to be procured. It is to be noted that the existing frequency being used shall be continued and the network expanded to cover all vulnerable areas.

108. *Development of data base and digitization of forest records including maps*. There is an urgent need to strengthen the data base on forestry and a system of collection, compilation and synthesis of policy relevant information is put in place. Currently a lot of information is collected in a fragmented manner and insufficient efforts are made to synthesize them and provide relevant feedback to planners and policy makers as also to those who are involved in plan implementation.

109. The FMIS and GIS capabilities will be strengthened to improve the planning and management ability. This will involve:
    1. Procurement of Hardware, Software, Peripherals, Accessories and Consumables
    2. Upgradation of software programmes on FMIS, MAS & GIS and strengthening for online access.
    3. Video conferencing facility down to division level
    4. Advanced training to GIS and other IT core-teams in well-qualified institutions.
    5. Data Collection including RS Data and Photographs.
    6. Generation of maps and their in house supply.

110. *Technology demonstration sites*. Considering the rapid improvement in natural resource management technologies, there is a need to continuously test, adapt and popularize new technologies. Especially when forests are managed for provision of environmental services like water, there is a need to constantly demonstrate the application of new innovations and how they affect forests and other land uses. Sensor technologies are improving, enabling continuous monitoring of ecosystem processes including nutrient cycles, carbon balance and so on. A wide array of practices could be adopted to regulate the flow of goods and services from forests.

111. To demonstrate the application of integrated resource management practices adopting a landscape approach, it is proposed to establish 3 large scale demonstration sites – 500 – 1500 ha. – which will become the centre of testing and demonstration of various technologies. Almost all the new developments – whether they be related to genetic improvement, water management, plantation growth, natural regeneration, soil and water conservation, trial of new species, application of improved silvicultural practices – will be applied in these demonstration sites and their impacts closely monitored. These demonstration sites will also have facilities to enable researchers to undertake specific studies.

112. *Environmental awareness programmes*. Increased public awareness is a pre-requisite for conservation and sustainable management of natural resources. The Forest Department will continue to support various environmental awareness programmes to mobilise public support and these will designed appropriately taking into account the needs and perceptions of the different stakeholders. A particular group that needs to be supported are school and college students. Already a number of initiatives are underway spearheaded by various governmental and non-governmental organizations. In this regard there is scope for programmes like "Kids to forests" and school adoption of micro-watersheds. There is a need to take the young generation to activities beyond just tree planting.

Table 14 *Indicative outlay for implementing Programme 8*

Sl. No.	PROGRAMME/ SUB PROGRAMME	Projected Outlay (In Crores)					
		2017-18	2018-19	2019-20	2020-21	2021-22	Total
8	**IMPROVEMENT OF FOREST GOVERNANCE**						
8.1	Review and restructuring of Forest Department	3	3	2	1	1	10
8.2	Support for LSG institutions to develop capacity in forest and tree resource management	4	4	5	6	6	25
8.3	Consolidation of forests	10	10	15	10	5	50
8.4	Review of rules and regulations	3	3	2	2	0	10
8.5	Human resource development, including the establishment of the Kerala Forest Academy and staff training programme.	10	15	20	20	15	80
8.6	Improvement of infrastructure	20	25	30	35	40	150

	and communications (under Rural Infrastructure Fund)						
8.7	Strengthening the data base and digitization of forest records including maps	10	15	20	20	15	80
8.8	Technology demonstration sites	5	5	6	8	6	30
8.9	Environmental awareness programme	5	5	5	5	5	25
	Sub-total	**70**	**85**	**105**	**107**	**93**	**460**

113. *Summary of resource requirements*. The total resource requirements for the 13th Five Year Plan is estimated as about Rs 3028 crores, as indicated in Table 15.

