Meghalaya Basin Development Authority
Meghalaya State
Republic of India

Preparatory Study on Project for Community–Based Forest Management and Livelihoods Improvement in Meghalaya

Final Report

Advanced Version

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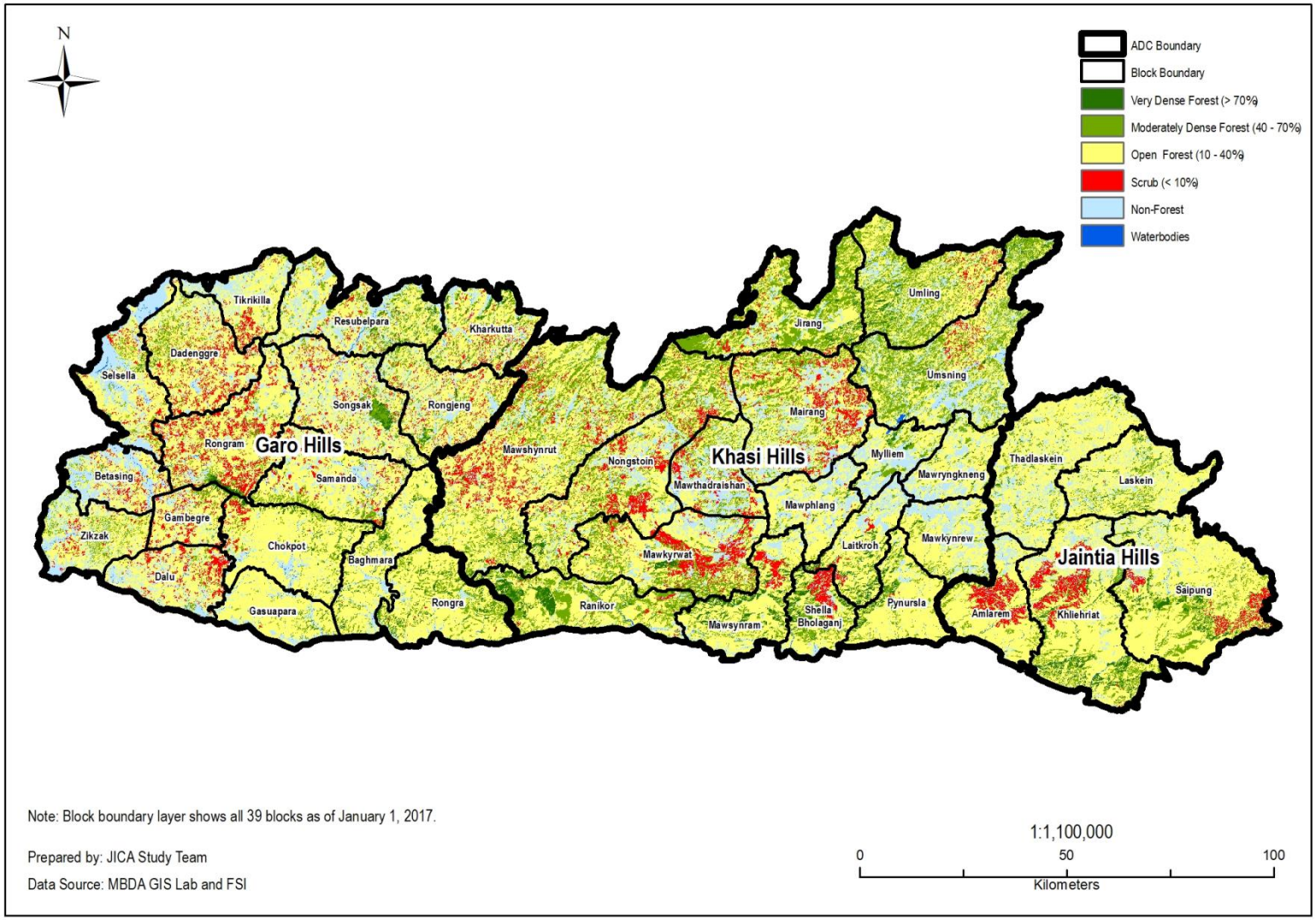
Location Map
(Forest Distribution in Meghalaya State)



Photographs of the Study

Jhum cultivation area in Reng Deng village, West Garo Hills District

Degraded forest area due to forest fire in West Khasi Hills District

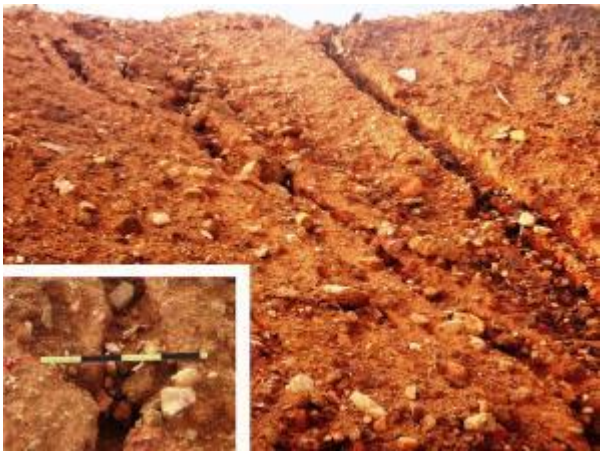
Forest degradation area due to quarry in West Jaintia Hills District

Village Reserve Forest targeting a natural forest in good conditions in Sasargre village, West Garo Hills District

Logging site for domestic purpose on Community Forest in Wahiajer village, West Jaintia Hills District

Saw mill using simple sawing machines in Khliehtyrshi Industrial Estate, West Jaintia District

Hi-Tech Nursery managed Silviculture Division, FED in Ri-Bhoi District



Rill erosion caused by heavy rainwater on the bare land in Sohmynting Village, West Jaintia Hills District

Utilization of eroded soil and spring water collected by check dam as paddy field in Mawshut Village, West Khasi Hills District

Agroforestry practiced in private land in Mawlyngbna Village, East Khasi Hills District

Strawberry cultivation with local materials & scientific techniques in Rural Resource & Training Center (RRTC), Umran

Fisheries & duck rearing under Integrated Farming System (IFS) in Rural Resource & Training Center (RRTC), Umran

Turmeric being dried before shipment in Longpohdon Village, Ri-Bhoi District

A shawl woven of natural-dyed silk & silkworms in Khweng Village, Ri-Bhoi District

Mushroom cultivation in Khweng Village, Ri-Bhoi District

Apiculture with cement-made bee boxes in Mawlyngbna Village, East Khasi Hills District

Pig-rearing with 'Bokashi'in Bethany Society training center, West Garo Hills District

Training on how to make vermi-compost in Bethany Society training center, West Garo Hills

Rain water harvesting tank collecting water from roof top in Bethany Society training center, West Garo Hills District

Exterior of Enterprise Facilitation Center building of Megha-LAMP in Mawshynrut CR&D Block, West Khasi Hills District

Enterprise Facilitation Center of Megha-LAMP in Mawshynrut CR&D Block, West Khasi Hills District

Demonstration of how to interpret satellite imagery and how to use GPS for Megha-LAMP village in Chibongre Village, West Garo Hills District

Interview about GIS&MIS facilities, human resources, management structure and others in GIS laboratory, Shillong, East Khashi Hills District

Lecture to trainees of Soil and Water Conservation Department in Conservation Training Institute (CTI) of Soil and Water Conservation Department, Byrnihat

Kick-off meeting at Forest and Environment Department in Shillong, East Khasi Hills District

Explanation of the survey overview at the courtesy visit in Tura, West Garo Hills District

Explanation of the survey overview to Deputy Commissioner and other concerned officers in Nongstoin, West Khasi Hills District

The 11th Annual National Seminar cum Workshop in Kodaikanal, Tamil Nadu State

Fact Finding Mission 1 explaining the overview of the Project in Shillong, East Khasi Hills District

Fact Finding Mission 2 explaining the proposed activities in Shillong, East Khasi Hills District

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Abbreviations

Abbreviation	Name
AD	Activity Data
ADB	Asian Development Bank
ADC	Autonomous District Council
ANR	Assisted Natural Regeneration
APCCF	Additional Principal Chief Conservator of Forests
APO	Annual Plan of Operation
AR	Artificial Regeneration
ATMA	Agriculture Technology Management Agency
B	Boron
B/C	Cost-Benefit Ratio
BCDI	Bamboo and Cane Development Institute
BDA	Biological Diversity Act, 2002
BDO	Block Development Officer
BDU	Basin Development Unit
BHS	Biodiversity Heritage Sites
BIS	Bureau of Indian Standards
BMC	Biodiversity Management Committee
BOD	Bio-Chemical Oxygen Demand
BPL	Below Poverty Line
Ca	Calcium
CAAA	Controller of Aids, Accounts and Audit
CAGR	Compound Annual Growth Rate
CAMPA	Compensatory Afforestation Fund Management and Planning Authority
CBEC	Central Board of Excise and Customs
CBO	Community Based Organization
CCEA	Cabinet Committee on Economic Affairs
Cd	Cadmium
CEDAW	Convention on the Elimination of All Forms of Discrimination against Women
CFI	Community Forestry International
CFO	Chief Forest Officer
CFM	Community Forest Management
CGST	Central Goods and Services Tax
CHDS	Comprehensive Handloom Development Scheme’
CIG	Community Interest Group
CIG	Common Interest Group ch-7
Cl	Chloride
COD	Chemical Oxygen Demand
CO2	Carbon dioxide
COP	Conference of the Parties
C/P	Counterpart
CPCB	Central Pollution Control Board
CPI	Consumer Price Index
CR	Community Reserve
CRMC	Community Reserve Management Committee

Abbreviation	Name
Cr	Chromium
CSR	Corporate Social Responsibility
CTI	Conservation Training Institute
Cu	Copper
DAY-NRLM	Deendayal Antodaya Yojana – National Rural Livelihoods Mission
DC	Deputy Commissioner
DDU-GKY	Deen Dayal Upadhyaya Grameen Kaushalya Yojana
DFO	Divisional Forest Officer
DF/R	Draft Final Report
DIPA	Diethylene Triamine Penta Acetic Acid
DLAC	District Level Advisory Committee
DM	Disaster Management
DO	Dissolved Oxygen
DPM	District Project Manager
DPR	Detailed Project Report
DPIU	District Project Implementation Unit
EAC	Expert Appraisal Committee
EC	Executive Committee
EF	Emission Factor
EFC	Enterprise Facilitation Centers
EIA	Environmental Impact Assessment
EIRR	Equity Internal Rate of Return
EMP	Environmental Management Plan
EOI	Expression of Interest
EPAs	Entry Point Activities
ESC	Environmental Social Considerations
ESMSF	Environmental and Social Management System Framework
EUR	Euro
F	Fluoride
FAO	Food and Agriculture Organization of the United Nations
FD	Forest Department
FDA	Forest Development Agency
Fe	Iron
FED	Forest and Environment Department
FLRC	Forest-based Livelihood Resource Center
FPC	Farmer Producer Company
FPO	Farmer Producer Organizations
F/R	Final Report
FRL	Forest Refference Level
FY	Fiscal Year
FSA	Farming Systems Approach
FSI	Forest Survey of India
GB	General Body
GBV	Gender-Based Violence
GCF	Green Climate Fund
GDP	Gross Domestic Products

Abbreviation	Name
GeM	Government e-Market place
GHADC	Garo Hills Autonomous District Council
GHCA	Garo Hills Conservation Area
GHG	Greenhouse Gas
GIM	Green India Mission
GIS	Geographic Information System
GIZ	Gesellschaft für Internationale Zusammenarbeit
GNLA	Garo National Liberation Army
GoJ	Government of Japan
GoI	Government of India
GoM	Government of Meghalaya
GP	Gram Panchayat
GPS	Global Positioning Syste
GSDP	Gross State Domestic Product
GSHAP	Global Seismic Hazard Assessment Program
GST	Goods and Services Tax
GWA	Green-Wash Area
Hg	Mercury
HLM	High Low Medium
HMM	High Medium Medium
HMNEH	Horticulture Mission for North East and Himalayan Region
HNLC	Hynniewtrep National Liberation Council
HPC	High Power Committee
HTN	Hi Tech Nurseries
IAS	Indian Administrative Service
IAY	Indira Awaas Yojana
IBDLP	Integrated Basin Development and Livelihood Promotion Programme
IBEF	India Brand Equity Foundation
ICAR	Indian Council of Agricultural Research
IFAD	International Fund for Agricultural Development
IFS	Indian Forest Statistics/Integrated Farming System
IGNDPS	Indira Gandhi National Disability Pension Scheme
IGNOAPS	Indira Gandhi National Old Age Pension Scheme
IGNWPS	Indira Gandhi National Widows Pension Scheme
IGST	Integrated Goods and Services Tax
ILRT	Institute of Livelihood Research and Traing
INM	Integrated Nutrient Management
INR	Indian Rupee
INRM	Integrated Natural Resources Management
IPC	Indian Penal Code
IPCC	Intergovernmental Panel on Climate Change
IPM	Integrated Pest Management
ISDP	Integrated Sericulture Development Project
IVCS	Integrated village Cooperative Society
IWDP	Integrated Wasteland Development Programme
IWMP	Integrated Watershed Management Programme

Abbreviation	Name
JFM	Joint Forest Management
JFMC	Joint Forest Management Committee
JGSY	Jawahar Gram Samridhi Yojana
JHADC	Jaintia Hills Autonomous District Council
JICA	Japan International Cooperation Agency
JICS	Japan International Cooperation System
JJ-FAST	JICA-JAXA Forest Early Warning System in the Tropics
JPY	Japanese Yen
K	Potassium
KfW	Kreditanstalt für Wiederaufbau
KHADC	Khasi Hills Autonomous District Council
LEISA	Low External Input Sustainable Agriculture
LMV	Light Motor Vehicles
LPG	Liquefied Petroleum Gas
LULC	Land Use Land Cover
LULUCF	Land use, Land use Change and Forestry
MBDA	Meghalaya Basin Development Authority
MCLLMP	Meghalaya Community Led Landscape Management project
MDF	Moderately Dense Forest
MDoNER	Ministry of Development of North Eastern Region
M&E	Monitoring and Evaluation
Megha-LAMP	Meghalaya Livelihoods and Access to Markets Project
MFF	Multi-tranche Financing Facility
Mg	Magnesium
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
MIDH	Mission for Integrated Development of Horticulture
MIE	Meghalaya Institute of Entrepreneurship
MIP's	Minor Irrigation Projects
MIS	Management Information System
MLM	Medium Low Medium
M/M	Man/Months
MML	Medium Medium Low
MMR	Maternal Mortality Rate
Mn	Manganese
Mo	Molybdenum
MoEF	Ministry of Environment and Forests
MoEF&CC	Ministry of Environment, Forest and Climate Change
MOU	Memorandum of Understanding
MP	Members of Parliament
MRV	Measurement, Reporting and Verificatio
MSME	Micro, Small and Medium Enterprise
MSPCB	Meghalaya State Pollution Control Board
MSRLS	Meghalaya State Rural Livelihood Society
Na	Sodium
NAP	National Afforestation Program
NAMP	National Air Monitoring Programme

Abbreviation	Name
NBA	National Biodiversity Authority
NDC	Nationally Determined Contribution
NDP	Net Domestic Product
NEHU	North Eastern Hill University
NERTPS	North Eastern Region Textile Promotion Schemes
NESRIP	North Eastern States Roads Investment Programme
NFBS	National Family Benefit Scheme
NFI	National Forest Inventories
NFMS	National Forest Monitoring Systems
NGO	Non-Governmental Organization
Ni	Nickel
NIC	National Information Centre
NH4-N	Ammonia Nitrogen
NO2-N	Nitrite Nitrogen
NO3-N	Nitrate Nitrogen
NPs	National Parks
NPV	Net Present Value
NR	Natural regeneration
NRLM	National Rural Livelihood Mission
NRS	National REDD+ Strategy
NRSC	National Remote Sensing Centre
NSAP	The National Social Assistance Programme
NSDP	Net State Domestic Product
NSS	National Sample Survey
NTFP	Non Timber Forest Produce
NWDPRA	National Watershed Development Project for Rain-fed Areas
NWMP	National Water Monitoring Programme
NWQM	National Water Quality Monitoring
ODA	Official Development Assistance
O&M	Operation and Maintenance
OF	Open Forest
NOx	Oxides of Nitrogen
PAH	Polycyclic Aromatic Hydrocarbon
Pb	Lead
PBR	Peoples' Biodiversity Register
PCCF	Principal Chief Conservator of Forests
PDA	Personal Digital Assistant
PES	Payments for Ecosystem Service
PF	Protected Forest
PIM	Participatory Irrigation Management
PLUP	Participatory Land Use Planning
PM	Particulate Matter
PMAY-G	Pradhan Mantri Awaas Yojana - Gramin
PMC	Project Management Consultants
PMGSY	Pradhan Mantri Gram Sadak Yojana
PMRY	Prime Minister Rozgar Yojana

Abbreviation	Name
PMU	Project Management Unit
PPP	Per Capita Purchasing Power Parity
PPVFR	Protection of Plant Varieties and Farmers' Rights
PRA	Participatory Rural Appraisal
pre-DPR	pre-Detailed Project Report
PRRIE	Participatory Rural Development and Resource Management by Integrated Training for Equal Opportunity
QCBS	Quality and Cost Based Selection
QPM	Quality Planting Materials
RCC	Roller Compacted Concrete
RDCF	Restoration of Degraded Community Forests
REDD+	Reducing Emissions from Deforestation and Forest Degradation and the role of conservation of forests and enhancement of forest carbon stocks
RELs	Reference Emission Levels
RF	Reserved Forest
RFA	Recorded Forest Area
RfP	Inviting Technical and Financial Proposals through Request for Proposal
RFRI	Rain Forest Research Institute
RIDF	Rural Infrastructure Development Fund
RLs	Forest Reference Levels
RPA	Remotely Piloted Aircraft
RPF	Resettlement Plan Framework
RPIU	Range Project Implementation Unit
RRTC	Rural Resources and Training Center
RS	Remote Sensing
RSCA	Reclamation of Shifting Cultivation Area
SAGY	Sansad Adarsh Gram Yojana
SAPROF	Special Assistance for Project Formation
SBB	State Biodiversity Board
SC	Scheduled Caste
SEAC	State level Expert Appraisal Committee
SECC	Socio Economic and Caste Census 2011
SEIAA	State Environment Impact Assessment Authority
SFM	Sustainable Forest Management
SGSY	Swarna Jayanti gram Swrozgar Yojana
SHG	Self Help Group
SIA	Social Impact Assessment
SIRD	State Institute of Rural Development
SLL	Special and Local Laws
SO_2	Sulfur Dioxide
SO_4	Sulphate
SOEs	Statement of Expenditures
SOP	Standard Operation Procedure
SP	Superintendent of Police
SPA	Seed Production Area
SPCB	State Pollution Control Board
SPMU	State Level Project Management Unit

Abbreviation	Name
SPV	Special Purpose Vehicle
SRES	State Rural Employment Society
ST	Scheduled Tribe
STFDPF	Scheduled Tribe and Forest Dependents Plan Framework
SWCD	Soil and Water Conservation Department
TA	Technical Assessment
TDS	Total dissolved solids
TFIPAP	Tripura Forest Environment Improvement and Poverty Alleviation Project
TNA	Training Needs Assessment
TOR	Terms of Reference
UAOP	Unmanned Aircraft Operator Permit
UAV	Unmanned Aerial Vehicle
UF	Unclassed Government Forest
UIN	Unique Identification Number
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
UTs	Union Territories
UTPCC	UT Pollution Control Committee
VDF	Very Dense Forest
VEC	Village Employment Council
VLEC	Village Level Executive Committee
VO	Village Organization
VPIC	Village Project Implementation Committee
VRC	Village Reserve Committee
VRF	Village Reserve Forest
WB	The World Bank
WDP	Watershed Development Project
WHO	World Health Organization
WLSs	Wildlife Sanctuaries
WP	Working Plan
WPI	Wholesale Price Index
WRD	Water Resource Department
WTI	Wildlife Trust of India
WUA	Water Users' Association
Zn	Zinc

List of Local Words Used in the Report

Local Word	Explanation in English
A'khing	Land owned by the clans (in Garo)
A'khing Nokma	A female head, as well as her husband, who has the custodianship of the land owned by the clan (A'khing land), but the land is managed by her husband and Chra/Mahari with the consensus of people belonging to the same clan (in Garo)
Chra	A group of Nokma's maternal uncles and brothers (in Garo)
Doloi	A chief of Elaka (in Jaintia)
Dorbar	Village Council
Elaka	Province (in Jaintia)
Hima	A cluster of several villages that is responsible for making policy and regulations of forests and other land issues in the area covered
Jhum	Shifting Cultivation
Jhumia	Shifting Cultivator
Jote	Private land owned by individual
Khas Land	Revenue Land
Kur	Clan
Law Adong	Sacred Grove/Village Restricted Forest
Law Kyntang	Religious Forest/Sacred Grove
Law Lyngdoh	Sacred Grove (Forest belonging to priest of traditional religion)
Law Niam	Religious Forest
Law-Ri Sumar	Private Forest
Law Shonong	Village Supply Forests
Mahari	A group of members who are closely related to each other based on the common motherhood (in Garo)
Mouja	Revenue Village
Panchayat	Village Council (in Hindi)
Panchayat Samitti	Block Council
Para	Hamlet
Patta	Title equal to the property
Raid	A cluster of a couple of villages that is responsible for making regulations on forests and other land issues in the area covered
Raid Forests	Forests belonging to a group of villages
Rangbah	Headman
Shnong	Village
Sordar	A head of village council (in Khasi)

Executive Summary

1. Introduction

Meghalaya is a small state located in the north-eastern region of India sharing borders on the north and east by Assam and on the west and south by Bangladesh. Meghalaya State covers a geographical area of 22,429 km^2, with elevation ranging from 60 to 1,950 m. Meghalaya is broadly divided into three major hill regions, named Garo Hills, Khasi Hills, and Jaintia Hills. Meghalaya State has three main tribes, named the Khasi, Garo and Jaintia. The state is divided into eleven administrative districts, which are further subdivided into 46 community development blocks. The number of villages is 6,851 according to the Socio Economic and Caste Census 2011. The population of the state as of 2011 is 2.96 million, of which 86.15 % is Scheduled Tribe (ST). According to the Sixth Schedule of the Constitution of India, recognizing the need to protect tribal traditions and societies, Meghalaya State has three Autonomous District Councils (ADCs), namely the Khasi Hills ADC, Garo Hills ADC, and Jaintia Hills ADC. The ADCs are vested with legislative, executive, and judicial functions, as well as local administration in some areas — including lands and resources other than Reserved Forests and shifting cultivation. In the state, more than 80% of the population depends on agriculture for their livelihoods. Approximately 15 % of total cultivated land is used for shifting cultivation, and more than 0.25 million people are engaged in shifting cultivation.

Forest cover of Meghalaya State in 2017 was estimated at approximately 76 % of the entire state with 42% of tha being open forest, implying the occurrence of deforestation and forest degradation. As a response to this, the Government of India (GoI) requested a Japanese ODA Loan project on community-based forest management and livelihood improvement from the Government of Japan. Upon this request, the preparatory study for the project (hereinafter referred to as "the Study") has been conducted by a study team dispatched by JICA (hereinafter referred to as "Study Team") to gather information necessary for the appraisal and examine the outline, cost, implementation structure, operation and maintenance system of the new project. The Study commenced its field survey in January 2019 and completed in June 2019. Based on the Study, the new project named the "Project for Community-Based Forest Management and Livelihoods Improvement in Meghalaya" (hereinafter the "Project") was designed. This report describes major outcomes of the Study including Introduction (Chapter 1), the Study Area (Chapter 2), Forests and Forest Management of the State (Chapter 3), Approaches to Livelihood Improvement (Chapter 4), Institutional Arrangement (Chapter 5), Review of the Pre-Detailed Project Report (Chapter 6), and Project Outline and Scope of Work (Chapter 7).

2. Project Needs and Rationale

2.1 Relevance and Linkage with Government Policies

The Project is consistent with the state government development policy as well as the regional and central government forest policies, including Meghalaya Vision 2030, North Eastern Region Vision 2030, Green India Mission, and Mission on Shifting Cultivation. The Project is in conformity with the strategies of the visions, such as empowerment of the people through participatory planning, sustainable development, and development of the capacity of people and institutions for accelerating growth. The Project will also contribute to the realization of the missions that aim to restore forest vegetation by planting trees and conducting agroforestry as well as land use planning at village level involving communities and concerned officials.

2.2 Necessity of Restoration and Conservation of Forest

Meghalaya State is rich in forest with a forest cover ratio of 75.6 %. However, 42.6 % of the total forest area is open forest in 2017 and its area increased by 157 km^2 between 2013 and 2017, while the total forest area decreased by 142 km^2 during the same time period. This trend implies that forest degradation has increasingly progressed in the state. Forest degradation causes social and

environmental problems such as soil erosion, loss of access to non-timber forest products (NTFPs), shortage of water for domestic and agriculture purposes, and increase in human-animal conflicts. Therefore, this situation requires interventions to mitigate the negative impacts on the local communities' livelihood as well as biodiversity.

2.3 Significant Effects of the Proposed Project Activities for Restoration and Conservation of Forests

The proposed project activities such as livelihood enhancement and land use planning will effectively contribute to the aforementioned required restoration and conservation of forests because these activities can potentially reduce pressure on forests and prevent disordered conversion from forest to other land use. If alternative livelihood means are provided to local people, for example, they can become less dependent on shifting cultivation, which is one of the major drivers of forest degradation. Participatory land use planning at the community level may work to prevent uncontrolled changes from forest to other land use especially on individually owned land.

2.4 Necessity of Enhancement of Community-based Forest Management

The state has unique characteristics in terms of forest tenure. Around 90 % of the forest belongs to communities, individuals, or clans. According to the Sixth Schedule of the Constitution of India and other relevant acts of the concerned ADCs, such forests are supposed to be managed by the ADCs administratively. Meanwhile, the Forest and Environment Department (FED) has made interventions in the management of community-owned or private forests through government schemes, such as Joint Forest Management and Community Reserve. In practice, communities have managed their forests following their customary rules for a long time. However, their traditional forest management has become less effective in recent years due to the increasing pressure on forest lands and forest resources from current population growth and economic development. Thus, the community-based forest management needs to increase its efficiency through capacity development for the communities and concerned institutions and the introduction of new, advanced scientific techniques.

3. Project Objectives and Approaches

3.1 Project Objective

The objective of the Project is to restore and conserve natural resources within the villages by sustainable forest management, livelihood improvement, and institutional strengthening, thereby contributing to conservation of environment, biodiversity, and uplifting of socio-economic conditions of people in the State of Meghalaya.

3.2 Project Approaches

Based on the analysis of causes of forest degradation in Meghalaya State described below, the following approaches are developed and adopted in the Project to achieve the project objective.

3.2.1 Causes of Forest Degradation

Causes of forest degradation and/or deforestation in the state are categorized into two groups depending on their relationship to forest changes: 1) direct causes; and 2) root causes. Direct causes include shifting cultivation with short rotation cycle, quarrying, forest fire, forest fragmentation due to economic development, conversion to monoculture plantations, and over-extraction of forest products, including timber and NTFPs.

On the other hand, root causes include a lack of land use planning at the community level, a lack of alternative livelihood means, and weak institutional arrangements due to a change to individualism in communities in the context of economic development. A lack of land use planning likely leads to

disordered conversion from forests to monoculture plantations, quarrying, and shifting cultivation with short rotation cycle. A lack of alternative livelihood means also leads to dependence on shifting cultivation and quarrying. Hence, both direct and root causes need to be approached to achieve the project objective.

3.2.2 Approaches

(1) Measures to Address Direct Causes

1) Site Specific Approach in Designing and Implementation of Project Activities

Direct causes of forest degradation and deforestation, and the surrounding natural and social conditions, vary depending on ADCs. For example, major drivers of forest degradation in Jaintia Hills ADC are listed in order of the degree of impact as follows; forest fire, charcoal burning, quarrying, and shifting cultivation, while shifting cultivation, quarrying, conversion to monoculture plantations, and illegal felling are known as major causes of forest degradation in Garo Hills ADC. Forest management systems are also unique in each ADC. Garo Hills ADC, for example, has its own scheme to support community-based forest management known as Village Reserve Forest. Therefore, project interventions to address the existing causes of forest degradation will be designed and implemented in accordance with the unique local situations in each ADC.

2) Harmonization among Project Interventions in Different Components

The harmonization of project interventions in each component is important since activities on sustainable forest management, soil and water conservation, and livelihood improvement are closely related to each other. Thus, the activities carried out on the ground will be designed and implemented while maintaining harmonization among the different components.

(2) Measures to Address Root Causes

1) Participatory Land Use Planning Using GIS

Land use planning at the community level is necessary to prevent further forest fragmentation, disorder quarrying, and conversion to monoculture plantations. The community-based land use planning should be conducted in a participatory manner because most of the lands belong to communities or individuals or clans. GIS plays a key role in implementing community-based participatory land use planning. Meghalaya State has an advantage that many kinds of spatial data and necessary equipment were already procured by past or ongoing projects. Unlike the existing paper-based, community social and resource maps prepared based on the community members' subjective perception, the existing spatial data can provide them with objective information obtained from the sky. The use of GIS as well as the spatial information will make it possible for communities to prepare scientific land use plans and share the information between not only community members but also officials of concerned institutions.

2) Enhancement of Livelihoods through Promotion of Women's Motivation and Participation

In order to reduce pressure on forest lands and forest resources, new livelihood means or improved productivity of existing livelihoods need to be introduced. For this reason, enhancement of women's participation in decision making in the practice of new livelihood means or methods is essential since women are main actors of livelihood activities. In Meghalaya State, women play an important role in maintaining household livelihoods, but their involvement in decision making in public situations is limited. Without their participation in decision making regarding planning and benefit sharing, it is difficult for women to have motivation for introducing new livelihood means or methods. The Project will promote women's participation in the decision-making process through the enhancement of women's capacity and leadership while changing unequal gender relations and gender roles rooted in the target areas.

(3) Institutional Strengthening

Institutional strengthening also plays an essential role in addressing the root causes of forest degradation and deforestation. The following three sub-approaches will be undertaken.

1) Facilitation to Implement the Existing Schemes

Various schemes regarding forest management and livelihood improvement, which were developed by the central government or ADCs, are adopted in the state. For example, there is a centrally sponsored scheme, called "Mission for Integrated Development of Horticulture (MIDH)", which helps community members improve their livelihoods in an integrated and comprehensive way by not only increasing productivity of cash crops, but also enhancing their marketing skills. Utilizing such existing schemes is more efficient and effective than creating new schemes or systems to improve livelihoods or forest conditions. Thus, the Project facilitates the implementation of the existing schemes.

2) Capacity Development of Communities and Institutions Concerned

Capacity development for the communities and institutions concerned including Project Management Unit (PMU), ADC, Forest and Environment Department (FED) and Soil and Water Conservation Department (SWCD) of the State Government is essential for smooth implementation of the project activities and ensuring sustainability of the Project. Thematic trainings on conceptual and practical knowledge and skills regarding gender, financial management, and land use planning will be provided for community members and officials of the concerned institutions. Moreover, mechanisms of decision making and reporting within one institution or between multiple institutions need to be improved at each level for proper planning and monitoring of the Project activities.

3) Introduction of Advanced Scientific Techniques for Data Collection and Monitoring

New advanced techniques will be introduced to effectively conduct project activities and finally achieve the project objective. In particular, GIS-related technologies will be effective for not only planning, but also for monitoring at the community level in a quantitative manner. Spatial data, newly collected using new advanced technologies, will be used in combination with the existing data, and various thematic maps will be effectively prepared. The prepared thematic maps and their attribute information will be further displayed online, and this will make it possible for major stakeholders to conduct efficient planning, monitoring, and evaluation of the project activities.

4. Prioritization of Proejct Site

4.1 Target Area and Potential Beneficiaries

As the Project shall be implemented in a participatory manner, the target area is selected on village basis. The villages which need to improve degraded forests and raise people's levels of living conditions shall be prioritized in the Project. The Project will also select villages which shall become models for other villages. The table below shows the different features of the first group (Group 1) and second group (Group 2) villages/village clusters and the proportion of each group.

Table ES- 1: Different Features of the First and Second Groups Villages

	Group 1	Group 2
Purpose	To enhance the quality of forest and reduce risks of soil erosion in degraded areas. To improve poor living conditions due to the above environment.	To create a model for Group 1 villages/village clusters that are backwards in respect to project interventions.
Typical Features	Physical/Natural: - Low vegetation cover	Physical/Natural:

	Group 1	Group 2
	- High exposure of soil surface - Steep slope - Degradation of forest Socioeconomic: - High rate of deprivation	- Rich vegetation cover Socioeconomic: - Registered forests to a government scheme or ADC - High accessibility to road networks and market
Expected Interventions	Conservation activities: - Development of community forests - Soil and water conservation - Catchment area protection	Advanced interventions: - Agroforestry - Non-Timber Forest Products - Supply chain development
Proportion (%)	90	10

Source: developed by Study Team

Further, in order to implement the Project interventions effectively, the Project shall be implemented by Block because all villages/village clusters are located within one of any of the block boundaries that also match ADC boundaries.

4.2 Selection Method

4.2.1 Block Selection

Blocks are prioritized based on soil erosion and forest degradation by criteria of vulnerability to soil erosion and forest degradation rate, as shown in the table below (step 1). For efficient implementation of the Project, Blocks, where the number of eligible villages is less than 25, are excluded. Furthermore, for appropriate regional distribution, adjustments should be made in order to include all the three ADCs.

4.2.2 Village Selection

In prioritized Blocks, villages/village clusters shall be selected by following step 2, step 3, and step 4 shown in the table below.

Table ES- 2: Selection Criteria for Target Blocks and Village/Village Clusters

No.	Criteria
Step 1: Selection of Blocks	
1	Select Blocks based on vulnerability to soil erosion: 1) Blocks whose total of 'very highly vulnerable', 'highly vulnerable' and 'medium' rate of vulnerability to soil erosion areas are 70 % and above. Prioritize Blocks based on degradation rate: 2) Blocks whose rate of change of total areas from 'Medium Dense Forest' to 'Open Forest', and from 'Very Dense Forest' to 'Open Forest' are 1 km^2 and above. Exclude Blocks based on the number of villages supported by other donor projects: 3) Exclude Blocks which have below 25 villages which have not been supported by IFAD and World Bank projects. Include Blocks under all ADCs' jurisdiction: 4) Include 'Thadlaskein' and 'Saipung' Blocks which are closest to threshold (for which the total of 'very highly vulnerable', 'highly vulnerable' and 'medium' rate of vulnerability to soil erosion are 70 % and above) from Jaintia Hills Blocks because there is no Jaintia Hills Block among those selected.
Step 2: Exclusion of villages/village clusters	
2	Exclude villages/village clusters previously supported by Megha-LAMP or MCLLMP. Exclude villages/village clusters in unsecured/land conflict areas (if applicable) Exclude villages/village clusters in areas where relocation is required.
Step 3: Selection/Prioritization of villages/village clusters for Group 1	

3	Select villages based on deprivation rate: - Prioritize villages in descending order of deprivation rate from selected Blocks. - Conduct site verification. - Exclude villages/village clusters that do not meet requirement in local environment and conditions. - Exclude village/village clusters that do not express willingness to participate in the Project. - Select 20 ~ 25 villages per one Block.
Step 4: Selection/Prioritization of villages/village clusters for Group 2	
4	Prioritize Blocks based on vulnerability to soil erosion: - Prioritize Blocks in descending order of total areas of vulnerability to soil erosion are 'Very Low' or 'Low' from selected Blocks. Select villages with forest conservation schemes and accessibility to road networks - Select 50 villages with village forest, private forest, or community reserve registered to state government or ADC and distance up to 2 km from village roads.

Source: developed by Study Team

As a result of Block selection, 22 Blocks from 11 Districts are identified for the project target shown in the table below.

Table ES- 3: Project Target Districts and Blocks

District	Block
1. West Garo Hills	Dalu Rongram Tikrikilla Gambegre
2. South West Garo Hills	Zikzak Betasing
3. North Garo Hills	Resubelpara Kharkutta
4. East Garo Hills	Songsak Rongjeng Samanda
5. South Garo Hills	Rongra Baghmara Gasuapara
6. West Khasi Hills	Mairang
7. South West Khasi Hills	Mawkyrwat
8. Ri-Bhoi	Umsning Umling
9. East Khasi Hills	Mawryngkneng Mawkynrew
10. West Jaintia Hills	Thadlaskein
11. East Jaintia Hills	Saipung
Total 11 Districts	Total 22 Blocks

Source: developed by Study Team

5. Project Outline

5.1 Logical Framework

A logical framework of the Project is presented on the following page. The Project was designed according to this logical framework. Monitoring and evaluation of the Project will be conducted by the operation and effect indicators shown in the logical framework.

Logical Framework

Project for Community-Based Forest Management and Livelihoods Improvement in Meghalaya

Original Draft (Prepared on 2019.07.16) Project Duration: 2019 to 2029

Version history: Version 0 Target Group: Communities in Meghalaya State

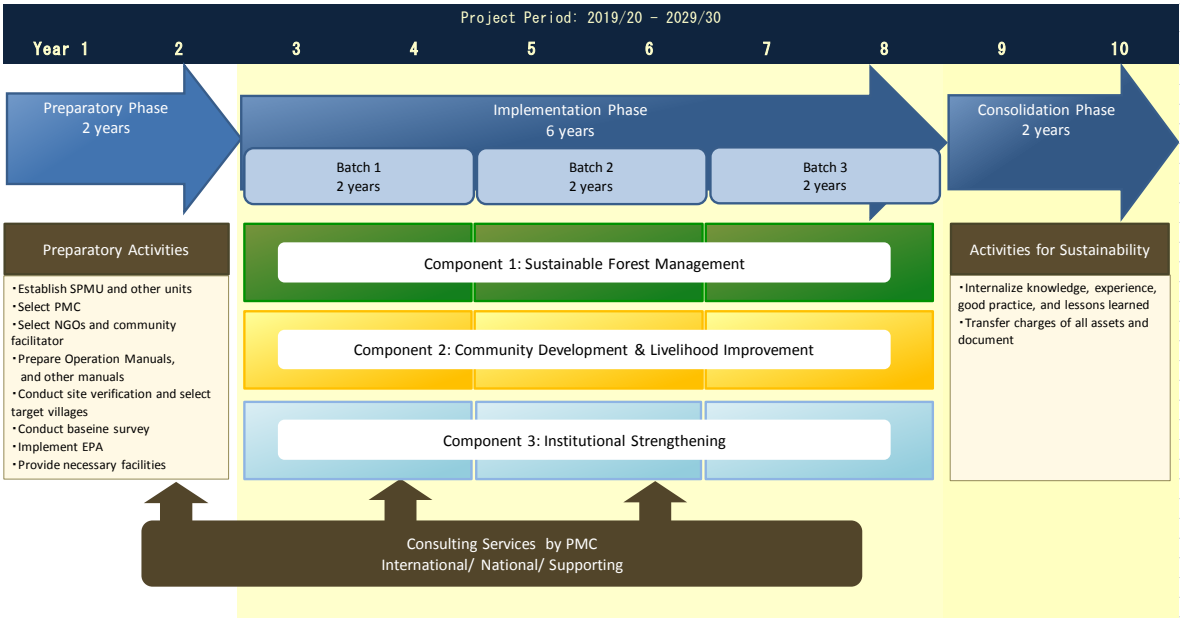
NARRATIVE SUMMARY	OPERATION AND EFFECT INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Overall GOAL To contribute to conservation of environment and biodiversity, and uplifting of socio-economic conditions of people in Meghalaya State.			
PROJECT PURPOSE To restore and conserve natural resources within the target villages in Meghalaya State.	1. Accessibility to water is increased by 40 % 2. Soil erosion is decreased by 50 %	1. Baseline survey and impact assessment 3. Baseline survey and impact survey 4. Records of FD of ADCs budget and interviews to ADCs	There is no major natural disaster that adversely affect the project areas.
OUTPUTS 1. Restoration of degraded forest areas and forest conservation is implemented through sustainable community forest management.	1.1 500 of CR/VRF/CF are registered 1.2 22,500 ha of forests are managed. 1.3 22,500 ha of community/privately owned forests are demarcated with maps	1.1 Baseline survey and records of FD of ADCs 1.2 Record of FED/FD of ADCs 1.3 Record of FED/FD of ADCs	- There is continuing commitment from the Government of Meghalaya and Jaintia Hills, Khasi Hills, and Garo Hills Autonomous District Councils - Laws and policies related to the project are not changed adversely - Security and political conditions are stable

2. Inclusive community development is promoted by facilitating women and youths' active participation and livelihoods of community people is improved by providing alternative livelihood means.	2.1 Women occupy more than 33 % of the project sub-committee members, specifically chairperson and vice chairperson on average. 2.2 The portion of women and youths' participants in the project activities, including forest management, GIS mapping, micro-planning, IGA, etc. is increased.Target will be decided in the time of baseline survey. 2.3 Average number of household income sources are increased and annual total household income of target villages is increased by 30 % 2.4 On at least 22 kinds of enterprise, feasibility study and market research are conducted, based on which enterprise development are promoted.	2.1 Record of Village Implementation Committees 2.2 Baseline survey and impact assessment 2.3 Baseline survey and impact assessment 2.3 Impact assessment	
3. Capability and capacity of community and governmental institutions is strengthened.	3.1 100 % of concerned institutions uses GIS related techniques for planning and monitoring	3.1 Report of SPMU/DPMU/BPMU	

Source: developed by Study Team

5.2 Project Phases and Components

The Project is planned so that it has an implementation period of ten years, which is divided into three phases: Preparatory Phase (24 months), Implementation Phase (72 months), and Consolidation Phase (Phase out) (24 months). During the implementation phase, activities conducted by communities will be carried out in three batches.



Source: developed by Study Team

Figure ES-1: Project Phase

5.3 Project Components

The Project has three key components: (1) Sustainable Forest Management, (2) Community Development and Livelihood Improvement, and (3) Institutional Strengthening. A supplemental component to the Project is Project Management Consultant. Key work quantities and components/sub-components of the Project are shown below.