Table 15 *Plan outlay for forestry and wildlife 2017 - 2022*

Sl. No	Programme Name	Estimated outlay (In Crores)
1	Management of natural forests for water	1015
2	Biodiversity conservation and protected area management	700
3	Sustainable ecotourism	47
4	Management of human-animal conflicts	216
5	Rationalisation of management of forest plantations	160
6	Trees outside forests including home gardens and urban forestry	120
7	Improvement of livelihood of forest dependent communities	310
8	Improvement of forest governance	460
	Total	**3028**

114. The projected outlay during the 13th Five Year Plan is more than double the outlay proposed during the 12th Plan. It may be noted that the 13th Plan proposes a complete change from the traditional incremental approach to managing forest resources. An overhauling of the governance arrangements are integral to reorienting management towards the production of environmental services, especially water. Without the fundamental change in governance, the sector will not be able to fulfill the aspirations of the Kerala society and the outcome will be continuous deterioration of the condition of forests.

CHAPTER 4
OUTCOMES AT THE END OF THE 13TH PLAN

115. The programmes and sub-programmes proposed will bring about a major paradigm shift in the way forests in the State are managed. Considering the precarious situation being faced by the State as regards the current state of forests and the challenges stemming from climate change a major departure from the "business-as-usual" approach is absolutely necessary. Implementation of the programmes as indicated would help in the following:
    1. Water yield and quality will become the most important objective of forest management and there will be measurable improvement in water supply from the forests.
    2. Ongoing efforts to conserve biodiversity and scientifically manage protected areas will be further improved. Involvement of Panchayats and other institutions in biodiversity conservation will be strengthened.
    3. Emerging opportunities for ecotourism will be fully utilized, ensuring that there will be no environmental degradation and at the same time significantly improving the income opportunities for local communities.
    4. Science based interventions will help to significantly reduce the incidence of human-animal conflicts. Timely preventive measures as also a publically funded insurance programme will help to address some of the long standing issues stemming from the overlap of human and animal habitats.
    5. Plantation management will be rationalized focusing on the most productive areas and intensive management will enhance their productivity. Low quality plantations will be reverted as natural forests through a process of natural succession helping to improve the provision of ecological services.
    6. Tree resources outside forests, especially home gardens, will be improved enabling the production of timber and other products enhancing the income of land owners. Owners of land not used for agriculture will be supported to raise wood lots and all the necessary support will be extended through changes in rules and regulations, marketing support and certification. Urban green spaces will be managed to provide amenity values, especially to improve the urban environment.
    7. The Forest Department in collaboration with other relevant agencies will take full responsibility for improving the livelihood of forest dependent communities. They will be fully involved in the management of forests, including plantations, sharing the benefits from such management.
    8. Forest governance system will be completely revamped to develop an efficient and knowledge based organization that is responsive to the needs of a changing society. The functions and structure of the Department will undergo major changes, especially in the context of watershed improvement for clean water becoming the most important objective of forest management.

Output and Outcome Indicators

116. Table below provides an indication of the outputs and outcome indicators of performance arising from the implementation of the proposed programmes and sub-programmes

Table 16 *Output indicators and outcomes*

Programme/ Sub-programme	Output indicators	Outcome indicators
Programme 1: Management of natural forests for improved water yield		
1.1. Watershed classification, mapping and assessment 1.2. Restoration and rehabilitation of watersheds 1.3. Water retention improvement 1.4. Riparian forest protection 1.5. Forest fire protection	• Area and number of watersheds identified and mapped. • Maps indicating the state of vegetation and the extent of degradation • Area of the watersheds restored; • State of vegetation cover in the area restored and the changes thereof at intervals of one year, based on GPS/ geo-coded system of monitoring. • Number and length of check dams and other structures. • Water-spread area of check dams. • Depth and quality of water retained during different seasons • Area of riparian forests protected. • State of vegetation in the riparian forests. • Area restored/ rehabilitated • Number of fire incidences and the annual area burnt. • Monetary damage caused by fires. • State of vegetation in the area affected by fires. • Spread of fire-resistant species and decline in the area under fire tender species.	• Quality of water flowing from the forests. • Base flow of water in the streams/ rivers flowing from forests. • Health of forest ecosystem measured in terms of vegetative cover at different levels and state of forest soils.
Programme 2: Biodiversity conservation and management of protected areas		
2.1 Habitat improvement of protected areas Strengthening anti-poaching efforts 2.2 Management of special ecosystems	• State of habitats in terms of fodder, water availability, number of individuals and species. • Number of wildlife related offences. • Number of cases successfully prosecuted. • Area of special ecosystems that have	• Reports on the overall state of biodiversity in the State indicating a significant improvement in population of key species of flora and fauna. • Bench marking

	been brought under protection. • State of flora and fauna in the protected ecosystems	reports indicate improvement in the condition of all protected areas.
2.3 Special programme for RET species	• Number of species protected through the special programme for RET species. • Reports on the status of RET species at regular intervals. • Maps indicating the distribution of RET species covered by the programme.	• Measurable improvements in the state of biodiversity outside forests – number and area of sacred groves protected, number of rare varieties of crop and livestock species conserved.
2.4 Acquisition of areas for corridors and voluntary relocation of villages from cores areas	• Area acquired for creation of corridors. • State of vegetation in the area acquired for corridors. • Reports on restoration carried out in the corridors. • Number of villages and households resettled. • Land area given for resettlement and the area vacated.	
2.5 2.6.Improvement of management of biosphere reserves	• • Measurable improvement in the state of flora and fauna as also ecological processes in the biosphere reserves.	
2.7.Flagship species programme	Increase in the number of visitors. • Improvement in the population of flagship species like elephant and tiger.	
2.8.Wetland conservation	• Increase in the number and area of wetlands protected.	
2.9.Zoological park and wildlife protection and research centre, Puthur	• Fully established zoological park in Puthur. • Number of visitors to the park.	
2.10. Support to Local Self Government Institutions for biodiversity conservation	• • Biodiversity registers updated in all the Panchayats. Unique ecosystems identified and conservation measures initiated by Panchayats.	
Programme 3. Sustainable ecotourism	•	

3.1.Development of a strategy and guidelines for ecotourism development	• A long term strategy developed, discussed and finalized and made available. Guidelines on how ecotourism sites within forests are to be managed in accordance with existing rules and regulations clearly specifying the “Dos and Don’ts”. This will prevent arbitrary and subjective interpretations.	
Development of new ecotourism sites	• Ten new sites identified and developed as ecotourism sites with the necessary facilities. • Systems of management in place. • Increased income to local communities, especially tribals.	• Number of visitors visiting eco-tourism site increases and eco-tourism becomes one of the most important sources of income to local communities and government. • Bench marking of eco-tourism sites indicates improvement in the quality of visitor experience. • Reports on the impact of ecotourism indicates that there are no adverse impacts on ecological sustainability.
3.2. 3.3.Marketing ecotourism products	• Publicity materials prepared and made available. • Web-sites on new eco-tourism sites.	
Training of tribals in ecotourism management	• Training materials developed. • Number of tribals trained in different aspects of ecotourism management	
3.3.3.5.Promotion of local crafts	• Unique products which are integral to local culture identified. • Local artisans encouraged to develop and improve the products. • Outlets for unique products established. • Income from sale of local crafts enhanced	
3.6. Ecotourism circuits	• Ecotourism sites linked together and comprehensive packages developed for visitors. •	
Programme 4: Management of human-wildlife conflicts		
Improvement of wildlife habitats	• Measurable improvements in food and water availability in wildlife habitats. Reduction in the incidence of animal intrusions to human habitats.	• Reports on the number of incidences of human-wildlife conflicts indicates a
4.1. Conflict prevention measures	• Length of trenches/	