Key Work Quantities
District: 11 Block: 22 Target Village: 500 Target Area of Sustainable Forest Management: 22,500 ha SHGs to be Covered: 1,000
1. Sustainable Forest Management
1.1 Participatory Land Use Planning 1.1.1 Land Use Planning of Selected Sites at 1:10,000 Scale 1.1.2 Facilitation of Participatory Land Use Planning at Communities 1.2 Restoration of Degraded Forest Areas 1.2.1 Constitution of JFMC and Preparation for JFMC Micro-Plan 1.2.2 Registration of VRF/CF and Preparation for Resolution 1.2.3 Restoration of Timber Resources (ANR with Enrichment Plantation) 1.2.4 Restoration of Natural Vegetation (ANR) 1.2.5 Afforestation on Barren Land (AR) 1.2.6 Restoration of Shifting Cultivation Areas (ANR)

1.2.7 Restoration of Degraded Lands due to Quarrying (ANR)
1.2.8 Improvement of Corridors (ANR)
1.3 Forestry Nursery
1.3.1 Creation of Permanent Nurseries
1.3.2 Improvement of Existing Nurseries
1.3.3 Creation of Community Nurseries
1.4 Conservation of Forests in Good Conditions
1.4.1 Constitution of Community Reserve and Preparation for Community Reserve Management Plan
1.4.2 Preparation for Working Schemes
1.4.3 Establishment of New Check Points
1.5 Forest Research
1.6 Soil and Water Conservation for Forest Management
1.6.1 Bench Terracing (Earthen Structures)
1.6.2 Earthen/Loose Boulder Contour Bunds
1.6.3 Earthen/Loose Boulder Box Terracing
1.6.4 Construction of RCC Check Dam
1.6.5 Construction of Minor Irrigation Check Dam
1.6.6 Construction of Conservation Pond (which can be also used for fishery)
1.6.7 Construction of Conservation Pond/Dug out Pond
1.6.8 Construction of RCC Water Storage Tank for Drinking Water
1.6.9 Construction of Spring Tapped Chamber

2. Community Development and Livelihood Improvement

2.1 Community Mobilization and Gender Sensitization
2.1.1 Community Mobilization Workshops
2.1.2 Gender-sensitization Workshop/Gender Training
2.2 Micro-planning
2.2.1 Training/Workshops on How to Make a Micro Plan
2.2.2 Conducting PRA
2.2.3 Planning a Micro Plan Converged with Available National/State Schemes
2.3 Entry Point Activities (EPAs)
2.3.1 Prioritization of EPAs
2.3.2 Conducting EPAs
2.4 SHG Activities
2.4.1 Selection of SHGs in Each Selected Village
2.4.2 Micro-credit Activity
2.4.2.1 Providing Revolving Fund per Village
2.4.2.2 Training/Workshop on Micro-credit Activity
2.4.3 Income Generation Activities (IGAs)
2.4.3.1 Training Needs Assessment/Market Research
2.4.3.2 Training and Exposure Visits
2.4.3.3 Provision of Seed Money for Each Selected SHG
2.4.3.4 Construction of Facility/Infrastructure Necessary for IGAs
2.4.4 Enterprise Development Activities
2.4.4.1 Feasibility Studies & Pilot Projects for Enterprise Development
2.5 Soil and Water Conservation for Livelihood Improvement
2.5.1 Construction of Rainwater Harvesting Structure
2.5.2 Construction of Drinking Water Tank

3. Institutional Strengthening

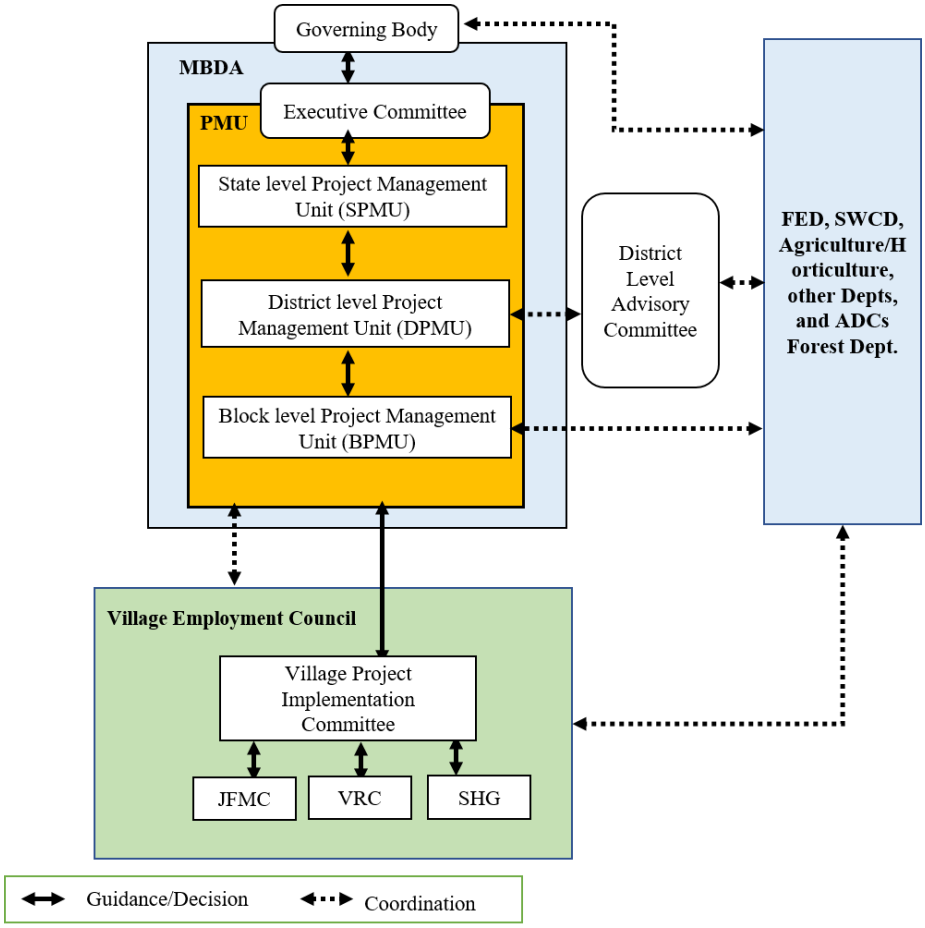
3.1 Capacity Development
3.1.1 Training Needs Analysis
3.1.2 Training, Exposure Visits and Workshops
3.1.3 JICA Forestry Sector Annual Workshop
3.1.4 NGOs/Resource Organizations
3.2 Monitoring and Evaluation
3.2.1 Baseline Survey
3.2.2 Setting Target for the Operation and Effect Indicators
3.2.3 Annual Planning and Review Meetings
3.2.4 Concurrent Monitoring

6. Implementatoin Structure

Project Management Unit (PMU) will be formed using the existing structure of MBDA, which already has experience in implementing externally-aided projects, particularly those requiring coordination with various government departments and institutions. The Project will be headed by the Project Director. In order to support the Project Director, an Additional Project Director shall be posted on a full-time basis. The overall implementation structure for the Project is shown below.

Implementing bodies consist of a State Level Project Management Unit (SPMU), District Level Project Management Unit (DPMU), Block Level Project Management Unit (BPMU), and Community Level Organization named the Village Project Implementation Committee (VPIC), which will be established under Village Employment Council (VEC).

The Project fund will be distributed through two channels; a) for procurement and operations at respective department/institutions, the fund will be transferred from SPMU to respective department/institutions, while b) the fund for activities implemented by VPIC will be transferred from SPMU to DPMU, and then to DPMU to VPIC.



Source: developed by Study Team

Figure ES-2: Implementation Structure

7. Operatoin and Maintenance Structure

The assets created during project implementation will be managed mostly by the Project. After project completion, responsibility for operation and maintenance (O&M) will rest with different institutions. A summary of O&M structure after the completion of the Project is given below.

No.	Infrastructure/ Institutions created under the Project	O&M Institutions	Maintenance Mechanism
Component 1: Sustainable Forest Management			
1	Community nurseries	JFMC/VRC/ CRMC/VEC	• Community nurseries will be operated only during project implementation.
2	Permanent nurseries	FD of ADC, FED	• Financial support will be provided by the Project for the duration of its implementation. • After project completion, ADC and FED will allocate their own budget.

No.	Infrastructure/ Institutions created under the Project	O&M Institutions	Maintenance Mechanism
3	Private forest where interventions are made by the Project	Individuals	• Funds for maintenance for the first five years will be provided by the Project. Thereafter, individual landowners will be responsible for the maintenance of the forest. In case timbers are produced for commercial purposes, profits from timber harvesting will be used for maintenance activities and replanting of trees.
4	Community forest where interventions are made by the Project	Community/ Custodian of the forest/ADC	• Funds for maintenance for the first five years will be provided by the Project. Thereafter, the community that owns the forest will be responsible for maintenance.
6	Barren lands where afforestation is created	Community/ FED/ADC	• Funds for maintenance for the first five years will be provided by the Project. Thereafter, JFMC or communities will be responsible for maintenance of the forest.
7	Restored shifting cultivation area	Community/ ADC	• Communities who own the land will be responsible for maintenance.
8	Soil and water conservation structures for forest management	VEC/MBDA/ SWCD	• O&M for the first two years will be taken care by the Project fund. • User fees will be collected from the beneficiaries. • Some funds for maintenance will be leveraged by scheme convergence in particular NREGA.
Component 2: Community Development and Livelihood Improvement			
9	Infrastructure/assets created under Entry Point Activities (EPA)	VEC/MBDA	• User fees will be collected from the beneficiaries and utilized for maintenance and other purposes under the leadership of user group's committee if necessary. • Some funds for maintenance will be leveraged by scheme convergence in particular NREGA.
10	Revolving fund for micro-credit	SHG/VEC/ MBDA	• Revolving fund will be managed by VEC, and will be loaned to members of SHGs with interest for IGA. • Guidelines will be developed to select borrowers and provide them with loans. • Guidelines for managing Revolving fund and adequate trainings would be ensured by the Project during consolidation phase.
11	Livelihood activities by SHGs	SHG/VEC/ MBDA/ Department of Agriculture/ Horticulture	• MBDA will coordinate with concerned department in case SHGs need support. • Technical support for agriculture activities will be provided by Department of Agriculture.

No.	Infrastructure/ Institutions created under the Project	O&M Institutions	Maintenance Mechanism
12	Soil and water conservation structures for livelihood improvement	VEC/ Beneficiaries	• O&M for the first two years will be taken care by the Project fund. • User fees will be collected from the beneficiaries. • Some funds for maintenance will be leveraged by scheme convergence in particular MGNREGA.
13	Cooperative societies established for enterprise development	MSMEs/ Cooperative societies/ MBDA	• Cooperative society will be responsible for operation and maintenance for its business activity.
Component 3: Institutional Strengthening			
14	GIS/MIS	MBDA/ADCs	• Systems and equipment will be transferred fully to MBDA before the project completion.
15	Project Management Unit (PMU)		• Assets handover manual shall be prepared and accordingly assets shall be handed over by the Project to MBDA.
16	Village Project Implementation Committee of VEC		• The committees will function for the duration of the Project.
17	Office buildings	MBDA	• The property will be transferred to MBDA before project completion.

8. Environmental and Social Considerations

The Project may not include any sub-projects that will make major environmental and social impacts; however, certain potential impacts and risks may arise during project implementation. Therefore, the Environment and Social Management System Framework (ESMSF) and the Scheduled Tribe and Forest Dependents Plan Framework (STFDPF) are prepared in accordance with the JICA Guidelines for Environmental and Social Considerations 2010 and the World Bank Operational Policy 4.10 (OP4.10). Draft Environmental Checklist and draft Environmental and Social Management System (ESMS) Checklist are also prepared.

Crucial points on Environmental and Social Considerations were agreed to by the Planning Department on behalf of MBDA and the Study Team during the Study. The agreement includes the following points: that no components/activities of the Project fall under "Category A"; that MBDA and JICA shall disclose information on environmental and social considerations in order to ensure accountability and to promote the participation of various stakeholders.

9. Gender Mainstreaming

Gender mainstreaming is essential for making sure that women are involved in the decision-making processes of the Project, and that their interests and needs based on their roles in maintaining their livelihoods and managing natural resources are reflected in the planning of the project's activities. For gender mainstreaming, a gender perspective should be integrated into both the organizational structure of the Project and project operation through the whole of each process of planning, implementation, and monitoring and evaluation. Interventions which need to be taken for mainstreaming a gender perspective in the organizational structure, such as conducting gender analysis and setting up a Gender Committee and the appointment of gender focal points are proposed. Interventions that are necessary for gender mainstreaming to the project operation, including the implementation of gender sensitization workshops and provision of training on

communication skills and leadership for women, are proposed.

10. Project Cost Estimation

The total project cost is estimated to be approximately [redacted] INR. A summary of cost components is shown in the table below.

Table ES- 4: Summary of Project Cost

Close to the public

11. Project Evaluation

The economic internal rate of return (EIRR), net present value (NPV), and cost-benefit ratio (B/C) of the Project were calculated to assess the economic viability of the Project based on the projected economic cash flow: these are shown in the table below. The EIRR is 15.5 %, which is higher than the discount ratio of 12 %, and the NPV and B/C are 1,350.4 million INR and 1.27, so that the Project is economically viable.

Table ES- 5: Summary of Conditions and Results of the Project Evaluation

Basic Assumptions	Economic life	50 years
	Standard conversion factor	0.9
	Discount rate	12 %
Project Costs	Financial Cost	9,288 million INR
	Economic Cost	6,855 million INR
Project Beneficial Activities	Forestry Production	Production from AR, ANR, ANR Mix (NTFP, Fuelwood, and pine)
	Prevention of Soil Erosion	Prevention of soil erosion by increase of vegetative cover
	Water Use	Aquaculture in the check dams and conservation pond, and water usage for living by the check dams, conservation pond and water tank
	Income Generation Activities	Income generation by production of piggery, mushrooms and weaving.
	CO_2 Reduction	Increment of CO_2 stock by forestry production with the Project and without.

Cost Benefit Analysis Results	NPV	1,350.4 million INR
	B/C	1.27
	EIRR	15.5 %
	Sensitivity Analysis of EIRR	Cost increase (10%): 14.0 % Cost Increase (20%): 12.8 % Benefit decrease (10 %): 13.9 % Cost (+10%) & Benefit (-10%): 12.6 %

Source: developed by Study Team

12. Implementation Schedule

The implementation schedule of the Project is presented on the following pages.

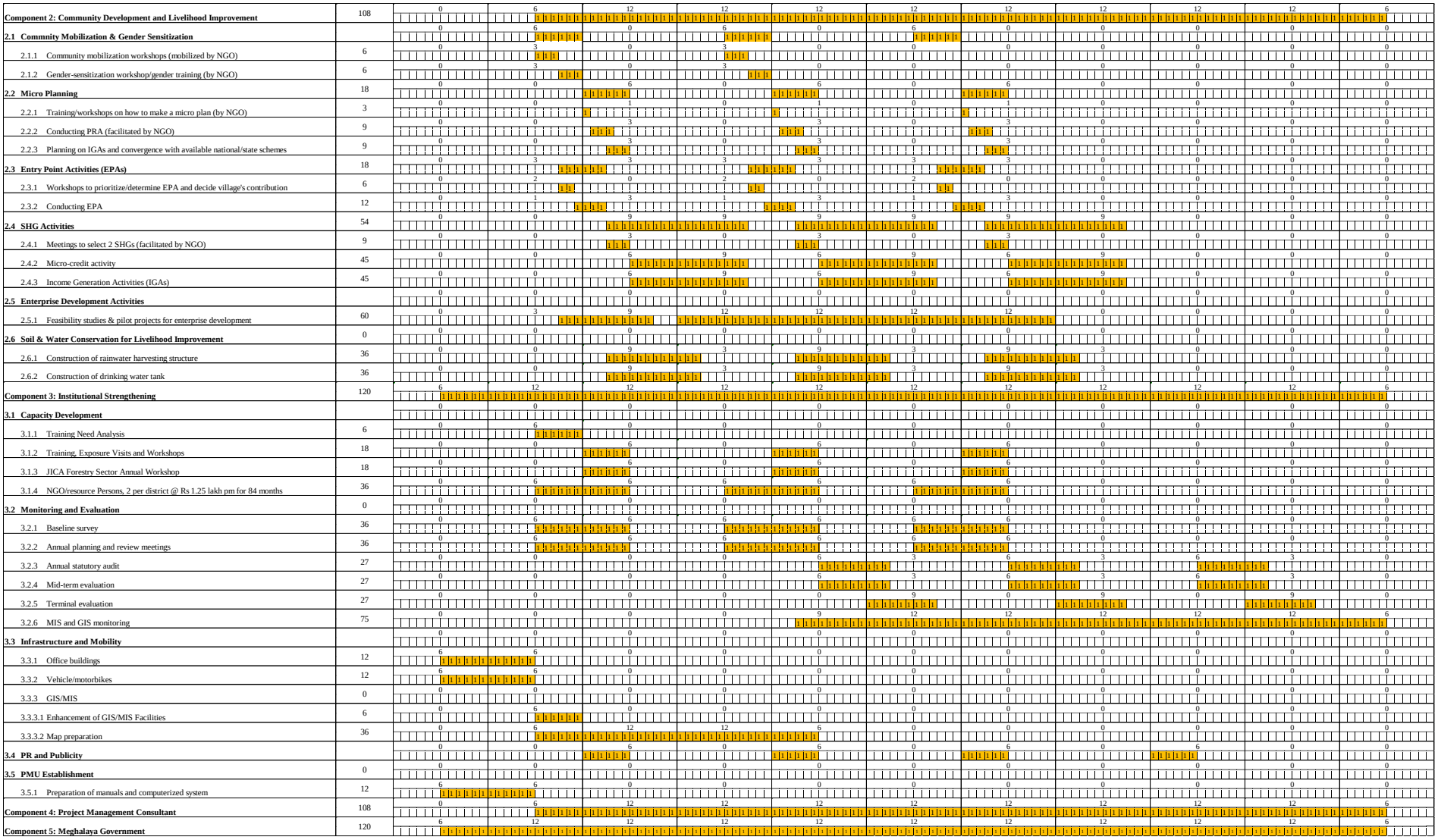
13. Risk and Secutiry Management

There are several risks that would hamper progress and achievement of the Project. A Risk Management Framework, in which potential risks are analyzed and mitigation measures against them are presented, was prepared during the Study. In conclusion, it was assessed that the overall risk for the Project was low. However, since various departments and organizations are involved in Project implementation at multiple levels, close coordination and efficient management are required. Moreover, because this is the first Japanese ODA loan project in the forestry sector for Meghalaya State, sufficient support and capacity building need to be provided to the executive agency and other concerned institutions.

Meghalaya State has a lower crime rate compared with other states in India and relative to national crime rates. In the past, two rebel groups were active; however, they are inactive now. Overall, it is concluded that there will be no serious security risks in the state for the implementation of the Project.

Implementation Schedule of the Project

	Month	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Appreisal	1	1										
Pledge	1	1										
Signing of Loan Agreement	1	1										
	0											
Procurement of Consultant	0											
- Preparation of RFP	2	1	1									
- No Objection by JICA	1		1									
- Advertising	1		1									
- Technical Bid Evaluation	2		1	1								
- No Objection by JICA	1			1								
- Price Bid Evaluation	2			1	1							
- No Objection by JICA	1				1							
- Contract Negotiation	1				1							
- No Objection by JICA	1				1							
Consulting Services	108	1	1	1	1	1	1	1	1	1	1	1
Preparation & Study	12	1	1	1	1	1	1	1	1	1	1	1
Project Management	96	1	1	1	1	1	1	1	1	1	1	1
Defect Notification Period (DNP)												
Land Acquisition	0	0	0	0	0	0	0	0	0	0	0	0
Component 1: Sustainable Forest Management	108	0 6 12 12 12 12 12 12 12 12 12 12 12 6										
1.1 Participatory land use planning		0 0 0 0 0 0 0 0 0 0 0 0 0										
1.1.1 Land use planning of selected sites at 1:10,000 scale	18	0 6 12 0 0 0 0 0 0 0 0 0 0										
1.1.2 Facilitation of participatory land use planning at communities	36	0 0 12 0 12 0 12 0 0 0 0 0 0										
1.2 Restoration of degraded forests		0 0 0 0 0 0 0 0 0 0 0 0 0										
1.2.1 Constitution of JFMC and preparation for JFMC micro-pan	6	0 6 0 0 0 0 0 0 0 0 0 0 0										
1.2.2 Registration of VRF/CF and preparation for resolution	6	0 0 6 0 0 0 0 0 0 0 0 0 0										
1.2.3 Restoration of timber resources (ANR with enrichment planting)	72	0 0 6 12 12 12 12 12 6 0 0 0 0										
1.2.4 Restoration of natural vegetation (ANR)	72	0 0 6 12 12 12 12 12 6 0 0 0 0										
1.2.5 Afforestation on barren land (AR)	72	0 0 6 12 12 12 12 12 6 0 0 0 0										
1.2.6 Restoration of shifting cultivation area (ANR)	72	0 0 6 12 12 12 12 12 6 0 0 0 0										
1.2.7 Restoration of degraded lands due to quarrying (Mixed Plantation)	72	0 0 6 12 12 12 12 12 6 0 0 0 0										
1.2.8 Improvement of corridors (ANR)	72	0 0 6 12 12 12 12 12 6 0 0 0 0										
1.3 Forestry Nurseries		0 0 0 0 0 0 0 0 0 0 0 0 0										
1.3.1 Creation of new permanent nurseries	72	0 0 6 12 12 12 12 12 6 0 0 0 0										
1.3.2 Improvement of existing permanent nurseries	72	0 0 6 12 12 12 12 12 6 0 0 0 0										
1.3.3 Community nurseries	72	0 0 6 12 12 12 12 12 6 0 0 0 0										
1.4 Conservation of Forests in Good Conditions		0 0 0 0 0 0 0 0 0 0 0 0 0										
1.4.1 Constitution of CR and preparation for CR management plan	36	0 0 12 0 12 0 12 0 0 0 0 0 0										
1.4.2 Peparation for working schemes	36	0 0 0 12 0 12 0 12 0 0 0 0 0										
1.5 Forest Research	36	0 0 12 0 12 0 12 0 0 0 0 0 0										
1.6 Soil & Water Conservation for Forest		0 0 0 0 0 0 0 0 0 0 0 0 0										
1.6.1 Bench terracing (Earthern Structures)	36	0 0 0 6 6 6 6 6 6 0 0 0 0										
1.6.2 Loose boulder contour bunds	36	0 0 0 6 6 6 6 6 6 0 0 0 0										
1.6.3 Loose boulder box terrcing,planting)	36	0 0 0 6 6 6 6 6 6 0 0 0 0										
1.6.4 Construction of check dam	36	0 0 0 6 6 6 6 6 6 0 0 0 0										
1.6.5 Construction of minor irrigation check dam	36	0 0 0 6 6 6 6 6 6 0 0 0 0										
1.6.6 Construction of conservation pond (which can also be used for fishery)	36	0 0 0 6 6 6 6 6 6 0 0 0 0										
1.6.7 Construction of conservation pond/dug out pond	36	0 0 0 6 6 6 6 6 6 0 0 0 0										
1.6.8 Construction of RCC water storage tank for drinking water	36	0 0 0 6 6 6 6 6 6 0 0 0 0										
1.6.9 Construction of spring tapped chamber	36	0 0 0 6 6 6 6 6 6 0 0 0 0										



Chapter 1. Introduction

1.1. Background and Objectives

Meghalaya is a small state located in a hill area in northeast India, bounded in the north and east by Assam State and in the south and west by Bangladesh. This state has approximately three million people (2011), a high rate of which (12.5%) is Below Poverty Line (BPL), and had a high population growth rate recorded in 2016 (9.7%) [1] . Meghalaya State covers a geographical area of 22,429 km^2, with elevation ranging from 60 to 1,950 m^2. The climate conditions are also varied, depending on the region. For example, the average temperature ranges from 5 ^oC to 32 ^oC, and the average annual precipitation varies depending on regions. For example, the average annual rainfalls over western Meghalaya, northern Meghalaya, and south-eastern Meghalaya are about 2,600 mm, between 2,500 and 3,000 mm, and about 4,000 mm respectively[3]. The state is divided into eleven administrative districts, which are further subdivided into 39 C&RD Blocks[4].

Table 1.1: Profile of Meghalaya State

Item	Data
Area	22,429 km^2
Population	2,964,007
Capital	Shillong
Official language	Khasi, Pnar, Garo & English
Temperature	5 ^oC – 32 ^oC
Literacy	75.48%

Source: Meghalaya State Web Portal and Pre-DPR

Forest land in India as a whole has been increasing in area since the 1990s. In Meghalaya State, on the other hand, illegal logging, intensive exploitation, and the aforementioned population increase have caused deforestation and forest degradation. Many poor people still live in and around forests, relying on forest ecosystems for their livelihood, such as for fodder, firewood, and materials for their lives. Deforestation and forest degradation threaten local people, as well as weaken the forest ecosystem function to store water in the soil and to keep the soil in place. They further cause natural disasters, such as flooding, and various issues including insufficient irrigation water. Under these circumstances, there is an urgent need for forest conservation to be addressed in order to sustain local people's lives, local communities, and the natural environment.

Considering these circumstances, the Government of India (GoI) launched "Green India Mission" in 2014. This program aims at sustainable forest management and ecosystem conservation. The Green India Mission targets an expansion of five million ha in forest area, improving the quality of forests, conducting biodiversity and watershed conservation in ten million ha, and improving the livelihoods of three million households in the vicinity of forests, all within ten years. Further, it intends to develop the capacity of the Joint Forest Management Committee (JFMC) and establish a participatory forest management system in collaboration with community-based organizations and government agencies.

In Meghalaya State, while forest cover was estimated at approximately 76% in 2017, the rate of open forest was 42% of the whole forest areas, implying the occurrence of deforestation and degradation. In these circumstances, GoI requested a project named the "Project for Community-Based Forest Management and Livelihoods Improvement in Meghalaya" (the Project) to Government of Japan. Upon this request, the preparatory study for the Project (the Study) has been conducted to gather information necessary for the appraisal, such as the Project's background objectives and overview, as well as to help provide cost estimation, an implementation structure,

[1] Pre-DPR

[2] "State of Environment Report, 2005, Meghalaya" prepared by Department of Environment and Forests, Government of Meghalaya

[3] http://meghalaya.gov.in/megportal/stateprofile

[4] Pre-DPR

operation and management system, and environmental and social considerations. This information will be further used to examine the appropriateness of the implementation of the Project as a Japanese ODA Loan project. In this regard, the Study plays an important role in planning and designing the Project.

1.2. Methodology and Approach

The Study has been conducted by a study team formed by a Joint Venture of Kokusai Kogyo Co., Ltd. and IC NET (the Study Team). This final report is an output of the Study as per literature reviews, a series of meetings with implementing agencies (MBDA, FED, SWCD, and ADCs) and other relevant stakeholders, field visits, subcontracted surveys, workshops and technical meetings, and discussions during the JICA missions. During the study period, the following subcontracted survey, JICA mission, workshop/technical meeting, and field visits were conducted.

Workshop and technical meetings:

- Kick off meeting: 21 January, 2019

Field visits:

- West Jaintia Hills District: 22 January, 2019
- Ri-Bhoi District: 23 January, 2019
- West Khasi Hills District: 31 January – 1 February, 2019
- West Garo Hills and East Gallo Hills Districts: 4 February – 7 February, 2019
- West Jaintia Hills District: 15 February, 2019
- Jaintia Hills ADC area: 29 April, 2019
- Garo Hills ADC area: 1 May – 3 May, 2019
- East Khasi Hills District: 6 May, 2019
- Ri-Bhoi District: 7 May, 2019
- Guwahati, Assam State: 7 May, 2019
- East Khasi Hills District: 9 May, 2019
- East Khasi Hills District: 8 June, 2019

Subcontracted survey:

- Living Conditions Survey: January – March 2019

JICA missions

- JICA The First Fact Finding Mission: April, 2019
- JICA The Second Fact Finding Mission: June, 2019
- JICA Detailed Fact Finding Mission: July, 2019

1.3. Report Structure

This final report is structured in the following order: (1) Examination of the present status, (2) Problem analysis, (3) Review of the pre-Detailed Project Report (Pre-DPR), and (4) Proposal for a new project. Chapter 2 presents information about Meghalaya State, focusing on geography, demography, socio-economic characteristics, natural conditions, and a development plan and cooperation. Chapter 3 describes forest and forest management in the state. Chapter 4 highlights approaches to livelihood improvement in the state. Chapter 5 examines the institutional arrangements of the state. Chapter 6 reviews and assesses the Pre-DPR submitted by the state government. Chapter 7 presents the final output of the outline of the Project, as well as the scope of its work.

Chapter 2. The Study Area: Meghalaya

2.1. Area, Location, and Physiography

Meghalaya is one of 29 states of the Indian Union, with Shillong as its state capital. Meghalaya is located in the north-eastern region of India, along with the states of Assam, Arunachal Pradesh, Manipur, Mizoram, Nagaland, Tripura, and Sikkim. The total area of Meghalaya is approximately 22,429 km², and it stretches from 25° 02'N to 26° 07'N in a north-south direction and from 84° 49'E to 92° 50'E in an east-west direction. Its elevation ranges from 60 to 1,950 m above sea level. Meghalaya is bordered on the north and east by Assam State and on the west and south by Bangladesh, sharing an approximately 496-km-long international boundary.

Meghalaya has predominantly hilly terrain with foothills and plain, flood prone areas. It is broadly divided into three major hill regions, named Garo Hills, Khasi Hills, and Jaintia Hills, with three types of landforms. Examples of these types are the Meghalaya Plateau, the young fold mountains, and alluvial plains. The Meghalaya Plateau is the detached north-eastern extension of Indian Peninsular shield, a part of which lies under the alluvium deposited by the Ganga Brahmaputra system of rivers. The rivers of the State are rain-fed in nature, and their discharge remains low during the summer. Major rivers include the Daring, Sanda, Bugi, Dareng, Simsang, Umkhri, Digaru, Umngot, and Myntdu Rivers.

2.2. Administrative System of the State

Each of the three main tribes of Meghalaya, the Khasi, Garo and Jaintia, had their own kingdom until they came under colonial rule in the 19th century and were incorporated into Assam. In April 1970, Meghalaya was carved as a semi-autonomous state out of Assam, consisting of two districts: the United Khasi Hills and Jaintia Hills, and the Garo Hills. In January 1972, Meghalaya gained full-fledged status as state.

Currently, the Governor is the constitutional head of the State government. State administration is run in the name of the Governor, while executive power is exercised by the Council of Ministers, with the Chief Minister as its head.

There are numerous government departments dealing with various sectors, such as agriculture, animal husbandry, finance, forest and environment, fisheries, health and family welfare, labour, and public works.

2.2.1. Administrative Structure

As of March 2019, Meghalaya State is divided into eleven administrative districts, where earlier there were seven. In 2012, East Garo Hills was divided into the East Garo Hills and North Garo Hills Districts, Jaintia Hills was divided into the East Jaintia Hills and West Jaintia Hills Districts, West Khasi Hills was divided into the West Khasi Hills and South West Khasi Hills Districts, and West Garo Hills was divided into the West Garo Hills and South West Garo Hills Districts. There are 46 community development blocks, and the number of rural villages shown in the Socio Economic and Caste Census 2011 is 6,851[5]. Each of the eleven districts is headed by a Deputy Commissioner (DC), and the DCs are officers of the Indian Administrative Service.

2.2.2. Autonomous District Councils

Before Meghalaya gained statehood from Assam, the tribal population existed in pockets which constituted minority populations. Recognizing the need to protect tribal traditions and society, Sixth Schedule of Indian Constitution, special provisions are made for the administration of tribal dominated area under the Sixth Schedule of Indian Constitution. Accordingly, Meghalaya State has

[5] Village here refers to census village.

three elected Autonomous District Councils (ADCs), namely the Khasi Hills ADC, Garo Hills ADC, and Jaintia Hills ADC. The ADCs are vested with legislative, executive, and judicial functions and local administration, despite tribal population being the majority in the state. The areas over which the ADCs are given authority are:

- Lands and resources other than Reserved Forests
- Water courses for agricultural purposes
- Shifting cultivation
- Establishment of village and town administration
- Public health and sanitation
- Appointment and succession of chiefs and their authority
- Marriage
- Social customs, traditional practices, and customary laws

District administrations within the purview of each of ADC are shown in the table below.

Table 2.1: ADCs and District Administrations

ADC	District
Khasi Hills ADC	East Khasi Hills
	West Khasi Hills
	South West Khasi Hills
	Ri-Bhoi
Jaintia Hills ADC	East Jaintia Hills
	West Jaintia Hills
Garo Hills ADC	East Garo Hills
	West Garo Hills
	South Garo Hills
	North Garo Hills
	South West Garo Hills

Source: MBDA

In ADCs, policy decisions are made its Cabinet, which is an elected body. To link ADCs and the state government, there is a Department of District Council Affairs, which is a state department. However, the department plays nominal roles such as facilitating between ADCs and the state for obtaining any approval (such as ADC rules) from the state Governor and assisting ADCs in conducting elections.

Annual budget for each ADC is individually prepared. Because of limited revenues for ADCs, they are supposed to receive some grant-in-aid from both state and central governments. However, such fund provision is neither fixed in terms of amount or frequency, and in reality, ADCs get limited grants. According to a government official, the average annual expenditure for ADC is around Rs 500 million. In fact, total expenditure for JHADC was about Rs 764 million in FY 2015, out of which only Rs 0.8 million was grant from the government.

2.3. Population, Economy, and Social Conditions of the State

2.3.1. Demography and Scheduled Tribes

The population of Meghalaya State as of 2011 is 2,966,889, of which the male population is 1,491,832 and female population is 1,475,057[6]. The total population comprises 79.93% rural population (2,371,439) and 20.07% urban population (595,450), detailed in Table 2.16: The state recorded the highest decadal population growth, at 27.82%, among all seven of the north-eastern

[6] Government of Meghalaya. 2016. *Statistical Abstract Meghalaya 2016*. Shillong: GoM.

states of India, as per the 2011 Census of India.

Table 2.2: Population by Sex, Area, and District

District	Rural			Urban			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Jaintia Hills	182,610	184,084	366,694	13,675	14,755	28,430	196,285	198,839	395,124
East Khasi Hills	228,409	231,032	459,441	182,340	184,141	366,481	410,749	415,173	825,922
Ri Bhoi	118,705	114,882	233,587	13,826	11,427	25,253	132,531	126,309	258,840
West Khasi Hills	172,380	167,976	340,356	21,335	21,770	43,105	193,775	189,746	383,461
East Garo Hills	138,763	134,962	273,725	22,460	21,732	44,192	161,223	156,694	317,917
West Garo Hills	286,923	281,510	568,433	37,236	37,622	74,858	324,159	319,132	643,291
South Garo Hills	66,470	62,733	129,203	6,700	6,431	13,131	73,170	69,164	142,334
Meghalaya	1,194,260	1,177,179	2,371,439	297,572	297,878	595,450	1,491,832	1,475,057	2,966,889

Source: Statistical Abstract Meghalaya 2016

Based on the 2011 Census, the total number of households in Meghalaya State is 538,299, of which 78.42% reside in rural areas[7]. The average household size in the state, specifically in rural areas, is relatively large compared to other states of the entire country, except for northern and north-eastern states. Meghalaya State, as well as Arunachal Pradesh, Manipur, and Nagaland States, is one of 11 states of which the average household size is five or more[8]. In Meghalaya State, households that have 'six to eight members' and 'nine members or more' make up 33.75% and 10.73% of the total rural households, respectively[9].

The state is inhabited largely by Scheduled Tribes (ST) groups of people, which make up 86.15% of the total state population (Table 2.3) whereas the total population of ST in the entire country make up only 8.6% of the total national population. On the other hand, the population of Schedule Castes (SC) in Meghalaya account for 0.58% of its total population, whereas the population of SC in the entire country makes up 16.6% of the total national population (Table 2.3). In the state, there are three major ST, namely the Khasis, the Jaintias, and the Garos, which account for 34%, 18.5 %, and 30.5 % of the total population, respectively. The remaining 17 % includes minor tribal groups of Hajong (1.2%), Biate (1.1%), Koch (1.0%), and Tiwa (0.9%), as well as immigrants from Bangladesh (7.5%) and Nepal (3.5%).

Table 2.3: Ratio of ST and SC Population

District	Total Population	Total ST Population	% of ST Population	% of Rural ST	% of Urban ST	Total SC Population	% of SC Population	% of Rural SC	% of Urban SC
Jaintia Hills	395,124	376,099	95.20	93.10	6.90	1,317	0.33	92.30	7.70
East Khasi Hills	825,922	661,158	80.10	65.40	34.60	5,642	0.68	54.10	45.90
Ri-Bhoi	258,840	230,081	88.90	92.30	7.70	590	0.23	85.40	14.60
West Khasi Hills	383,461	375,097	97.80	88.60	11.40	168	0.04	86.30	13.70
East Garo Hills	317,917	305,180	96.00	87.20	12.80	509	0.16	42.20	57.80
West Garo Hills	643,291	474,009	73.70	88.70	11.30	8,810	1.37	70.90	29.10
South Garo Hills	142,334	134,237	94.30	91.70	8.30	319	0.22	59.90	40.10
Meghalaya	2,966,889	2,555,861	86.15	83.60	16.40	17,355	0.58	66.70	33.30

Source: Statistical Abstract Meghalaya 2016

2.3.2. Socio-economic Conditions and Poverty Level

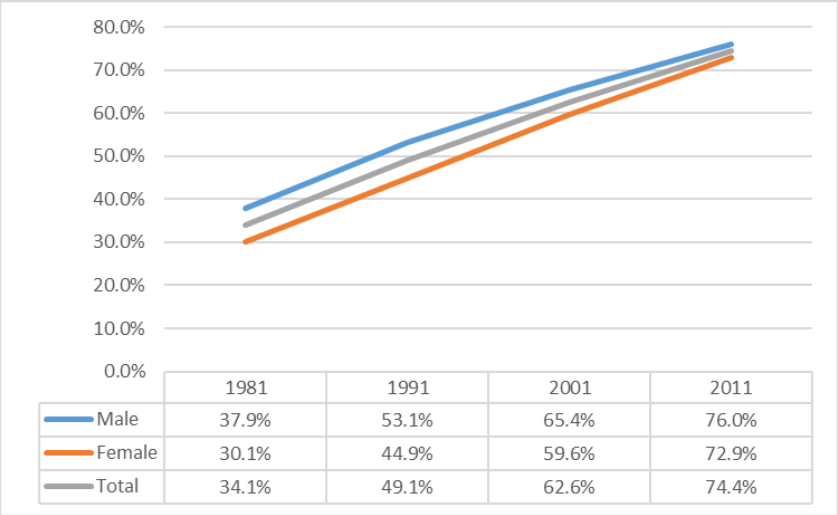
(1) Literacy Rate

[7] Government of Meghalaya. 2016. *Statistical Abstract Meghalaya 2016*. Shillong: GoM.

[8] https://www.itnext.in/article/2015/09/30/census-2011-india-average-household-size (last access Feb. 28, 2019)

[9] ibid.

The literacy rate of Meghalaya has drastically improved from 34.08% in 1981 to 74.43% in 2011[10], shown in Figure 2.1.



Source: Statistical Abstract Meghalaya 2016

Figure 2.1: Trend of Sex-wise Literacy Late (1981-2011)

There is quite a huge disparity in the literacy rate between ST men and ST women in rural areas, specifically in Garo Hills District, while the gender disparity in urban areas of all districts is less than 3.35 percent points (Table 2.4).

Table 2.4: Literacy Rate of ST by Sex, Area, and District (2011)

Districts	ST Rural		ST Urban		Total ST Male	Total ST Female
	ST Male	ST Female	ST Male	ST Female		
Jaintia Hills	54.99	62.92	92.31	90.61	57.74	65.16
East Khasi Hills	76.75	79.51	93.34	91.23	82.58	83.99
Ri-Bhoi	75.23	74.46	84.94	83.22	75.98	75.18
West Khasi Hills	77.54	76.05	88.01	88.11	78.74	77.49
East Garo Hills	75.30	66.99	92.93	90.24	77.64	70.2
West Garo Hills	72.80	61.62	93.32	90.48	75.17	65.19
South Garo Hills	74.18	64.62	91.48	88.13	75.63	66.66
Meghalaya	72.19	69.78	92.30	90.33	75.54	73.54

Source: Statistical Abstract Meghalaya 2016

(2) Tenure of Farm land

A majority of the state population, specifically the rural population, is engaged more in rain-fed agriculture, including bun cultivation and shifting cultivation or *jhum*, than it is in agriculture that uses irrigation. This has made marginal and small farmers, as well as landless sharecroppers, vulnerable to risks related to food and livelihood insecurity due to such phenomena as increasing population, changing climate, soil erosion, and low productivity[11]. In Meghalaya, marginal farmers and small farmers account for 76.57% out of a total number of 209,561 farmers who hold and operate land (Table 2.5)[12]. The average sizes of land holdings for marginal farmers and small farmers are 0.45 ha and 1.33 ha, respectively[13]. Furthermore, there is a certain proportion of the landless sharecroppers who rent small land from a landowner on an annual basis; specifically, this

[10] ibid.

[11] Nair, Malini et al. 2013. "Poverty index as a tool for adaptation intervention to climate change in northeast India" *The LSE Research Online* (available at http://eprints.lse.ac.uk/31061/, last access Feb.27, 2019).

[12] Government of Meghalaya. 2016. *Statistical Abstract Meghalaya 2016*. Shillong: GoM.

[13] ibid.

is the case in East Khasi Hills, Ri-Bhoi, and Jaintia Hills where much land has been privatized[14]. These landless, marginal, and small farmers have more difficulty in improving their livelihoods by selling surplus cash crops or even meeting food self-sufficiency because of not only very limited land holding/operations, but also a lack of water resources during dry season, fertile soil, technology, access to the market, etc.

Table 2.5: Number of Farmers Holding and Operating Land Area for the Year 2010-2011

Farmers' Category	No. of Farmers Holding & Operating	% of Farmers	Area (ha)	Average holding Size (ha)	% of Area
Marginal Farmers	102,714	40.00	46,196	0.45	16.08
Small Farmers	57,755	27.56	76,833	1.33	26.75
Small-Medium Farmers	40,542	19.35	113,174	2.79	39.40
Medium Farmers	8,312	3.97	47,132	5.67	16.41
Large Farmers	218	0.11	3,923	16.48	1.37
Total	209,561	100.00	287,258	1.37	100.00

Source: Statistical Abstract Meghalaya 2016

(3) Basic-life Supporting Infrastructure

The accessibility of a household to infrastructure and facilities, such as drinking water, electricity, and liquefied petroleum gas (LPG), is closely related to basic human life. Thus, it tends to determine the living conditions of household members. The accessibility varies by residential area and the economic status of a household. In Meghalaya State, 30.17% of total rural households use wells and 21.75% use springs for drinking water, while rural households using taps make up only 28.72%. On the other hand, 77.59% of total urban households use taps, while the total urban households using springs make up only 8.82 %[15]. Similarly, the majority of total urban households (94.93%) have access to electricity while only 51.57% of total rural households do[16]. The population of the state that uses LPG is only 0.2 million out of 5.6 million in all seven north-eastern states of India. Many households in the state, specifically those living in rural areas, still rely on firewood for cooking and other purposes.

(4) Poverty Level

The economic condition of people in Meghalaya State is lower than their counterparts in other states in the north-eastern region and the entire country. The Per Capita Purchasing Power Parity (PPP) of Meghalaya State in 2017 is USD 4,845, ranking fifth out of the seven north-eastern states and 28th of all 33 states in India[17], shown in Table 2.6. This is about USD 1,000 less than the average PPP of the entire country.

Table 2.6: State-wise PPP per capita in North-eastern States and Other States in India

State/Area	PPP (Int. $)	Rank among 7 Northeastern States	Rank among All 33 States
Goa	17,644.48	-	1
Delhi	17,317.08	-	2
Arunachal Pradesh	6,728.17	1	16

[14] Based on the Study Team's interview with official of Directorate of Horticulture on Feb. 15, 2019.
[15] ibid.
[16] ibid.
[17] Available at https://statisticstimes.com/economy/comparing-indian-states-and-countries-by-gdp-capita.php (last access Feb. 27, 2019)

Nagaland	6,303.20	2	19
Mizoram	5,992.28	3	20
Tripura	5,487.28	4	22
Meghalaya	4,845.15	5	24
Assam	3,484.45	6	30
Manipur	3,272.69	7	31
India	5,855.31	-	-

Source: https://statisticstimes.com/economy/comparing-indian-states-and-countries-by-gdp-capita.php (last access Feb. 27, 2019)

More than 80% of total population in Meghalaya State depend their livelihoods on agriculture. However, agriculture in the state is characterized with limited land holding/operation, low productivity due to soil erosion, limited use of agricultural inputs and scientific farming technology, and inappropriate market system. According to the 2011 census, around 12.5% of total rural population are below poverty line. As mentioned previously, landless sharecroppers and marginal and small farmers, in particular, are placed in difficult circumstances and exposed to the risk of further food and income deficit.

The survival or ability of those who live below the poverty line to escape from poverty depend largely on whether they can diversify their income sources by having a couple of sources that are alternatives to *jhum* or sharecropping which is not reliable at all. The household income structure in 2012-2013 in the north eastern hill region of India shows that the households derive their income from crop production (47.85%) and other income from livestock rearing (21.56%), off farm businesses (17.99%), and wages and salaries (12.60%)[18]. According to the result of National Sample Survey (NSS) in 2016, the increase rate of the income from crop production, livestock rearing, off farm businesses, and wages and salaries was 1.18, 7.30, 8.20, and 1.81 times, respectively, over the period from 2002-03 to 2012-13[19]. This trend shows that livestock rearing played important role to enhance income.

Based on these analyses, livestock rearing is one of the reliable income sources found in Meghalaya State, as well as in other north-eastern states. Taking this point into account, Nair, Malini. et al. analyzed the relative poverty status of all districts in the north-eastern states by developing their own poverty index, consisted of indicators of 'urban-rural population ratio', 'per-capita income', 'number of livestock owned per household', 'Gini Coefficient of income', and 'literacy rates'. In their analysis, West Garo Hills, Ri-Bhoi, and South Garo Hills Districts are categorized as 'Very High' in their poverty index[20]. Similarly, Jaintia Hills District is categorized as 'High', while East Garo Hills and West Khasi Hills Districts are 'Moderate' and East Khasi Hills District is 'Very Low'[21].

2.3.3. Traditional Decision-making Structures

Meghalaya State is consisted of 11 districts with 46 blocks. In each district, the state government sets up line departments' offices at the district and block levels, and a deputy commissioner takes up a role of administrative governance of such line-departments' offices.

Parallel to this state government's administrative structure, there are hierarchical, traditional decision-making structures, from the district level to the family level, that are mainly responsible for forests, other land, and natural resource issues. Under these structures, total 11 districts are

[18] Datta, K.K. "Towards Enhancing the Farm Income in the Relatively Disadvantaged Areas in India: the North East Hill Region of India." available at http://www.isaeindia.org/wp-content/uploads/2017/06/keynote%20paper%20-Theme%20IV%20-%20Dr%20KK%20Datta.pdf (last access May 5, 2019)

[19] ibid.

[20] Nair, Malini et al. 2013. "Poverty index as a tool for adaptation intervention to climate change in northeast India." in *the LSE Research Online* (available at http://eprints.lse.ac.uk/31061/, last access Feb.27, 2019).

[21] ibid.

divided into three ADC areas: 1) Khasi Hills ADC looks after four districts of East Khasi Hills, West Khasi Hills, South West Khasi Hills, and Ri-Bhoi Districts; 2) Jaintia Hills ADC looks after two districts of East Jaintia Hills and West Jaintia Hills Districts; and 3) Garo Hills ADC looks after five districts of East Garo Hills, West Garo Hills, North Garo Hills, Southwest Garo Hills, and South Garo Hills Districts. As mentioned previously, each of ADCs had been established in late 1950's due to the demand of tribal people for autonomy while Meghalaya was still belonging to Assam. Even after the establishment of Meghalaya State in 1972, the system of ADCs has been maintained to date. ADC, specifically Department of Forest within ADC, is mandated mainly to make policies and regulations on forests, other land, and natural resources. All ADCs in Khasi, Jaintia, and Garo Hills are not in the relation of reporting to or collaboration with a deputy commissioner at the district level or line department offices at the district and block levels. However, ADCs are in a hierarchical relation only with the State Governor, and they have to get an approval from the State Governor whenever they developed a new act and law.

In each of three hill areas, including Khasi, Jaintia, and Garo Hills, there are hierarchical, traditional decision-making structures, under ADC, that are supposed to fill a decision-making role and dealt with common property and natural resource issues based on their customary laws, regulations, and traditional practices[22]. The reason why several hierarchical, traditional decision-making structures, instead of the lowest administrative unit of a village or *Shnong*[23], look after forests, other land, and natural resources is that the boundary of forests, agricultural land, and watershed is often unclear between neighbouring villages, and the common property without clear boundary at the village level is managed and looked after by the hierarchical, traditional institutions under ADC. However, the hierarchical systems of such traditional institutions vary by hill area and tribe, while ADC is common to all three hill areas.

First, Khasi Hills has a system of a larger territory cluster consisted of several villages, called *Hima*, which functions as the second highest decision-making body under ADC[24]. In a *Hima*, policies and regulations on the communal property of forests and other land are exclusively determined by its executive committee, which comprises a head of the *Hima* or *Syiem Hima*, a secretary, vice secretary, treasurer, vice treasurer, and representatives of each village belonging to the *Hima*[25]. Under *Hima*, there is a smaller territory cluster composing a few villages, called *Raid*. Similarly, *Raid* has its own executive committee, for the purpose of decision-making, which is headed by *Syiem Raid*[26]. At the village level, every villag has a village council or *Dorbar Shnong* that takes responsibility for village-owned forest and other land issues, under the leadership of its head of a village or *Rangbah Shnong*[27]. In addition to village-owned property and natural resources, *Rangbah Shnong* often takes up a role of decision-making for community development. If there are more than one clan in a village, each clan or *Kur* may have an elder who acts as a head of the clan, or *Rangbah Kur*[28].

Secondly, in Jaintia Hills, there are provinces or *Elakas* as the second highest level or structure under ADC. Each of *Elakas* is headed by *Doloi*. The lowest level or structure in Jaintia Hills is a village, called *Chrong* or *Shnong*, which is headed by *Wheh Chrong* or *Ranbah Shnong*. Power and

[22] Tiwari, B.K. et al. 2010. "Forest management practices of the tribal people of Meghalaya, north-east India." *Journal of Tropical Forest Science* 22 (3): pp. 329-342.

[23] According to Khasi Hills District Autonomous Council Village Administrative Bill, 2014, 'village' is defined as "an area of human habitation having definite contiguous boundary where a number of houses has been grouped together under one village for administrative purposes and recognized as such by the *Elaka* under which the village falls and by the Executive Committee". In Meghalaya, as well as in other states, MGNREGA is implemented at the 'village' level.

[24] Tiwari, B.K. et al. 2010. "Forest management practices of the tribal people of Meghalaya, north-east India." *Journal of Tropical Forest Science* 22 (3): pp. 329-342.

[25] ibid.

[26] ibid.

[27] ibid.

[28] ibid.

functions of *Dolois* and *Wheh Chrong* have been given on a basis of Elaka Act 2015. These are generally similar to those of *Siem Hima* and *Rangbah Shnong* in Khasi Hills. This is mainly because the forest management of Khasi Hills and Jaintia Hills is based on United Khasi and Jaintia Hills Autonomous District Act of 1958.

Lastly, in Garo Hills, there is no system of *Hima*, *Raid, Eleka,* or *Dorbar Shnong* under ADC. In Garo Hills, not much land has been prioritized yet, but rather has remained as clan-owned or *A'khing* land, which tends to spread across multiple villages. This is because the boundaries of land in Garo Hills are also not determined by villages' boundaries, but *A'khing Nokma*'s boundaries. *A'khing* land is allotted to each household belonging to the same clan on an annual basis in the case of *jhum* cultivation and for an almost permanent term in the case of plantations[29]. The land is under the custodianship of *A'khing Nokma*, any daughter who has been selected so and inherited *A'khing* land from her mother. For actual decision-making on land allotment and other clan-related issues, however, the husband of *A'khing Nokma* takes the role and acts on her behalf[30]. Members of the *A'khing Nokma*'s clan do not have the right to sell or have control over the land allotted to them, but have access to use. *A'khing Nokma* often looks after several villages and each village of them or each clan at the village level is looked after by a clan's head or *Nokma* and its *Nokma* Council. There are *Chra* comprising the maternal uncles and brothers of the Nokma and *Mahari* comprising male relatives from the same motherhood of the *Nokma*[31].

In all of the traditional institutions mentioned, only men are usually entitled to membership, based on traditions and social norms, except *Dorbar Shnong* in Jaintia Hills where that women are supposed to be involved in the executive committee of *Dorbar Shnong* is regulated by 'Village Administration Bill'. While the members of traditional institutions in Khasi Hills and Jaintia Hills are both elected or selected periodically, the same persons tend to continuously be selected and take up the same roles for a quite long time. On the other hand, there is no regular election or selection for the members of traditional institutions in Garo Hills. Instead, those in Garo Hills assume roles indefinitely on the basis of their age and consanguineous or affinal relationship with the *Nokma*. Regardless of the different way of selecting members between Khasi Hills and Jaintia Hills and Garo Hills, all of these traditional institutions (except *Dorbar Shnong* in Jaintia Hills) exclude women from their decision-making processes. There are some villages in not only Jaintia Hills, but also Khasi Hills where women *Dorbar Shnong* members are elected due to the encouragement of and interventions made by NGOs, including North East Network that is devoted to the promotion of gender equality. However, these are still rare cases. Moreover, in most villages even general meetings are held and important issues are discussed without the presence of women, in addition to their absence from the membership of the executive committee.

2.3.4. Gender Issues

(1) Women's Status in India

In India, women and girls are generally more disadvantaged than men and boys in all aspects of life, including access to social services, economic opportunities, property ownership, and political participation although gender equality is ensured by the constitution.. This is mainly due to socio-cultural and religious values and patriarchal norms. The Government of India signed the UN Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) in July 1980 and ratified it in July 1993. Since ratification, the Government has submitted progress reports, up to the 4th and 5th joint progress report in 2012. In response to the latest report, the CEDAW Committee based in Geneva pointed out the shortcomings of Government's efforts in addressing certain issues, including among others gender-based violence (GBV), women's limited participation in politics, women's limited labor force participation and land ownership, the still high maternal mortality rate (MMR), and child marriage. In Global Gender Gap Index 2018, India

[29] MBDA and AFC India Ltd. 2014. *Report on Land Tenure and Livelihoods in Meghalaya*. Shillong: MBDA.
[30] Pre-DPR.
[31] Pre-DPR

ranked 108 out of 149 countries. Of the four elements of the Index, each of which are composed of multiple sub-indicators, India ranked 142 in the element of 'economic participation and opportunity' and 147 in 'health and survival'.

(2) Critical Gender Issues in Meghalaya State

Apart from the majority of Hinduism-based society in India, tribal society in Meghalaya State is matrilineal, where the youngest or any daughter inherits land from her mother and takes care of her parents, female siblings' families, and other relatives as the head of the family or clan. Thus, people have no obvious preference for boys over girls; infanticide is not practiced, nor are girls discriminated against, relative to the rest of the country, in regards to food and nutrition intake, health care, and school enrolment. This can be proved by the state's sex ratio for the age group of 0 to 6 years, which is 973, versus 927 for India as a whole. It can also be seen in the state's female literacy rate, which is 73.78%, versus 65.45% for India as a whole.

Matrilineal society in the state, however, does not necessarily mean that gender equality is ensured, or that women are empowered and enjoy equal opportunities and rights. Rather, based on its socio-cultural norms and traditions, unequal gender relations and gender division of labor have been deeply embedded in the society[32]. This is not different from other Hindu and patriarchal societies in other parts of India. Though women inherit land and have ownership under their names, they do not have control over it or make any decisions about it. Rather, their uncles or husbands do[33]. Similarly, due to traditional social norms, in the past, women were not allowed even to attend public meetings and are still excluded from membership in traditional hierarchical institutions, such as village councils or *Dorbar Shnong*, *Raid*, *Hima*, etc., as previously mentioned. Women's representation in the Meghalaya Legislative Assembly has also been non-existent or very limited, with its highest total being 5 out of 60 total members elected for the period of 2013 to 2018[34].

Such unequal gender relationships have reinforced gender division of labor/role and led to certain problems in the state. The problems include husbands' abandoning wives and children, the feminization of poverty, and GBV. Based on social norms and traditions, women mainly take responsibility for household chores and child care, whereas men work outside and earn a living. In rural areas, however, women take more roles, such as fetching water, collecting firewood, cultivating crops, and taking care of livestock, in addition to household chores and child-care wherease men mainly cultivate crops and are engaged in labor work. Due to a lack of male landownership, men tend to be less motivated to invest their hard work in cultivation[35], and due to the tradition of cohabitation, men tend to easily abandon their wives and children for other women, without paying alimony or child support[36]. This causes an increasing number of female-headed households and the feminization of poverty, both in rural and urban areas[37]. In contrast to Hinduism-based society, women in tribal society are not restricted by social norms from working outside or doing daily labor work[38]. Due to gender-discriminating wage rates, however, doing daily labor work does not necessarily contribute to the survival and livelihoods of women and their families. Furthermore, Meghalaya State recorded the highest in domestic violence rate in the

[32] UNDP. 2009. "Chapter 8 Women's Empowerment in Meghalaya", in *Meghalaya Human Development Report 2008*. Delhi: UNDP.
[33] ibid.
[34] https://www.thequint.com/voices/opinion/opinion-meghalaya-assembly-elections-northeast-few-women-politicians-bjp-cong (latest access March 2, 2019)
[35] UNDP. 2009. "Chapter 8 Women's Empowerment in Meghalaya", in *Meghalaya Human Development Report 2008*. Delhi: UNDP.
[36] https://www.thequint.com/voices/opinion/opinion-meghalaya-assembly-elections-northeast-few-women-politicians-bjp-cong (last access March 2, 2019)
[37] ibid.
[38] ibid.

country, as per the National Family Health Survey (1998-99)[39], and is one of the country's top ten states in regards to its percentage of child marriage for both girls and boys[40]. Thus, many women suffer from gender inequality despite it being a matrilineal society, as their counterparts in Hinduism- and Muslim-based societies do.

The Meghalaya State Commission for Women was established in accordance with the Meghalaya State Commission of Women Act, 2005. In collaboration with the Commission, the Government of Meghalaya, specifically the Department of Social Welfare Department, is mandated to empower women in the state and eliminate all forms of discrimination against women. However, its intervention is limited to the implementation of centrally-sponsored schemes which focus on skill training and income generation through self-help groups (SHGs). It does not, however, address the need to foster women's strategic gender needs, namely agency and decision-making power, nor does it address GBV through political and legislative intervention, advocacy, and practices. The centrally-sponsored schemes implemented by the Department of Community and Rural Development include *Swarna Jayanti Gram Swrozgar Yojana* (SGSY), *Jawahar Gram Samridhi Yojana* (JGSY), *Indira Awaas Yojana* (IAY), among others. The Department of Labour has provided vocational training for women under the "Women's Vocational Training Programme". Similarly, Meghalaya State Rural Livelihood Society, under the Department, has implemented National Rural Livelihood Mission (NRLM) which target exclusively women. Other departments, such as the Department of Agriculture, involve women farmers in their activities and training programs, setting up the quota of more than 30% of total participants for women under centrally-sponsored schemes in particular.

2.3.5. State Economy

(1) Gross State Domestic Product

Like other north-eastern states, Meghalaya State has had slow economic growth and development. Its gross state domestic product (GSDP) for 2016-2017 was about Rs 272.28 billion, with a compound annual growth rate (CAGR) of 6.8% between 2011-2012 and 2016-2017[41].

Meghalaya State is predominantly an agricultural economy, as the agriculture sector engages about two-thirds of its total workforce[42]. However, the GSDP of the sectors of 'agriculture', 'forestry & logging', and 'fishery' was about Rs. 38.19 billion in 2014-2015, which accounts for only 15% of the total GSDP (Table 2.7).

[39] UNDP. 2009. "Chapter 8 Women's Empowerment in Meghalaya", in *Meghalaya Human Development Report 2008*. Delhi: UNDP.

[40] The Shillong Times dated Aug. 11, 2018.

[41] https://www.ibef.org/download/Meghalaya-March-2018.pdf (last access March 5, 2019).

[42] JICA. 2015. *Republic of India Data Collection Survey on Agriculture Sector in Northeast India Final Report 2015.* Tokyo: JICA.

Table 2.7: Trend of GSDP 2009-2010 to 2014-2015

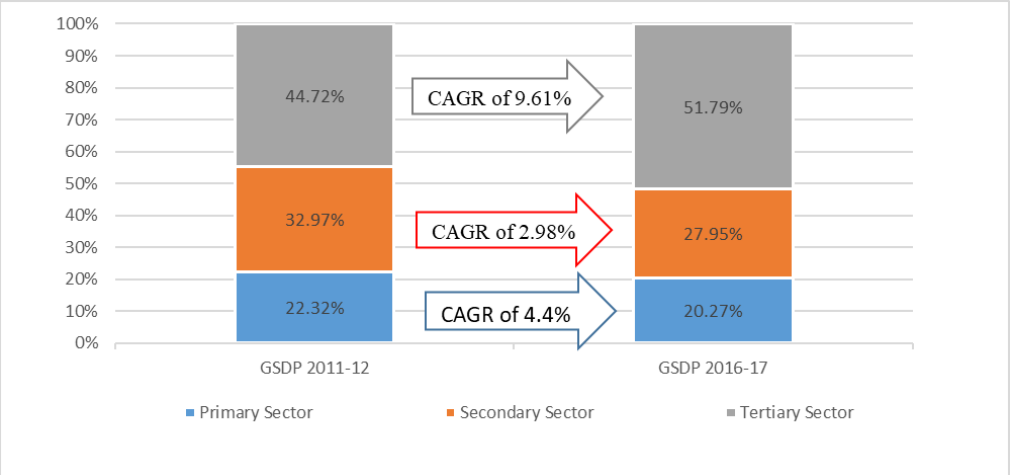
	2009-10	2010-11	2011-12	2012-13 (P)	2013-14(Q)	2014-15(Adv)
Agriculture	174,935	183,955	204,115	240,000	271,271	299,169
Forestry & Logging	50,566	56,444	60,087	64,039	68,891	73,651
Fishing	3,670	3,859	4,083	6,582	7,638	9,030
Sub-total	**229,171**	**244,258**	**268,285**	**310,621**	**347,800**	**381,850**
Manufacturing	70,689	95,253	114,443	125,315	130,095	151,544
Mining & Quarrying	86,701	105,743	115,234	93,109	95,920	98,051
Construction	210,830	231,059	331,810	366,205	449,012	490,563
Electricity, Gas & Water Supply	32,863	22,732	15,656	32,471	31,956	36,751
Sub-total	**401,083**	**454,787**	**577,143**	**617,100**	**706,983**	**776,909**
Transport, Storage & Communication	88,098	104,580	117,621	140,100	164,376	194,762
Trade, Hotel & Restaurant	129,471	154,202	178,162	182,938	205,957	231,962
Banking & Insurance	30,494	42,869	54,902	55,280	58,160	68,348
Real Estate, Ownership of Dwelling & Business Services	98,524	103,350	111,547	115,748	125,314	130,036
Public Administration	176,828	200,583	223,191	238,158	262,836	302,597
Other Services	117,241	153,627	189,006	240,961	320,781	446,876
Sub-total	**640,656**	**759,211**	**874,429**	**973,185**	**1,137,424**	**1,374,581**
Total SGDP	**1,270,910**	**1,458,256**	**1,719,857**	**1,900,906**	**2,192,207**	**2,533,340**

P: Provisional, Q: Quick Estimates, and Adv.: Advanced Estimates

Unit: in Rs 100,000

Source: GoM. 2016. *Statistical Abstract Meghalaya 2016.* Shillong: GoM.

Similarly, based on India Brand Equity Foundation (IBEF)'s analysis, the contribution of the primary sectors of agriculture and related sectors to the GSDP in 2016-2017 was 20.27% with a CAGR of 4.4% between 2011-2012 and 2016-2017[43] as shown in Figure 2.2. In contrast, tertiary sectors grew at a CAGR of 9.61% during 2011-2012 and 2016-17, and raised its proportion of the GSDP from 44.72% in 2011-2012 to 51.79% in 2016-2017. On the other hand, the proportion of GDSP made up by secondary sectors, including 'manufacturing', 'mining & quarrying', and 'construction', declined from 32.97% in 2011-2012 to 27.95% in 2016-2017, with a CAGR of 2.98%.



Source: https://www.ibef.org/download/Meghalaya-March-2018.pdf (last access March 5, 2019).

Figure 2.2: Sector-wise GSDP of Meghalaya for 2011-12 and 2016-17

(2) Agriculture

In Meghalaya State, more than 80% of the population depends entirely on agriculture for their livelihoods[44]. However, agriculture in the state is characterized by marginal or small holding and operation, as well as no or limited use of scientific or modern techniques, low productivity, and low production. Land under cultivation as of 2013-2014 was only 12.7% of the total area of the state,

[43] https://www.ibef.org/download/Meghalaya-March-2018.pdf (accessed March 5, 2019).

[44] Tiwari, B.K. and Lynser, M.B. 2010. "Forest management practices of the tribal people of Meghalaya, north-east India." *Journal of Tropical Forest Science*, 22(3): pp. 329-342.

out of which land cultivated more than once per year was only 20%[45]. This is mainly because farmers graze their cattle in their paddy field during dry season, instead of cultivating vegetables. Low productivity and low production are attributed not only to no or limited use of agricultural inputs and scientific or modern techniques, but also to soil erosion caused by heavy rainfall and the shortened cycles of *jhum* cultivation, due to an increase in population.

In Meghalaya State, 43,200 ha, which accounts for about 15% of total cultivated land, is used for *jhum* cultivation, and more than 0.25 million people are still involved and depend on *jhum* cultivation for their livelihoods[46]. Farmers cultivate dry rice, maize, finger millet, yam, tapioca, sweet potatoes, ginger, chilies, etc. under *jhum* cultivation[47]. According to Swami, the cycle for *jhum* cultivation has been shortened from 10 to 20 years to 5 to 7 years[48]. Furthermore, "the Report on Land and Tenure and Livelihoods in Meghalaya" by AFC India Ltd. shows that the cycle for *jhum* cultivation was already shortened to 5 to 7 years in 1983, based on "1983 Task Force Report", and 2 to 3 years in 2014, based on "2014 Information of State Agriculture and Soil Conservation Department"[49]. The shortened cycle for *jhum* cultivation has led to soil erosion and a drastic decline in productivity[50]. Due to this critical reason, as well as the reason that *jhum* cultivation has caused deforestation, many farmers have already partially converted *jhum* land to plantations'. Based on an interview with individual farmers and focus groups discussion conducted in West Garo Hills in February and May 2019, they have no intention to make *jhum* cultivation completely replaced by plantation farming because they depend on *jhum* cultivation as a way of getting food grains and vegetables for domestic consumption. In reality, however, participants in the focus groups discussion conducted in Selbalgre Village, West Garo Hills District in May 2019 said that around 75% of the total *jhum* land has already been converted to areca nuts' plantations' which deprives most of their cash income.

In the state, various types of food grain and horticulture crops are cultivated. These vary by altitude- and climatic eco-zones and farming methods, namely settled cultivation, plantation farming, *jhum* cultivation, and agro-forestry[51]. The most dominant food grain crop in the state is rice, including dry rice cultivated in upland through *jhum* cultivation, which accounts for 72.88% of the total food grain production in the state (Table 2.8). Other food grain crops are maize, wheat, and small millets. Main tuber and spices crops, cultivated through both settled and *jhum* cultivation and agro-forestry, include potatoes, sweet potatoes, tapioca, ginger, turmeric, chilies, and black pepper (Table 2.9). On the other hand, main fruits, cultivated in tropical and sub-tropical areas, are mandarin oranges, pineapple, bananas, papaya, and strawberries, while main plantation crops in those areas are tea, areca nuts, cashew nuts, rubber, and coffee (Table 2.10).

Table 2.8: Area, Production, and Yield of Main Food Grain and Horticulture Crops

	Rice				Wheat	Maize	Total Small Millets	Total Pulses	Total Food Grains
	Autumn	Winter	Spring	Total					
Area in ha	33,310	63,834	13,747	110,891	489	29,533	2,942	8,304	152,159
Production (metric tons)	88,818	175,689	35,885	330,392	1,012	71,056	3,058	12,687	418,205
Average Yield (kg/ha)	2,666	2,752	4,793	2,979	2,070	2,406	1,039	1,528	2,748

Source: data provided by Directorate of Horticulture, Government of Meghalaya

[45] Government of Meghalaya. 2016. *Statistical Abstract Meghalaya 2016*. Shillong: GoM.
[46] Pre-DPR.
[47] Swami, Sanjay. 2018. "Shifting cultivation: A tribal way of life in north east India and alternative approaches for increasing productivity." in *The Pharma Innovation Journal*, 7 (3), pp. 300-385.
[48] ibid.
[49] AFC India Ltd. 2014. *Report on Land Tenure and Livelihoods in Meghalaya*. Shillong: MBDA.
[50] Swami, Sanjay. 2018. "Shifting cultivation: A tribal way of life in north east India and alternative approaches for increasing productivity." in *The Pharma Innovation Journal*, 7 (3), pp. 300-385.
[51] Based on the Study Team's interview with officials of the Directorate of Horticulture on Feb. 15, 2019.

Table 2.9: Area, Production and Yield of Main Tuber and Spices Crops and Fruits

	Tuber Crops				Spice Crops						
	Potato	Sweet Potato	Tapioca	Total	Ginger	Turmeric	Chilly	Garlic	Black Pepper	Tezpata	Total
Area in ha	19,449	4,690	6,353	30,452	10,363	3,281	2,743	417	1,032	3,956	21,792
Production	214,620	17,847	40,351	272,618	74,893	23,823	2,628	1,282	766	11,904	115,296
Average Yield (kg/ha)	11,035	3,838	6,320	8,952	7,227	7,261	1,282	3,074	742	3,009	5,291

Source: data provided by Directorate of Horticulture, Government of Meghalaya

Table 2.10: Area, Production and Yield of Fruits and Plantation Crops

	Fruits								Plantation Crops					
	Total Citrus Fruits	Pineapple	Banana	Papaya	Straw-berry	Template Fruits	Others	Total Fruits	Tea	Arecanut	Cashew-nut	Rubber	Coffee	Total
Area in ha	12,558	12,162	7,242	962	144	1,316	3,588	37,972	2,955	18,571	10,459	5,260	416	37,661
Production in MT	57,764	140,945	94,320	7,783	1,057	10,986	134,417	447,272	18,001	31,478	22,686	3,188	455	75,808
Average Yield in kg/ha	4,600	11,589	13,024	8,090	7,340	8,348	37,463	11,779	6,092	1,695	2,169	606	1,094	2,013

Source: data provided by Directorate of Horticulture, Government of Meghalaya

(3) Livestock Management/Animal Husbandry

In Meghalaya State, animal husbandry is an important industry contributing to the GSDP of the agriculture sector, while most animals that are reared in the state are indigenous. Improved or crossbred animals are very limited (Table 2.11). Commonly-managed livestock include cattle, buffalo, goats, pigs, sheep, and poultry; this last of which includes fowl (chicken) and duck, as shown in Table 2.11.

Table 2.11: Livestock Population as per the 2012 Census and Growth Rate as Compared to the 2007 Census

	Population (Number)		Growth Rate (%)
Cattle	Crossbred	26,458	-1.45
	Indigenous	879,295	2.20
Buffalo	Indigenous	24,894	10.02
Goat	Indigenous	47,233	29.23
Pig	Exotic/Crossbred	137,984	96.68
	Indigenous	431,317	-5.04
Sheep	Exotic/Crossbred	805	232.64
	Indigenous	20,186	-2.95
Poultry (Fowl)	Improved	344,157	25.84
	Desi	3,197,559	16.15
Poultry (Duck)	Improved	514	-93.56
	Desi	22,331	-61.76

Source: Department of Animal Husbandry & Veterinary, GoM. 2019. *Report on Integrated Sample Survey for Estimation of Production Milk, Egg and Meat*. Shillong: GoM.

Based on the sample surveys conducted, a greater percentage of households rear poultry and pigs throughout the year (Table 2.12)[52].

[52] Department of Animal Husbandry & Veterinary, GoM. 2019. *Report on Integrated Sample Survey for Estimation of Production Milk, Egg and Meat*. Shillong: GoM.

Table 2.12: Percentage of Households Managing Livestock by Season in 2016-2017

Unit: %

	Summer	Monsoon	Winter	Annual
Cattle	48.59	46.15	44.56	46.31
Poultry	82.08	81.65	85.16	82.98
Sheep	0.06	0.97	0.42	0.01
Goat	28.39	22.01	17.07	22.16
Pig	59.02	65.04	67.62	64.18

Source: Department of Animal Husbandry & Veterinary, GoM. 2019. *Report on Integrated Sample Survey for Estimation of Production Milk, Egg and Meat*. Shillong: GoM.

In terms of livestock management for commercial purposes, cattle are often managed for the purpose of using its manure for cultivation and producing meat, while milk production is very low. Furthermore, the majority of productive cows in the state are indigenous, while crossbred cows, of which dairy yield is much higher than that of indigenous ones, are limited (Table 2.13)[53].

Table 2.13: Estimated Number of Productive Cows, Yield per Day, and Production in the Year of 2016-2017 and 2017-2018

	Status	Year 2016-2017			Year 2017-2018		
		No.	Yield per day in kg	Production in 1000 tons	No.	Yield per day in kg	Production in 1000 tons
Indigenous Cows	in Milk	122,200	0.762	34.112	122,800	0.774	34.681
	Milch	235,000	0.297		220,600	0.430	
Crossbred Cows	in Milk	15,000	8.888	48.771	15,200	8.951	49.654
	Milch	17,700	7.542		17,500	7.746	

Source: Department of Animal Husbandry & Veterinary, GoM. 2019. *Report on Integrated Sample Survey for Estimation of Production Milk, Egg and Meat*. Shillong: GoM.

In Meghalaya State, where the majority of the population believes in Christianity and has the practice of eating beef, beef production makes up over a half of the total meat production in the state, as seen in Table 2.14.

Table 2.14: Meat Production by Category

	Total Production (in ton)	Proportion of Total Meat Production (in %)	Yield per Animal (in kg)
Cattle	23,171	53,74	89.86
Buffalo	570	1.32	117.89
Pig	14,414	33.43	43.35
Sheep & Goat	1,348	3.13	10.32
Poultry	3,615	8.38	1.32
Total	43,118	100.00	-

Source: Department of Animal Husbandry & Veterinary, GoM. 2019. *Report on Integrated Sample Survey for Estimation of Production Milk, Egg and Meat*. Shillong: GoM.

(4) Mining

The state is endowed with large deposits of a number of valuable minerals, such as coal, limestone, clay, granite, kaolin, glass-sand, and uranium, among others, as shown in Table 2.15.

[53] ibid.

Table 2.15: Various Mineral Resources of Meghalaya State

Type of Mineral	Total Reserve in million ton	Use	Major Places of Occurrences
Limestone	15,100.00	Cement, metallurgical, and chemical	Khasi Hills: Cherrapunjee, Mawlong, etc. Jaintia Hills: Lakadong, Lumshonong, etc. Garo Hills: Darrang Era-Aning, Siju, etc.
Coal	976.48	Sub-bituminous with medium to high sulphur	Khasi Hills: Langrin and East Darrangiri Jaintia Hills: Bapung Garo hills: Darranggiri
Clay	97.00	Whiteware, earthenware, furnace lining, curing soap, etc.	Khasi Hills: Cherrapunjee and Mahadek Jaintia Hills: Tongseng Garo Hills: Rongrenggiri
Granite	50 million m^3	Table top, wall cladding, etc.	Ri-Bhoi: Nongpoh Khasi Hills: Mylliem and Mawkyrwat Garo Hills: Rongjeng
Kaolin	5.24	Whiteware	Khasi Hills: Mawphlang, Smit, etc. Jaintia Hills: Thadlaskein, Mulieh Shangpung, etc. Garo Hills: Darugiri
Glass sand	3.00	Ordinary glassware	Khasi Hills: Laitryngew, Umstew, etc. Garo Hills: Tura

Source: website of the Department of Mining and Geology in Meghalaya State.

Though the 'mining and quarrying' sector in the year of 2016-2017 was worth about Rs 7.96 billion, accounting for only 3.6% of the total GSDP in the same year[54], mining activities have brought in the desired effect of economic growth in the state[55]. Due to the difficulty in maintaining their livelihoods through agriculture, many rural people and even migrants from neighbouring states and other countries, such as Bangladesh and Nepal, have started mining to survive and earn income[56].

Besides this, coal and limestone are important minerals found in Meghalaya State. Total coal and limestone reserves in the state are 976.48 million tons and 15,100 million tons, respectively. NSS's data for 2011-2012 shows the percentage of workers engaged in coal mining in Meghalaya State was about 1.5 percent of total of one million workers. In 2012-2013, revenue from this sector in the form of mineral concession fees, rents, and royalties was around Rs 3.57 billion, which constituted about 27% of the state's own revenue receipts.

2.4. Natural Conditions of the State

2.4.1. Meteorology and Hydrological Condition

(1) Climate Condition of the State

Meghalaya State gets hit with the southwest monsoon and northeast wind in the winter. Its summer

[54] Government of Meghalaya. 2018. *Statistical Handbook Meghalaya 2017*. Shillong: GoM.
[55] Sarma, K. and Yadav., P.K. 2013. Relentless Mining in Meghalaya, India. *Conservation Science*, 1 (2013), pp. 5-12.
[56] ibid.

rainy season lasts for 5 months, from May to September[57]. The temperature in the western part of the state is warmer, ranging between 13 ℃ to 32 ℃, while the central upland is relatively cooler with a minimum temperature that goes down to around 5 ℃ and a maximum temperature at around 25 ℃[58]. Table 2.16 presents the minimum and maximum mean monthly temperatures in the state.

Table 2.16: Minimum and Maximum Monthly Temperatures in Meghalaya State

Month	Mean Maximum (℃)	Mean Minimum (℃)
Jan	15.7	7.2
Feb	17.3	8.9
Mar	20.5	12.5
Apr	21.7	14.5
May	22.4	16.1
Jun	22.7	17.9
Jul	22.0	18.1
Aug	22.9	18.2
Sep	22.7	17.5
Oct	22.7	15.8
Nov	20.4	12.3
Dec	17.0	8.3

Source: https://www.yr.no/sted/India/Meghalaya/Shillong/statistikk.html

The state is covered by a warm per-humid agro-ecoregion and is divided into two distinct sub eco-regions, namely thermic temperature and hyperthermic temperature regimes[59].

The warm per-humid agro-ecoregion with thermic temperature is characterized by the warm summers and cold winters belonging to semi-temperate climates. It comprises the central plateau region of East Khasi, West Khasi, and Jaintia Hills Districts. It occupies 6,420 km^2, representing 30.1% of the total geographical area of the state. The mean annual rainfall ranges from 2,415 to 11,418 mm, and potential evapotranspiration (PE) ranges from 889 to 961 mm, resulting in a water deficit of 25 to 132 mm during the dry spells that occur in the post-monsoon period.

The warm per-humid agro-ecoregion with hyperthermic temperature is characterized by the hot and moist summers and cool winters belonging to sub-tropical climates. It covers the an area from the middle and lower plateau region to the central plateau of East and West Garo Hills and part of East and West Khasi Hills and Jaintia Hills. It occupies an area of 14,920 km^2, accounting for 69.9% of the total geographical area of the state. The mean annual rainfall varies from 2000 to 3,362 mm, and potential evapotranspiration (PE) ranges from 1,000 to 1,299 mm. This eco-region experiences a short water deficit of 300-350 mm in the seasonal dry spells that follow the monsoon season[59].

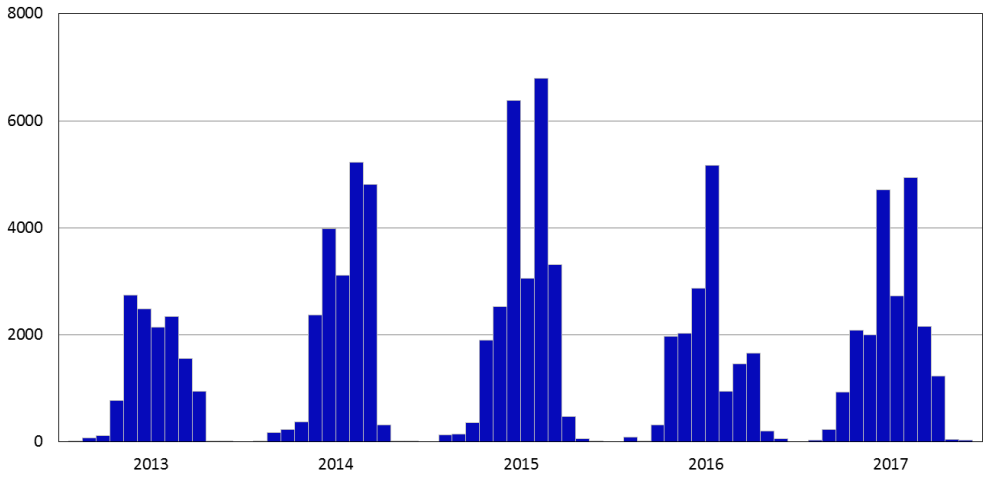
[57] The Official Web Portal of Government of Meghalaya.: http://meghalaya.gov.in/megportal/stateprofile

[58] Government of Meghalaya, Department of Agriculture. Temperature Statistics in Meghalaya.: http://www.megagriculture.gov.in/PUBLIC/agri_scenario_TempStats.aspx

[59] Government of Meghalaya, Soil and Water Conservation Department. Meghalaya Basic Information.: http://megsoil.gov.in/soil1.html

(2) Rainfall of the State

Rainfall in Meghalaya varies by place and altitude. At Cherrapunjee in East Khasi Hills District, the average annual rainfall is as high as 12,000 mm, but in Shillong, located at about 50 km away from Cherrapunjee, the average annual rainfall is 2,200 mm[57]. In the last five years, East Khasi Hills District has had significant rainfall, about 7,000 mm annually. On the other hand, Ri-Bhoi District received relatively moderate annual rainfall, with around 1,500 mm. Figure 2.3 depicts cumulative monthly rainfall in the state for the past five years[60]. As seen in the figure, heavy rain is observed in the summer season, with the highest rainfall in August 2015, amounting to 6,797 mm. Meanwhile, almost no rain is observed between November and February of each year. The total annual rainfall in the state ranged between 13,247 mm in 2013 and 25,205 mm in 2015. In addition to these figures, rainfall data for 2016 are given in Table 2.17.



Source: Data compiled by Study Team from IMD (2019)

Figure 2.3: Cumulative Monthly Rainfall in the State for the Past Five Years

Table 2.17: Rainfall Data for the Year 2016 in Millimeters (mm)

(1) South West Garo Hills

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Ampati	1	0.2	33.6	34.4	256.8	307.6	242.8	48.6	110.2	N/A	N/A	N/A	1,035.2

(2) South West Khasi Hills

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Mawkyrwat	27.2	2.2	45.4	352.8	505.6	664.4	2570.7	142.4	670.4	N/A	N/A	N/A	4,981.1

(3) East Jaintia Hills

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Khliehriat	N/A	N/A	N/A	15.4	2,221.4	3.6	2.4	2,173.6	N/A	N/A	N/A	N/A	4,416.4

(4) North Garo Hills

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Resubelpara	0.3	0.1	28.2	8.1	12.7	6.1	15.4	6.6	4.1	N/A	N/A	N/A	81.6

[60] India Meteorological Department Ministry Of Earth Sciences.: http://hydro.imd.gov.in/hydrometweb/(S(4h1qv1bmddygbt3wsq4lyd32))/DistrictRaifall.aspx

(5) South Garo Hills

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Baghmara	15	N/A	154.2	168.4	382.6	354.2	950.2	148.2	383.6	N/A	N/A	N/A	2,556.4

(6) West Garo Hills

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Tura	21.2	N/A	213.6	207.4	413.4	431	642.2	190.2	297.2	N/A	N/A	N/A	2,416.2

(7) East Garo Hills

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Williamnagar	12.6	N/A	169.95	217.42	513.36	114.89	1,015.8	59	236.8	N/A	N/A	N/A	2,339.82

(8) West Jaintia Hills

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Jowai	28	9.6	46.2	94.4	320.9	353.6	7,889.6	87.2	272	N/A	N/A	N/A	9,101.5

(9) West Khasi Hills

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Nongstoin	22.6	14.6	67	172.2	314.4	310.9	1,417.2	184.6	N/A	N/A	N/A	N/A	2,503.5

(10) East Khasi Hills

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Shillong	49.4	60.5	284.14	4142.8	3,115.1	2,949.2	9,866.5	715.52	943.8	0	0	0	2,2127.0

(11) Ri-Bhoi District

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Nongpoh	29.66	0.8	66.4	76	43.2	3	33.4	11.8	N/A	N/A	N/A	N/A	264.26

All Data Source in the Tables: Department of Agriculture (http://www.megagriculture.gov.in/PUBLIC/agri_scenario_RainFallStats.aspx; accessed in February 2019)

2.4.2. Land Use and Land Resources

(1) Land Use

The total geographical land area of Meghalaya is 2.2 million ha, of which 0.9 million ha is forest area (42.2% of the geographical area) and 0.3 million ha (15.1%) is cropped area that includes shifting cultivation. Cultivable wasteland in the State is 0.4 million ha (17.4%)[61].