	solar fences/ and other preventive measures. • Reduced response time.	drastic decline in the number of incidences as also as regards the loss of life and property.
4.2. Strengthening of Rapid Response Teams	• Increased ability to drive animals back to forests.	• Increased awareness among the forest-fringe communities as regards conflict-avoidance.
4.3. 4.4.Development of early warning system with people's participation	• Number of villages/ area/ households covered by the early warning system • Insurance scheme launched.	
4.5.Publically funded insurance programme	• Increase in the number of people participating in the insurance scheme. • Timely compensation provided to those affected by wildlife.	• Existence of a very efficient, transparent and timely compensation system.
4.6. Amendments to wildlife legislation	• Rules and regulations revised and approved by the competent authority. • An effective system to control the population of wildlife that cause excessive damage developed and implemented. •	
Programme 5: Rationalization of management of forest plantations		
5.1.Improved management to enhance productivity of hardwood plantations like teak	• Strategy for plantation improvement finalized. • Best practices guidelines for plantation management developed. • Extent of plantations treated to improve productivity. • Change in the productivity measured in terms of mean annual increment. Changes in the characteristics of soil fertility.	• Health of plantations, including that of soil improves significantly as evident from measurements of parameters like soil nutrients, pest and disease infestation, fire incidence and quality of tree growth in terms of height and diameter.
5.2.Indigenous fast growing species	• Area planted with indigenous fast growing species. • Survival and growth of plantations.	• Improvement in productivity reaching the full potential as applicable to each site.
5.3.Industrial raw material plantations	• Area of industrial plantations treated for improving productivity. • Productivity of industrial plantations	
5.4.Improved logging practices and marketing	• Guidelines for reduced	• Higher level of carbon stock – both in the

	impact logging. • Number of people trained in reduced impact logging. • Condition of plantations after logging. • Reduction in the time lag between logging and sale of timber. •	vegetation and soil. • Increase in the share of contribution of forests in wood supply in the state.
5.5.Labour welfare and mechanization	• Improved productivity and higher wages for those involved in forest work. • Improved working conditions, including safety and health of forest workers. •	• Improved income and working conditions for forest labour.
Programme 6: Trees outside forests including home gardens and urban forestry		
6.1.Support for improvement of trees outside forestry	• Area/ number of trees planted in home gardens and other areas. • Increase in the diversity of species. Increase in the volume of trees outside forests	• Improvement in the extent of trees outside forests as reflected in tree density and diversity.
6.2.Urban forestry	• Number of Corporations/ Municipalities preparing strategies and action plans for development of urban green spaces. • Area of urban green spaces developed and increase in per capita green space. • Number of people using urban green spaces for their amenity values.	• Increase in the production of certified timber from home-gardens and private woodlots. • Increase in income from growing trees to land owners.
6.3.Harithakeralam Programme	• Number of schools and other institutions undertaking tree planting. • Area/ number of trees planted. • Area afforested/ reforested by local self-government institutions	• Improvement in the number and extent of sacred groves in the State.
6.4.Kudumbasree nurseries	• Number of kudumbasree units participating in the programme. • Number of seedlings produced and sold by Kudumbasree units. • Income generated	• Regular supply of high quality seedlings of all major species grown in home gardens and higher incomes to Kudumbasree members from the management of tree nurseries.

	through nursery management. •	
Programme 7: Improvement of livelihood of forest dependent communities		
7.1.Participatory forest management	• Number of new and active VanaSamrakshanaSamithis (VSS) • Number of members in the VSSs. • Area of forests/ plantations that are managed by VSSs. • Increase in income of VSS members.	
7.2.Ecodevelopment programme	• Area of tribal settlements brought under eco development programmes.	
7.3.Hamlet development programme and Oorumithra	• Number of hamlets with improved educational and health care facilities. • Number of Oorumithras appointed. Degree of access to better health and educational facilities.	• A significant improvement in the quality of life of tribals living within and adjoining forests in terms of higher incomes, access to various facilities and health of people. • Strengthened linkages between tribals and forests, enabling them to conserve and manage the resources sustainably fully benefitting from their traditional knowledge.
7.4.NWFP collection, value addition and marketing	• Increase in the quantity and value of different non-wood forest products collected. • Number of tribals trained in improved collection and processing techniques. • Branding and labelling of products and products covered under fair-trade certification.	
7.5.Medicinal plant nurseries	• Number of women groups establishing and managing medicinal plant nurseries. • Number of seedlings produced and sold. • Income accruing to women groups from sale of seedlings/ planting materials	
7.6.Farm forestry and support for environment-friendly farming practices	• Documentation of traditional ecologically appropriate farming practices. • Number of tribal farmers supported to	