Table 2.18 presents land use patterns for the whole Meghalaya State. The remarkable point is the high percentage of cultivable land area and fallow land area (24.7% and 9.6% of the geographical area, respectively). The potential net sown area could be increased when the fallow land is used for cultivation purposes[61].

Table 2.18: Land Use in Meghalaya State

Item	Meghalaya	
	ha	%
Geographical Area	2,242,900	100
Forests (Classed and Unclassed)	946,127	42.2
Area not available for Cultivation		
(i) Area under non-agricultural uses		

[61] Government of Meghalaya Department of Agriculture. Land Use Pattern.: http://www.megagriculture.gov.in/PUBLIC/agri_scenario_landuse_pattern.aspx

Item	Meghalaya	
	ha	%
a. Waterlogged land	1,022	42
b. Social forestry	19,203	0.9
c. Land under still water	28,973	1.3
d. Other land	58,416	2.6
Total (a to d)	107,614	4.8
(ii) Barren and Uncultivable Land	131,734	5.9
Total Area not available for cultivation (i) + (ii)	239,348	10.7
Other Uncultivated Lands		
a. Permanent pastures and other grazing lands	-	-
b. Land under misc. tree crops and grooves, etc.	164,295	7.3
c. Cultivable wasteland	390,744	17.4
Total - Other Uncultivated Land (a+b+c)	555,039	24.7
Fallow Lands		
a. Fallow lands other than currently fallow	155,193	6.9
b. Currently fallow land	60,048	2.7
Total - Fallow Lands (a + b)	215,241	9.6
Cropped Area		
Net Area Sown	285,499	12.7
Area Sown More than Once	54,226	2.4
Total Cropped Area (Sown Area)	339,725	15.1

Source: Study Team from and Department of Agriculture:
http://www.megagriculture.gov.in/PUBLIC/agri_ scenario_LandUseStats.aspx

Table 2.19 on the following page shows the district-wise land use patterns in the state in 2013. West Garo Hills District and South Garo Hills District have relatively low percentage of cultivable land area compared with other districts and the whole state.

Of the total agricultural land in Meghalaya, it is reported that 62% is used for food grains, 25% for cash crops, and 9% for horticultural crops, with the remaining 4% is for miscellaneous crops[62].With the high variety of its topography, Meghalaya State cultivates a variety of agricultural crops. Rice and maize are the major staple crops, and widely grown kinds of fruit are oranges, pineapple, lemons, guava, jack fruit, and bananas. The commercial crops cultivate by people there are potatoes, jute, cotton, areca nuts, ginger, turmeric, betel leaves, and black pepper. *Jhum* or traditional shifting cultivation, and terrace cultivation are predominantly done by local people in the state, which leads to lands being permanently cultivated[62].

The relatively high proportion of non-cultivated land area, especially "Cultivable wasteland" is likely due to land degradation caused by shifting cultivation[62,63]. Shifting cultivation in these degraded areas exploits land with its short cycles without taking care of soil health, which deteriorates land much faster than natural remediation process. This erosion from shifting cultivation is found particularly in Garo Hills[64].

[62] Solomon Retna Dhas Nadar Jeeva, Roytre Christopher Laloo and Bhanu Prakash Mishra. (2005). Traditional agricultural practices in Meghalaya, North East India.
[63] Patiram and R. Kumar. (2005). Land Husbandry for Restoration of Degradation in North Eastern Hills.
[64] Sukanya Sharma. (2017). The Third Perspective on Shifting Cultivation.

Other causes of uncultivated land are reported as coal mining in such as Jaintia Hills[63] and soil acidity[65]. Regarding soil in Meghalaya State, it is affected to get acid by significant amount of rainfall. High rainfall leads excessive leaching of cations, resulting low soil pH[65]. Acid soil was observed by the Study Team.

Some studies reported a trend showing a decrease in forest area, depending on the districts.[66, 67] One cause of the decrease in forest area is mining. According to one report, forest cover decreased by 12.5%, while there was about a three-fold increase in mining area from 1975 to 2007[67].

[65] Indian Council of Agricultural Research. (2005). Degraded and Wastelands of India Status and Spatial Distribution.

[66] Pallabi Deka, P. K. Ryngnga and S. J. Deka. (2016). Landuse/Landcover Change Detection in Umshing-Mawkynroh of East Khasi Hills District, Meghalaya Using Spatial Information Technology.

[67] Sarma, Kiranmay and Kushwaha, Satya. (2019). Coal mining impact on land use/land cover in Jaintia Hills District of Meghalaya, India using remote sensing and GIS technique.

Table 2.19: District-wise Land Use Patterns in 2013

District	Ri-Bhoi		East Khasi Hills		West Khasi Hills		Jaintia Hills		East Garo Hills		West Garo Hills		South Garo Hills	
Land Classification	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
Geographical Area	244,800	100	274,800	100	524,700	100	381,900	100	260,300	100	367,700	100	188,700	100
Forests (Classed and Unclassed)	86,905	35.5	107,085	39.0	206,527	39.4	154,029	40.3	124,530	47.8	164,765	44.8	102,286	54.2
Area not available for Cultivation														
(i) Area under non-agricultural uses														
a. Water Loged Land	-	-	-	-	-	-	-	-	18	-	1,004	-	-	-
b. Social forestry	2,426	1.0	2,989	1.1	3,049	0.6	2,668	0.7	2,371	0.9	2,673	0.7	3,027	1.6
c. Land Under Still Water	1,968	0.8	4,789	1.7	5,917	1.1	4,299	1.1	2,634	1.0	6,189	1.7	3,177	1.7
d. Other Land	9,698	4.0	11,913	4.3	17,398	3.3	11,615	3.0	1,627	0.6	5,006	1.4	1,159	0.6
Total (a to d)	14,092	5.8	19,691	7.2	26,364	5.0	18,582	4.9	6,650	2.6	14,872	4.0	7,363	3.9
(ii) Barren and Uncultivable Land	19,369	7.9	34,239	12.5	48,702	9.3	13,817	3.6	4,651	1.8	7,177	2.0	3,779	2.0
Total - Area not available for Cultivation (i) + (ii)	33,461	13.7	53,930	19.6	75,066	14.3	32,399	8.5	11,301	4.3	22,049	6.0	11,142	5.9
Other Uncultivated Land														
a. Permanent Pastures and Other Grazing Lands	-	-	-	-	-	-	-	-	-	-	-	-	-	-
b. Land under Misc. tree Crops and Grooves, etc.	29,707	12.1	17,249	6.3	43,982	8.4	17,479	4.6	25,247	9.7	24,185	6.6	6,446	3.4
c. Cultivable Wastelands	56,987	23.3	48,059	17.5	101,182	19.3	113,903	29.8	36,913	14.2	14,736	4.0	18,964	10.0

District	Ri-Bhoi		East Khasi Hills		West Khasi Hills		Jaintia Hills		East Garo Hills		West Garo Hills		South Garo Hills	
Total - Other Uncultivated Land (a+b+c)	86,694	35.4	65,308	23.8	145,164	27.7	131,382	34.4	62,160	23.9	38,921	10.6	25,410	13.5
Fallow Lands														
a. Fallow Lands other than Currently Fallow	8,847	3.6	5,921	2.2	47,759	9.1	17,611	4.6	20,240	7.8	35,267	9.6	19,548	10.4
b. Currently Fallows	6,181	2.5	4,778	1.7	18,933	3.6	9,755	2.6	4,901	1.9	10,674	2.9	4,826	2.6
Total - Fallow Lands (a + b)	15,028	6.1	10,699	3.9	66,692	12.7	27,366	7.2	25,141	9.7	45,941	12.5	24,374	12.9
Cropped Area														
Net Area Sown	22,286	9.1	37,834	13.8	31,212	5.9	36,065	9.4	37,020	14.2	95,644	26.0	25,438	13.5
Area Sown More than Once	2,947	1.2	7,811	2.8	6,861	1.3	414	0.1	5,339	2.1	25,355	6.9	5,499	2.9
Total Cropped Area (Sown Area)	25,233	10.3	45,345	16.5	38,073	7.3	36,479	9.6	42,359	16.3	120,999	32.9	30,937	16.4

Source: Department of Agriculture.: http://www.megagriculture.gov.in/PUBLIC/agri_scenario_LandUseStats.aspx

(2) Land Resources

1) Mineral Production in the State

Meghalaya State is endowed with a large amount of mineral deposits, especially coal. Coal production is an important industry in the state[68]. The estimated coal reserve there is 559 million tonnes spreading over an area of 214 km^2, which accounts for approximately 1% of the total geographical area of the state. The Garo Hills District has the highest coal reserves, with 390 million tonnes, followed by West Khasi Hills (98 million tonnes), Jaintia Hills (39 million tonnes), and East Khasi Hills Districts (31 million tonnes)[69]. Production is the highest in Jaintia Hills, with 1.6 million tonnes in 2015.[68] The total mineral production value in the state was Rs 39.4 billion, of which coal amounted to Rs 37.4 billion (95%) in 2012-13[70].

2) Environmental Concerns in Mining

Although mineral production in Meghalaya has huge economic potential, particularly the production of coal, there are pressing environmental issues. The challenge lies in private lands in the state. Coal mining is carried out by 'rat-hole' method, which devastates forests and the surrounding environment, with serious consequences for resources such as water[71].To avoid environmental destruction, the state government applies existing environmental laws, such as the Forest (Conservation) Act, 1980, to protect forests and rivers. Based on these regulations, no mining activity is allowed near rivers, and mining applicants must obtain clearance from the Pollution Control Board and Forest and Environment Department by submitting an application to the state government through the Deputy Commissioner of the District. On receipt of the application, the Deputy Commissioner examines it in consultation with, among others, the land owner and traditional institutions like the ADC and Dorbars[72]. In the application, an environment management plan should be provided, and after mining exploitation, environmental restoration such as afforestation is required. Restoration, however, is done "as far as practicable"[72]. In addition, unlike other states in India, mining in the Meghalaya State predominantly takes place on private lands[69,73]. Regulating such lands is challenging, as it is written in the Mineral Policy 2012 that the policy is not applicable to extraction of minor minerals from private land[72]. It is also reported that most mining is done after merely obtaining no-objection certificates from the ADC and bypassing mandatory forest and environmental clearances and regulatory checks[74].

[68] Government of Meghalaya, Department of Mining and Geology. (2017).: http://www.megdmg.gov.in/minerals.html

[69] Department of Environment and Forests, Government of Meghalaya. (2005). State of the Environment Report, 2005

[70] Government of India Ministry of Mines. (2015). Indian Minerals Yearbook 2013 (Part- I) 52nd Edition STATE REVIEWS (Meghalaya).

[71] Kiranmay Sarma1 and Pramod K. Yadav. (2013). Relentless Mining in Meghalaya, India.

[72] Government of Meghalaya, Department of Mining and Geology. (2012). The Gazette of Meghalaya, Extraordinary Published by Authority PART－IIA the Meghalaya Mines and Minerals Policy, 2012.

[73] R. E. Lamare and O. P. Sing. (2016). Limestone Mining and ITS Environmental Implications in Meghalaya, India.

[74] Rajkamal Goswami, Muneeswaran Mariappan1, Thangjam Somendro Singh, and T. Ganesh. (2016). Conservation effectiveness across state and community forests: the case of Jaintia Hills, Meghalaya, India.

2.4.3. Soil Types

(1) General Characteristics

Source: Study Team, January 2019

Figure 2.4: Parent Materials (Gneissic Complex)

The soils in the hills are derived from gneissic complex parent materials (Figure 2.4); they are dark brown to dark reddish-brown in colour, and vary in depth from 50-200 cm. Soil texture varies from loamy to fine loamy. The soils of the alluvial plains adjacent to the northwest and southern plateau are very deep, dark brown to reddish-brown in colour and sandy-loam to silty-clay in texture. Meghalaya soils are rich in organic carbon, which is a measure of their nitrogen-supplying potential, and deficient in available phosphorous and medium to low in available potassium. The reaction of the soils varies from acidic (pH 5.0 to 6.0) to strongly acidic (pH 4.5 to 5.0). Most of the soils occurring on higher altitudes under the high rainfall belt are strongly acidic due to intense leaching. Base saturation of these soils is less than 35%. These soils are not suitable for intensive crop production. There is not much difference in the fertility classes of the soils in the state. Four soil fertility classes, namely, High Low Medium (HLM), High Medium Medium (HMM), Medium Medium Low (MML), and Medium Low Medium (MLM), have been established from the soil test data so far compiled in the state Soil Testing Laboratory. Regarding micronutrient status, it has been observed that almost all the acid soils of the North-Eastern region of the country are deficient in available boron (B) and molybdenum (Mo). Acid soils in Meghalaya are rated low in available B and Mo. The total zinc, copper, and manganese contents of these soils vary from 10.00 to 17.25, 17.00 to 71.00, and 110 to 770 ppm (parts per million), respectively, while the diethylenetriamine penta-acetic acid (DIPA), extractable zinc, copper, and manganese content of these soils ranges from 0.72 to 3.20, 0.6 to 2.8 and 3.0 to 162.0 ppm, respectively. A study conducted by the Indian Council of Agricultural Research (ICAR) Complex, Shillong, revealed that about 40% of state soils contain micronutrients below the critical level[75].

(2) Soil Distribution

According to the Soil Map of Meghalaya State[76], four types of soil order in the United States Department of Agriculture soil taxonomy and 20 subgroups are distributed in the state. Details and descriptions are given in Table 2.20.

Table 2.20: Soil Distribution in Meghalaya State

Order	**Subgroup**	Description
Ultisol	**Typic Kandiudults**	Deep, excessively drained, fine soils on moderately sloping side-slopes of hills having loamy surface with moderate erosion hazard
	Typic Haplohumults	Deep, poorly drained, fine-loamy soils in very gently sloping valleys with very slight erosion hazard and groundwater table below one metre depth of the surface
	Typic Kandihumults	Deep, excessively drained, fine soils on moderately sloping side-slopes of hills having loamy surface with moderate erosion hazard and slight stoniness
	Typic Paleudults	Deep, somewhat excessively drained, fine soils on moderately

[75] Department of Agriculture (http://www.megagriculture.gov.in/PUBLIC/agri_scenario_soil.aspx; accessed in February 2019)

[76] http://megsoil.gov.in/images/meghalaya_soil_map.jpg; accessed in January 2019

Order	**Subgroup**	Description
		sloping side-slopes of hills having loamy surface with moderate erosion hazard
	Humic Hapludults	Deep, well drained, fine soils on very gently sloping plains having loamy surface with slight erosion hazard
	Typic Kanhapludults	Moderately deep, excessively drained, fine soils on moderately sloping side-slopes of hills with severe erosion hazard and slight stoniness
Alfisols	**Ultic Hapludalf**	Moderately deep, excessively drained, fine-loamy soils on steeply sloping side-slopes of hills having loamy surface with severe erosion hazard and moderate stoniness
Inceptisols	**Typic Dystrochrepts**	Moderately deep, excessively drained, loamy-skeletal soils on gently sloping hill tops with very severe erosion hazard and strong stoniness
	Humic Haplaquepts	Deep, poorly drained, fine-loamy soils on very gently sloping valleys with very slight erosion hazard and ground water table below one metre depth of the surface
	Umbric Dystrochrepts	Moderately shallow, excessively drained, fine-loamy soils on moderately steep side slopes of hills having loamy surface with severe erosion hazard and strong stoniness.
	Typic Haplumbrepts	Deep, somewhat excessively drained, fine-loamy soils on moderately steep side-slopes of hills with slight erosion hazard
	Dystric Eutrochrepts	Moderately deep, excessively drained fine soils on moderately steep side slopes of hills with moderate erosion hazard
	Aquic Eutrochrepts	Deep, moderately well drained, fine soils on very gently sloping upland having loamy surface with slight erosion and slight flood hazards
	Aeric Haplaquepts	Deep, imperfectly drained, fine soils on nearly level plains with slight erosion and slight flood hazards
	Cumulic Humaquepts	Deep, poorly drained fine soils on nearly level valley bottom with very slight erosion hazard and ground water table below one metre depth of the surface
	Typic Haplaquepts	Deep, very poorly drained, fine soils in nearly level valley having clayey surface with very slight erosion ground water table between one to two metres of the surface and moderate flood hazards
	Aeric Haptaquepts	Deep, poorly drained fine soils in nearly level valley with slight erosion ground water table between one to two metres of the surface and slight flood hazards
	Pachic Haplumbrepts	Moderately deep, excessively drained loamy-skeletal soils on moderately steep side-slopes of hills having loamy surface with very severe erosion hazard and strong stoniness
Entisols	**Typic Udorthents**	Deep, excessively drained, coarse-loamy soils on steeply sloping hill tops with severe erosion hazard and strong stoniness
	Lithic Udorthents	Shallow, excessively drained, loamy-skeletal soils on moderately steep side-slopes of hills with very severe erosion hazard and strong stoniness

Source: compiled by Study Team based on the existing soil map mentioned above.

(3) Relationship between Topo-sequence and Soil Distribution

The Study Team conducted a field soil survey in Nongrmai Village, West Khasi Hills District, in January 2019 in order to reveal the relationship between micro-topography and distributed soils. In addition, some soil physical properties were also tested by portable test kits (Figure 2.5). As a result, oxisols were found on the crest flat and it was recognized that the series of soil distribution colour varied depending on height, with reddish, yellowish, and grayish colours. The Study Team has identified the cause of the soil variation as being moisture conditions, which in turn were caused by surface water that drifted along the topo-sequence (Figure 2.6).

Source: Study Team, January 2019

Figure 2.5: Soil Survey

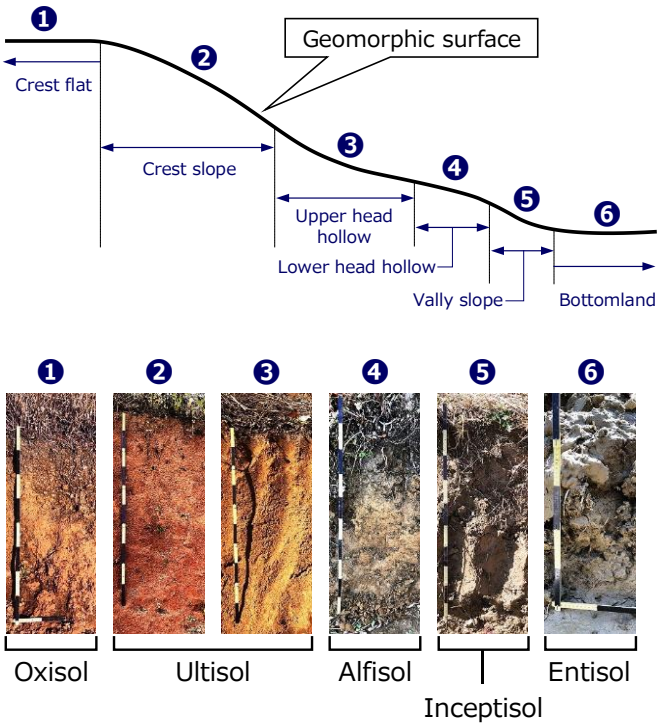


Figure 2.6: Relationship between Topo-sequence & Soil Distribution (Case of Nongrmai Village, West Khasi Hills District)

Source: Study Team

(4) Current State of Agricultural Soils

1) *Jhum* Cultivation Soil

Jhum cultivation, also known as shifting cultivation, is one of the oldest types of cultivation practices; it is practiced mainly in the north-eastern states of India, where Meghalaya State is located. *Jhum* cultivation is generally practiced on hills located on slopes ranging from gentle to steep. The cultivation method usually begins by selecting a forest patch and clearing the vegetation usually in December and January. The small cut trunks portion and roots are usually not removed, and slashed vegetation dries up on hill slopes for one to two months or is burnt in February and March. Ploughing and cultivation of crops begin in April and May, and the cultivation continues for a few years until the soil loses its fertility. The site is cultivated for food crops, such as maize, paddy, finger millet, green gram, black gram, rice bean, rajma, tomato, cucurbits, colocasia, sweet potato, ginger, and turmeric. Moreover, the site becomes fallow-land and starts to regain its natural

forest once the final crop is harvested[77].

As many studies have pointed out, the cultivation cycle in jhum cultivation is very important and varies considerably. In past years, a cycle of fifty years or more was needed to adequately maintain ecological balance. At present, *jhum* cycle has been reduced to 4-6 years; however, this cycle period is very short for the appropriate recuperation of the site and for repairing ecological damage. This kind of cultivation in short cycles decreases soil productivity due to the excessive loss of soil nutrients and socio-economic imbalances in the village communities. A longer cycle period is ideal for restoring soil fertility and stopping soil erosion.

Socioeconomically, *jhum* cultivation practice has a lot to do with the production of agricultural crops in Meghalaya. There is no other alternative means of livelihood for the ethnic people of the area because of their poor economic conditions, and this situation makes them continue practicing cultivation short cycle and perhaps further reducing the *jhum* cycle according to their needs[78]. Figure 2.7 illustrates three types of soil conditions in jhum cultivation areas.

		
a) Overview of *jhum* area The slope angle is 30-50˚. Food cultivation started one year ago and various crop seeds are planted directly on the ground.	**b) Soil profile of *jhum* area** The surface layer (until about 15 cm deep) is gravelly and very poor in organic materials and clay which can retain soil nutrients.	**c) Close-up of the soil surface** Particle diameter of the gravels are 1-3 cm and various kinds of rock break into rubble. Water retention capacity is very poor.

Source: Study Team

Figure 2.7: Soil Condition of Jhum Cultivation Area (the Case of Garo Hills ADC Area)

2) Bun Cultivation Soil

Bun cultivation is a farming system of Meghalaya; it is also called a modified *jhum* system. This system is an indigenous practice mainly in the Khasi Hills and Ri-Bhoi Districts for the cultivation of crops such as potato, sweet potato, ginger, and vegetables on a series of beds formed along the slopes of the hills. This system involves: the cutting of shrubs and grasses, putting of dried vegetation in the form of raised beds along the slopes and covering it with soil collected from its surroundings, the burning of the covered vegetation and planting in the soil afterwards. Although good crops yields have been obtained in the system, it leads to large amount of soil erosion. Such bun fields usually accommodate two or three cropping seasons in a year.

[77] Yadav, P.K. (2013), "*Slash-and-burn agriculture in north-east India*", Expert opinion on Environmental Biology

[78] National Informatics Centre, Meghalaya State Centre (2001, http://megsoil.nic.in/shifting_cul.htm; accessed in May 2019)

		
a) Furrow of bun cultivation	**b) Surface of the furrow**	**c) Close-up of the soil structure**
The slope angle was around 20˚ and the ridge height was 15 cm. Potato cultivation started two years ago.	Subsoil is exposed by drainage water, but the ridge soil still gretains organic materials and clay.	Although not rich in organic materials, it maintains aggregate structures and functions for water retention and drainage.

Source: Study Team

Figure 2.8: Soil Condition of Bun Cultivation Area (the Case of West Jaintia Hills District)

2.4.4. Drainage and the Catchments[79]

The drainage pattern of Meghalaya State represents a most spectacular feature revealing the extraordinarily straight courses of the rivers and streams along the joints and faults. The magnificent gorges scooped out by the rivers in the southern Khasi and Jaintia Hills are the result of massive headword erosion by antecedent streams along joints of the sedimentary rocks over the block, experiences relatively great uplift. Westward in the Garo Hills, the consequent streams are mostly controlled by the structures, faults and monoclines in the sedimentary rock. The northern part of the plateau, devoid of any sedimentary cover, is marked by a long incisive valley formed due to head ward erosion along joints in the gneissic rocks and granites. The limestone-covered country over southern Garo, Khasi, and Jaintia Hills represent typical karst topography. The present physiographic configuration of the plateau was attained through different geological events since the Mesozoic to present day, as indicated by polycyclic surface at various levels. Eight main rivers in the north and five main rivers in the south drain the state. Rivers in the north and south are tributaries of Brahmaputra and Meghna respectively.

2.4.5. Natural Disasters and Disaster Management[80]

Meghalaya State is a multi-hazard state and is prone to disasters such as earthquakes, floods, cyclonic storms, among others. Flash floods, fire, landslides, cyclonic storms, coal mine collapse, and flooding are recurrent phenomena in recent years which led to the loss of many lives and extensive damage to properties in the state. It is therefore obvious that the state is in need of a Disaster Management (DM) Plan to direct all aspects of DM (including disaster preparedness, post-disaster response, short and medium-term physical reconstruction, social rehabilitation, and long-term disaster mitigation). Following the enactment of 'The Disaster Management Act, 2005', by the Government of India (GoI), the Government of Meghalaya formulated a set of DM Rules 2010 under the provisions of DM Act, 2005. The state also brought out a revised DM Policy in 2013.

(1) Vulnerability to Earthquakes

Meghalaya State witnessed a seismic event of '8.7 magnitude in 1897[81]'. This region has been identified as a potential site of a future catastrophic earthquake. With the growth of population and

[79] Soil & Water Conservation Department, Government of Meghalaya (2017, http://megsoil.gov.in/basic_info.html; accessed in February 2019)

[80] MEGHALAYA STATE DISASTER MANAGEMENT PLAN, 2016 (http://megrevenuedm.gov.in/reports/ Meghalaya _State_Disaster_Management_Plan_Volume1.pdf; accessed in February 2019)

[81] H. W. Roehler (1987), "*Paleoenvironments and Sedimentology*", U.S. Geological Survey Professional Paper, 1314-C, pp. 40, U.S. Government Printing Office, Washington, D.C.

infrastructure, seismic vulnerability has increased and previous earthquakes have provided a glimpse of the devastating potential of seismic tremors. According to Global Seismic Hazard Assessment Program (GSHAP) data, Meghalaya falls in a region of high to very high seismic hazard. As per the 2002 Bureau of Indian Standards (BIS) map, this state also falls in Zone V.

(2) Vulnerability to Cyclones

Meghalaya is situated in northeastern India, on the border of Bangladesh, which is highly prone to cyclones and high winds. Every year about 60% of the area is affected by a cyclone in Bangladesh. West Jaintia Hills and East Jaintia Hills Districts may experience wind speeds of up to 55m/s. Occasional cyclones do occur in western Meghalaya, with their severity increasing during the monsoon season. The Districts closest to Bangladesh, like South West Garo Hills, South Garo Hills, South West Khasi Hills, and West Khasi Hills, fall in a very high cyclonic zone due to their close proximity to the Bay of Bengal (which is a cyclone basin). In this zone, wind speed can reach up to 50 m/s, which can cause large scale damage. The Bay of Bengal accounts for seven percent of the annual tropical cyclone activity worldwide; the recorded frequency of cyclones along the Bay of Bengal is four per year and inevitably one of these four transforms into a severe cyclone, causing human and property losses.

(3) Vulnerability to Floods

In Meghalaya, floods occur in river valleys, when water flow exceeds the capacity of the river channel, particularly at bends or points where a river meanders. The plains in areas of Meghalaya, adjoining Assam, are affected by flooding due to the back flow of water from the River Brahmaputra during the flood season, between June and October. Tributaries such as Krishnai, Jinari, Jingjiram, Rongai, Dudhnoi, Ringgi, Gohai, and Dilni cause flooding in the plain areas of the state. The flood-prone areas of Meghalaya Sate include:

- Western part of Meghalaya, in places like Tikrikilla, Phulbari, Rajabala, Garobadha, Hallidaygunj, Bhaitbari, Fersakandi, Magurmari, Silkata, Mahendraganj, etc.
- Plain areas near Bangladesh, like Baghmara, Balat, Shella, Dawki, etc.
- Urban flooding in localized areas of Shillong, Williamnagar, Tura, etc.
- Localised areas of West Khasi Hills, South West Khasi Hills, East Khasi Hills, and Jaintia Hillsand in Ri-Bhoi Districts

(4) Vulnerability to Landsides

Meghalaya, being a hilly terrain, is prone to landslides. Every year a number of landslides have been reported in various localities. These cause a lot of misery to the public, resulting in the loss of lives and property, the disruption of communication networks, in addition to causing economic burdens on society. Landslides are primarily attributed to high slopes, immature geology, neo-tectonic activity, heavy rainfall, and unplanned and improper land use practice in the state. Landslides generally occur during heavy rains, that is, during the months of June to October in Meghalaya.

(5) Vulnerability in Prone Areas

The southern part of Meghalaya is more susceptible to landslides than the northern part. National Highways like Bajengdoba-Tura-Dalu, Damra-Siju-Baghmara, Guwahati-Shillong-Tamabil, and Shillong-Jowai-Badarpur are prone to landslides. Landslides used to occur frequently at Sonapur on Shillong-Jowai-Badarpur Road, but now the problem has been mitigated by the construction of a tunnel for vehicular traffic. The urban areas of Shillong, Tura, and Jowai are also prone to landslides due to the faulty construction of houses and rapid urbanization.

(6) Vulnerability to Fires

Urban areas in Meghalaya are vulnerable to accidents involving fire for various reasons, most of which have been attributed to accidents caused by careless human activities, leading to outbreaks of fire. Most of the urban areas have a high density of population and narrow lanes, making them highly vulnerable to fire. Approximately 76% of the geographic area of the state is covered by forests, which are very vulnerable to forest fires during the dry season from February to April. Every year a large stretch of these forests is destroyed, either by forest fires or by shifting cultivation, or *jhum*, which is practiced in parts of the state in which large areas of forests are burnt down for cultivation purposes. Such types of slash-and-burn or burn-and-plant methods of shifting cultivation destroy not only forest cover, but also cause adverse effects on the people living close to the forests by polluting the environment. Financial institutions, NGOs and government agencies have had some measure of success in enlightening farmers on the ill effects of *jhum* agriculture and so new innovations, such as firefighting equipment and technologies, have been incorporated with traditional methods for higher yield.

(7) Lightning and Hailstorms

Lightning occurs during the monsoon months and can strike at any place. Hailstorms generally occur in the pre- and post-monsoon months. Some losses of crops, lives, and property due to lightning and hailstorms have been reported in the state.

(8) Mining related vulnerability of the State

Most of the coal mining in the state is done un-scientifically, i.e. through rat-hole mining. Coal mine accidents, such as the collapse of mine walls or mine flooding, cause several deaths annually. The Government of Meghalaya has passed the Meghalaya Minerals and Mining Policy of 2012 to regulate mining activity in the state.

2.5. Development Plans, Programs and Projects in the State

2.5.1. State and Regional Development Plans (including Meghalaya Vision 2030)

(1) Meghalaya Vision 2030

1) Background

Meghalaya State is facing the development problems of high poverty rates and slow growth in per capita GDP. According to the Planning Commission's report in 2012, population below the poverty line in the state was about 12% at that time.[82] Another survey conducted by the Government of Meghalaya State in 2002, however, gave an estimate that 48.9% of population in the state is below the poverty line, varying from 39.5% in the Jaintia Hills to 55.9% in the East Garo Hills[83]. The main causes of the high poverty rate are limited employment and income generation opportunities, poor linkage with the market, and low agricultural productivity due to traditional *jhum* cultivation practiced in rural areas.

The Net State Domestic Product (NSDP) of the state is below the averages of both north-eastern states and all states in India. The gap in the average NSDP between Meghalaya State and all states in the country steadily increased from 2003 to 2012, and the state's per capita NSDP, which was Rs 55,306 in 2011-2012, was lower than the average per capita NSDP of all states, which was Rs 60,972. The state has to achieve a 9% of annual growth rate in its NSDP to catch up with the average NSDP of all states in India from 2015-2016 to 2029-2030.

[82] Government of India Planning Commission. (2013). Press Note on Poverty Estimates, 2011-12.

[83] M Govinda Rao Anuradha Bhasin Alokesh Barua Mukesh Anand Rita Pandey R Srinivasan. (2013). A Vision Document for the State of Meghalaya 2030.

2) Seven Strategic Initiatives

To address the aforementioned challenges, the state has put forward 'A Vision Document for the State of Meghalaya 2030' (Vision 2030), which includes a set of seven strategic initiatives. The strategies are aimed at poverty alleviation and economic growth, as well as development of a participatory or demand-driven model, where all stakeholders participate in planning, implementation, and monitoring processes for their own programs instead of a state-centric or top-down model.

The seven strategic initiatives for the development of the state are as follows:

- Empowerment of people through participatory planning and inclusive governance
- Development of institutions and systems to establish markets in the state
- Sustainable development by protecting natural resources and harnessing the benefits of people
- Development of infrastructure to establish markets and attract investment to the state
- Expansion of trade and investment opportunities for the state in a globalized world
- Development of the capacities of people and institutions
- Development of main sectors, including access to education, healthcare, and employment opportunities

Vision 2030 reviews the state's critical situations in the following key sectors and proposes some strategies to improve them, as shown below.

3) Agriculture

Meghalaya has a high percentage of cultivable wasteland compared to the total net sown area, as explained in the section 2.4.2. All districts in the state, except for West Garo Hills (9.4%) and South Garo Hills (12%), have more than 20% of cultivable wasteland on average. The total percentage of fallow land in the state is reported to be 10.3%. This situation indicates that the state is able to expand crop cultivation area. The critical problems for the state, however, are low agricultural productivity and dependence on imported food, such as cereals, pulses, eggs, and meat. In order to make up for this situation, Vision 2030 suggests exporting the products for which the state has relative competitive power. The crops expected to increase production and be exported to neighbouring north-eastern and other states are rice, maize, ginger, turmeric, and pineapple. Processing these crops and exporting them are also a suggested strategy, as explained in the section of 5) Small Scale Industry below. To produce these crops efficiently, *jhum* cultivation should be replaced with the practice of settled cultivation. Conversion to settled cultivation would also contribute to more use of fallow lands.

4) Livestock Products

The state has a large number of livestock in terms of per capita availability, compared to other north-eastern states, as well as whole of India. Since the state depends on imported products for meat and eggs, the development of value-added products, such as meat processing and milk production, are recommended.

5) Small Scale Industry

Small-scale industry (SSI), including the processing of agricultural crops and the making of wood furniture, handicrafts, and other items, is an important economic opportunity. Fruits grown in the state, such as oranges, peaches, and pineapple, can be processed as jams, squash, facial scrubs, and various other products for sale in the market. Turmeric and a variety of medicinal herbs can be processed into herbal and health-based products. Other natural resources, such as bamboo, silk, and forestry products, are also good local-resource-based products. To promote processed products is commercially important and can solve the problem of loss caused by the long length of time transportation and poor transportation infrastructure.

In Meghalaya State, there are a great deal of proven deposits of valuable minerals, including limestone and coal. The mining industry can create a good opportunity for the state and districts for economic development. The method of mining, however, should be cautiously investigated in order to protect the environment and human health.

The critical problem of SSI faced by local people is a lack of skill and financial support, inadequate capital investment, and limited access to or linkage with the main markets. First, training on modern methods and technology for efficient production is required. In particular, farmers who have to cultivate cash crops would need support in technical training and the marketing of their products. The inability to expand business scale and control optimal volume of production also needs to be improved. Secondly, credits are not available for most local people. The credit-deposit ratio of commercial banks was only 30% in 2006. Thirdly, the main markets in Assam State, Kolkata, and Delhi, are far from Meghalaya. Besides, there is no sufficient reliable transportation infrastructure to deliver products. It is also not easy to find new markets for local people because of a lack of knowledge and experience.

The solution suggested in Vision 2030 is to form a cluster of local SHGs or common interest groups (CIGs). A cluster system will function effectively in the way that a cooperative society or enterprises produce the same, similar, or interrelated products using the same resources solving common problems, and shipping a large amount of products together. Thus, limited access to credit and markets would be dealt by creating a cluster of several SHGs or CIGs.

6) Improvement in Marketing

Enhancing marketing is a key to economic and livelihood development. Linking with the market and creating a value chain are important strategies for enhancing marketing. To develop a value chain, robust infrastructure facilities are vital. For this, the private sector would play a crucial role by investing in them.

7) Water Supply Management

In spite of a tremendous amount of rainfall, Meghalaya State experiences a water deficit. Therefore, a water harvesting technique and effective water use are crucial. Having hilly slopes and a mountainous terrain in the state, water is severely run-off, and multiple-cropping in a year is almost impossible. Thus, an irrigation facility based on river and stream water would be a salient measure for agricultural development. The construction of a rain water harvesting facility is also important for households to secure domestic water.

8) Tourism

Meghalaya State has a potential for tourism. The number of foreign tourists who visited the state in 2006 was 4,177 and that of domestic tourists was 652,756. The potential areas and subjects of tourism are water sports, wildlife, trekking, adventure tourism, and eco-tourism. Eco-tourism could close regional disparities in income. Furthermore, village-based enterprises based on tourism could diversify sources of income, creating employment opportunities. To promote tourism, training for government officials and tour operators and the development of resort facilities and trails are required. A fundamental task for the State Government to promote tourism is to create a reliable database that its officials can use to do detailed analyses of trends, seasonality, and other related matters, and to routinely update it. Such a database will allow the government to do appropriate planning and set up policy measures. It is also important to ensure by law that tourism be economically, socially, and environmentally sustainable. The government first needs to ensure that relevant regulations and rules be in place to promote the development of environmentally sustainable tourism.

9) Forest and Environment Conservation

As a necessary environmental intervention, first, *jhum* cultivation should be improved so that soil erosion can be minimized. Others types of intervention include facilitating sustainable land planning and management concerning the environment, and regulating mining, irrespective of the size of mines, in order to reduce environmental degradation. For areas where *jhum* cultivation is practiced, introducing organic agriculture is recommended, as is starting horticulture and agro-forestry, and adopting other better agricultural practices. In terms of rehabilitation for mining-affected areas, technology should be developed. Applicable existing technologies should also be applied immediately. In addition, policy and judicial arrangements might be required for effective forest management, such as land use policy. A reward system, similar to compensation mechanisms, is expected to be worked out.

Regarding forest conservation, an intervention necessary for community forests includes carefully identifying specific areas: the extent of the intervention also needs to be determined. In addition, it is necessary to consider where facilitation is required and where regulatory mechanisms are to be instituted. Caution should be taken to protect local people's lives, which depend on the forest, and to ensure the autonomy of traditional institutions. To plan and implement forest resource management, a set of digital data about the state and districts is vital. Such a data set will enable policy makers and local people to understand forest changes and trends, based on which they can create a policy or plan and implement it. Non-spatial data, such as land ownership and local customs, is also important and should be user-friendly.

10) Capacity Building

In general, building institutional and administrative capacity among public entities is an explicit goal of a development policy. Public entities need to develop their capacity to build a good partnership with community-based organizations (CBOs) and the private sector, so that these two can assume a role in planning, monitoring of projects, and evaluation. Their capacity for statistical analysis is also important to generate more accurate and timely data from primary sources. From this point of view, Information Technology (IT) is a key technology for rapid monitoring and improving evaluation. IT can combat a wide range of problems, especially those faced by the state, including the geographical isolation of the state from other parts of the country and the lack of access to the market faced by many remote communities, social and financial services, and other issues.

It is also important to involve local decision-making bodies in centrally sponsored and state-sponsored schemes. Local decision-making bodies, such as ADCs, *Sordar*, and *Dorbar Shnong*, should participate in the activities involved in such schemes, including awareness- raising and the strengthening of knowledge and skills. CBOs and NGOs working in the same area are supposed to have important roles in linking local people with government agencies.

(2) Data Collection Survey on Agriculture Sector in Northeast India

The GDP of the agriculture sector in the north-eastern states, accounting for 23.9% of the total GDP, was higher than that of all states in the country (as of 2008/09). In the north-eastern states, 80% of the total population lives in rural area, where agriculture is the main source of income and livelihoods; other industries, including manufacturing, are limited. As a result, the dependency of people on agriculture is high, so it is important to improve and strengthen the agricultural sector.

Given this situation, a survey was conducted in 2015 in order to collect data and information, as well as analyze critical issues and possible counter-measures in the agriculture and allied sectors in north-eastern states, including Meghalaya State. In the study, the following interventions were identified to improve matters on each key issue.

1) Market

Meghalaya State has faced disadvantages in terms of its access to the market and marketing, due to its topography and low capacity (skills) in marketing among the people there. These impede the economic development of the state. According to the report of the 2015 survey, about one-third of the villages in the state were not connected to a main road, and therefore farmers had to carry their products on their backs and walk to the market. This limited their access to the market and the amount of the products they can sell in the market. Farmers in West Garo Hills said in the interview that there are four major constraints in terms of marketing, namely the low price for agricultural products, fluctuation of prices, lack of market information, and lack of knowledge about marketing.

Although the topography of the state does not make it easy to ship products, the report mentions that Guwahati Market is one of the most important markets for Meghalaya State that can link people with the markets of mainland India. On the other hand, Shillong, the capital of the state, has difficulty in selling products. The main market in Shillong, called Bada Bazar, is too crowded without enough space, and there is no more area to expand the space set aside for selling. It is also difficult to move to a new place because it is difficult to get an agreement from the *Syiem* and *Durbar* that control and manage the market.

2) Agriculture Production

Many farmers in Meghalaya State depend on *jhum* cultivation, which causes soil degradation when it is conducted with a short rotation cycle. To promote sustainable agricultural systems, the report says that it is necessary to do the following things:

- To increase cropping intensity by introducing short-duration and high-yield varieties
- To introduce proper nutrient management practices
- To make the most use of available water sources for irrigation, including the creation of an extensive rain water harvest facility to reduce runoff loss and soil erosion.
- To reduce the time required for agricultural operations through efficient farming practice and meet labour demand for agriculture

For better marketing and productivity, the report proposed the following three components:

- To produce agricultural products, focusing on market demand based on market research
- To increase productivity and expand cultivation area for larger production
- To conduct capacity development necessary for above-mentioned two components in a timely manner

These three components are implemented through the promotion of a topo-sequential integrated farming system (IFS) and the improvement of farmers' livelihood through the linkage of farmers with market demands.