	undertake ecologically appropriate farming practices. • Support to marketing of products from farms.	
7.7. Employment in specialized activities	• Number of tribals employed in specialized activities. • Income from specialized activities. •	
Programme 8: Improvement of forest governance		
Review and restructuring of the Forest Department	• Detailed plan for restructuring Forest Department prepared. • Improved delegation of responsibilities to lower level functionaries. • Effective monitoring of performance put in place. • Improved efficiency in implementing the different tasks. • Technical competence of staff, especially at the field level, improved significantly.	• A totally restructured department that is efficient, effective and responsive to the changing needs of society. • An increase in the production of goods and services – especially ecological services like clean water – from the forests. • A governance system that uses the most efficient tools and techniques. • New tools and techniques that help to manage forests sustainably are continuously developed, tested, refined and applied. • Increased involvement of local institutions in the management of forests. • A highly successful social mobilization in support of Greening and creating a carbon neutral Kerala
8.1. 8.2.Support for LSG institutions to develop capacity for forest management	• Number of Panchayats taking responsibility for management of forests and plantations. • Length of forest boundaries clearly demarcated on the ground through erecting cairns.	
8.3.Consolidation of forests	• Area of government forests that are clearly demarcated. • Maps indicating the boundaries of forests that have been demarcated on the ground indicating the coordinates.	
8.4.Review of rules and regulations	• Updated and improved rules and regulations that encourages improved protection and management of forest and tree resources.	
8.5.Human resource development	• Reports on the progress of establishment of the Kerala Forest Academy. • Number of staff who	

	have undergone training. • Reports on the post-training monitoring of trained staff. • Reports on the performance of staff. • Improved living and working conditions, especially for field staff.
8.6.Improvement of infrastructure and communications	• Reduced time to respond to emergencies. •
8.7.Strengthening the data base and digitization of forest records including maps	• Digitization of all forest records including maps completed. • Ready access to all key records. Improved ability to monitor changes in the state of forests and the different activities.
8.8.Technology demonstration sites	• Three large scale demonstration sites established and made operational to demonstrate the implementation of integrated forest management. • Guidelines on improved field practices. • Number of new adaptive and applied know-how developed, demonstrated and disseminated.
8.9.Environmental awareness programme	• Number of educational institutions participating in environmental awareness programmes. • Number of school/ college groups actively involved in the protection of local environment. • Successful social mobilization of people in support of forest conservation.

ANNEXURE 1

PROCEEDINGS OF THE MEMBER SECRETARY
STATE PLANNING BOARD

(Present: Sri V S Senthil IAS)

Sub: Formulation of 13th Five Year Plan – Constitution of Working Groups – reg.

Ref: Note No. 260/2016/PCD/SPB dated 06.09.2016 of the Chief (i/c), Plan Co-ordination Division, State Planning Board

Order No. 300/2016/AGRI(W6)/SPBDated:19.09.2016

As per the reference cited, State Planning Board has constituted Working Group on 'Forestry and Wildlife' to formulate the draft proposals in the sector for inclusion in the Thirteenth Five Year Plan.

The Working Group on **'Forestry and Wildlife'** is hereby constituted with the following members.

Co-Chairperson

Sri P MaraPandiyan IAS, Additional Chief Secretary, Forestry and Wildlife

Co-Chairperson

Dr C T S Nair, Former Forestry Expert of FAO, Sivagiri, MuthucadPuthenveedu P.O., Naduvathu, Wandoor, Malappuram-679328