Topo-sequential IFS can improve productivity and natural resources management through: 1) selected micro watersheds; 2) the recovery of the water holding capacity of forests; 3) the construction of check dams and ponds; 4) the development of irrigation facilities; 5) the provision of technical training on farming, horticulture, livestock, and fisheries; and 6) linkage with the market for agricultural produce and processed products. The report also recommends supplying quality seedlings for horticultural crops by producing them at tissue culture laboratories.

3) Horticulture

Along with a broad variety of topography and climate conditions within the state, it is possible to cultivate a wide range of horticultural crops which have the potential for improving the livelihoods of local people. High potential crops include fruits, flowers, spices, and medicinal and aromatic plants. Exotic crops like strawberries are expected to increase farmers' incomes because of high

demand in local and international markets. The promotion and commercialisation of horticulture would be accelerated by value-addition and through the formation of CIGs or SHGs.

4) Agro-business

Agro-business is one of the sectors in which the state should promote and improve its enterprises. Critical needs for the sector are the improvement of basic technical skills related to enterprises and the creation of business opportunities for agricultural products. Unlike training courses provided by agriculture-related departments, the Meghalaya Institute of Entrepreneurship (MIE) emphasizes looking at the agriculture value chain. As people engaged in agriculture are not so familiar with business, it is a challenge for the MIE to provide such a training program for them.

5) Irrigation

Irrigation is an important facility for improving agricultural productivity in the state. Although Meghalaya State has the largest amount of rainfall in the world, water is sometimes insufficient during the dry season. Irrigation facilities, however, have not been well developed in the state. Based on findings from an interview with farmers conducted in West Garo Hills District in 2015, a major constraint on agricultural production was a 'lack of [an] irrigation facility", a response received by 42% of the farmers interviewed. In addition, 6% of the respondents raised the issue of "lack of irrigation water".

6) Environmental Concerns

Along with the promotion of agricultural production, the protection of existing forest areas is highly important for forest-dependent people and the ecosystem. As effective measures, conducting an awareness-rising program targeting local communities and planting fast-growing species of fruit trees in *jhum* areas are suggested in the report of the study in 2015. To avert the further pressure of encroachment on existing forests, crop cultivation should be encouraged in wasteland or other marginal lands.

7) Animal Husbandry and Dairy Farming

Meat processing and dairy products would be good activities for income generation in the state. For this, pigs, poultry, and small ruminants should be raised. The following points are recommended measures to be done to increase meat and dairy-product production:

- To establish dairy cooperative societies/ SHGs/CIGs for easy marketing
- To initiate small-scale and value-added milk product processing industries
- To promote fodder harvesting
- To consolidate animal-health-care program

8) Fishery

The report of the study conducted in 2015 expresses the potential for fisheries as a means for income generation in the state. The following interventions are recommended for their promotion.

- To transform low-lying area to an aquaculture pond
- To introduce aquaculture in paddy fields, specifically in low-lying paddy fields
- To cultivate and supply in a timely manner quality fish fingerlings based on demands
- To improve infrastructure for transporting fish to the distant markets
- To produce quality- and nutritious fish feeds

9) SHG

The report of the study in 2015 shows that 24.6% of the total number of registered cooperative societies was non-active as of 2014. Many of these organizations were dependent on external

support to run their activities. A majority of the business done by the societies was heavily subsidized and did not follow any business model. While a majority of the societies did not make profits, some societies did. The Strawberry Growers Association in Ri-Bhoi District was one of such successful cooperative societies. It significantly contributed to the growth of strawberry cultivation.

A possible cause for the inactivity of the societies would be financial constraints. Not a small number of SHGs in Meghalaya State have faced a challenge in managing their finances. As of 31st March 2014, 3,075 SHGs in the state recorded outstanding loans amounting to Rs 127 million. This was because the bank transaction cost for accessing financial and other supporting services was very costly due to geographical reasons and the limited presence of service providers. Many of the borrowers became defaulters not because of laziness about making repayments, but because of the burden of the high cost and time required to reach the bank. On the other hand, the positive side of cooperative societies is the formation of clusters. A cluster approach is effective, especially for marginal and small farmers in remote areas. By forming a cluster composed of several SHGs, members living and farming in a scattered area can ship their products jointly to newly established production centres.

2.5.2. Poverty Alleviation Programs

The Government of India has implemented various programs in order to reduce poverty. Based on "Mahatma Gandhi National Rural Employment Guarantee Act" (MGNREGA), an Indian labor law, and social security measures aiming to guarantee the right to work, the Ministry of Rural Development has implemented the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) since 2006. This scheme mainly aims to enhance livelihood security in rural areas by providing at least 100 days of wage employment in a financial year to every household whose adult members volunteer to do unskilled manual work. Another objective of the scheme is to create durable assets, such as roads, canals, ponds, and wells. Since April 2008, the MGNREGS has covered all districts of India, so it is called "the largest and most ambitious social security and public works program in the world."

Another large-scale national scheme focused on poverty reduction is the *Deendayal Antodaya Yojana* - National Rural Livelihoods Mission (DAY-NRLM), which is also implemented by the Ministry of Rural Development. The DAY-NRLM is aimed at alleviating rural poverty through building sustainable community institutions by the poor. It seeks to mobilize about 90 million households into SHGs and link them to sustainable livelihood opportunities by building their skills and enabling them to access formal sources of finance, entitlements, and services from both public and private sectors. It is envisaged that the intensive and continuous capacity building of rural poor women will ensure their social, economic, and political empowerment and development. The Mission has been implemented in 5,123 blocks spread across 612 districts of 29 states, including Meghalaya, and 5 Union Territories (UTs). From April 2014 to November 2018, 30 million rural poor women have been mobilized into 2.69 million SHGs across the country. Under the Start-up Village Entrepreneurship Program of the Mission, training was provided for 30,352 enterprises in 17 states during 2016 and 2017.

2.5.3. Watershed Management Programs

(1) National Watershed Development Project for Rain-fed Areas (NWDPRA)[84]

The NWDPRA has been restructured by retaining the technical strengths of the older programme and incorporating the lessons learnt from successful projects, especially on community participation. It is now mandatory for "watershed development" to be planned, implemented, monitored, and maintained by the watershed communities themselves. Moreover, to bring about uniformity in approach between the watershed-based programmes being implemented by various agencies, the

[84] http://www.megagriculture.gov.in/PUBLIC/watershed_management_Default.aspx (accessed in February 2019)

revised Guidelines of NWDPRA are in conformity with the common approach for watershed development, jointly formulated and adopted by the Ministries of Agriculture and Rural Development. It is expected that the revised NWDPRA will truly become a people's movement for the development of land and water resources and for enhancing productivity in rain-fed areas on a sustainable basis.

Management of land resources under the watershed programme includes both rain-fed cultivated land and uncultivated land under ownership of private land owners, panchayat, the revenue department, among other owners. This is being done with a view to increasing food production as well as diversifying the existing farming system, particularly of small and marginal farmers, through the sustainable enhancement of productivity of various commodities. Hence special focus is proposed on aspects such as Integrated Pest Management (IPM), Integrated Nutrient Management (INM), Farming Systems Approach (FSA), Low External Input Sustainable Agriculture (LEISA), agro-forestry, agri-horticulture, silvi-pasture, and animal husbandry. The watershed approach would result in improving the productivity not only of agriculture and allied commodities but also the overall production of bio-mass for the enhancement of self-employment opportunities and thus the overall incomes of rural households.

Conservation and management of rainwater holds the key for sustainable agriculture in rain-fed areas. In the case of water resource management, the focus is not merely on the development of new water resources but also on efficient utilization of already developed resources, particularly based on indigenous systems. This is to be attempted through the substitution of crops that require high amounts of water with those that require low amounts, and also through the adoption of efficient methods of irrigation (e.g. micro-irrigation systems).

(2) Water Management of Minor Irrigation Schemes[85]

The need for adopting the participatory approach for management of irrigation projects is crucial for conserving resources and their optimal utilization, since Participatory Irrigation Management (PIM) refers to the involvement of Irrigation users in all aspects of Irrigation Management and at all levels. The aspects include the initial planning and design of new Minor Irrigation Projects (MIP's), their construction, supervision as well as improvement, and for decision making, operation and maintenance (O&M), and the monitoring and evaluation of the system. The irrigation system in the country, especially in Meghalaya State, has so far been largely constructed and managed by the government, so introducing PIM requires a new paradigm in Irrigation Management. The Water Users' Association (WUA) has also been registered in various districts of the state. The objectives of PIM can thus be summarized as follows:

- To inculcate a sense of ownership and responsibility among the farmers.
- To resolve differences or conflicts regarding implementation, water distribution, operation and maintenance, or any other related issue.
- To improve service through better operation and maintenance.
- To achieve optimum utilization of available resources through improved systems of water delivery, matching to the greatest extent possible the needs of crops.
- To achieve equity in water distribution.
- To make optimum use of natural precipitation as ground water in conjunction with flow irrigation.
- To increase production per unit of water or per unit of land as the case may be.
- To help the farmers to have a greater choice of crop sequences and timing, period and frequency of water supply, depending on soils, climate and other infrastructure facilities available in the area, such as transport of produce, marketing of produce, etc., such as to maximize the income and returns.
- To develop professional relationship between the irrigation officers and staff with farmers.

[85] http://www.megagriculture.gov.in/PUBLIC/water_management_Default.aspx (accessed in February 2019)

- To promote economy in the use of water.
- To mobilize local resources in cash or kind or in terms of labour towards meeting the O&M charges.
- To branch out into activities other than the distribution of water for the purpose of raising resources, so long as they are consistent with the basic responsibilities of the WUAs, for example to assist farmers in a tie up with agro industries, etc.

In Meghalaya State, the maintenance of completed Minor Irrigation schemes is being looked after by the Irrigation Department. The need for PIM is being felt now, but progress towards the implementation of the PIM is still in its infant stage. As the system is yet to be fully evolved, the achievements so far made in this respect are only to the extent of formation and registration of WUAs in the completed project areas. At present, the formation of WUAs for MI projects is in progress and, in most of the project areas, the WUAs have been formed and duly registered under the Society Act. The draft Memorandum of Understanding (MOU) between the WUAs and the Department for handing over the operation, maintenance, and management of MIPs to the WUAs has been submitted to the government. The cabinet's approval in this regard is being awaited. Regarding the realization of water rates, being a policy matter, the government's approval in this regard is needed.

2.5.4. Central Sponsored Programs

(1) Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) [86]

To address poverty issues in rural areas, GoI passed the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), 2005 in September 2005. This act gives legally guarantees one hundred days of wage employment in a financial year for a rural household whose adult members are willing to do unskilled manual work. This act is implemented, requiring the formulation of National Rural Employment Guarantee Schemes by the state government. Under this act, the state government has accordingly implemented the scheme, named the Meghalaya Rural Employment Guarantee Scheme, in July 28, 2006. The scheme has made a major difference all the previous employment programmes. As per instructions by GoI, in the year 2011, the state had created a society named the State Rural Employment Society (SRES), headed by the Mission Director to oversee the overall implementation of the scheme. This scheme is being implemented as the Centrally Sponsored Scheme on a cost sharing basis between GoI and the State Government, with a ratio of 90 to 10.

(2) Indira Awaas Yojana (IAY)/Pradhan Mantri Awaas Yojana - Gramin (PMAY-G) [87]

Indira Awaas Yojana (IAY) is a scheme that provides funds between Rs 70,000 and 75,000 per unit to SC/ST and people living below the poverty line, for the construction of new houses. In the year 2016-17, IAY was restructured to a new scheme, "Pradhan Mantri Awaas Yojana-Gramin (PMAY-G)," that aims at providing high quality houses to all houseless households and households that live in low quality and old houses in rural areas, as per the SECC 2011 by 2022. In this scheme, essential infrastructure such as toilets, LPGs, electricity, and drinking water can be also provided. The unit cost of assistance under this scheme is Rs 130,000 per house. Funds for this scheme are provided jointly by GoI and the state government at a ratio of 90 to 10.

(3) National Rural Livelihood Mission (NRLM)[88]

National Rural Livelihood Mission (NRLM), formerly known as Swarnajayanti Grameen Swarojgar Yojana (SGSY) or Deen Dayal Antyodaya Yojana (DAY), is a scheme launched by GoI in 2011. Its

[86] http://meghalaya.gov.in/megportal/scheme/data_view1/35084 and http://nrega.nic.in/netnrega/home.aspx
[87] http://meghalaya.gov.in/megportal/scheme/data_view1/35085 and https://pmayg.nic.in/netiay/home.aspx
[88] http://meghalaya.gov.in/megportal/scheme/data_view1/35086 and https://aajeevika.gov.in/

objective is to reduce poverty by building strong institutions for the poor, particularly organising Self Help Groups (SHGs) for women, and further enabling low-income households to access opportunities for gainful self-employment and skilled wage employment to improve their livelihoods on a sustainable basis. For implementation of this scheme, an autonomous society named Meghalaya State Rural Livelihood Society (MSRLS), headed by the Chief Executive Officer, was established in 2012. This scheme was first implemented in four pilot blocks, including Dalu, Rongram, Mairang, and Mawkyrwat C and R.D. Blocks. During the years 2016 and 2017, the implementation of the scheme was further expanded to four other blocks, including Umsning, Mawkynrew, Resubelpara, and Laskein C and R.D. Blocks. Funds for the scheme are provided jointly by GoI and the state government at a ratio of 90 to 10.

(4) Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY)[89]

Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY) was launched by GoI in 2014 as a part of the aforementioned NRLM. This aims to enable poor rural youths for becoming economically independent through training and providing them with jobs with monthly minimal wages. It is one of the initiatives of GoI that intends to promote rural livelihoods and diversify income sources. As a part of the Skill India campaign, this scheme plays a key role in supporting the government-run social and economic programs, such as the Make in India, Digital India, Smart Cities Mission, Start-Up India, and Stand-Up India campaigns. Partners of the scheme are supported through investment, capacity building, strategies for retention, linkages to international placement, and technology support for training purposes. This scheme is implemented by State Institute of Rural Development (SIRD).

(5) Shyama Prasad Mukherji Rurban Mission[90]

Shyama Prasad Mukherji Rurban Mission was launched by GoI in 2016 in order to establish well-designed rurban clusters of villages in rural areas and provide economic, social, and physical infrastructure facilities and services on site. For focused development of these rurban clusters, the provisions of aforementioned facilities and services are made through convergence of various schemes and missions. GoI determined to establish a total of 300 rurban clusters by 2021. The Chisim Apal cluster in North Garo Hills District was approved by GoI as the first phase of this mission in 2015-16. The first phase had different developmental activities. Of a total of Rs 500 million, Rs 150 million is supported by the Ministry of Rural Development (MoRD) as a critical gap funding. In the context of Meghalaya, two other clusters have also been approved for the first phase, namely Mawlangwir in South West Khasi Hills District and Sohkha in West Jaintia Hills District.

(6) National Social Assistance Programme (NSAP)[91]

The National Social Assistance Programme (NSAP) was launched by GoI in 1995 to introduce a National Policy for Social Assistance for the poor. This programme has five components, including: the Indira Gandhi National Old Age Pension Scheme (IGNOAPS), Indira Gandhi National Widows Pension Scheme (IGNWPS), Indira Gandhi National Disability Pension Scheme (IGNDPS), National Family Benefit Scheme (NFBS), and Annapurna. IGNOAPS provides financial assistance to BPL persons. People aged 60 years or over receive Rs 500 per month per beneficiary, while people aged 80 years and over receive Rs 550 per month per beneficiary. Under IGNWPS, assistance is given to BPL widows between 40 and 79 years of age, with the maximum assistance being Rs 500 per month per beneficiary. Under IGNDPS, assistance is given to BPL persons with severe or multiple disabilities between 18 and 79 years of age, with the maximum assistance being Rs 500 per month per beneficiary. NFBS provides one-time assistance (Rs 20,000), extending financial assistance to BPL families when a person between the ages of 18 and 59 who supported his/her whole family by earning money dies. Annarpurna scheme provides food security to meet the requirement of those senior citizens who remain uncovered. In this scheme, 10 kg of rice is provided to each beneficiary for free

[89] http://meghalaya.gov.in/megportal/scheme/data_view1/35099 and http://ddugky.gov.in/
[90] http://meghalaya.gov.in/megportal/scheme/data_view1/35100 and http://rurban.gov.in/
[91] http://meghalaya.gov.in/megportal/scheme/data_view1/35101 and http://www.nsap.nic.in/

of charge every month.

(7) Sansad Adarsh Gram Yojana (SAGY)[92]

The Sansad Adarsh Gram Yojana (SAGY) was launched in 2014 by the Hon'ble Prime Minister of India. This is a rural development scheme focusing on village development by conducting social and cultural development activities and supporting village people for their social mobilization. Under this scheme, each Member of Parliament (MP) or Sansad chooses one village from their own constituency, excluding their own village and related villages, and instil certain values of villages to transform the selected village members as a model by 2019. Meghalaya has taken the initiative to implement SAGY within the state. This scheme is implemented by SIRD. Initially, three Gram Panchayats (GPs) were selected by the fourMPs representing Meghalaya. The GPs are:

- Chengalma GP Village under Resulbepara C & R.D. Block in North Garo Hills District was selected by Mr. Purno A. Sangma, M.P Lok Sabha.
- Shangpung GP under Laskein C & R.D. Block in West Jaintia Hills District was selected by Mr. Vincent H. Pala.
- Iewrynghep GP under Mawkynrew C & R.D. Block in East Khasi Hills District was selected by Ms. Wansuk Syiem.
- Nongbah Myrdon Village under Umsning C & R.D. Block in Ri-Bhoi District was selected as a model village by Mr. KTS Tulsi, a nominated member to the Rajya Sabha.

(8) Integrated Wasteland Development Programme (IWDP)

The Integrated Wasteland Development Programme (IWDP) is funded by the Department of Land Resources, Ministry of Rural Development, GoI, with the ratio of 91.66% and 8.34% between GoI and the state government. With the intention of involving village communities in the implementation of Watershed Development Projects (WDP) under IWDP, MoRD of GoI adopted the WDP Guidelines (1995), which was subsequently revised in 2001 (WDP Revised Guidelines, 2001) and later evolved into the New Guidelines for Hariyali in 2003, which has been implemented since April 1, 2003. In the country, the total 112 projects were sanctioned for treatment in 439 micro-watersheds covering a total area of 221,225 ha with approximately Rs 1.3 billion in total.

(9) Integrated Watershed Management Programme (IWMP)[93]

During the year 2009-10, GoI, the Ministry of Rural Development, and the Department of Land Resources approved the treatment of 30,000 ha in 18 watershed projects of Meghalaya. The main objectives of the programme are to check soil and water erosion and surface run-off, rain water harvesting, soil moisture enhancement, and groundwater recharge. It also intends to promote employment opportunities as a result of the above-mentioned interventions. They further approved 52,000, 37,500, and 38,870 ha worth of treatment areas during the years 2010-11, 2011-12, and 2012-13, respectively. The central and state share for the IWMP projects is at a ratio of 90 to 10.

(10) National Bamboo Mission

The National Bamboo Mission was once launched as a central sponsored scheme in 2006-07 and integrated into Mission for Integrated Development of Horticulture (MIDH) during 2014-15 and continued till 2015-16[2]. After that, restructured National Bamboo Mission was approved by the Cabinet Committee on Economic Affairs in April 2018[94]. The main objectives of the Mission are first to promote a holistic growth of the bamboo sector by increasing bamboo plantation areas and promoting bamboo processing and marketing, to provide supplemental income for farmers engaged in bamboo production and processing, and contribute to the enhancement of resilience to climate change. Target areas for increasing bamboo plantation are non-forest areas, such as farm land,

[92] http://meghalaya.gov.in/megportal/scheme/data_view1/35102 and http://saanjhi.gov.in/
[93] http://meghalaya.gov.in/megportal/scheme/data_view1/15818 and http://megsoil.gov.in/major_prog.html
[94] https://nbm.nic.in/ (last access July 12, 2019)

homesteads, community lands, and arable wastelands[95]. The Mission is supposed to target and cover the states which have social, commercial, and economical advantages, including Madhya Pradesh, Maharashtra, Chhattisgarh, Odisha, Karnataka, Uttarakhand, Bihar, Jharkhand, Andhra Pradesh, Telangana, Gujarat, Tamil Nadu and Kerala. Meghalaya State is not included among the target states of the Mission though the Mission states that other states with a potential may be considered for inclusion[96].

2.5.5. Externally Assisted Projects

(1) Meghalaya Livelihoods and Access to Markets Project (Megha-LAMP)[97]

Meghalaya Livelihoods and Access to Markets Project (Megha-LAMP) has been implemented under Meghalaya Basin Development Authority (MBDA) since September, 2015, as part of the Integrated Basin Development and Livelihoods Programme (IBDLP). Megha-LAMP has been supported from the International Fund for Agricultural Development (IFAD) with an objective of improving household incomes and quality of life in the rural areas of Meghalaya, through the development of markets and value chains for sustainable livelihoods. The project budget is USD 174 million; USD 50 million was funded by loan assistance with technical assistance from IFAD, while another USD 50 million was covered from the state government. The remaining cost was covered by bank loans, convergence funds, and some contributions from participating households.

Megha-LAMP is implemented in eighteen C & R.D. Blocks in all eleven districts of the state. The project has a target of 1,350 project villages in these eighteen blocks and supports a total of 47,400 enterprises. Three major components of this project are: (1) integrated natural resources management and food security, (2) rural finance, and (3) inclusive supply chain and enterprise development. The target villages were selected based on five criteria such as access to market, average product score, the number of CLF of MRDS, presence of past interventions by IFAD projects, and the number of BPL households[98] (Table 2.21).

Table 2.21: Selection Criteria of Megha-LAMP

No.	Criteria	Descriptions
1	Access to market	Access to markets is a key criterion in the selection process, and Blocks with the higher number of markets were given priority. The information were collected by preliminary interviews with local villages.
2	Average Product Score	Marketable product scoring was conducted in a participatory manner. Scores were based on the perception of the importance of key products in each Block by key stakeholders in the respective Blocks. Key stakeholders included local farmers, traders, extension agents, and government officers. Three top products out of each of the 29 Blocks were identified from a total of 87 products shortlisted for the selection process.
3	Number of CLF of MRDS	The number and performance of CLFs were graded by Block. Under MRDS, a number of CLFs had been formed which are still operational.
4	Presence of Past Interventions by IFAD Projects	To ensure equity of development, Blocks where no past IFAD projects had been implemented were prioritized over those that had already had past interventions.
5	Number of BPL Households	Blocks with the higher number of households below poverty line (BPL) were given priority. The information regarding poverty were acquired from the 2011 Census.

Source: MBDA

[95] ibid.
[96] https://nbm.nic.in/Documents/pdf/NBM_Revised_Guidelines.pdf（last access July 12, 2019）
[97] http://www.mbda.gov.in/megha-lamp and Final Project Design Report, 2014, Meghalaya Livelihoods and Access to Markets Project, IFAD
[98] Interviews with MBDA

Blocks with the highest accumulated score per district on the above five criteria were proposed as project targets. Further, site verification was conducted in villages within the proposed Blocks, and target villages were finally determined.

Based on the above criteria, Megha-LAMP selected a total of 1,350 target villages in the state. Table 2.22 shows the block-wise numbers and distribution patterns of target villages, and a list of the target villages are shown in Annexure 1.

Table 2.22: Megha-LAMP Target Village Distribution by Block

No.	ADC	District	Block	No. of Villages			Total
				Phase 1	Phase 2	Phase 3	
1	Jaintia Hills	East Jaintia Hills	Khliehriat	15	32	21	68
2		West Jaintia Hills	Amlarem	15	31	21	67
3			Thadlaskein	14	31	21	66
Subtotal							201
4	Khasi Hills	East Khasi Hills	Khatarshnong	15	33	18	66
5			Mawphlang	15	32	20	67
6			Shella	15	31	21	67
7		Ri-Bhoi	Umling	36	58	3	97
8		South West Khasi Hills	Ranikor	15	31	21	67
9			Zikzak	15	32	21	68
10		West Khasi Hills	Mawshynrut	15	32	21	68
Subtotal							500
11	Garo Hills	East Garo Hills	Dambo Ronjeng	12	38	20	70
12			Songsak	20	30	20	70
13		North Garo Hills	Kharkutta	15	32	20	67
14		South Garo Hills	Baghmara	29	61	20	110
15			Chokpot	29	62	20	111
16		West Garo Hills	Tikrikilla	15	37	21	73
17			Dadenggre	20	31	23	74
18			Selsella	15	36	23	74
Subtotal							649
Total				325	670	355	1,350

Source: compiled by Study Team based on information from MBDA

(2) Meghalaya Community Led Landscape Management Project (MCLLMP)[99]

Meghalaya Community Led Landscape Management project (MCLLMP) is being implemented under MBDA as a part of IBDLP, with support from the World Bank, for a period of five years from 2018 to 2023. The project budget is USD 260 million; USD 48 million is funded by the World Bank, while USD 12 million is covered by the Government of Meghalaya. The rest will be covered by the convergence of state and centrally sponsored schemes. The project aims to strengthen community-led natural resource management in different landscapes in Meghalaya, focusing on the following three components:

- Strengthening of knowledge and the capacity of communities for improved natural resource management
- Planning and investments in activities for sustainable natural resource management
- Project management and governance

The focused activities of the project are the restoration of degraded forest, soil and water

[99] http://www.mcllmp.com/ and Project Implementation Plan, 2017, Meghalaya Community Led Landscape Management Project (CLLMP), World Bank

conservation, the restoration of springs and water bodies, eco-tourism, agroforestry, and homestead forestry.

In MCLLMP, which aims to strengthen community-led natural resources management with landscape approach, the results of analysis for vulnerability to soil erosion by NESAC was first used. In Meghalaya State, natural resources including forests, bio-diversity, water sources and soils are high state of degradation due to anthropogenic and climate factors. Therefore, MCLLMP included areas that have acute water shortage, high degradation of forests, and soils with high incidence of poverty of resource dependent villages.

The vulnerability analysis was conducted based on three parameters including vegetation cover (Normalized Difference Vegetation Index, NDVI), soil conditions (Soil Brightness Index, SBI), and slope by sub-watersheds, and each sub-watershed was scored based on specific weights. Table 2.23 shows the results of vulnerability analysis by NESAC.

Table 2.23: Priority Class Based on NESAC Vulnerability Analysis

	Very highly vulnerable	Highly vulnerable	Medium	Low	Very low	Total
Number of sub-watersheds	30	29	77	13	30	179
Area (%)	17	16	43	7	17	100

Source: Prepared by the Study Team based on data from MBDA

Of all the existing villages, 1,931 villages in sub-watersheds classified as “Very highly vulnerable” or “Highly vulnerable” by the vulnerability analysis were selected for the Project. From the selected villages, villages were further narrowed down based on the following criteria, and the number of villages decreased from 1,931 to 579.

- Villages that are not supported under Megha-LAMP
- Village with greater than or equal to 60 households from the 2011 Census

In addition to the selected villages, villages that Deputy Commissioners in each region recommendations and/or reports from district field team members were added to the list of target villages. The added villages were also visited for confirmation of on-site conditions.

Based on the above criteria, MCLLMP selected a total of 579 target villages in the state. Table 2.24 shows the block-wise distribution patterns of target villages in MCLLMP, and a list of the target villages are shown in Annexure 2.

Table 2.24: MCLLMP Target Village Distribution by Block

No.	ADC	District	Block	Total
1	Jaintia Hills	East Jaintia Hills	Khliehriat	17
2		West Jaintia Hills	Lakein	11
3			Thadlaskein	7
Subtotal				35
4	Khasi Hills	East Khasi Hills	Khatarshnong Laitkroh	1
5			Mawkynrew	30
6			Mawphlang	53
7			Mawryngkneng	12
8			Mawsynram	29
9			Mylliem	49
10			Pynursla	2
11			Shella Bholaganj	14
17		Ri-Bhoi	Jirang	1

No.	ADC	District	Block	Total
18			Umling	18
19			Umsning	4
12		South West Khasi Hills	Mawkyrwat	44
13			Ranikor	13
14		West Khasi Hills	Mairang	27
15			Mawshynrut	6
16			Nongstoin	17
Subtotal				320
20	Garo Hills	East Garo Hills	Dambo Rongjeng	36
21			Samanda	2
22			Songsak	14
23		North Garo Hills	Resubelpara	6
24		South Garo Hills	Baghmara	15
25			Chokpot	16
26		South West Garo Hills	Betasing	32
27			Zikzak	54
28		West Garo Hills	Amlarem	7
29			Dadenggiri	2
30			Dalu	28
31			Rongram	12
Subtotal				224
Total				579

Source: compiled by Study Team based on information from MCLLMP

MCLLMP visited 579 villages for site verification to examine villages' willingness. As of February 2019, the site verification has been completed for 128 villages. After all the site verifications, MCLLMP aims to decrease the number of target villages from 579 to 400.

(3) North Eastern States Roads Investment Programme (NESRIP)[100]

The North Eastern States Roads Investment Programme (NESRIP) is a Centrally Sponsored Scheme of the Ministry of Development of North Eastern Region (MDoNER) and is assisted by the Asian Development Bank (ADB). Total project cost is approximately Rs 13.5 billion (USD298.2 million (Converted with USD1 = Rs 45.4, as of the year 2011). ADB will cover USD200 million, GoI will cover USD83.3 million, and the State Government will cover the remaining USD 14.9 million.

ADB provides a loan assistance of at maximum of USD200 million (Rs 9.08 billion, converted with USD1 = Rs 45.4) under the Multitranche Financing Facility (MFF) in two tranches. Tranche I, a loan agreement for USD74.8 million, was signed on July 9, 2012 and became effective on October 22, 2012. Tranche II, a loan agreement for USD125.2 million, was signed between GoI and ADB on February 17, 2014 and became effective on May 20, 2014. This program was executed during a period of 5 years as per approved by Cabinet Committee on Economic Affairs (CCEA) on May 19, 2011. The last disbursement date under any Tranche will be June 30, 2021.

NESRIP envisaged the construction/improvement of a total of 433.4-km-long roads in six north-eastern states namely Assam, Manipur, Meghalaya, Mizoram, Sikkim, and Tripura States. Five roads (197.3-km-long in total) were covered in Tranche I, and other six roads (236.1-km-long in total) were covered in Tranche II. With regard to Meghalaya State, it is expected to complete the construction of the road between Garobada and Dalu (93.4 km) by June 2019 as a part of Tranche I.

[100] http://mdoner.gov.in/

Chapter 3. Forests and Forest Management of the State

3.1. Forests of the State

3.1.1. Forest types & Flora of Garo, Khasi and Jaintia Hills Districts

(1) Major Forest Types

Major types of forest vegetation in Meghalaya State are categorized into five forest types, shown in Table 3.1 as per the Champion & Seth classification system (1968).

Table 3.1: Forest Types in Meghalaya State

Type	Proportion (%)
Tropical Wet Evergreen	10.45
Tropical Semi-Evergreen	1.93
Tropical Moist & Dry Deciduous	61.62
Subtropical Broad-Leaved Hill Forests	17.71
Subtropical Pine Forests	8.29
Total	100.00

Source: Meghalaya Biodiversity Board

(2) Features and Major Flora of each Forest Types

1) Tropical Wet Evergreen Forests

This forest type spreads over the lower reaches of Khasi Hills, up to 1,200 m, and is usually found in high rainfall areas as well as near catchment areas.
The dominant tree species include *Castanopsis indica*, *C. Tribuloides*, *Dysoxylum* sp, *Elaeocarpus* sp, *Engelhardtia spicata*, *Syzygium* spp., etc.

The ground flora of undershrubs and herbs include *Dracaena elliptica*, *Leea edgeworthia*, *Phlogacanthus* sp., and other species belonging to the family *Acanthaceae*, *Rubiaceae*, *Balsaminaceae* and *Asteraceae*. There are also abundant epiphytic Orchids, Ferns, Gesneriads, Piper, mosses, and many others.

2) Tropical Semi Evergreen Forests

This forest type occupies the north and north-eastern slopes of the Khasi Hills up to an elevation of 1,200 m and with an annual rainfall of 1,500-2,000 mm. There are deciduous elements along with evergreen types.

Major deciduous species include *Careya arborea*, *Dillenia pentagyna*, *Callicarpa arborea*, *Tetrameles* spp. Other dominant species include *Elaeocarpus floribundus*, *Dillenia indica*, *Symplocos paniculata*, and *Sapindus rarak*.

The ground flora is also very seasonal, with greater representation from the *Zingiberaceae* family.

3) Tropical Moist and Dry Deciduous Forest

This is very prominent vegetation in Meghalaya, covering a large part of East and West Garo Hills Districts, Ri-Bhoi District, and other districts, in areas that receive an annual rainfall of less than 1,500mm and have high temperatures. These forests are characterized by seasonal leaf shedding and profuse flowering.

The dominant tree species which are valued economically include *Shorea robusta*, *Tectona grandis*, *Terminalia myriocarpa*, *Gmelina arborea*, *Artocarpus chapsala*, *Lagerstroemia parviflora*, and

Maorus laevigata. Other associated species include *Schima wallichii*, *Toona ciliata*, *Albizzia lebbeck*, and *Dillenia pentagyna*.

There is less epiphytic flora, but orchids, ferns, and members of the *Asclepidaiceae* family are often seen.

Bamboo forests are not natural, but occur sporadically in patches in *jhum* fallows. The common bamboo species are *Dendrocalamus hamiltonii* and *Melocanna bambusoides*. Some other species that are less frequently found include *Bambusa pallida*, *Bambusa tulda*, *Chimonobambusa khasiana*.

4) Subtropical Broad Leaved Forests

The temperate forests occupy the higher elevations (>1,000m) with very high rainfall (2,000-5,000 mm) along the Southern slopes of Khasi and Jaintia Hills. The sacred groves largely fall under this category and these types of trees are relics that have evolved over millions of years.

The common trees include *Lithocarpus fenestratus*, *Castanopsis kurzii*, *Quercus griffithii*, *Q. semiserrata*, *Schima khasiana*, *Myrica esculenta*, *Symplocos glomerata*, *Photinia arguta*, *Ficus nemoralis*, *Manglietia caveana*, *Acer* spp., *Exbucklandia populnea*, *Engelhardtia spicata*, *Betula alnoides*, and *Rhododendron arboretum*.

These forests are exceptionally rich in epiphytic flora, comprising ferns, lichens, mosses, orchids, and zingibers, among other examples.

5) Subtropical Pine forests

The pine forests are confined to the higher reaches (900-1,500 m) of the Shillong plateau in Khasi and Jaintia Hills.

Pinus kesiya is the principal species that forms pure stands. In certain places the pines are associated with a few broad leaved species like *Schima wallichii*, *Myrica esculenta*, *Erythrina arborescence*, *Rhus javanica*, *Rhododendron arboretum*, and *Quercus* spp.

Shrubs include *Rubus*, *Osbeckia*, *Spirea* and *Artemesia*. During the rainy season there is a profuse herbaceous undergrowth that includes *Chrysanthemum*, *Aster*, *Hypochaeris*, *Prunella*, *Plectranthus*, *Desmodium*, *Ranunculus*, *Anemone*, *Potentilla*, *Clinopodium*, P*olygonum*, and *Elsholtzia*.

6) Subtropical Grasslands and Savannahs

In addition to the five forest types mentioned above, grasslands are observed in Meghalaya State as a form of secondary vegetation. They are prevalent in higher altitudes as a result of the removal of pristine forests.

The dominant grass genera in these grasslands are *Panicum*, *Paspalum*, *Imperata*, *Axonopus*, *Neyraudia*, *Sporobolus*, *Saccharum*, *Chrysopogon*, *Oplismenus* and others, along with sedges.

3.1.2. Forest Cover in the State

(1) Categories of Forest Cover in India

In 2003, forest cover in India was classified into three categories based on canopy density, namely Very Dense Forest (VDF), at more than 70%, Moderately Dense Forest (MDF), at more than 40% and less than 70%, and Open Forest (OF), at more than 10% and less than 40 %. Forest lands with less than 10% canopy density are categorized as Scrub, which is not regarded as forest. Other lands are categorized as Non-forest.

The forest cover has been assessed by an interpretation of satellite image data since 2001. India uses LISS-III sensor data for interpretation with a 23.5 m by 23.5 m resolution. Because the digitized boundary of Recorded Forest Area (RFA) has not been available in all states in India, except for 16 states[101], it is not possible to assess forest cover change within recorded forests in those states. Therefore, "Green-Wash Area (GWA)" has been adopted for the assessment of forest cover in those states for which there are no available digitized RFA boundaries. GWA represents forest area at the time the Survey of India was carried out in preparation of topographic maps in the 1980s. The area of GWA on the topographic maps corresponds to the RFA of the country, and GWA was digitized based on the map at a 1: 250,000 scale. GWA accounts for 22.39% of the total geographical area in the country[102]. The data in the following table presents forest cover change including areas both within and outside GWA.

(2) Forest Cover Area in Meghalaya State

Table 3.2 presents forest cover change through the years indicated in the whole of India and within Meghalaya State.

Table 3.2: Forest Cover Change through Years in India and Meghalaya State

	2007				2013				2017			
	India		Meghalaya		India		Meghalaya		India		Meghalaya	
	km^2	%	km^2	%	km^2	%	km^2	%	km^2	%	km^2	%
VDF	51,285	7.6	410	2.4	83,502	12.0	449	2.6	98,158	13.9	453	2.6
MDF	339,279	50.0	9,501	54.9	318,745	45.7	9689	56.0	308,318	43.5	9,386	54.7
OF	287,769	42.4	7,410	42.8	295,651	42.4	7150	41.4	301,797	42.6	7,307	42.6
Total Forest Cover	678,333	100	17,321	100	697,898	100	17,288	100	708,273	100	17,146	100
Scrub	40,269	1.2	211	0.9	41,383	1.3	372	1.7	45,797	1.4	505	2.3
Total Geo Area	3,287,263	-	22,429	-	3,287,263	-	22,429	-	3,287,469	-	22,429	-
Ratio Forest Cover/ Geo Area	-	20.6	-	77.2	-	21.2	-	77.1	-	21.5	-	76.4

Source: India State of Forest Report 2009 (data for 2007), 2013 and 2017
Note: Percentage of Scrub is ratio to the total geographical area

Figure 3.1 below depicts forest cover change and the proportion of canopy density in the state from 2003 to 2017. As shown in Figure 3.1, the total forest cover area in Meghalaya State was nearly stable through these years. In particular, MDF showed a great increase in 2007 compared with the previous assessment, by 2,693 km^2. According to the India State of Forest Report 2013, the reason for the increase in forest cover was because of the regeneration of shifting cultivation and better protection.[103,104] Other research in Garo Hills found that there was a trend toward an increase in dense forest, mostly in moderate and high altitude and slope areas. This increase was because of regeneration efforts conducted by the government and other organizations. Areas of dense forest concentrate in mostly moderate and high altitude and slope areas, which are difficult to access. On the other hand, open forest and non-forest areas expanded due to shifting cultivation, in especially easily accessible areas[105].

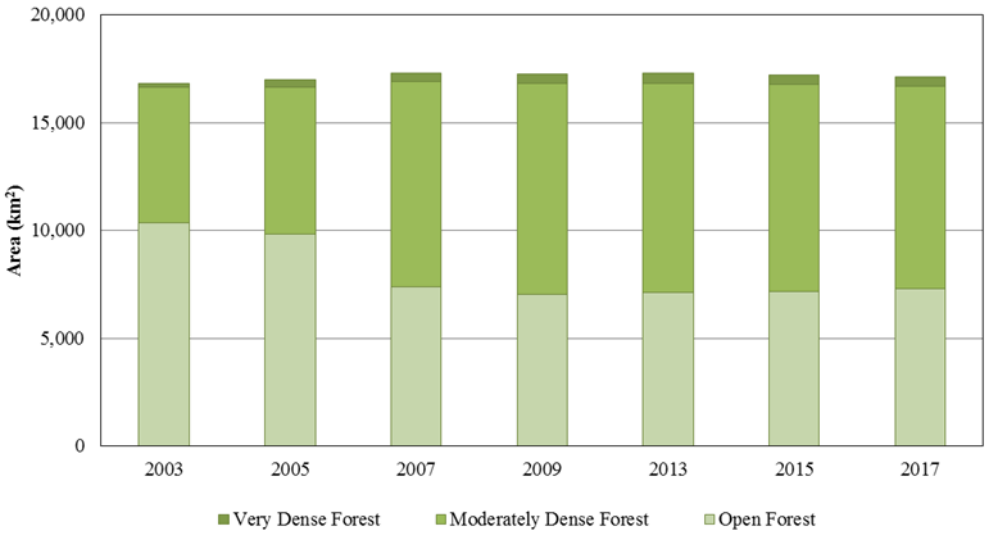
[101] Andhra Pradesh, Chhattisgarh, Goa, Gujarat, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Tamilnadu, Telangana, Uttarakhand, West Bengal, A&N Island

[102] Forest Survey of India. (2013). India State of Forest Report 2013.

[103] Forest Survey of India. (2003). India State of Forest Report 2003.

[104] Forest Survey of India. (2005). India State of Forest Report 2005.

[105] Sarma, K. Yadav, P.K and Sarmah, R.K. (2013). Landscape Dynamics in Relation to Slope and Elevation in Garo Hills of Meghalaya, India using Geospatial Technology.



Source: India State of Forest Report from 2003 to 2017

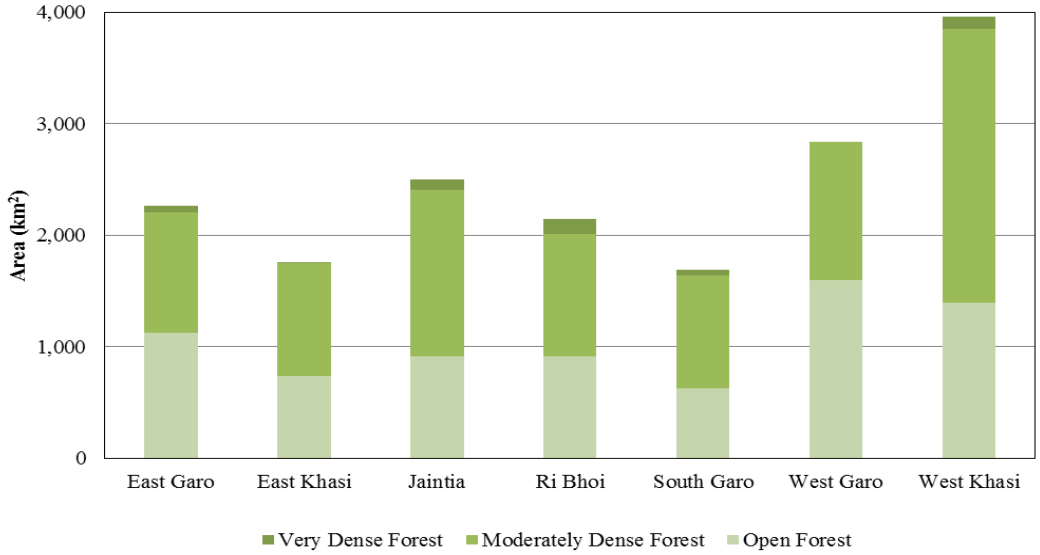
Figure 3.1: Forest Cover Change and Proportion of Forest Classification Based on Canopy Density in Meghalaya State from 2003 to 2017

In the district-wise analysis for forest cover area in the India State of Forest Report 2017 (Table 3.3 and Figure 3.2), the total forest cover area varies among districts. West Khasi Hills District has the largest forest cover with 3,958 km^2, while South Garo Hills District has almost half of that, with 1,887 km^2. Most districts have larger MDF area than OF area, ranging from 1,244 km^2 (43.8% of the total forest cover) in West Garo Hills to 1,014 km^2 (60.1%) in South Garo Hills District. Regarding OF, West Garo Hills has the highest proportion (56.2%), followed by East Garo Hills (49.8%) and Ri-Bhoi (42.7%) Districts. In West Garo Hills District, no VDF is reported.

Table 3.3: District-wise Forest Cover Area in Meghalaya State in 2017

	East Garo		East Khasi		Jaintia		Ri-Bhoi		South Garo		West Garo		West Khasi	
	km^2	%	km^2	%	km^2	%	km^2	%	km^2	%	km^2	%	km^2	%
VDF	63	2.8	3	0.2	100	4.0	132	6.2	45	2.7	0	0.0	110	2.8
MDF	1,075	47.4	1,012	57.8	1,488	59.4	1,096	51.1	1,014	60.1	1,244	43.8	2457	62.1
OF	1,128	49.8	736	42.0	915	36.6	915	42.7	629	37.3	1,593	56.2	1391	35.1
Total Forest cover	2,266	100	1,751	100	2,503	100	2,143	100	1,688	100	2,837	100	3,958	100
Scrub	53	2.0	106	3.9	86	2.3	35	1.4	12	0.6	63	1.7	146	2.8
Total Geo Area	2,603	-	2,748	-	3,819	-	2,448	-	1,887	-	3,677	-	5,247	-
Ratio Forest Cover/ Geo Area	-	87.1	-	63.7	-	65.5	-	87.5	-	89.5	-	77.2	-	75.4

Note: Percentage of Scrub is ratio to the total geographical area
Source: India State of Forest Report 2017



Source: India State of Forest Report from 2017

Figure 3.2: District-wise Forest Cover Area in Meghalaya State in 2017

3.2. Forest Management in the State

3.2.1. Forest Acts and Policies

(1) Forest Acts and Policies in India

1) Forest Acts and Rules in India

In India, laws and rules on forest and forestry have been established since the colonial era in the 18th century. Even after independence, the GoI inherited those acts and rules. In the initial stage, from the 18th century to the early 19th century, the acts neglected the rights of forest dwellers over forest resources and tribal customs and practices, and instead focused on timber production. Gradually, the acts have come to recognize the rights of forest dwellers over forest resources and pay attention to the conservation of forests. Major laws related to forest and forestry are summarized in the table below.

Table 3.4: Forest Acts and Rules in India

Year	Law	Key Features
1865	Forest Act	This act was the first forest act in India. It gave powers to the Governor General of India as well as local governments, enough to declare any land covered by trees, bush wood, or jungle a 'Government Forest'. It aimed at restricting the access of local people to the forests.
1878	Indian Forest Act	This act established absolute state property rights over forests, along with the legal separation of customary rights. It classified forests into Reserved Forests, Protected Forests, and Village Forests. The act stipulated that villagers could not take anything from those forests even for their personal use. They could, however, take wood to build their houses or to use as fuel from protected or village forests.
1927	Indian Forest Act	The purpose of this act was to lay down the procedure by which the government could acquire property and generate revenue from it. The act was timber-oriented. It

Year	Law	Key Features
		consolidated the law relating to forests, the transit of timber and other forest-produce. Forest conservation is not discussed. This act remains the legislative basis for today's state forest management.
1980	Forest Conservation Act	This act restricts the state government's power to de-reserve a forest, and it restricts the use of forest land for non-forestry purposes without the prior approval of the central government.
1996	Supreme Court Order 1996	The court redefined the scope of the Forest Conservation Act 1980 as it applied to all forests, regardless of their legal status or ownership. The order suspended tree felling across the entire country, except in accordance with working plans approved by the central government.
2010	National Green Tribunal Act 2010	This act was established for the effective and expeditious disposal of cases relating to environmental protection and the conservation of forests and other natural resources, including the enforcement of any legal right relating to the environment and giving relief and compensation for damages to persons, property, and for matters connected therewith or incidental thereto.

Source: MOEF. Compiled by Study Team

Of all the acts and policies summarized in the above table, the Indian Forest Act 1927, Forest Conservation Act 1980, and Supreme Court Order 1996 are further discussed in the following sections, because they are the foundation of current forest management in India.

a. Indian Forest Act 1927[106]

The Indian Forest Act 1927 still provides the legal foundation for forest management in the state even today. The act aims to consolidate and conserve forests and wildlife, regulate transference of timber and other forest-produce. The act regulates constitution of Reserved Forests (RF) and Protected Forests (PF). It defines the procedure by which a state government can declare an area of a RF, a PF, or a village forest. It also defines forest offences, prohibited actions inside a RF, and penalties for violation of the provisions of the Act.

b. Forest Conservation Act 1980[107]

The Forest Conservation Act 1980 restricts the state government's power to de-reserve forests and the use of forest land for non-forest purposes without the prior approval of the central government. The basic objective of this act is to regulate the indiscriminate diversion of forest lands for non-forestry uses and to maintain a logical balance between the country's need for development and the conservation of natural heritage. An amendment was added in 1988, and restrictions on the de-reservation of forests or the use of forest land for non-forest purposes were created. In the context of this act, "Non-forest purpose" means the breaking up or clearing of any land or portion thereof for (1) the cultivation of such products as tea, coffee, spices, rubber, palms, oil-bearing plants, horticultural crops, and medicinal plants and (2) any purposes other than re-afforestation.

[106] https://www.forestlegality.org.risk-tool/country/india (Accessed on 3rd March 2018)

[107] Forest (Conservation) Act, 1980 with Amendments Made in 1988.
http://chandigarh.gov.in/pdf/forest-acts.pdf

c. Supreme Court Order 1996[108]

On 12 December, 1996, the court, among other things, redefined the scope of the Forest Conservation Act 1980, and suspended tree felling across the entire country. The Forest Conservation Act 1980 essentially requires central government approval for the conversion of forest land to non-forest purposes. Until 1996, it was assumed that the act applied only to reserve forests. However, the Supreme Court said the act applied to all forests regardless of their legal status or ownership. It also redefined what constituted "non-forest purposes" to include not just mining but also the operation of sawmills. The court also suspended tree felling everywhere, except in accordance with working plans approved by the central government.

2) Forest Policies in India

Forest policies were developed at the national level to ensure that forests would be properly managed and conserved based on the forest acts mentioned in Section 3.2.1 (1) 1) Major forest policies at the national level are summarized in the table below. As this table shows, the forest policies in India have gradually recognised the rights of forest dwellers over forest resources and enhanced their participation in forest management. The policies also aim at increasing forest cover through afforestation and protecting ecosystems.

Table 3.5: Major Forest Policies in India

Year	Policy	Key Features
1952	National Forest Policy	This policy sets out guidelines which were directed towards the supply of cheap timber and non-timber forest products for state-sponsored industrialization and modernization. The policy added a dimension of increasing forest cover. It envisaged a tree cover of 33% of the total geographical area.
1988	The National Forest Policy	This policy aims at the preservation and restoration of the ecological balance of forests negatively affected by human and development activities. The policy envisages people's involvement in the development and protection of forests for the first time. It also gives priority to meeting the requirements of forest dwellers, including those related to fuelwood, fodder, and small timber.
2006	National Afforestation Program (NAP)	This NAP scheme aims to support the process of devolving forest protection, and management and development functions to the decentralized institutions of JFMCs at the village level, and Forest Development Agencies (FDAs) at the forest division level. The overall objective of the scheme is to develop forest resources with people's participation, focusing on improving the livelihood of forest-fringe communities, especially those of poor people.
2009	Compensatory Afforestation Fund Management and Planning Authority (CAMPA)	CAMPA was established as a national Advisory Council under the chairmanship of the Union Minister of Environment & Forests for the monitoring of technical assistance and evaluation of compensatory afforestation activities. It is meant to promote afforestation and regeneration activities as a way of compensating for forest land diverted to non-forest uses. The fund was constituted based on the Supreme Court of India's order in 2006 and was authorized to disburse funds in 2009, endowed with around USD 5 billion[109].
2014	Green India Mission (GIM)	GIM aimed at improving the quality of five million hectares of degraded forest and bringing another five million hectares of non-forest areas under forest cover through social and farm

[108] http://www.indiaenvironmentportal.org.in/files/epw1.pdf (Accessed on 3rd March 2018)
[109] https://forestlegality.org/risk-tool/country/India (accessed on 2018/3/3)

Year	Policy	Key Features
		forestry in order to realize sustainable forest management and eco-system conservation.
2014	Guidelines for Felling and Transit Regulations for Tree Species Grown on Non-Forest Private Lands	This guideline was established to create an enabling environment for motivating people, and facilitating their ability, to plant trees on non-forest and/or private lands that will supplement and partner the effort of the government to increase forest and tree cover in the country.
2014	National Agroforestry Policy	The value and role of agroforestry is ambiguous and undervalued despite the fact that agroforestry is beneficial in numerous ways and because the mandate of agroforestry falls through the cracks in various ministries and departments. The policy was established to encourage and expand tree plantation in a complementary and integrated manner with crops and livestock to improve productivity, employment, income, and the livelihoods of rural households.
2018	National REDD+ Strategy in India	This strategy was created to facilitate REDD+ programme in the country. It analyzes drivers of deforestation and forest degradation, proposes strategies against deforestation and forest degradation, overviews national related policies for forestry, and considers institutional mechanism involving both government and community entities for the implementation of REDD+ India.

Source: compiled by Study Team

Of all the acts and policies summarized in the above table, the National Forest Policy 1988, National Afforestation Programme (NAP), and Green India Mission are further discussed in the following sections because these policies are closely related to the Project.

a. National Forest Policy 1988

The National Forestry Policy 1988 provides the foundation of current forest management with people's participation through Joint Forest Management (JFM). Before the promulgation of the National Forestry Policy 1988, the objective of forest management by the government was to produce timber and generate revenue. The National Forest Policy 1988 shifted the objective to the improvement of the livelihoods of local communities that depend on forests. This policy also governs the maintenance of environmental stability through the preservation and restoration of ecological balance. The main objectives of this policy are as follows:

- To maintain environmental stability.
- To meet the requirements of fuelwood, fodder, and minor forest products.
- To create a massive people's movement for achieving these objectives and to minimize pressure on existing forests.
- To check soil erosion and denudation in the catchment area for the mitigation of flooding and drought and for the retardation of the siltation of reservoirs.

The policy emphasizes the necessity of increasing forest and vegetation cover on hill slopes in catchment areas. It also stipulates the industrial need for wood should be met increasingly by farm forestry.

b. National Afforestation Program (NAP)

The NAP scheme aims to support the process of devolving forest protection, management, and development functions to the decentralized institutions of JFMCs at the village level, and the Forest Development Agencies (FDAs) at the forest division level. The overall objective of the scheme is to develop forest resources with people's participation, focusing on improving the livelihoods of the forest-fringe communities, especially those of poor people.

c. Green Indian Mission

The Green Indian Mission (GIM) was established in 2014 as one of the eight national missions of the government under its National Action on Climate Change. GIM aims at increasing five million hectares of forest areas in ten years and improving the quality of forest to realize sustainable forest management and eco-system conservation.

d. National REDD+ Strategy in India

India issued the national REDD+ strategy in 2018. It overviews deforestation drivers, country's relevant law and forest management structure such as JFMC, and it explains countermeasure to address deforestation and forest degradation.

The National REDD+ Strategy (NRS) categorized deforestation drivers into two categories, namely Planned drivers which are driver in legal framework, and Unplanned Drivers which are beyond public control such as traditional cultivation. The NRS focuses on addressing Unplanned Drivers, with providing local people alternative livelihood. The NRS also explains fuction of existing forest laws and forest protection structure such as JFM. These forest laws and JFM scheme contribute to making women involve in forest amangement and ensuring traditional rights. Details are explained in Annexure 3.

3) Wildlife and Biodiversity Acts and Rules

The commitment to protect wildlife and the natural environment is embodied in India's post-Independence Constitution. Article 48A of the Constitution requires states to endeavour to "safeguard the forests and wildlife of the country", while the Article 51A (g) makes it the duty of every citizen to protect and improve the natural environment, including forests, lakes, rivers and wildlife.

There are multiple laws related to wildlife and biodiversity in the country and implemented in Meghalaya State, as listed in the table below.

Table 3.6: Wildlife and Biodiversity Acts and Rules in India

Year	Law	Key features
1972	The Wildlife (Protection) Act	Sanctuaries and national parks are established under this law. A 2003 amendment introduced two new categories, namely, community reserves and conservation reserves. Hunting of all species is banned except for vermin listed in Schedule V. Strict protection of sanctuaries and national parks. Community use is not permitted.
2002	Wildlife (Protection) Amendment Act	Conservation Reserves and Community Reserves are introduced in this amendment act. It also provides the establishment of management committees for both of these categories of reserves. The state government may, after having consultations with the local communities, declare any area owned by the government, particularly areas adjacent to existing Protected Areas (PA) and corridor sites between PA, as a conservation reserve for protecting landscapes, seascapes, biodiversity, and habitats. Community Reserves are declared in community or private lands, outside the existing PA, where the community or an individual has volunteered to conserve wildlife and its habitat, to protect fauna, flora, and for traditional conservation practices.
2002	The Biological Diversity Act	This act has the triple objectives of conservation, sustainable use, and benefit sharing. Regulates access to biodiversity and traditional knowledge and for benefit sharing. Provisions for

Year	Law	Key features
		the establishment of village level Biodiversity Management Committee, Local Biodiversity Fund, and role for the community in the management of biodiversity. Introduces a provision for Biodiversity Heritage sites.
2010	Wetlands (Conservation and Management) Rules	These rules aim at the protection of Ramsar sites and other important wetlands. The central government's prior permission is mandatory for the conversion of wetlands. Establishment of the Central Wetland Management Authority.

Source: compiled by Study Team

Of all the acts and policies summarized in the above table, the Wildlife Protection Act 1972 is further discussed in the following section because the act constitutes Community Reserves, which is an important scheme for community forest management.

a. Wildlife Protection Act 1972

The Wildlife Protection Act 1972, with its amendments, is the focal legislation governing the management of biodiversity and habitats in the country. PA are established through this act. It also prohibits the hunting, catching, and trapping of all species, except those listed as vermin or pests in Schedule V of the Act (Section 9), both inside PA and outside of them. State governments shall designate PA through notification, and claims of rights by any person in the case of sanctuaries and national parks are to be examined and settled expeditiously by the District Collector. According to the 2003 amendment to the act, the sanctuary status of an area shall take effect immediately upon notification (Section 18A.1). The law provides a firm basis for the protection of biodiversity, although it does not provide enabling provisions for the community use of biodiversity.

The act provides four categories of PA: (1) Sanctuary, (2) National Park, (3) Conservation Reserve, and (4) Community Reserve. No exploitative use or habitat alteration is permitted within sanctuaries; the prior permission of the Chief Wildlife Warden is be required when such activities are to be undertaken for the improvement of wildlife. In the case of National Parks, the approval of the National Board for Wildlife is be required for such interventions. The act also prescribes penalties for violations. The legal character of each category of PA is given in the table below.

Table 3.7: Legal Characteristics of the Four Categories of Protected Areas

Categories	Statutory features
Sanctuary	No consumptive use and/or habitat alteration is allowed except with the prior permission of the Chief Wildlife Warden with the approval of the state government, and should be intended to improve habitat management. Cattle grazing and the movement of cattle may be permitted. Provision to establish a local advisory committee for each sanctuary.
National Park	Stricter controls than sanctuaries; no grazing or cattle movement allowed; habitat alterations for management purposes, if any, should be made with the approval of the Chief Wildlife Warden in consultation with the National Wildlife Board. No continuation of rights permitted. No alteration of boundaries without the approval of the National Board of Wildlife.
Conservation Reserve	Declared on any area owned by the government, particularly areas close to existing PA. Management by the Chief Wildlife Warden, on the advice of a management committee established for the site.
Community Reserve	On community land or private land with the voluntary consent of the community or the private individual. Management committee formed by the government, composed of five representatives nominated by the community and one member from the state forest or wildlife department. A management plan shall be prepared by the committee and approved by the government.

Source: compiled by Study Team

(2) Forest Acts and Policies in Meghalaya

Major acts and rules regarding forests in Meghalaya are categorized and summarized in the table below.

Table 3.8: Forest Acts and Rules in Meghalaya State

Act & Rule	Outline
Forest Management & Forestry	
Assam Reorganization (Meghalaya) Act, 1969 – Section 66	Section 66 indicates the continuance of existing laws and their adaptations. All laws in force immediately before the appointed day in the autonomous state shall continue to be in force therein until altered, repealed, or amended by a competent legislature or other competent authority.
Assam Forest Regulation, 1891	A regulation to amend and consolidate the law related to forests, the transit of forest produce and the duty leviable on timber and other forest produce. In this regulation, It regulates constitution of a reserved forest and acts prohibited in reserved forests as well as penalties for damage in the forests. It also provides a power to the state government to constitute a village forest for benefits for village communities. Bamboo and canes were regarded as "tree" in this regulation.
The Meghalaya Forest Regulation, 1973	A regulation to amend the law relating to forest, forest-produce, and duties leviable on timber in Meghalaya. It provides the state government power to constitute a reserved forest and to create village forests. It also prescribes the general protection of forests and forest produce. It also regulates duties on imported forest produce and makes rules to regulate the transit of forest produce.
The Meghalaya Forest Regulation (Application and Amendment) Act, 1973	An act to provide for the extension and application of, and to amend, the Assam Forest Regulation, 1891, and the Meghalaya Forest Regulation, and for matters connected therewith or incidental thereto. By virtue of this act, the Assam Forest Regulation, 1891, was extended in its application to the State of Meghalaya, the Assam Act being named as the Meghalaya Forest Regulation.
Meghalaya Forest (Ejectment of Unauthorized Person from Reserved Forests) Rules, 1979	Rules empowers Divisional Forest Officers to eject any person who has entered into unauthorized occupation of land in a reserved forest or order him to vacate such unauthorized occupancy, including the power to sell, confiscate, or destroy any crops raised, or building or construction erected on the land without authority.
The Meghalaya Forest (Removal of Timber) (Regulation) Act, 1981	An act to regulate and control the removal of timber outside the state for preservation of forests and to prevent their indiscriminate destruction, and for matters connected therewith and incidental thereto.
Meghalaya Forest (Removal of Timber) (Regulation) Rules 1982	Rules frames to ensure the carrying out of various provisions contained in the Meghalaya Forest (Removal of Timber) (Regulation) Act, 1981, containing a detailed provision related to the grant of licenses for the removal of timber outside the state, the establishment of trading depots within the state, payable license fees, records to be maintained and furnished for the license holder, verification by the competent authority, etc.
The Meghalaya Forest Authority Act, 1991	An act to provide for the constitution of authority for unified control of forests in Meghalaya.
The Meghalaya Forest Regulation (Amendment) Act, 1998	An act amends clause (l) of sub-section (2) in Section 40 of the Meghalaya Forest Regulation (Assam Regulation No.7 of 1891 as applied and amended by Meghalaya) as follows: the establishment of not only saw mills but also saw pits, veneer mills, plywood factories and any kind of forests-based industries are prohibited absolutely, or subject to conditions, rules, within specified local limits.

Act & Rule	Outline
Meghalaya Forest Based Industries (Establishment & Regulation) Rules, 1998	Rules frames in compliance with the interim orders passed by the Hon'ble Supreme Court of India in the Writ Petition (Civil) 202/95 to regulate the establishment and operation of forest-based industries in other words. saw mills, saw pits, veneer mills, plywood mills, etc.
Meghalaya Tree Felling (Non-Forest Areas) Rules 2006	Rules to regulate the felling of trees in non-forest areas, including the procedure for permission to fell trees from registered tree plantations. All permissions granted for the felling of trees from registered social forestry plantations or plantations raised by other government departments subject to payment of afforestation or regeneration costs. Application for felling of trees from registered private plantations raised without government funding shall be made by the authorized person to the Chief Forest Officer of the ADCs or the Divisional Forest Officer, depending upon the jurisdiction. Horticultural tree species, including bamboo shall not require permission for felling. The transit of timber from non-forest land shall be under transit passes, and as per provisions of relevant acts and rules.
The Meghalaya Charcoal (Control of Production, Storage, Trade and Transit) Rules, 2008	The rules restrict that charcoal production should follow the rules and charcoal shall be produced only from wood obtained from legal sources. The amount of charcoal produced and storage shall be specified by DFO and only producers and stockist registered to DFO are allowed to produce or storage charcoal. No charcoal shall be transported unless covered by a transit pass issued by Forest Officers authorized by DFO.
The Meghalaya Forest Regulation (Amendment) Act, 2012	An act to amend the Meghalaya Forest Regulation Act, (Assam Regulation 7 of 1891 as adapted and amended by Meghalaya). Section 3 of the regulation stipulates that a new clause (10) shall be inserted after clause (9), which defins "forest" as an area if it is a compact or continuous tract of a minimum of 4 hectares of land, irrespective of ownership, and where more than 250 trees or 100 bamboo clumps grow naturally per hectare.
Green Highways (Plantation, Transplantation, Beautification & Maintenance) Policy-2015	A policy that evolves a framework for plantations along with National Highways to reduce the impact of air pollution and dust by establishing trees and shrubs, to provide shade, to arrest soil erosion of embankment slopes, to moderate the effect of wind, and to create employment opportunities for local people. The policy prescribes institutional arrangements, financing patterns, land requirements, and plantation agencies. It encourages the involvement of local institutions like Joint Forest Management Committee (JFMCs) and Self-Help Groups (SHGs) in roadside plantations, including for the maintenance and use of trees. Convergence with schemes of other government departments and agencies is also encouraged. It includes a plantation scheme that involves tree species selection, plantation pattern, and technical specification.
Wood Based industries (Establishment and Regulation) Guidelines, 2016	Guidelines that extend to the whole of India. Each state shall constitute a State Level Committee which assesses the availability of timber and the quantity of different raw materials for wood-based industrial units in the state. The Committee shall also assess the annual requirement of timber and other forest produce in the domestic markets in the state and maintain a database of timber and other raw materials utilized by each wood-based industrial unit. In Meghalaya, the establishment of wood-based industries shall be permitted within the industrial estates. The establishment and operation of a furniture unit shall not require a license. A furniture unit shall not use converted round logs. It shall use only sawn timber sourced from licensed saw mills and may use bamboo, reeds and canes.

Act & Rule	Outline
Catchment Protection	
The Meghalaya Tree (Preservation) Act, 1976	An act to make provisions for regulating the felling of trees for the purpose of protecting catchment areas and soil from erosion and to preserve the special characteristics of the hilly areas as regards landscape, vegetal cover and climate, and to provide for matter connected therewith and incidental thereto.
The Meghalaya Tree (Preservation) Rules, 1976	Rules that prescribe the procedure of application to obtain permission to fell tree(s) from Divisional Forest Officer. They also prescribe how appeals are to be made and offenses to be dealt with.
The Meghalaya Protection of Catchment Area Act, 1990	An act to provide for the protection of catchment areas with a view to preserve water sources and to make provisions for matter connected therewith. The Act regulates the constitution of the Meghalaya Catchment Areas Advisory Board, whose main function is to advise the Government on matters connected with the catchment areas and their protection, including the declaration of catchment areas and appropriate methods of management of the areas. In the case of a critical catchment area, tree felling, *jhum*, quarrying of sand or stone, and the excavation of earth shall be prohibited therein or within a distance not exceeding two hundred meters from the periphery.
Wildlife and Biodiversity	
The Wildlife (Protection) (Meghalaya) Rules, 1977	Rules that regulate the constitution of the Wild Life Advisory Board. They also regulate hunting of wild animals, including game hunting and hunting licenses and wild animal trapping licenses. They also prescribe entry in sanctuaries or National Parks in terms of permits, vehicles, and fees for operating a camera. Trade or commerce in wild animals is also regulated by the rules.
Meghalaya Biological Diversity Rules, 2010	Rules that regulate the constitution of the Meghalaya Biodiversity Board, whose main function is to advise the State Government on matters concerning conservation of bio-diversity, sustainable use of its components, and fair and equitable sharing of benefits arising out of the use of biological resource and knowledge. The rules also prescribe the operation of the State Bio-diversity Fund and the establishment and management of the Bio-diversity Heritage Site. They request that every local body constitute a Biodiversity Management Committee.

Source: compiled by Study Team

Apart from the acts and rules constituted by the Meghalaya State Government mentioned in the above table, the ADC also constituted their own acts or rules related to forest management as described in the table below.

Table 3.9: Forest Related Acts and Rules in ADCs

Name	Outline
The Garo Hills District (*Jhum*) Regulation, 1954	The regulation aims to provide the regulation and control of the practice of shifting cultivation or *jhum*. It prohibits practice of *jhum* in certain areas such as the radius of 400 m of any water source or catchment area declared by an order of the Executive Committee and area which is covered by sal and other valuable trees. The Executive Committee shall be competent to fix the cycle of shifting cultivation and direct *jhumers* to plant fast growing trees in *jhum* areas. Individual *jhumers* who plant trees shall acquire exclusive right to use the trees and the right to conduct shifting cultivation again on the land which recovers the fertility. The Executive Committee can also give directions that shifting cultivation areas in which fast growing tree species has been planted shall not be used for shifting cultivation for such number of years. The Executive Committee may pay subsidies approved by the District Council to the individual *jhumers* for planting trees in their shifting cultivatoin land. The regulation also introduces permanent cultivation and terraced form of cultivation and horticulture.
The United Khasi-Jaintia Hills Autonomous District (Management and Control of Forest) Act, 1958	To provide for the management and control of forests in the United Khasi – Jaintia Hills Autonomous District. Classification of forest to which this act applies and methods of management of each category are described.
The Garo Hills District (Forest) Act, 1958	To provides for the management of any forest not being a reserved forest in the Autonomous District of Garo Hills and for the levy and collection of forest revenue.
The United Khasi-Jaintia Hills Autonomous District (Management and Control of Forests) Rules, 1960	The act classified forests to which the act applies into seven categories; Private Forest, *Law Lyngdoh*, *Law Kyntang*, *Law Niam*; *Law adong* and *Law Shnoung*; Protected Forests; Green Block; *Raid* Forests; and District Council Reserved Forests, and Unclassed Forest. The act regulates each type of forest should be managed by who and based on what.
The Garo Hills Autonomous District (Constitution and Management of Village Forest) Rules 1976	The rule was prepared to exercise the powers conferred by section 17 and 18 of Chapter II of the Garo Hills District (forest) Act 1958. The rule regulates the process of constitution of Village Forest and management and control of Village Forest including formation of Village Forest Committee, banned items, and limitation of forest produces used by each household
The Khasi Hills Autonomous District (Protection and Promotion of Khasi Traditional Medicine) Act, 2011	The act was prepared to codify indigenous knowledge of traditional medicine and make provisions for the protection and promotion of Khasi traditional medicine and use under the background which traditional medicine is under threat from depletion of medicinal plants, inadequate documentation and transmission. It aims to conserve medicinal plants through declaration of medicinal plant sanctuaries and regulations on entry to and prohibited activities in the sanctuaries.
The Khasi Hills Autonomous District (Protection and Promotion of Khasi Traditional Medicine) Rules, 2013	In order to enforcement of the Khasi Hills Autonomous District (Protection and Promotion of Khasi Traditional Medicine) Act, 2011, the rules regulate details of declaration of medicinal plant sanctuaries and formulation of rules and guidelines for collection of medicinal plants by individuals and organizations regarding medicinal plants management.

Source: compiled by Study Team

3.2.2. Forest Classification

Meghalaya State has 9,496km^2 (42.3% of the total geographical area) of the Recorded Forest Area (RFA)[110] which is designated as per legal classification[111]. RFAs are classified into three categories: Reserved Forest (RF), Protected Forest (PF), and Unclassed Forest (UF), which are constituted under the Indian Forest Act 1972. Meghalaya State has two National Parks and three Sanctuaries, and these are categorized as RF[112]. For each classification, there are certain restrictions on activities as shown in Table 3.10.

Table 3.10: Legal Classification of Recorded Forest Areas

Category	Restrictions on activities
Reserved Forest	An area notified under the provisions of Indian Forest Act or the State Forest Acts having full degree of protection. In Reserved Forests all activities are prohibited unless permitted.
Protected Forest	An area notified under the provisions of Indian Forest Act or the State Forest Acts having limited degree of protection. In Protected Forests all activities are permitted unless prohibited.
Unclassed Forest	An area recorded as forest but not included in reserved or protected forest category. Ownership status of such forests varies from state to state.

Source: India State of Forest Report 2001

The area of each classed and unclassed forest in India and Meghalaya State is presented in Table 3.11. As seen in the Table, the ratios of both RF and PF are very low in Meghalaya State compared with those of the whole of India. On the other hand, UF in Meghalaya State is much higher than that of the country.

Table 3.11: Forest Cover Change through Years in India and Meghalaya State

	Area (km^2)		Ratio to Total Recorded Forest Area (%)		Ratio to Total Geographical Area (%)	
	India	Meghalaya	India	Meghalaya	India	Meghalaya
Reserved Forests	434,705	1,113	56.65	11.72	13.22	4.96
Protected Forests	219,432	12	28.59	0.13	6.67	0.054
Unclassed Forest	113,881	8,371	14.84	88.15	3.46	37.32
Total Recorded Forest Areas	767,419	9,496	100	100	23.34	42.34
Geographical Area	3,287,469	22,429	-	-	100	100

Source: India State of Forest Report 2017

RF are used and managed exclusively by the state Forest Department. Local people have no rights to use RF for activities such as felling trees, collecting forest products, grazing, hunting, and shifting cultivation. Only acts permitted by the state are allowed by local people.

PF targets forest land other than RF. They are also managed by the state Forest Department, and local people are basically prohibited from using PF to collect forest products and having their livestock for graze and other activities. Yet local individuals and communities have certain rights to use PF under acts permitted and licensed by state forest officers, such as collecting minor forest products for household use.

[110] 'Record Forest Area (forest area) refers to all the geographic areas recorded as 'forests' in government records (India State of Forest Report 2015).

[111] Forest Survey of India. (2017). India State of Forest Report 2017

[112] Joy Dasgupta and H. J. Symlieh. (2006). Trends in tenure arrangements for forest and their implications for sustainable forest management: the need for a more unified regime. In: Understanding forest tenure in South and Southeast Asia.

UF are any kind of forest and forested wasteland, but they are not notified in the government gazette as "Reserved" or "Protected" Forests under the Indian Forest Act, 1927. In the north-east region, including Meghalaya State, most areas of UF are owned by local communities and clans[112].

3.2.3. Forest Management System

Forest management in Meghalaya can be divided into two categories. One covers the management of RFAs and the other covers non-forest recorded areas. The former is under responsibility of FED and the latter is under responsibility of ADCs in principle. However, in practice, FED sometimes conducts interventions in management of non-forest recorded areas adopting national schemes or acts such as Joint Forest Management (JFM) and the Wild Life (Protection) Amendment Act that regulates constitution of Community Reserve. Furthermore, under the administrative management by the ADCs, non-forest recorded areas are practically managed by local communities or traditional institutions according to their customary rules[113]. Traditional institutions have developed their own rules and norms for protection of their own forests from biotic interferences like illegal logging and fire, and monitor on the implementation of the rules[114].

(1) Management of Recorded Forest Areas

As mentioned earlier, RFA, including RF and (PF occupies only less than 10% of total forest area in Meghalaya State. All government-owned forests, in other words, RF and PF, are managed according to scientific Working Plans (WP) prepared by FED. As of February 2019, there were four approved WP under three territorial Divisions as shown in Table 3.12. All four WPs include five working circles, namely a plantation working circle, forest protection working circle, JFM working circle, an NTFP working circle, and a Wildlife Management working circle. The period covered by the plans is ten years, from 2012-13 to 2022-23. Mid-term revision of the WP was initiated in July 2018.

Table 3.12: Approved Working Plans

Territorial Division	Working Plan (WP)	Covered Areas
Khasi Hills Territorial Division	WP on the RF & PF in and around Shillong	8 RFs, 1,810.59 ha
	WP of Nonogkhyllem & Umsaw RF	2 RFs, 9,054.75 ha
Garo Hills Division	WP of Garo Hills Division	16 RFs, 278,0123 ha
WP of Jaintia Hills Division	WP of Jaintih a Hills Division	2 RFs, 31,633.27 ha

Source: FED

Regarding the plantation working circle, the achievement of establishing a plantation was well beyond the targets of most of the WP. On the other hand, information on the achievements of other working circles is not available.

The main objective in the management of RFA is to conserve forests. Timber production is not conducted in RF or PF.

Wildlife Protected Areas, which are under government control, such as National Parks (NP), Wildlife Sanctuaries (WLSs, and Biosphere Reserves, area managed under scientific Management Plans formulated by the Wildlife Wing of the FED. There are two NP and four WS in the state (Table 3.13).

[113] Tiwari, B.K. et al. 2008. Forest products of Meghalaya present status and future perspective (available at www.researchgate.net/publication/320164337, latest access March 11, 2019

[114] Final Report, Living condition survey for preparatory study on project for sustainable community forest amangement in Meghalya (2019)

Table 3.13: National Park and Wildlife Sanctuary

NP/WLS	Area (km^2)
Balpakram NP	352.00
Nokrek NP	47.48
Nongkhyllem WLS	35.64
Siju WLS	5.18
Baghmara WLS	0.02
Narpuh WLS	59.90

Source: FED

(2) Management of Non-Recorded Forest Areas

As mentioned earlier, more than 90% of forest areas are non-recorded forest areas that belong to communities, individuals or clans. However, the data of those non-recorded forest areas are very limited. As shown in the table below, only 54,200 ha of non-recorded forest areas is covered with the data in total, which is equivalent to only 3.4% of Unclassed Forest and Non-forest areas with forest cover in the state. Without the data, it is difficult to manage the forests in accordance with the regulations or policeis preparead by the stage governemnet as well as the ADCs. Generation of accurate and comprehensive data on community owned or private forests is one of the fundamental challenges in terms of forest management on non-recorded forest areas.

Table 3.14: Community Owned or Private Forests

ADC	Community forest (Registered)		Individual owned forest (Registered)		Clan owned forest (Identified)	
	No.	Ha	No.	Ha	No.	Ha
Jaintia Hills	89	19,956	173	14,200	20	508
Khasi Hills	N/A	N/A	79	18,135	N/A	N/A
Garo Hills	61	1401	-	-	-	-

Source: Jaintia Hills ADC, Khasi Hills ADC, and Garo Hills ADC

1) Feature of Each ADC Regarding Forest Management

As mentioned earlier, forests belonging to communities, individuals, or clans are administered by an ADC. Practically, such forests are managed by communities, individuals, or clans. Each ADC has a unique land tenure and forest management system, forest vegetation, and landscape. Major drivers of deforestation and/or forest degradation are also different depending on the ADC. According to the results of the Living Condition Survey[115], not only shifting cultivation but also forest fire and illegal felling were recognized as major dirvers. The features of each ADC are summarized in Table 3.15.

In accordance with the unique social and natural conditions forest management systems also vary depending on the ADC. Forest management systems and their background in each ADC are described below.

Table 3.15: Features of Each ADC regarding Forest Management

ADC	Land tenure	Forest vegetation	Major drivers of forest degradation/ deforestation	Forest management
Jaintia Hills	Three categories of land; non-transferable land, private land, and land for	Tropical Wet Evergreen Forest, Northern Tropical Semi-Evergreen Forest,	1) Forest fire 2) Charcoal burning 3) Quarrying of stone/ limestone 4) Shifting	According to the United Khasi Jaintia Hills Autonomous District Act 1958, the forests are classified into six

[115] Ibid.

ADC	Land tenure	Forest vegetation	Major drivers of forest degradation/ deforestation	Forest management
	services rendered to government	Subtropical Broad-Leaved Hill Forest, Subtropical Pine Forest, East Himalayan Wet Temperate Forest	cultivation	categories and methods of management are regulated in each category. Community forests and private forests can be registered to the ADC.
Khasi Hills	Four categories of major land owenership; private land, group and clan land, community land, and government land. Major part of land is individual owned land.	Tropical Wet Evergreen Forest, Northern Tropical Semi-Evergreen Forest, North India Tropical Moist Deciduous Forest, Subtropical Pine Forest, East Himalayan Wet Temperate Forest, Northern Subtropical Broad-Leaved Hill Forest	1) Forest fire 2) Quarrying of stone/ limestone 3) Charcoal burning	Community forests and Priavte forests can be registered to the ADC. Communtiy forests are accessible for all community members. Private forests, on the other hand, are accessible for the owners. However, in some cases, collection of NTFPs including fuel wood in private forests are allowed for other community members.
Garo Hills	All lands/forests owned by *Nokma* /*Aking Nokma* in principle. However, the introduction of wet-rice cultivation has promoted private ownership.	Northern Tropical Semi-Evergreen Forest, North India Tropical Moist Deciduous Forest, Northern Subtropical Broad-Leaved Hill Forest	1) Shifting cultivation 2) Quarrying of stone/limestone 3) Conversion to monoculture plantation 4) Illegal felling	According to the Garo Hills ADC Act 1958, forests owned by communities can be registered as Village Reserve Forest.

Source: Interviews with official concerned by Study Team in January and Februalry 2019. Tiwari, B.K. et al. 2008. Forest products of Meghalaya present status and future perspective (available at www.researchgate.net/publication/320164337, latest access March 11, 2019

2) Community-led Forest Management

a. JFM

Joint Forest Management (JFM) is one of the major schemes for forest management involving communities across the country. Based on the JFM Circular issued by GoI in 1990 and the JFM guidelines subsequently issued in 2000 and 2002, JFM was introduced to Meghalaya State in 2003 by promulgation of the notification No. FOR. 64/99/186. In Meghalaya State, in which more than 90 % of forest area belongs to communities or individuals or clans, JFM targets forests owned by them.

As of February 2019, there are 366 JFMCs in the state covering 30,741 ha (Table 3.16). JFMCs were developed by Forest Development Agencies (FDAs) as implementation agencies of the National Afforestation Programme (NAP) at the village level in Meghalaya. Recently, JFMCs are also regarded as the implementation agencies of GIM.

Table 3.16: JFMCs in Meghalaya State

FDAs	No. of JFMCs	Target Areas (ha)
Jaintia Hills	32	2,627
East Khasi Hills	48	3,365
West Khasi Hills	53	5,753
Ri-Bhoi District	80	3,656
East Garo Hills	45	3,772
West Garo Hills	44	4,477
South Garo Hills	29	3,452
Jaintia Hills Territorial Division, Jowasi	19	1,050
Khasi Hills Wildlife Division, Shillong	16	2,589
Total	366	30,741

Source: FED

Based on the MOU made between Forest Development Agency (FDA) and the JFMCs, tree planting is conducted for five years, including maintenance of a given forest owned by a community or individuals with sanction or financial support from FED. After the five years, the planted land is handed over to the owners and is thereafter managed under the provision of the Meghalaya Tree Felling (Non-Forest Areas) Rules 2006 that regulates tree felling and replanting in the land[116].

According to the notification No.FOR.64/99/86, it is stipulated that more than one member of the Executive Committee (EC) shall be a person nominated by the ADC. In reality, however, some JFMCs do not include members nominated by the ADC. Even in cases in which JFMCs have members nominated by the ADC, the members do not participate in decision-making, since budget matters are controlled by FED.

b. Community Reserve

Based on Section 36 of the Wild Life (Protection) Amendment Act, 2002, the state government has declared sixty four Community Reserves (CRs), which cover 6,170.41 ha in total, by February 2019. The purpose of declaring CR is to protect fauna, flora, and traditional or cultural conservation values and practices. In accordance with the purposes of constitution of CR, some sacred groves are declared as CR in the state. With the issue of the notifications on declaration of CRs, land use patterns cannot be changed within CR. With the declaration of CR, Community Reserve Management Committees shall be constituted, consisting of five representatives, to manage CR through preparation and implementation of a management plan for CR.

Though the target areas of CR are made up of land owned by communities or individuals in the state, the Wildlife Division of FED has been responsible for declaration of CR. It conducts a survey on fauna and flora, demarcates boundaries, and establishes boundary pillars. The Division also supports the construction of infrastructure in community reserves such as pavement trails, toilets, and signboards. Moreover, it supports tree planting in community reserves through the provision of seedlings and wages for work done planting trees. However, in case FED does not have enough money budgeted, communities conduct tree planting voluntarily. The ADCs does not play any role in the establishment and management of CR except registration of CR to ADC concerned.

c. Village Reserve Forest

According to section 17, Chapter II of the Garo Hills ADC (Forest) Act 1958, communities can register their community forests as a "Village Forest" to the ADC. Rules for constitution and management of the Village Forest are regulated by the Garo Hills Autonomous District (Constitution and Managmenet of Village Forest) Rules 1976. Among the Village Forests, those to

[116] FED (2017) Sylvan Mosaic.

be conserved carefully shall be registered as "Village Reserve Forest (VRF)"[117]. Use of forest resources in VRF is strictly restricted in comparison with that of Village Forests. By being registered to the ADC, the forests are legally protected and the communities which own the forests can get incentives from the ADC to reserve the forests. Various types of incentives such as support for black pepper or cardamom cultivation, provision of solar ramp, construction of bench terraces or a bridge have been provided. There is no guideline or rules to decide what kinds of support are provided as incentives. Incentives provided are decided from two aspects of feasibility and benefit for communities by Forest Department of the ADC. A VRF is managed by a Village Forest Committee constituted by the Executive Committee of the Garo Hills District Council, which is chaired by *Nokma*. After the registration, each village needs to develop a village resolution to regulate use and management of the forest. The Forest Department (FD) of the ADC supports enforcement of the village resolution. If there are actions against the resolution, a fine is imposed.

d. Registration as "Community Forest"

The Khasi Hills ADC and Jaintia Hills ADC do not have any specific schemes like the VRF in Garo Hills ADC. In these ADCs, community owned forests can be registered to the ADCs as a "Community Forest". Even though communities register their own forests to the ADCs, they do not obtain any financial support from the ADCs due to financial constraints. However, as being registered to the ADCs, the status of the forest can be secured and legalized. This benefits communities. In the case of Jaintia Hills ADC, a certificate with a map of the forest is prepared by FD is issued in the name of the Chief Forest Officer (CFO). Table 3.17 shows the main features of CFM schemes in Meghalaya State.