Members

1. Sri K G Mohanlal IFS, Principal Chief Conservator of Forest(Forest Management)
2. Sri G Harikumar IFS, PCCF, Wild life
3. Dr T S Rajeev, Professor, Kerala Veterinary and Animal Science University, Wayanad
4. Dr U N Nandakumar,Senior Principal Scientist, Department of Silviculture, KFRI, Trissur
5. Dr E V Anoop, Professor and Head, Department of Wood Science, Collegeof Forestry, Kerala Agricultural University, Trissur
6. Dr A V Santhoshkumar, Professor and Head, Department of tree Physiology and breeding, College of Forestry, Vellanikkara, Trissur
7. Dr T K Kunhamu, Professor and Head, Department of Silviculture and Agroforestry College of Forestry, Vellanikkara, Trissur
8. Dr K P Ouseph IFS (Rtd.), Komayil House (54/3340) Royal Lane, Kadavantra P.O, Kochi-682020

Convener

Dr P Rajasekharan, Chief (Agriculture), State Planning Board

Co-Convener

Smt Dhanya S Nair, Assistant Director, State Planning Board

Terms of reference

1. To review the development of the sector with emphasis as to progress, achievements, present status and problems under its jurisdiction during the 11th and 12th Five Year Plan periods.
2. To evaluate achievements with regard to the plan projects launched in the sector, both by the State Government and by the Central Government in the State during these plan periods.
3. To list the different sources of data in each sector and provide a critical evaluation of these data sources, including measures for improvement.
4. To identify and formulate a set of output and outcome indicators (preferably measurable) for each sector and base the analysis of the previous plans on these indicators.
5. To develop policies for the conservation and preservation of forests, national parks, and wild life sanctuaries, policies in whose formulation and implementation local communities will actively be involved. The Group will deal with issues of human animal conflict in forest fringe areas. The

Group will deal with problems pertaining to the implementation and potential of forestry watershed projects, assess the demand for various wood products, forest –based as well as non-forest.

6. To suggest, in particular, a set of projects that can be undertaken during the 13th Plan period in the sector.
7. The Co-Chairperson is authorised to modify terms of reference with approval of State Planning Board. The Co-Chairperson is authorised to invite, on behalf of the Working Group, experts to advise the Group on its subject matter. The non-official members of the Working Group will be entitled to travelling allowances as are applicable to class I officers of the Govt. of Kerala. The class I officers of GoI will be entitled to travelling allowances as per rules if reimbursement is not allowed from Departments.
8. The working group will submit its draft report by 1st December 2016 to the State Planning Board.

Sd/-
Member Secretary

To

The Person concerned
The Sub treasury Officer, Vellayambalam

Copy to:-

The Accountant General, Kerala (A&E) with C/L
All Divisions, State Planning Board
PS to VC
PA to Member Secretary
Stock file

Forwarded by order
Sd/-
Chief (Agriculture)

PROCEEDINGS OF THE MEMBER SECRETARY
STATE PLANNING BOARD

(Present : Shri V S Senthil IAS)

Sub :- Formulation of 13th Five Year Plan –**Working Group on Forestry & Wildlife** –
Revised Proceedings- reg
Ref :- 1.This office order of even no. dated 19.09.2016

Order No. 300/2016/AGRI (W6)/SPB dated. 14.10.2016

State Planning Board, vide reference cited, has constituted a Working Group on "**Forestry & Wildlife**" to formulate the draft proposals in the sector for inclusion in the 13th Five Year Plan. This Working Group consists of 10 members including 2 co- chairpersons.

Hon'ble Vice Chairperson has suggested to include more subject experts / officials for facilitating the process. Shri P K Pathak IFS, APCCF (FBA), an expert in the planning process has participated in the Working Group meeting and is selected as the co-ordinator of the Drafting Committee of this Working Group.

In this circumstance, a revised proceedings is hereby issued by including Shri, P K Pathak IFS, Additional Principal Conservator of Forests as a member of this Working Group on Forestry & Wild life.

The order read as 1st above stands modified to this extent.

Sd/-

Member Secretary

To
Shri P K Pathak
APCCF (FBA)

Copy to :-
Sr. Administrative Officer, SPB
Chief (i/c), PCD
Stock File

Forwarded by order
Sd/-
Chief (Agriculture)