Table 3.17: Community Forest Management Schemes in Meghalaya State

Scheme	Joint Forest Management	Community Reserve	Village Reserve Forest
Area	All ADCs	All ADCs	Garo Hills ADC
Target Site	- Bare land - Individually-owned forest - Community-owned forest (no JFMC in Reserved/ Protected Forests)	- Community or private lands with wildlife and its habitat conserved by communities or individuals voluntarily - Sacred groves	- Natural forests owned by communities
Implementation organization	Joint Forest Management Committee	Community Reserve Management Committee	Village Resource Committee
Purposes	- Increase forest cover by planting trees (from the viewpoint of FED) - Conserve community forest in order to increase wild animals and retain water (from the viewpoint of communities)	- Protect fauna, flora, and traditional or cultural conservation values and practices - Conserve biodiversity	- Conserve forests - Use forest resource
Use & Management	- NTFP can be extracted for domestic purposes - However, some JFMCs are not allowed to extract NTFP from their JFM project area	- Land use pattern cannot be changed - Detail management and use are decided by the committees - Basically no extraction of forest resources	- Each village develops a village resolution to regulate use and management

[117] Interview with CFO of the Garo Hills ADC on April 25, 2019.

Scheme	Joint Forest Management	Community Reserve	Village Reserve Forest
Intervention of FED/ADC FD	- FED supports tree planting including five-year maintenance through provision of seedlings and wages based on MOU made with JFMCs - FED supports EPA - FED official and person nominated by ADC shall be members of EC	- FED identifies communities with willingness to register their forests as CR - FED conducts a survey on fauna and flora, boundary demarcation, establishes boundary pillars, supports development of infrastructure and tree planting in the forest	- ADC provides incentives such as alternative livelihood means, infrastructure, and material supports to the community
Legal background	- JFM Circular in 1990 and JFM guidelines in 2000 and 2002 - Notification No. FOR. 64/99/186 - JFMCs are registered under Societies Registration Act	- Wild Life (Protection) Amendment Act, 2002	- The Garo Hills District (Forest) Act, 1958 - The Garo Hills Autonomous District (Constituion and Management of Village Forest) Rules 1976

Source: Study Team

e. Good Practices of Community-led Forest Management

Through the first field survey in India, some good practices of community-led forest management were observed. Two impressive cases are shown below as examples.

e.1. Wahiajer Village, West Jaintia Hills District

Wahiajer Village has managed their community forests in a sustainable manner according to their customary law for 157 years, since the village was established in 1862. The village owns community forests with the area of 769.17 ha in total; most of that area is covered with pine trees. At present, the village consists of 1,300 households. The villagers are allowed to harvest trees only for domestic purposes, including timber and fuelwood. Basically, each household is allowed to harvest three trees every year free of charge. To avoid the depletion of forest resources, the forests are divided into several plots and the villagers use a plot for harvesting trees by rotation. A selection cutting method is applied; only trees with a diameter of above 1 feet are allowed to be cut. After harvesting trees, trees are planted by all households and fire lines are maintained twice per year. Even following such rules and methods, it is sometimes recognized that forest resources have decreased. In such cases, tree harvesting is suspended for 4 to 5 years on all plots.

In February 2010, the village registered the community forests with the Jaintia Hills ADC to secure their legal status. In this way, the village has sustainably managed their community forests while enjoying forest resources for their own livelihood.

e.2. Sakaladuma Village Reserve Forest, Sasargre Village, West Garo Hills District

Sasargre Village registered its community forest of 58 ha as a Village Reserve Forest (VRF) with the Garo Hills ADC in 2006 to protect the forest legally. A Village Reserve Committee was established and chaired by *Nokma*. In addition, a "village resolution", which contains detailed rules on forest use and management, was developed by the village. Since registration, the ADC has supported construction of a traditional house as one of the tourist spots in the village as an incentive for the village to conserve the forest. The villagers realized that, since registration, the forest had revived and the amount of water supplied by it increased as a result of diminishing logging by the villagers and outsiders.

3) Private Forest Management[118]

The United Khasi-Jaintia Hills Autonomous District (Management and Control of Forest) Rule, 1960 regulates registration of Private Forest and *Law-Ri Sumar* in accordance with Section 4 (a) of Chapter I. Private or individual forest owners can register his or her own forest as "Private Forest" at their respective ADC. Once a forest is registered as "Private Forest", the land owners must manage the forests following the management rule described in section 4 (a) of Chapter II. According to the Rule, the owners do not have any right to the sale, mortgage, leasing, fit, barter Private Forests without the previous approval of CFO of each ADC. In other words, the owner cannot freely change the land's use as a forest to other uses. Moreover, when the owners want to fell or remove trees from their own forests, they need to request the Forest Department of the concerned ADC to mark trees to be harvested in accordance with the direction issued by the CFO. Unless the owners register their forests as "Private Forest", the forests cannot be included in the Working Scheme. Thus, if the forest owners want to harvest timber for commercial purposes, they must register their own forests as "Private Forest".

4) Impacts of intervention of FED and/or ADC

The first field survey results revealed that intervention by FED or the ADCs worked well for supporting proper community forest management. Although communities had managed their community forests according to customary rules, all of the communities interviewed during the first field survey mentioned that intervention of FED or the local ADC enhanced the conservation of their forests in the following ways. First, though the rules of forest management and use did not change much before and after the establishment of JFM, CR, or VRF, villagers came to follow the rules better than before since they had a deeper understanding of the importance of the forest by having this explained to them by forest officials of FED or the ADC; another possible reason is that they are afraid of power of the authorities. Second, boundary demarcation was conducted and boundary pillars were established with the support of FED or the ADC. This makes villagers and outsiders recognize that the forest should be protected. As a result, entering the forests or conducting illegal activities in the forests was reduced. Third, when a conflict happens within a community or between communities (e.g. *Nokma*), the ADCs can act as a third party to help resolve the conflict. In Garo Hills ADC, for example, boundaries of two villages were close to the boundary of a VRF, but they were not clear, so that conflict occurred between the communities. The Forest Department of the ADC notified the Revenue Department of the ADC which has responsible for demarcating boundaries of villages in order to solve the conflict. Communities reported that forest resources and wild animals were revived, the amount of water increased, and seasonal streams became permanent as a result of the intervention of FED or the ADC.

5) District Council-owned Plantations and Forests

Apart from forests belonging to communities, individuals, or clans, there are District Council-owned Plantations and/or District Council-owned Forests which are managed by the Forest Department (FD) of the ADC, as shown in Table 3.18. The purposes and uses of the plantations and forests by the ADC are various.

Table 3.18: District Council-owned Plantation/Forest

ADC	District Council-owned Plantations	District Council-owned Forests
Jaintia Hills	Around 300 ha	18 nos., 2,442 ha
Khasi Hills	12 nos., 954.97 ha	0
Garo Hills	(data being requested)	N/A

Source: Jaintia Hills ADC, Khasi Hills ADC, and Garo Hills ADC

[118] The United Khasi-Jaintia Hills Autonomous District (Management and Control of Forest) Rule, 1960.

a. Jaintia Hills ADC

At the Jaintia Hills ADC, the main purpose of the District Council-owned Plantations is to protect the environment and conserve water sources. If necessary, timber harvest is allowed on the Plantations. In particular, when a new village is established and the villagers need timber for the construction of their houses, they can request permission to cut timber, since a new village does not have any community forests. When such a request is accepted by the ADC, the villagers are allowed to cut up to three trees per household.

Apart from the District Council-owned Plantations, Jaintia Hills ADC has 18 District Council-owned Forests covering 2,442 hectors in total. These forests are called Protected Forests. Their main purpose is to conserve forest and water and to protect the environment. Most of these are natural forests, but some are artificial forests. The FD of the ADC manages the forests following decisions made by the Executive Committee of the ADC. Villagers are allowed to harvest timber and fuelwood for domestic purposes. The FD of the ADC conducts patrols to prevent encroachment. Due to financial constraints, it is difficult for the FD of the ADC to sufficiently conduct maintenance activities, such as forest fire prevention and tree planting. As a result, most District Council-owned Forests, or Protected Forests, became bare land.

b. Khasi Hills ADC

The Khasi Hills ADC has 12 District Council-owned Plantations covering 954.97 ha. The main purpose of the Plantations is to conserve forests and offer them as an example of conserving forests to communities, to help them understand the importance of forests for water conservation and other services. Timber production is not a main purpose even through tree species such as teak and pine that are planted on the Plantations are useful for timber. When villagers make a request to the ADC to allow timber harvesting for domestic purposes, they are allowed to harvest timber. When illegal logging happens on a Plantation, seized timber is sold through auction and the revenue from it becomes ADC revenue. Since the Plantations were established three to four decades ago and are covered by trees, there is no space for tree planting at this time. Hence, the FD of the ADC just conducts maintenance activities, such as thinning and removing tree affected by diseases or insects.

The Khasi Hills ADC does not have any District Council-owned Forests separately from these Plantations.

c. Garo Hills ADC

Most of all range and beat offices of the Forest Department of the Garo Hills ADC have District Council-owned Plantations. Each plantation is 20 to 30 ha, thus, the total area is not large. According to the CFO, there are around 300 hectors; hence, it is not so important for catchment protection. The main purpose of the Plantations is to produce timber and generate revenue through the sales of timber for the ADC. For this sake, timber tree species such as teak and sal are planted.

On the other hand, the Garo Hills ADC has a huge area of District Council-owned Forests, with tens of thousands of hectares. The Revenue Department of the ADC conducted a survey to measure the area about five to six years ago; however, the survey was not completed. The CFO of the Garo Hills ADC intends to make the use of forests which have huge potential. People illegally live in the forests and conduct shifting cultivation or establish monoculture plantations of plants such as areca nuts and rubber. Due to illegal living, there is no water or electricity. If they are registered as “Forest Villagers”, the ADC will support their lives and sustainable forest management by shifting monoculture plantations to agroforestry in the forests.

6) Working Scheme

Working Schemes shall be prepared in compliance with the interim Supreme Court Order of 1996 and various subsequent orders that ban the felling of trees in any forests — excluding forests that have a Working Scheme which is scientifically-prepared and duly approved by GoI. In other words,

trees in community or individually-owned forests cannot be harvested for commercial purposes without a Working Scheme. The Working Schemes aim not only to provide legal permission for timber harvest for commercial purposes but also to ensure sustainable forest management by restricting the amount of annual yield under that of growth of trees.

The current status of the preparation of Working Schemes is summarized in the table below. As the table shows, no valid Working Scheme is available as of May 2019. In the case of the Jaintia Hills ADC, the latest Working Scheme was valid from 2012 to 2017, and a new Working Scheme is pending approval. This Working Scheme covers only 32 plots of private or community-owned forest with a total area of 521.78 ha within Thadlaskein C & R.D. Block. The Working Scheme of the Khasi Hills ADC for 2014-2019 is still in draft stage. The Working Scheme of the Garo Hills ADC is under preparation.

Table 3.19: Current Status of the Preparation of Working Schemes

ADC	Status of Working Scheme	Valid year of Working Scheme	Area and number of plots covered by Working Scheme	Permissible sustainable yield
Jaintia Hills	Expired	2012-2017	8,553 ha, 308 plots	75,110 m^3/5 years
	Pending approval	-	521.78 ha, 32 plots, (Thadlaskein C & R.D. Block only)	1,222 m^3/year for Pine WC
Khasi Hills	Under draft	2014-2019	5,196 ha, 72 plots	Pine: 262 m^3/year Mixed: 347 m^3/year
Garo Hills	Under preparation	-	-	-

Source: Jaintia Hills Working Scheme 2012-2017, Draft of Jaintia Hills Working Scheme, Draft of Khasi Hills Working Scheme 2014-2019

The Working Schemes consist of several working circles which will be described in this section. In case of the new Jaintia Hills Working Scheme, it includes three working circles, namely the Pine Working Circle, Afforestation Working Circle, and Wildlife Working Circle (overlapping circle). The prescription for each Working Circle is based on the principle of 'sustained yield' and suggests a precautionary measure to prevent depletion of forest resources. For example, for the new Jaintia Hills Working Scheme, a sustainable annual yield of 2443.09 m^3/year is prescribed for the Pine Working Circle. However, considering the need for the conservation of forests and compensating losses due to undetected theft and natural calamities, the permissible annual yield is limited to 50 % of that sustainable annual yield. Hence, the permissible annual yield prescribes for the Pine Working Circle is 1,221.55 m^3/year.

According to the latest Working Scheme of the Jaintia Hills ADC from 2012 to 2017, the total permitted yield was 75,110 m^3. Of that, only 64,882 m^3 were extracted within the five-year period. The main reasons for this were that the forest owners did not come forward to receive permission due to the factor of low prices and the inability of the Jaintia Hills ADC and FED authorities to undertake the timely marking of trees to be felled for harvesting.

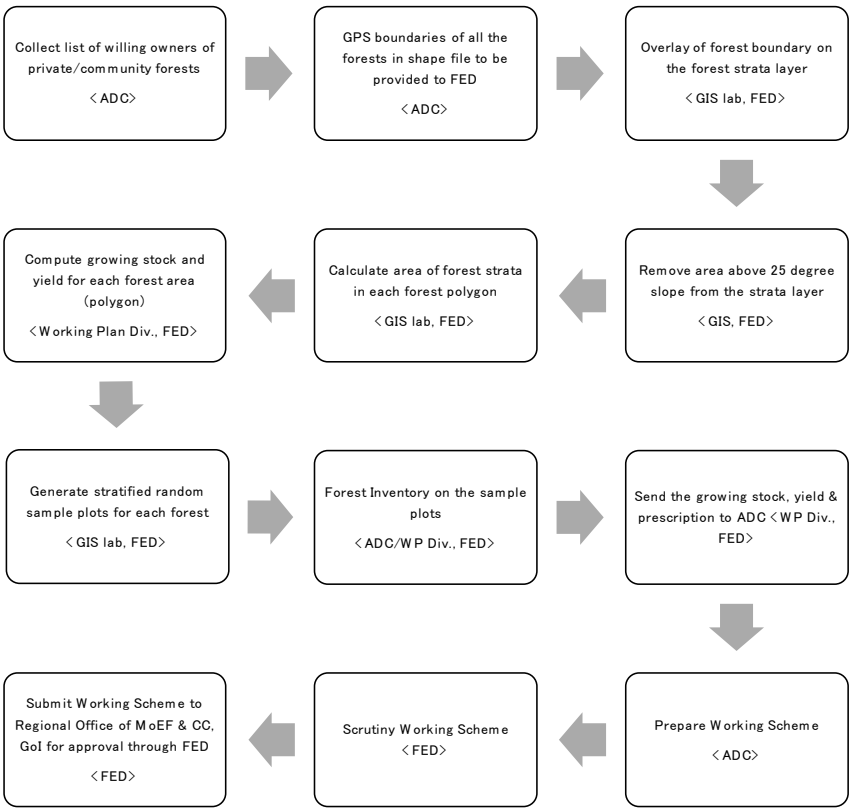
The Working Schemes also prescribe silvicultural operations for harvesting, planting, and the maintenance of the forests, such as selection cutting, and weeding and cleaning operations to protect the growing stock from accidental forest fires. The prescription of the Working Scheme will be applicable for a time period of five years from the date of its approval.

ADCs are responsible for preparing Working Schemes based on the willingness of forest owners with the support of FED, especially the GIS Lab and Working Plan Division,[119] following the procedure shown in Figure 3.3. As this figure shows, the process of preparing a Working Scheme consists of many steps, and the preparation of a Working Scheme for entire forest areas under the

[119] Working Scheme for private/community forests under Thadlaskein C & RD Block of JHADC

administrative control of each ADC requires many tasks, which usually takes a very long time due to limited human resources.

Such a complicated process of preparation of a Working Scheme, which requires substantial costs from the ADCs, is one of the reasons for insufficient implementation of Working Scheme. In case of Khasi Hills ADC, only some forest owners have applied to a Working Scheme. Under such circumstances, the ADC cannnot expect to obtain enough royalty for covering the cost for preparing a Working Scheme. Some forest owners may hesitate to apply to a Working Scheme worring about losing some of the beneifts generated through the sales of timber by the ADC[120].



Source: Working Scheme for private/community forests under Thadlaskein C & RD Block of JHADC

Figure 3.3: Procedure of Preparation of Working Schemes

Working Schemes also describe the expected revenue for each ADC from the collection of royalties. For example, it is estimated to be Rs 845,610 annually in the new Working Scheme for Jaintia Hills. From the aspect of sustainability of forest management, 30% of the royalties will be kept separately as a fund called 'green cess', which will be used for the implementation of artificial regeneration in blank patches of forests.

As described above, a Working Scheme can contribute to the realization of sustainable forest management if timber harvest is conducted following the plan described in the scheme. However, according to the information provided by a former private forest owner whose forest was included in a former Working Scheme in the Khasi Hills ADC, the Working Scheme was not fully enforced. Some forest owners harvested even small trees which were not allowed to be harvested according to the scheme[121]. This suggests that not only preparation of a Working Scheme but also its enforcement should be enhanced.

[120] Interview with a FD official of Khasi Hills ADC on May 13, 2019.

[121] Based on the Study Team's Interview with the former forest owner in East Khasi Hills District on May 13, 2019.

3.2.4. Forest Nursery in Meghalaya

(1) Hi Tech Nurseries

FED has two hi tech nurseries (HTNs): one in East Garo Hills District and the other in Ri-Bhoi District. The HTN in East Garo Hills District was established by a state government scheme in 2010-11 with 1.87 crore. The nursery has the capacity to produce 3 lahk seedlings and its germination bed is equipped with two heaters and an exhaust fan. The germination bed is also equipped with root containers. According to an official of FED, when the seeds of some indigenous tree species were sown, a 95% germination rate was recorded, which was much higher than the usual germination rate. This HTN is not functioning as of February 2019. Since the termination of the state government project in 2014, it has not been used officially.

Another HTN in Ri-Bhoi District is managed by the Silviculture Division of FED. An existing nursery was upgraded as an HTN by installing three mist chambers with sprinklers in 2016 which cost Rs 14 lakh. Excluding the mist chambers, other facilities or equipment are almost the same as those of ordinary permanent nurseries. The area of the nursery is approximately 2 ha and the production capacity is 3 to 4 lakh of seedlings. Though root containers were installed, they were not used properly. A Range Officer in charge of the nursery has not received any training on how to manage an HTN. He has tried to develop some technologies of seedling production through trial and error.

The purpose of the HTN is to produce seedlings for the conservation of endangered tree species including *Podecarpus neriifolius*. In addition to seedlings of seven endangered tree species, seedlings of thirty tree species including both indigenous and exotic species and some bamboo species are produced in the nursery. Seeds are collected from RFs or PFs and private forests across the state. Seedlings produced in the nursery were planted on a plot of land purchased from a community to conserve endangered species. To procure high quality seeds stably, a seed orchard of 15 ha was established in 2017 on other place of the nursery.

(2) Permanent Nurseries

Apart from the HTNs, FED has a total of four central nurseries in East Garo Hills District, East Khasi Hills District, and West Khasi Hills District. In addition, 29 range level nurseries, and 7 beat level nurseries are managed under the Social Forestry Division[122]. The purpose of those permanent nurseries managed by the Social Forestry Division is to produce seedlings and distribute them to community members or community organizations such as schools and churches. Tree species whose seedlings are produced at the nurseries vary depending on the nursery. Commonly produced species include *Delonix regia*, *Michelia champaca*, *Terminalia* spp., *Cedrela toona*, and *Schima wallichii*.

In case of the nursery managed by the Social Forestry Division in Kyrdemkulai Range, Ri-Bhoi District, which was established in 1984-85, seedlings of five tree species including *Pinus kesia* were produced and distributed to communities. Before 2015, seedlings were distributed by free of charge, however, seedlings are sold by Rs 2 per seedling with a subsidy of Rs 6 per seedling as of May 2019. Seeds are locally collected from mother trees identified by a skilled staff member of the nursery. The area of the nursery is 2 ha and production capacity is 2 lakh. However, as of May 2019, only approximately 1 lakh of seedlings are produced due to a limited financial budget.

Apart from the nurseries managed by FED, the Forest Department of the Jaintia Hills ADC has one permanent nursery. The Forest Departments of the Khasi Hills ADC and the Garo Hills ADC do not have any nurseries.

[122] Social Forestry Division, FED

(3) Community Nurseries

In Meghalaya, many community nurseries have been established by the Community Nursery and Afforestation Project under the Integrated Basin Development and Livelihoods Programme (IBDLP). As of August 2018, 209 community nurseries were established by this project. According to the instructions given for them, each nursery produces 25,000 seedlings, out of which 10,000 seedlings are tree species used for planting for catchment protection and 15,000 seedlings are horticulture species for sale to generate income. Each nursery has 25 beds, with one bed having 1,000 or 1,500 seedlings. Some nurseries produce more than 25,000 seedlings based on their experience of earning money through the sales of seedlings. IBDLP provides 1 lakh to a community group for the procurement of materials such as poles, shade, and polytubes. The community group decides which species to plant and collect seeds locally.

In reality, the number of seedlings produced as well as the ratio of the number of tree species to that of horticulture species varies depending on the nursery. According to the results of analysis of the data of 122 nurseries as of August 2018, approximately 14,000 seedlings were produced per nursery on average. The maximum number of seedlings produced was 158,000 in Umket Villages in Ri-Bhoi District and the minimum one was 350 in Mawrongland Village in South West Khasi Hills District. Out of 122, 62 nurseries produced less than 10,000 seedlings. Some nurseries produced only forest tree species and others produced only horticulture species. Tree species produced in those nurseries include *Azadirachta indica*, *Gmelina arborea*, *Tamarindus indica*, sandal wood, and indigenous forest tree species. Regarding horticulture species, seedlings of arecanut, mango, and jack fruit were commonly produced. Out of 122 nurseries, only 24 nurseries have data on selling seedlings. The results of the analysis show that there is a gap between the plan and practice of establishing community nurseries and producing seedlings at the nurseries.

Apart from the community nurseries established under IBDLP, JFMCs are supposed to establish their own nurseries and produce seedlings. In reality, however, some JFMCs did not establish their own nurseries and used seedlings provided by FED or purchased from others for the establishment of plantations[123]. A range officer of FED who is in charge of nursery management stated that seedling production at JFMC nurseries has the possibility of failure due to a lack of technical skills. Thus, it may be better to produce seedlings not at nurseries managed by JFMCs but those managed by FED even though there is a risk of damaging seedlings while transferring them from nurseries to planting sites[124].

3.2.5. Forest Produces and Marketing

The forests of the state are the source of the livelihoods for many poor and landless people, who reside in and around the forests. The majority of the population, who live in the vicinity of the forests in rural areas, rely solely on the collection and commercialization of timber, fuel wood, and many other NTFPs for their livelihoods.

(1) NTFPs

Bamboo, cane, and wood-based handicraft and furniture units are key livelihood means for most of the poor in rural areas. According to a study, there are about 380 different types of NTFPs which are collected by the people of the state[125]. The forests of the state are very rich in NTFP and there is enough space to increase income by using scientific management techniques in the harvesting, cultivation, processing, value addition, and marketing of these products. Some important causes of low benefits accruing to people from forests include: the nonexistence of any management plan for the forests outside of the jurisdiction of the State Forest Department and poor mechanisms for the

[123] Interview with Dieng Syiang JFMC in West Khasi Hills District on February 1, 2019.
[124] Interview with the range officer in Ri-Bhoi Distrcit on May 7, 2019.
[125] Tiwari, B.K. 2002. *Traditional system of Bay Leaf (C. tamal) management by West Khasi Communty of Meghalya, India*. Center of Environmental Studies, North-Eastern Hill University, Shillong

transfer of technology and management skills to forest-owning communities.

The following NTFPs are ready for market and important for providing income to the poor in the state:

- Broom Grass (*Thysanolaena maxima*)
- Bay Leaf (*Cinnamomum tamala*)
- *Dalchini* (*Cinnamomum zeynalicum*)
- Bamboo
- Packing Leaf (*Phyrnium puvinerve*)
- Wild Pepper (*Piper peepuloides*)
- Wood Lichen (*Usnea* sp.)
- Charcoal
- Fuel Wood

1) Broom Grass

Broom grass has a very good market. The brooms produced in the Khasi Hill, Jaintia Hills, and Ri-Bhoi areas are exported by way of Guwahati, while those produced from Garo Hills are exported through Dhudnei to other states, such as West Bengal and Orrisa. The production of broom grass in each ADC area is shown in the table below.

Table 3.20: Production of Broom Grass in Khasi Hills, Garo Hills, and Jaintia Hills Areas

ADC	Annural Production (t)
Khasi Hills	345.97(1)
Garo Hills	2353(2)
Jaintia Hills	2353.3

Source: CFOs of Khasi Hills ADC, Garo Hills ADC, and Jaintia Hills ADC
Note: (1) Average of last three years production (2015-16, 2016-17, and 2017-18)
(2) As per recent export records

2) Bay Leaf (*Cinnamomum tamala*)

The production of bay leaf from small trees ranges from 30-40 kg/tree/harvest and form the bigger trees it ranges from 55-65 kg/tree/harvest. Maximum production is recorded in Garo Hills followed by Khasi Hills while Jayantia hills record very small production[126].

3) Dalchini (*Cinnamomum zeynalicum*)

Dalchini, a type of well-known spices, is found in plenty in the Ri-Bhoi District. People there grow this tree on a large scale. Dalchini is also found in the Khasi Hills and Garo Hills areas.

As per the statistical statement of the Khasi Hills ADC, 96.55 tonnes of Dalchini was produced and transported from the state during the period of 2000-2005. According to the forest resource survey of Meghalaya, the total amount of Dalchini produced and transported to other areas of the country during the same period was 445.25 tons[127].

Dalchini is often produced by private growers. It is a preferred species as it takes only about four years to mature. The trunk and branches are used as fuelwood after the bark has been peeled off for commercial sale. If grown at a spacing of 1 m on the margins of farmland it also serves as a fence and prevents cattle from entering farmland.

[126] Tiwari, B.K. et al. 2008. Forest products of Meghalaya present status and future perspective (available at www.researchgate.net/publication/320164337, latest access March 11, 2019
[127] ibid.

(2) Timber

Regarding timber production, forests in Meghalaya State are rich in useful timber species, such as sal (*Shorea robusta*), pine (*Pinus kesiya*), and teak (*Tectona grandis*). In particular, huge areas of pine forests spread throughout the Jaintia Hills and Khasi Hills areas, and rich Sal forests spread throughout the Garo Hill area. The volume of timber produced in the state during the period of 2005-06 to 2009-10 is shown in the table below.

Table 3.21: Production of Timber in the State during 2005-06 to 2009-10

Year	2005-06	2006-07	2007-08	2008-09	2009-10	Average
Volume (1,000 m^3)	0.08	0.98	1.02	0.88	0.52	0.70

Source: Basic Statistics 2015

ADC wise timber production in recent years is shown in the table below.

Table 3.22: ADC Wise Timber Production

ADC	Annual Production (m^3)
Khasi Hills	204,817.98(1)
Garo Hills	N/A(2)
Jaintia Hills	10,366.52

Source: CFOs of Khasi Hills ADC, Garo Hills ADC, and Jaintia Hills ADC
Note: (1) Average of last two years production (2017-18 and 2018-19)
(2) Timber harvesting was prohibited by the Supreme Court order and ADC's policy[128]

Yet, according to the statistics on the northeast region of India in 2015, forestry and logging in proportion to the GDP of the state is as low as 3.36%, which indicates that the abundant forest resources are not fully used. According to the Basic Statistics of North Eastern Region 2015[129], potential production of timber in the state is estimated 0.421million m³.

At the same time, few communities or individuals, which own forests, interviewed by the Study Team during the first and second field surveys showed their intentions to harvest timber for commercial purposes. Particulary, communities in Garo Hills ADC, where all forests belong to communities, showed little intentions to harvest timber for commercial purposes. According to the results of the Living Condition Survey, all sample villages under Garo Hills ADC and Khasi Hills ADC, except one village under Khasi Hills ADC in which all lands belong to private owners, strictly prohibited timber harvesting for commercial purposes.

(3) Royalties

NTFPs and timber provide revenue to the government through royalties. As an example, the royalties for NTFP and major timber species in the Jaintia Hills ADC is shown in the tables below.

Table 3.23: Royalty of NTFPs in Jaintia Hills ADC

Sl. No.	Name of NTFP	Rate of Royalty (Rs)
1	Tejpatta	30/- per quintal (100 kg)
2	Wild pepper	220/- per quintal (100 kg)
3	Broomstick	40/- per quintal (100 kg)
4	Pine dhoop wood	18/- per quintal (100 kg)
5	Cinnamon	150/- per quintal (100 kg)
6	CP bark	120/- per quintal (100 kg)

[128] Interveiw with CFO of the Garo Hills ADC on February 6, 2019.

[129] North Eastern Council Secretariat (2015). Basic Statistics of North Eastern Region 2015. http://necouncil.gov.in/sites/default/files/uploadfiles/BasicStatistic2015-min.pdf

Sl. No.	Name of NTFP	Rate of Royalty (Rs)
7	Wood lichen	70/- per quintal (100 kg)
8	Firewood	120/- per MT
9	Topchini	750/- per MT
10	Wood charcoal	210/- per MT
11	Amla	70/- per MT
12	Cane	10/- per running meter
13	Bamboo	6/- each

Source: Secretary, Jaintia Hill ADC, 2012 vide memo no. JHADC/FOR/99/2005/481-91 DATED 31/3/2012

Table 3.24: Royalty of Major Timber Species in Jaintia Hills ADC

Species	Specification	Rate of Royalty (Rs per m^3)
Tectona grandis	a) 0.61 to 1.22M b) 1.22 and above	1120/- per cubic meter 1350/- per cubic meter
Shorea robusta *Michelia champaca* *Phoeche goal parensis*	a) 0.61 to 1.22M b) 1.22 and above	150/- per cubic meter 300/- per cubic meter
Pinus khasiana *Permilia mynocarpa* *Cassia fistula*	a) 0.61 to 1.22M b) 1.22 and above	130/- per cubic meter 250/- per cubic meter
Betula alnoides *Albizia procera* *Albizia lebbek* *Artocarpus chaplasa*	a) 0.61 to 1.22M b) 1.22 and above	70/- per cubic meter 120/- per cubic meter
Vitex peduncularis *Mangifera indica* *Adina cordifolia*	a) 0.61 to 1.22M b) 1.22 and above	60/- per cubic meter 90/- per cubic meter

Source: Jaintia Hills ADC, 2012 vide memo no. JHADC/FOR/99/2005/481-91 DATED 31/3/2012

3.3. Biodiversity

3.3.1. Biodiversity Profile of the State

(1) Biodiversity Description

Meghalaya State is endowed with rich biodiversity, representing an important part of the Indo-Myanmar biodiversity hotspot, which is one of the four biodiversity hotspots in India and 34 in the world.[130]

The state has great diversity of flora and fauna. Floral diversity is very rich, with 3,128 species of flowering plants, contributing to 18% of the total flora of the country; moreover, 1,237 of these species are endemic.[131] In particular, Khasi Hills and Jaintia Hills are major habitat areas for flora and important survival areas for the tertiary flora of eastern Asia.[132]

The faunal diversity of the state constitutes 5,538 species, accounting for 62% of the total faunal species known in India.[132] It includes 139 species of mammals, 540 species of birds, 94 species of reptiles, 55 species of amphibian and 152 species of fishes. Of all these species, 35 species of mammals, ten species of birds, and nine species of reptiles are endangered or vulnerable.[132]

[130] Meghalaya Biodiversity Board. (2017). http://megbiodiversity.nic.in/biodiversity-meghalaya

[131] Department of Environment and Forests, Government of Meghalaya. (2005). State of the Environment Report, 2005.

[132] Meghalaya Biodiversity Board and Wildlife Institute of India. (2017). The Meghalaya State Biodiversity Strategy and Action Plan.

(2) Areas for Biodiversity Protection

Despite its importance as a biodiversity hotspot, many species in Meghalaya State are facing the threat of extinction and thus it is highly important to protect and conserve species. The causes of the endangerment of wildlife have resulted from various pressures, such as overexploitation, deforestation, and habitat destruction[130].

Overexploitation of wild animal is driven by market force and hunting for domestic consumption. Demand for animal parts and live animal induces poaching to trade these animals. For example, Asian Black Bear's bile and Tokay gecko are used for medicine in some countries includingChina[132,133]. Emma Gray's forest lizard is traded for pet[132]. In Garo Hills, Asian Elephant is hunted by militants for its tusk and it is sold in Assam and even in Bangladesh[132]. Elephant is also hunted for its meat and meat is sold in local market[134].

To protect and conserve important flora and fauna, the government of Meghalaya has established the Protected Area Network, which constitutes 2 National Parks, 4 Wildlife Sanctuaries and 1 Biosphere Reserve. The Protected Area Network occupies 1,134 km^2 in the state, constituting about 5.1% of the state's geographical area[135].

The state government also establishes Biodiversity Heritage Sites (BHS) where unique, ecologically fragile ecosystems with rich biodiversity and domesticated species exist[136]. BHS are established under the Biological Diversity Act, 2002, and are operated by the State Biodiversity Board (SBB).

Besides the government-owned areas, sacred groves that are managed by local communities are also an important bio-reserve area. Meghalaya State revealed that 514 species representing 340 genera and 131 families are present in these sacred forests[137]. Local communities are reported to be protecting sacred groves well[137].

(3) Organization Structure for Biodiversity Conservation

Under the Biological Diversity Act, 2002, National Biodiversity Authority (NBA) was assigned and established by the Central Government, and the SBB was also established by the state government. The Act bans the collection, commercial utilization, and research of biodiversity resources. NBA examines applications for the use of biological resources and decides whom to give permission regarding its use. There is, however, an exemption for local communities in the utilization of biodiversity resources.

The SBB functions in advising the state government in matters related to biodiversity conservation, receives and examines applications for the utilization of biological resources before NBA does, and caries out other tasks related to the Act. In addition, the SBB investigates and proposes establishing BHS in consultation with local people, NGOs, and other relevant bodies before making a decision. After scrutiny studies, the SBB declares the establishment of BHS. This process is defined in the guidelines issued by NBA[138].

Besides NBA and the SBB, local communities constitute a Biodiversity Management Committee (BMC) for the purpose of promoting conservation and the sustainable use of biological diversity by

[133] Choudhury, A. U. (2013). Records of Asiatic black bear in North East India.
[134] The Ruffor Small Grants Foundation. Wildlife Distribution and Hunting South Garo Hills.
[135] Meghalaya Biodiversity Board. (2017). Protected Areas. http://megbiodiversity.nic.in/protected-areas
[136] Meghalaya Biodiversity Board. (2017). Biodiversity Heritage Sites. http://megbiodiversity.nic.in/biodiversity-heritage-sites
[137] B. K. Tiwari, Beautiqueen Shylla, Carielyne Kharsyntiew, Wanrapbok Syiemlieh, and Queenie Syngkrem. (2017). Meghalaya Community Led Landscape Management Project Environmental Management Framework.
[138] Ministry of Law. (2002). The Biological Diversity Act, 2002

local people and institutions in potentially rich areas. Pursuant to the guidelines of NBA, a permanent staff from the state government is nominated to be an ex-officio secretary in BMC. NBA and SBB consult with BMC before any decision making. There were 263 BMCs in Meghalaya State recorded in 2018[139].

3.3.2. Man-Animal Conflicts

Despite the fact that Meghalaya State is rich in biodiversity, due to the rapid increase of the human population and excessive expansion of human settlement, human-animal conflict sometimes occurs in the state. There were 8,087 cases of man-animal conflict reported during the last five years, including 7,383 instances of crop raiding and 47 of human injury or death in the state (Table 3.25).

Table 3.25: Man-Animal Conflicts in the Last Five Years

Unit: Number of cases

Type	2013-14	2014-15	2015-16	2016-17	2017-18	Total
Human death	6	3	9	4	5	27
Human injury	3	3	9	3	2	20
Damage to houses	262	59	113	135	44	613
Crop damage	1684	1183	2085	1446	986	7384
Livestock killed	39	1	3	0	0	43
Total	1994	1249	2219	1588	1037	8087

Source: FED

Such conflicts in the state mostly involve wild elephants. It was estimated that there are approximately 1,700 elephants in Meghalaya[140]. A main cause of the conflict is the fragmentation of forests due to economic development, such as the construction of highways or universities, mining, and the expansion of shifting cultivation areas. In order to address this issue, FED has undertaken the following measures.

- Ex-gratia payment to victims
- Construction of elephant proof trenches
- Engagement of volunteers to scare away the elephants
- Protection and improvement of the core habitats (viz. national parks, wildlife sanctuaries, community reserves, reserve forests etc.) of elephants and other wild animals by planting species preferred by wild animals
- Improvements in corridors linking core habitats by the planting of species preferred by wild animals in the blank areas that fall in such corridors.

Regarding the improvement in corridors, FED has provided 50 to 100 seedlings of jackfruit which is preferred by elephants and villagers to around 25 households in a few villages in the elephant corridors every year for last 10 to 15 years. FED encourages them to plant not only jackfruit but also other species such as bay leave and bamboo in the corridors to create canopies for movement of elephants.

FED has been negotiating with communities to purchase of part of their land in a corridor, however, it has not been succeeded. Thus, FED is planning to register the land as Community Reserve.

The major habitats of elephants are located in Southwest Garo Hills District, West Garo Hills District, and East Garo Hills District. In addition, a part of West Khasi Hills District is also a habitat of wild elephants.

[139] Meghalaya Biodiversity Board. (2018). http://megbiodiversity.nic.in/bmc-district-wise

[140] MoEF&CC (2010) Gajah, Securing the Future for Elephants in India, The report of the Elephant Task Force, http://www.moef.nic.in/downloads/public-information/ETF_REPORT_FINAL.pdf (last access March 13, 2019)

Regarding the improvement of the linkages of corridors, five elephant corridors have been identified in the Garo Hills ADC jurisdiction area as follows[141,142].

- Baghmara National Park to Balpakram Reserve Forest (6 km long and 4.5 km wide)
- Siju Wildlife Sanctuary to Rewak Reserve Forest (1.6 km long and 0.5 km wide)
- Rewak Reserve Forest to Imangiri Reserve Forest (6.5-8.4 km long and 1.7-2.8 km wide)
- Nokrek National Park to Imangiri Reserve Forest (4-5 km long and 3-4 km wide)
- Rnggira Reserve Forest to Nokrek National Park (7-8 km long and 1.5-2 km wide)

Not only FED, but the FD of the Garo Hills ADC also addresses this issue of improving corridor linking by promoting the registration of community forests as Village Reserve Forests in the corridors. For example, at the corridor between Rewak Reserve Forest and Imangiri Reserve Forest, the Garo Hills ADC's FD is working with Wildlife Trust of India (WTI), Nokma, and villagers to secure the corridor by declaring 230 ha of the community forest in the corridor to be Village Reserve Forest. The improvement of corridor linking in such a way contributes not only to the protection of elephants but also to the improvement of the livelihoods of community members, since they can obtain incentives such as black pepper cultivation by registering their community forests as VRFs. The improvement of corridor linking also prevents elephants from straying into human residential areas or farm land, so that community assets, including houses and farms, can be protected.

3.4. REDD+ Pilot Projects in Meghalaya

Two REDD+ pilot projects which were discussed in the Pre-DPR are examined in this section. The current progress status of REDD+ in India as well as the technical requirements of REDD+ are summarized in Annexure 3.

3.4.1. Raid Umket REDD+ Pilot Project

(1) Project Overview

Raid Umket in Ri-Bhoi District is one of the traditional culsters of villages in the Khasi Hills area, comprising a total of seven villages. The Raid Umket REDD+ Pilot Project was initiated by FED in 2015 for six of these villages. Aiming to enhance the carbon sequenstration of forest for the subsequent 20 years. However, for the community where the forest has been degraded for the last few decades, the main reasons for participation in the REDD+ Pilot Project has been to restore the number of wild animals and recharge water in the ground. The project targets only *Raid* (community) forest and village forests that are owned by communities. The target forests comprise 24.2 ha of dense forest and 32.0 ha of open forest. The implementation methodology for the pilot project basically followed the "Source Book of by GOCF-GOLD, COP 22 Version 1".

In Raid Umket, project activities include tree plantations, the creation of fire lines, fire watches, the introduction of improved chulhas, and capacity building in bamboo processing for the villagers. The project also involves private forest owners in setting rules about the use of private forest and can further involve them in the REDD+ pilot project. The rules for private forests were prepared together with the private forest owners and the Pilot Project Management Committee.

(2) Carbon Stock

The reference level in the Raid Umket REDD+ Pilot Project forest area in 2010 and 2015 was 4,541 and 4,422 tC respectively. At the same time, comparisons of inventories in 2015 and 2017 showed

[141] Menon, V., Tiwari, S.K., Ramkumar, K., Kyarong, S., Ganguly, U., and Sukumar, R. (2017). Right of passage, Elephants Corridors of India.
[142] Presentation materials prepared by CFO, Garo Hills ADC

an increase in the total forest carbon stocks by 165 tC in the project area[143].

3.4.2. Khasi Hills Community REDD+ Project

(1) Project Overview

The Khasi Hills Community REDD+ Project is India's first community-based REDD+ project. The project was initiated by the Community Forestry International (CFI) in 2010 and is presently managed and implemented by local communities with support from CFI, the Bethany Society, the Khasi Hills ADC, Planet Action, and the Waterloo Foundation[144]. This project is located in the Umiam River Watershed, and the target area covers 27,139 ha, comprising of 9,270 ha of dense forest and 5,947 ha of open forest in 2010. It involves ten traditional institutions (*Hima*), which is a territorial cluster of several villages, as discussed in Chapter 2. The *Hima* in this REDD+ project consists of 62 villages.

This project was designed to slow, halt and reverse the loss of community forests and sacred groves over a period of 30 years, beginning in 2010, by providing institutional support, new technologies, and financial incentives to conserve existing forests and regenerate patchy, degraded forests. The project also targets poverty in the communities. The Plan Vivo Standard, based on which this project was designed, has the following eight requirements[145]:

- A project intervention area with clear land tenure for local people
- Project activities that generate ecosystem service benefits and maintain or enhance biodiversity
- Transparency and accountability with the engagement of relevant stakeholders and in compliance with the law
- Participatory project design and implementation by the community to attain local needs
- Credible quantification and monitoring of ecosystem service benefits generated by the project
- Concrete risk management
- Positive livelihood and socioeconomic impact
- Equitable benefit sharing and transaction of ecosystem services through Payments for Ecosystem Services (PES) Agreements

For REDD+ mitigation purposes, this project focuses on regenerating target forest through the technique of Assisted Natural Regeneration (ANR), reducing the number and severity of forest fires by establishing fire lines, reducing the amount of fuel wood collected from the target forest while establishing fast-growing woodlots, and installing fuel-efficient cook stoves.

In addition to forest protection, the project also implements socio-economic activities including piggery, poultry, community nursery, as well as empowerment of women's SHGs. The SHGs are trained in bookkeeping, micro-finance and small enterprise, and they are also involved in activities such as the use of fuel efficient stove, stopping *jhum* farming, and ecotourism strategy development.

The project director stated that it is necessary to implement not only forest protection activities but also socio-economic activities to maintain beneficiaries' interest in the project along with improving people's livelihood.

The outcome of project activities was outstanding as presented by several reports. In October 2016, Plan Vivo conducted a monitoring visit to the carbon certified plot. Compared with the monitoring results of two reference sites from 2011 and 2016, there was an increase in open forest by 37%

[143] Working Plan Division Climate Change, Research & Training Wing Forests and Environment Department Government of Meghalaya. (2018). Raid Umket REDD+ Pilot Project Project Design Document (PDD).
[144] CFI. (2017). Project Design Document.
[145] The Plan Vivo Foundation. (2013). The Plan Vivo Standard.

from shrub vegetation, as well as dense forest by 9% at the target site. At the same time, forest fires had been reduced, and the amount of charcoal produced had also decreased[146]. Further, according to the annual forest inventory conducted by the Synjuk Federation in 2014, it was reported that in the 10 ANR plots, there was an increase of carbon stocks by 2.7 tC/ha/year in open forest through ANR, which is much higher compared with open forest without ANR (0.28 tC/ha/year).[147]

(2) Carbon Profit and Project Progress

In 2017, the technical specifications for the Khasi Hills REDD+ Project's first five-year verification (2011-2016) was prepared to analyse the impact of project activity on the mitigation of deforestation and regeneration through ANR. That same year, the project design document was updated. Based on its specifications, it is expected that CO_2 emissions will be reduced by 364,616 tons between 2010 and 2021 through community-based forest management. During the period of 2013 to 2015, the project sold 10,000 to 20,000 tCO_2 each year. The funds from these sales have been deposited into the federation account.

Carbon benefits arising from the project are wholly owned by the Synjuk Federation and are used for mitigation activities, the management of project activities, and the monitoring of these activities, as well as for the distribution of carbon revenue to the 62 villages within the ten Himas. All carbon revenue is deposited in a designated project account.

The Synjuk Federation also has responsibility for marketing carbon credits with support from a number of international NGOs and GoI. CFI has assisted the federation in raising funds through carbon credit sales since 2015. The Synjuk Federation is currently exploring the long-term sale of carbon offsets to a private company, INFOSYS.

(3) Organization

The Khasi Hills REDD+ Project also aims to create community institutional capacity for a thirty-year climate adaptation strategy for their watershed. As mentioned above, the project area is comprised of ten *Hima* and forms a federation to coordinate the management of their forest. The project involves 25 community facilitators and 124 volunteers from each village. The volunteers are youths who are engaged in organizing SHGs and participate in forest monitoring for the project.

Forest monitoring is conducted through the participation of the volunteers and SHGs. The project provides the volunteers with GPS, who then give the location data of forest changes collected using that GPS to the project staff. Since using GPS does not require high-level technical skills, volunteers can easily use it and report data. SHGs are also encouraged to do forest monitoring. This villager reporting system enables the project to capture forest change at the ground level, while the project staff members monitor forest change by looking at satellite images. In addition, this cooperative monitoring system maintains villagers' interests in their forest.

(4) Key for the Project

The project director stated that, overall, it is important to ensure the following elements for the achievement of the community forest management project.

- To involve community members in decision-making and activity planning.
- To ensure "Convergence" with all community organizations, including villages and *Himas*.
- To select motivated participants.
- To build trust between the project and community.

[146] WeForest. (2016). Supporting Khasi Communities to Regenerate their Forest November 2016 Report.

[147] Mark Poffenberger. (2015). Restoring and Conserving Khasi Forests: A Community-Based REDD Strategy from Northeast India. *Forests 6* (12), 4477-4494.

The project emphasizes building the project in a community-oriented way. It listens to what community wants, makes micro plans on the basis of each cluster's situation, and provides opportunities to all beneficiaries including women who conventionally have less power. At the same time, since the project involves various community organizations and people, the success of the project depends on their commitment, and the arrangement of all of these participants. The building of beneficiaries' trust and the increase in their commitment to the project require a certain amount of time. In the preparation stage, the project focused on building community trust; this took five to six years.

The project director stated that although this is a REDD+ project, financial rewards from carbon credits did not necessarily work as a major incentive for forest conservation to villagers. The achievement of the project has come from communities' willingness to restore their forest and improve their livelihoods.

Chapter 4. Approaches to Livelihood Improvement in the State

4.1. Holistic Livelihood Improvement

In rural Meghalaya, it is crucial to seek a holistic approach in order to improve the livelihoods of poor people who have suffered from food and livelihood insecurity. First, such a holistic approach is to be aimed at the diversification of income sources, not only to reduce risk, but to accumulate income from several sources. This is because the rural poor may not be able to earn sufficient income from only one source due to the lack or limited availability of natural resources, such as land, soil, and water, in quantity and of quality. They also face problems in terms of accessibility to infrastructure for transportation, scientific techniques and business skills, market information, social networks, and financial services. Thus, the problems faced by the rural poor need to be addressed in a holistic way, focusing on the introduction of alternative income sources and income generation activities. Since a certain portion of rural population, specifically in Khasi and Jaintia Hills, is the landless or sharecroppers, income generation activities should not be confined to farming activities, but non-farming activities which do not require private agricultural land.

The following sections discuss effective methodologies to improve the livelihoods of rural poor people or farmers through possible alternative income sources and income generation activities in the state.

4.1.1. Agroforestry and NTFPs

Agroforestry should be effective for addressing soil restoration, plant regeneration, and biodiversity, as well as an increase in agricultural productivity, by planting multiple crops and Non-Timber Forest Products (NTFPs) among trees and shrubs. NTFPs for substantial use, such as firewood, mushrooms, and edible wild plants, as well as more commercially valuable NTFPs, such as broom grass, bay leaf, wild/black pepper, cardamoms, jack fruits, and coffee, may contribute to the improvement of the livelihoods which have been insecure due to a degraded environment and a decline in agricultural productivity. In order to avoid the inconvenience of lead time until such economically-valuable spice and fruits tree seedlings grow to be harvested, mixed cropping with fast-growing species, such as broom grass, bamboo, packing leafs, and tuber crops through agroforestry is effective.

NTFPs are vital to the rural life of the state in terms of not only income generation, but also subsistence. Based on the results of a study conducted by Lynser, M.B. and Tiwari, B.K, people in the study area of rural Meghalaya use 172 species of NTFPs mainly as food (40%), medicine (18%), and fuelwood (18%), and to a lesser extent for construction, handicrafts, and ornamental purposes. Edible wild leaf vegetables like *Houttuynia cordata* and *Oenanthe javanica*are are collected by people there in large quantities for domestic consumption and sale in the market, while edible wild fruits like *Myrica esculenta*, *Castanopsis purpurella*, and *Rubus* spp, and medicinal plants, with the exception of *Panax pseudoginseng*, are collected mainly for domestic consumption only. Thus, protection and regeneration of such plants as edible wild plants and mushroom through agroforestry can directly contribute to the food security of the rural poor, although income generation from them might be minimal.

On the other hand, bay leaf, black/wild pepper, and cardamons are commercially valuable NTFPs in the state. If rural people also work on by-products from these NTFPs, such as by collecting seeds and growing seedlings, they can also benefit from them as additional income sources. The trend in bay leaf and wild pepper production from 2000-2001 to 2004-2005 is shown in Table 4.1.

Table 4.1: Production of Commercially Valuable NTFPs by Area

Year	Bay Leaf (in Metric Tons)				Wild Pepper (in Metric Tons)
	Khasi Hills	Jaintia Hills	Garo Hills	Total	Khasi Hills
2000-2001	6,860.0	0.0	61,200.0	68,060.0	18.5
2001-2002	5,680.0	4.0	110,000.0	115,684.0	13,1
2002-2003	7,291.0	9.0	0.0	7,300.0	13.0
2003-2004	6,780.0	0.0	51,400.0	58,180.0	9.9
2004-2005	7,380.0	0.0	18,000.0	25,380.0	14.9
Total	33,991.0	13.0	240,600.0	274,604.0	69.4

Source: Tiwari, B.K. et al. 2008. *Forest Products of Meghalaya: Present Status and Future Perspective*. (The name of the journal/publisher is not stated).

In Meghalaya, agroforestry is widely practiced. However, its patterns vary by the climatic and geographical conditions of a place. For example, in South Meghalaya with extreme rainfall (>6,000 mm) and steep slopes (40 to 60 degrees), people grow multi-crops, through agroforestry, such as bay leaf, betel leaf, wild pepper, jack fruit, leechi, pineapple, packing leaf, and broom grass which are mostly economically important plants and cash crops[148]. Similarly, in the foothills of the state, various agricultural crops are grown in combination with multi-purpose tree species, including *Anthocephalus cadamba*, *Bombax ceiba*, *Dipterocarpus retusus*, *Gmelina arborea*, *Machilus bombycina*, etc. This is mainly because people in Meghalaya traditionally put priority on multi-purpose trees and shrubs. Through 'alder-based faming practice', for example, people grow multi-purpose tree species together with ginger, maize, potato, sweet potato, and turmeric. In the case of 'aquilaria-based farming practice', people grow areca nut, bamboo, banana, and black pepper with Aquilaria. This is a common practice in all parts of the state. In lower altitude of the state, such as Khasi and Garo Hills, people grow black pepper, ginger, maize, and turmerice in the inter spaces through 'arecanut and coconut-based farming practice'.

Indian Council of Agricultural Resaerch (ICAR), Umium has developed a number of agroforestry models for Meghalaya State with the estimates of the yield and income of each crop and tree.

Table 4.2: Yield of Mixed Agricultural Cropping Pattern under Fruit Tree Species

Tree Species	Crop composition	Density (ha^{-1} ± S.D.)	Yield (qha^{-1}±S.D.)
Musa paradisica	Pineapple	6333.33 ± 20824.51	45.34 ± 69.74
Pyrus communis	Ginger Maize Turmeric	21568.63 ± 648.32 1428.57±125.41 15686.27±210.51	18.02±4.32 0.23±0.51 26.94±5.33
Citrus grandis	Maize Turmeric Cauliflower Mustard leaf	1500.00±117.00 13725.49±2,407.07 966.67±305.43 740.74±218.83	0.27±0.07 9.66±3.39 16.60±9.12 4.85±3.54
Psidium guajava	Maize Turmeric	694.44±102.33 13725.49±1410.20	0.10±0.11 24.10±10.26
Acreca catechu	Pineapple	6666.67 ± 2084.15	29.74 ±29.60

[148] Tiwari et al. 2010. "Forest Management Practices of the Tribal People of Meghalaya, North-east India". *Journal of Tropical Forest Science*, 22(3): pp. 329-342.

Tree Species	Crop composition	Density (ha^{-1} ± S.D.)	Yield (qha^{-1}±S.D.)
Citrus reticulata	Maize Cabbage Cauliflower Ginger	836.21±11,690.33 1333.33±926.11 1026.67±666.66 17824.37±326.87	0.11±0.21 22.09±4.32 16.52±7.69 15.98±4.20
Artocarpus heterophyllus +*Litchi chinensis*	Ginger *Colocasia* Maize Bottle gourd	10344.83±16610.54 526.31±128.84 1333.33±526.39 503.70±310.25	14.21±9.48 1.96±0.59 0.18±0.53 5.39±2.13
Artocarpus heterophyllus +*Areca catechu* +*Litchi chinensis*	Betel vine	333.27±222.31	25.40±10.54

Source: Bhatt, B.P. et al. 2005. "Production Potential of Traditional Agroforestry Sytems of Meghalaya: A Case Study". *Agroforestry in North East India: Opportunities and Challenges*. Eds. by Bhatt et al., pp. 337-349. Umium, Meghalaya State: ICAR.

In spite of agroforestry being widely practiced across the state, there is a lack of data and information about the status of NTFPs, including the volume and value of supply and demand for certain products, as well as who the major market players are[149]. As shown in Table 4.3, status and constraints facing 10 major NTFPs were roughly identificed through CIFOR's study in 2008.

Table 4.3: Status and Constraints Facing Major NTFPs in Meghalaya

	NTFP	Status Highlights	Constraints (Opportunities for Interventions and invetstments)
1	Bamboo	・ State has 12 genera & 43 species of bamboo, used for handicrafts, plywood, and paper manufacturing, construction purposes, food (bamboo shoots), fodder, and firewood. ・ Estimate volume of production marketed is 38,568MT/yr; value around Rs 49.2 million	・ Limited value-addition: tonnes are exported outside the state for processing ・ Bamboo handicrafts, as well as Bamboo shoot processing, remain mostly micro-scale
2	Charcoal	・ Fuel for domestic and industrial use ・ Volume of production marketed is 9,673 MT/yr; value around Rs. 66.5 million	・ Inefficient processing technology ・ Strict but las implementation of rules leads to uncertainity and unsustainable practices
3	*Dalchini*	・ Bark is used as a spice in food, incense, perfume, pharmaceuticals, and soaps ・ Annual production is around 89 MT; valueing around Rs 84,500	・ Very low price for producers (market information distorted by traders) ・ Regulation and royalty collection as it is considered a forest product
4	Fuel Wood	・ For cooking and other heating needs ・ Estimated annual production marketed is 491,635 MT; valuing around Rs 614.5	・ High transport costs limit buyers who require large volume ・ Unsustainable harvesting

[149] Center for International Forestry Research (CIFR). 2008. "Developping Forest-based Enterprises in Meghalaya." *Livelihood Brief*. August 2008, Number 11, pp.1-4.

	NTFP	Status Highlights	Constraints (Opportunities for Interventions and invetstments)
		million	
5	Bay Leaf	· Used for making spices and condiments (Masala) · Estimate volume of production marketed annually 44,370 MT; valuing around Rs 576.8 million	· Lack of storage and drying facilities, price information, and credit facilities · Lack of proper storage and drying facilities result in leaves truning brown and thus lower prices
6	Broom Grass	· Estimate volume of production marketed annually 135,803 MT; valuing around Rs 1.8 billion	· Lack of credit and strage facilities · Local traders distort prices · Royalties, taxes, and illegal collections in check gates
7	Medicinal Plants	· There are more than 100 medicinal plants in Meghalaya, but mostly for household purposes only with very few being sold	· Lack of data on existing market (e.g. volume and value of production and sources) · Limited selling or processing
8	Packing Leaf (*Phymium Puvinerve*)	· Grows abundantly and a popular wrapping and packaging material in the state and is source of cash for many rural poor	· Bulky and low price · Presence of substitute in the form of plastics and polythene bags
9	Wild Pepper	· Used in a variety of Ayurvedic medicines · Estimate volume of production marketed annually 123 MT; valuing around Rs 8.6 million	· Price fixed by traders · Royalties, taxes, and illegal collections in check gates
10	Wood Lichen	· Used mainly in making spices · Estimate volume of production marketed annually 127 MT; valuing around Rs 7.2 million	· Sold as raw product; limited value-addition, and low price

Source: CIFOR. 2008. "Developing Forest-based Enterprises in Meghalaya." *Livelihood Briefs.* Augst 2008, Number 11, pp.1-4.

4.1.2. Integrated Farming System

Integrated Farming System (IFS) is a cost-effective and sustainable farming system. The Department of Agriculture in the state has introduced IFS to farmers through training conducted by District Training Centere and demonstration in farmers' schools conducted by the Agriculture Technology Management Agency (ATMA), as well as on-farm trial and training conducted by Krishi Vigyan Kendra (KVK). This system fits the demand of a place like Meghalaya State well, where the majority of farmers are marginal or small farmers holding less than 1.5 ha of land, and the quality of soil and manure is poor. With efficient soil, water, and pest management under IFS, the waste of one enterprise becomes the input of another, making for a better use of resources. Under the integrated crop and livestock farming of IFS, crop residues can be used for animal feed while manure can be used as feed for fish and enhance agricultural productivity. As one of its major training programs, the Rural Resources and Training Centere (RRTC) in Umran also provides an IFS program. Furthermore, Bethany Society, as well as seven other NGOs/Societies, have been contracted to provide about 2,000 youths with a one-month-long training on IFS-based agro-business, including piggery, poultry, horticulture, food processing, beekeeping, and mushroom cultivation under an ADB-sponsored project, named 'Supporting Human Capital Development in Meghalaya' (2014-2020).

In relation to IFS, the Department of Agriculture, as well as other training institutes and NGOs, have tried to disseminate vermi-compost and organic pesticide through training and demonstrations for farmers. In Meghalaya State, state government does not provide any subsidy for chemical fertilizer, and it encourages farmers to use organic compost, especially vermi compost, as well as organic pesticide. Vermi compost can contribute to not only the improvement of soil fertility and productivity of crops in farmers' own land, but also income generation by selling it to other farmers. Vermi compost can be produced in a few month, and it can be sold at around Rs 20 per kg. Similarly, bamboo bineger as organic pesticide can be produced by farmers and can be sold at around Rs 300 for a bottle of 750 ml in the market. Under ADB-sponsored skill development project, Bethany Society and other training partner organizations have conducted training on piggery and poulty with organic 'bokashi' compost. Bokashi compost can last 8 years and can be sold as well.

As mentioned above, the strength of IFS is the effective and efficient utilization of waste from one animal/crop for another, which can result in an increase in productivity of each. Manure from pigs and poultry can be used as feed for fish if a pond is constructed nearby and young fish is released there. Similarly, the manure can be also used for horticulture, specifically vegetable cultivation. Waste of crops post-harvest can be used as feed for animals. IFS, combining horticulture with livestock management and aquaculture, might more benefit small farmers who hold and operate around 1 ha.

4.1.3. Horticulture and Floriculture

In Meghalaya State, horticulture and floriculture are key sectors with high potential because of relatively higher quality of certain crops and flowers and increasing demand for these, especially inside the state. For example, turmeric production in the state is considered one of the best in the world as it contains 7.5% of curcumin. Similarly, mandarin orange and pineapple production in the state is well recognized even by people outside the state. Carnations, which are popular among people in the state, are sold at a high price of Rs 15 to 20 per piece (one flower) at florist shops in Shillong. Roses, gerbera, and orchid are also popular and traded at a high price.

It is important to target or select not only commercially valuable crops, but crops that are climatically and geographically suitable, on which a SHG or farmers' group work to generate income, since available crops vary by the state's agro-climatic zones (Table 4.4).

Table 4.4: Agro-climatic Zone-wise Fruits and Other Crops

Tropical Zone (100-300m)	Sub-tropical Zone (300-1,000m)	Temperate Zone (1,100-2,000m)
Litchi, Papaya, Lemon Orange, Pineapple Banana, Guava Areca nut, Black pepper Betel leaf, Coconut Turmeric, Cinnamon Chilly, Potato, Sweet Potato	Litchi, Lemon Orange, Guava Grape fruit, Pineapple Ginger, Turmeric Cinnamon, Chilly Potato, Sweet Potato Vegetables	Plum, Peach Pear, Apricot Chestnut, Potato Spices, Off season vegetables

Source: Department of Agriculture. 2006. Meghalaya Agriculture Profile 2006. Shillong: DoA.

In the case of the IFAD-sponsored project, Megha-LAMP, the following horticultural and other crops and products are targeted, based on geographical and economical competitiveness: 1) vegetables (maily potato); 2) pineapple; 3) ginger; 4) turmeric; 5) black pepper; 6) piggery; and 7) niches, including honey, sericulture, aromatic rice, etc.; as well as 8) non-farming activities, such as handicrafts & handlooms.

Among centrally-sponsored schemes, there is a major scheme called the 'Mission for Integrated Development of Horticulture (MIDH)' under which there is a sub-scheme called the 'Horticulture

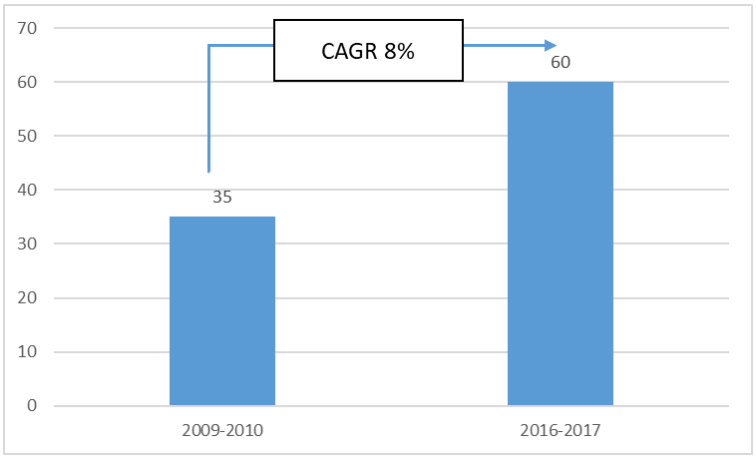
Mission for North East and Himalayan Region (HMNEH)'. First, MIDH/HMNEH is aimed at the following: 1) to promote holistic growth in the horticulture sector through promotion, extension, post-harvest management, processing, and marketing; 2) to encourage farmers to form Farmer Producer Companies (FPCs) and Farmer Producer Organizations (FPOs) as clusters to enhance their horticulture production, sales, and income; and 3) to improve productivity by using quality inputs and efficient water use through micro-irrigation, as well as through technical support for rural youth in horticulture and post-harvest management. Under MIDH/HMNEH, there are various components focused on the development of priority crops, such as tuber crops, fruits, spices, plantation crops, flower, mushrooms, and bamboo, through which agricultural inputs, such as quality seeds, are provided for farmers in order to expand the area of land cultivating these crops.

The Directorate of Horticulture under the Department of Agriculture prioritizes marketing and food processing in order to promote the horticulture sector. As a marketing strategy, it encourages farmers to form a FPC and FPO under MIDH/HMNEH and 'Organic Mission', and to provide the FPOs/FPCs formed with business and marketing assistance through service providers who are hired for each scheme or mission by the Directorate/Department. Under a state-sponsored scheme focused on marketing, the Department has just constructed 12 'Lay-by Markets' across the state. In each of the Markets, a 'Marketing Committee' composed of *Dorbar Shnong*, farmers, and an official of Divisional Horticulture Office, will be established at the village level, and the committee will locate a store among farmers.

Other outstanding marketing support by the state government is "1917 iTEMS", a toll-free service for linking farmers with traders/retailers across the state, which was commenced in 2017. Under this service, whenever farmers produce any amount of any crops, they can call '1917' and request Meghalaya Institute of Entreprenurship (MIE) to link them with possible traders/retailers who demand the crops. MIE contacts with all relevant traders/retalers with whom it has network and give the prices offered by the traiders/retailers contacted to the farmer. Then, the farmer can choose a trader/retailer whom he/she likes most based on the price offered. MIE sends a truck to pick up the crops produced and send them to the trader/retailer with a minimal cost of petrol and driver's wage. MIE increased the number of trucks from 16 in the beginning to 200 at present. To date, "1917 iTEMS" has been utilized by 17,000 farmers.

In terms of food processing, MIDH/HMNEH also covers processing, as well as storage and cold chain, under the component of post-harvesting management. In addition, 13 projects under the 'National Mission for Food Processing' and 12 projects under the 'Technology Up-gradation/Establishment and Modernization of Food Processing Industries Scheme' have been sanctioned by the state government. In order to promote food processing, specifically that of juice, jam, pickles, and canned food, in May 2018, the government has upgraded and merged two pre-existing units working on fruit processing under the Department of Agriculture into the Directorate of Food Processing. However, this is under preparation for upgradation as of February 2019. Furthermore, the Directorate of Horticulture has a processing factory, but it has faced difficulties in marketing. In this regard, MIE has supported the Directorate in terms of policy-making.

During 2009-2010 and 2016-2017, the area in the state in which cut flowers are under production has increased from 35 ha to 60 ha, with a CAGR of 8% as shown in Figure 4.1.



Source: https://www.ibef.org/download/Meghalaya-March-2018.pdf. (last access March 6, 2019).

Figure 4.1: Area with Cut Flowers under Production in 2009-2010 and 2016-2017

The Directorate of Horticulture has schemes focused mainly on the development of floriculture, including a state-sponsored scheme, the 'Floriculture Development Scheme', and the centrally-sponsored 'Technology Mission Scheme on Horticulture', both of which promote commercial floriculture in the state. At Horticulture HUB in West Khasi Hills District, which is located in a temperate zone (at 1,100 to 2,000 m elevation) and is suitable for flower cultivation. At the HUB, seedlings of a few varieties of flower are sold to farmers; it also buys flowers from farmers. The HUB links farmers with traders and buyers, and without taking any marginal charge from farmers, it gives the flowers bought from farmers to traders and buyers at the same price it pays to farmers. The HUB also provides each farmer who starts floriculture and constructs a greenhouse with some necessary inputs and subsidies supported by the schemes for constructing a greenhouse. However, it costs a farmer about Rs 170,000 to construct a 100 m² green house, so floriculture is only available for those who have knowledge and can afford to make such an initial investment by taking on some risk.

4.1.4. Livestock Management

In the state, livestock management or animal husbandry is one of the most reliable strategies for diversifying income sources and enhancing household livelihoods. This is also a good source of stable income for the landless who have only backyard in their residential area. However, most people in the state rear indigenous species of livestock and rear them in a traditional way, so the productivity and production of meat, milk, or eggs are very low. In this light, the Animal Husbandry and Veterinary Department has planned to start a new state-sponsored scheme, the 'Meghalaya Pig Mission', in which 100 exotic pigs will be imported from the UK and will then be bred at 13 "Multiplier Farms" across the state, until there are 569,000 pigs. The target is to provide 300 cooperative societies with the new pigs. Another aim of the mission is to promote a value chain for processing pork meat. The Department has proposed Rs 2 billion for the mission.

As mentioned previously, dairy production is very limited in Meghalaya State. Therefore, the Department has implemented a state-sponsored scheme, the 'Meghalaya Milk Mission', since December 2018, with a budget of Rs 2.5 billion. Under the mission, 50 to 60 Milk/Dairy Cooperative Societies have already been formed. The mission targets the formation of 300 cooperative societies and will financially assist members of the societies formed for purchasing cows. Through this mission, the Department aims to increase annual dairy production from its current level of 84,000 tons to 100,000 tons, as well as increase per capita per day milk intake from its current level of 77g to 110g by 2024.

One of the active cooperative societies, the 'Umlyngka Primary Milk Producer Cooperative Society', with 125 members (107 men and 18 women), produces around 5,000 litters of milk per

day which is the largest amount of daily milk production in Shillong. Based on the data collected every 6 months, the members rear 1,355 cows in total as of May 2019 and each of the members might rear around 10 cows. These cows are crossbred and produce around 10 to 20 litters of milk per day. Each member brings milk to the collection center established by the cooperative society every morning and the milk collected is shipped to Milk Union which covers the area of East Khasi Hills and Ri-Bhoi Districts. The society buys milk from its members at the price of Rs 41.25 per litter and sells it to Milk Union at the price of Rs 42. The amount of Rs 0.75 per litter is the profit of the cooperative society, which is used for salaries for two employees and vaccination fees for the members' cows. The Union has 14 cooperative societies as members and collects 14,000 to 15,000 litters of milk from these societies every morning. It produces 24,000 bags of milk per day, each of which contains 0.5 litters, and sells them to 10 to 20 distributers at the price of Rs 23.35 per bag or Rs 47 per litter. If the quality of the milk shipped is not good enough for the national standard, the Union rejects the milk or buys it at a lower price for a processing purpose. Thus, quality control is one of the most critical challenges for the members of the societies.

4.1.5. Sericulture

In Meghalaya State, entrepreneurship in sericulture and weaving is actively promoted by the Directorate of Sericulture and Weaving. According to the Directorate, about 16,000 households in the state are involved in sericulture farming and 15,900 households in weaving. Raw silk production increased from 517 metric tons in 2012-2013 to 927 metric tons in 2016-2017. Under the 2018-2019 budget, the State Government proposed an outlay of USD 5.59 million for the sector, as the Directorate has implemented several statewide schemes, as well as regional north-eastern and centrally sponsored schemes. Statewide schemes include the 'Upgradation of Existing Mulberry, Eri, and Muga Departmental Seed Farm', aimed at the modernization of seed preparation, disinfection of terrace making, ploughing, weeding, etc. and renovation of old facilities, the 'Strengthening of Silk Reeling Unit', focused on the provision of marketing support for farmers by purchasing silk cocoons from farmers, and the 'Promotion and Upgradation of Sericulture Training Program'.

Under the 'North Eastern Region Textile Promotion Schemes (NERTPS)' for both the sericulture and handloom sectors, funds to benefit 1,000 sericulture farmers through the 'Intensive Bivoltine Sericulture Development Project (IBSDP)' and 2,300 sericulture farmers through the 'Integrated Sericulture Development Project (ISDP)', including 72 handloom clusters, have already been approved . Based on the 2016-2017 budget, 75 handloom clusters were organized in Khasi and Garo Hills. On the other hand, through the centrally sponsored 'Comprehensive Handloom Development Scheme' (CHDS), the Central Government is assisting handloom manufacturers in the setting up of a yarn depot for the production of handloom products and product development and diversification centers.

The production of silk cocoons tends to be limited to monsoon season (May to October), when mulberry is quite available and silkworms are active due to relatively hot temperatures. According to a member of the self-help group (SHG) engaged in sericulture in Nonglwai Village, in West Khasi Hills District, the production of silk cocoons in 2018 was 125 kg, all of which were transported to and sold at Rs 300 per kg by the Directorate of Sericulture and Weaving . A profit of Rs 37,500 in total was distributed among all 10 members of the SHG. In 2012, the Directorate provided all of these members with a one-week training of 'Beneficiaries Empowerment Training' in their village. On the other hand, a certain family engaged in the silk handloom business in Khweng Village, in Ri-Bhoi District sells over Rs 200,000 annually. This family, has successfully linked with buyers/retails not only inside the state, but also in other states and even outside India, including in Italy and Japan, through family members' marketing activities in the big fairs and exhibitions held in Delhi and other big cities in India.

4.1.6. Apiculture (Bee-keeping)

Apiculture is traditionally practiced in Meghalaya State. The dominant species of the state are Apis florea and Apis cerana. While Apis mellifera was introduced currently, it is reported that they were not adopted well. Honey production of the state is approximately 500 MT annually. This is less than one percent of the total production in the entire country. The average yield per colony in the sate was found to be 10 kg which is lower than the national average of 15.32 kg per year. East Khasi Hills and South Garo Hills Districts are potential areas for honey production. The major markets for honey are located in East Khasi Hills, West Jaintia Hills, Ri-Bhoi, and South Garo Hills Districts. The honey produced in the state is mainly consumed locally. Around 80 % of honey is sold as unprocessed or producer-level processed honey in the open market. The price of wild honey ranges from Rs 350 to Rs 600 per kg. The honey is packed in used glass bottles and sold either in the local markets along the roadside or from the farmer's doorstep.

Most of beekeepers in the sate are marginal or small farmers who have a keen interest in apiculture. Apiculture is not necessarily a main source of household income. Around 1,000 to 1,200 beekeepers are located in different parts of the state, but concentrated in pockets closer to flora in East Khasi Hills, South Garo Hills, and Ri-Bhoi Districts. Based on an interview with a beekeeper in Mawlyngbna Village, East Khasi Hills District in January 2019, he learned apiculture from his father and started apiculture in 2017. He collected bees from a forest nearby and rear them in 52 boxes set up in the backyard of his house. According to him, apiculture is available from December to March in his place, and he can collect 4 to 5 kg of honey per box per day and sell honey at around Rs 500 per kg. There are around 10 beekeepers in his village and all sell honey to the same middleman without negotiation.

The state government has tried to promote apiculture through the following projects: 1) Apiculture Mission by MBDA and 2) Scheme of Fund for Regeneration of Traditional Industries (SFRTI). In addition, Meghalaya Khadi Village Industries Board (MKVIB) and MEI support a cluster of bee-keepers and entrepreneurs across the state for a technical and marketing purpose. First, MKVIB provided 305 target bee-keepers with a awareness program and technical training and 10 boxes for bee-keeping per trainee in 2017/2018 through Khadi and Village Industries Commission (KVIC) while it originally targeted 950. MIE technically and financially supports around 30 entreproneurs who produce and sell honey and specifically two of them who try to export their honey to such countries/regions as Europian countries, Singapore, and UAE/Dubai, which require a certificate of the quality of the honey. MIE bears the cost for testing the quality of smaples and issuing a certificate by a company in Germany.

4.1.7. Extension Services and Training Opportunities

The Department of Agriculture has Agriculture and Horticulture Offices and District Training Centere at the district level, where District Agriculture Officers, District Horticulture Officers, and District Training Officers are stationed. In addition, ATMA and HUB are established at every district to provide agricultural inputs and extension services, including demonstrations and training. The ATMAs conducts farmer schools at the block level, where a common interest group/SHG of women and men farmers get together at a demonstration plot and learn the latest techniques for farming horticulture and food crops and IFS, specifically organic compost and pesticide, through a series of six-day training sessions over a period of a few months.

The Department also sends farmers to training programs provided by RRTC, which has fixed training programs on such topics as IFS (15 days), organic farming (15 days), vermi-ccompost (3 days), preparation of bio-pesticide/bio-solution (3 days), kitchen gardening (5 days), livestock management (15 days), pig farming (5 days), poultry (5 days), dairy (5 days), sustainable agriculture (15 days-one month), beekeeping (5 days), food processing (5 days), floriculture (5 days), and horticulture (5 days). Every training program includes a session of a 'rural entrepreneurship development program' which aims to foster farmers' business–mind setting. Each of the training programs is composed of 5% theory and 95% practice. RRTC has an

accommodation facility where both women and men trainees can stay overnight, instead of commuting each day.

In addition, KVK under ICAR also conducts On-Farm-Trial (OFT) targeting a small number of farmers to introduce new species of animals and crops and test if they can be adopted well in a place. If the test of OFT is successful, the ways of cultivating new species of crops and of rearing new species of animals are disseminated to a larger number of farmers through fron-line demonstration (FLD) and farmers' Day. KVK also provides training programs for farmers, based on the results of OFT and FLD. In the state, there are seven KVKs of which KVKs in Jaintia Hills, East Khasi Hills, and West Khasi Hills are hosted by the Department of Agriculture in the state and others are hosted by ICAR or Central Agriculture University. The areas covered by KVKs include mainly agronomy, horticulture, plant breeding & genetics, and soil science.

4.1.8. Group Formation and Access to Financial Services

Based on the policy of the central government, the Department of Agriculture encourages farmers to form a SHG, cluster, or FPC/FPO under any of the centrally-sponsored or state-sponsored schemes, as mentioned previously. Similarly, an IFAD-sponsored project, called Megha-LAMP, targets the formation of three clusters per block, in 18 blocks across the state. The main objective in forming such clusters is to make farmers competitive by purchasing agricultural inputs at lower cost by ordering larger quantities and shipping products in larger quantities than a single farmer can do so.

In addition to the key component of 'Supply Chain and Enterprise Development', Megha-LAMP has a component called 'Integrated Village Cooperative Society' (IVCS), which targets the formation of 300 IVCSs composed of 100 members in each one across all 18 target blocks. Under this component, the IVCS formed are supposed to open a bank account in the beginning and raise a capital/share from the members of each IVCS. If an IVCS raises more than Rs 50,000, it can receive Rs 125,000 as corpus fund from Megha-Lamp whereas if one raises more than Rs 100,000, it can receive Rs 250,000. As of June 2019, there are 21 IVCSs that have raised more than Rs 50,000, and out of them, 4 IVCSs have raised more than Rs 100,000. Any member of each IVCS can get a loan of up to Rs 200,000 to start a business if her or his business plan is accepted. The formation of an IVCS at the block level, however, is not user-friendly because members have to travel long distances to get together. The IVCSs should have been formed at the village level instead.

Forming a SHG and working in the group may benefit the members of the SHG in many ways. First, the members can learn from each other and supplement one's weakness with other's strength, by which members can get empowered. If the leadership and other roles within the group are rotated among the members, the members can be empowered and become self-confident with leadership skills and other specific knowledge. Moreover, if a farmer individually cultivates multi-crops, rears animals, and goes to the market to sell them by herself or himself, she or he cannot afford a time and might end up earning limited income. However, 'Nonglwai Iamonglang SHG' in Nonglwai Village, West Khasi Hills has made five pairs out of ten members and rotate the role of taking care of the poultry and pigs owned by the SHG for every month and of going to the market to sell the crops cultivated by the SHG for every week. On the other hand, SHGs often face a conflict among members on the unequal contribution of labor to SHG activities. The existence of a leader with strong leadership or a reliable care-taker-type leader might be a key to success in maintaining a SHG and making decent profits through SHG activities.

There is a centrally-sponsored 'National Rural Livelihood Mission' (NRLM), focused on the formation of SHGs with women's members and micro-credit activities. However, this mission was commenced in 2016 and has been implemented in 27 blocks out of 46 blocks as of June 2019. Therefore, the number of women having access to micro-credit or other financial services, such as a bank loan, is still limited in the state. Under NRLM, women members of SHGs have access to

financial services, such as savings and micro-credit, and are able to borrow a small amount of loan money from their own savings accounts and a large amount from the Community Investment Fund (Rs 110,000 per SHG) or Vulnerability Reduction Fund (Rs 70,000 per village) managed by a Village Organization (VO) established as an operational unit at the village level. A member of a SHG who wants to get a loan is supposed to make a business plan (Micro Credit Plan) and get a permission from all members of the SHG or from the VO. Meghalaya State Rural Livelihood Society (MSRLS) which implements NRLM in the state provides the SHGs with an awareness program and training on how to run micro-credit activities, as well as skill training for income generation activities. MSRLS hires local youth as village cadres who help SHGs manage micro-credit activities and local micro-credit planners who help them make Micro Credit Plans.

Nongrmai Village in West Khasi Hills District is one of the NRLM target villages in the state. A very poor woman who is a single mother living in the village borrowed money from the Fund, with which she has started a trading business by buying vegetables from farmers and selling them at the market. She has earned a sufficient living through this business and has sent her children to school. Another woman in the same SHG also received a loan of Rs 75,000 from the Fund in 2017 to open a small shop where she sells her vegetables and other living ware and serves tea, snacks, and meals. She paid back the loan in 2018 and earns Rs 15,000 per month by managing the shop. These two women are very satisfied with their current living conditions, which were brought about by their having access to these financial services.

In addition, Department of Cooperation promotes the formation of cooperative societies. By registering as a cooperative society under the Department, its members are able to receive a loan up to Rs 500,000 without collateral from Meghalaya Cooperative Apex Bank. There are 1,649 cooperative societies registered as of March 2018, of which 1,227 are functioning, as shown in Table 4.5.

Table 4.5: District-wise Number of Cooperative Societies

District	Functioning	Non-functioning	Total
East Khasi Hills	251	55	306
West Khasi Hills	130	57	187
Jaintia Hills	140	57	197
Ri-Bhoi	184	80	264
East Garo Hills	65	19	84
West Garo Hills	168	48	216
South Garo Hills	40	21	61
South West Khasi Hills	104	59	163
Amlarem Sub-division	72	14	86
Sohra Sub-division	73	12	85
Total	1,227	422	1,649

Source: Department of Cooperation

Based on the interview conducted by Study Team, a woman entrepreneur, a member of the cooperative society comprised 20 members, has managed a handloom business in Nongston, West Khasi Hills District, for about two decades. After she took a three-month training on handloom in Bangalore, she started her business with a machine provided by the Department of Sericulture and Weaving. She received three loan, one of Rs 130,000 before starting the business, another of Rs 200,000, and finally a Rs 200, 000 loan later. These came from the Cooperative Apex Bank in order for her to start the business, procure raw materials, and invest in machines. She has already paid back all the loans.

Having access to financial services, including a micro-credit program and bank loans, is a pre-condition for women and men to start their own businesses. In a state where women are relatively literate and are not disturbed by their husbands about their borrowing money, if they have

access to such services, they can take the opportunity and might manage their businesses well.

4.2. Enterprise Development

As per the 6th Economic Census (provisional), 106,758 enterprises have been established across the state, as shown in Table 4.6. In all the districts for which data is available, more enterprises are located in rural areas than in urban areas. Similarly, some proportion of the enterprises in all districts does not have their premises or physical locations.

Table 4.6: Number of Enterprises in the State as per 6th Economic Census (Provisional)

District	Enterprise					
	With Premises	Without Premises	Total	Rural	Urban	Total
East Khasi Hills	31,122	4,038	35,160	14,548	20,612	35,160
Ri-Bhoi	9,412	2,844	12,256	11,397	859	12,256
West Khasi Hills	9,022	1,686	10,708	8,435	2,273	10,708
South West Khasi Hills	-	-	-	-	-	-
East Jaintia Hills	-	-	-	-	-	-
West Jaintia Hills	11,090	3,578	14,668	12,647	2,021	14,668
West Garo Hills	15,735	5,403	21,138	17,280	3,858	21,138
South West Garo Hills	-	-	-	-	-	-
East Garo Hills	6,498	1,768	8,266	5,263	3,003	8,266
North Garo Hills	-	-	-	-	-	-
South Garo Hills	3,748	814	4,562	3,595	967	4,562
Total	86,627	20,131	106,758	73,165	33,593	106,758

Source: Government of Meghalaya. 2016. *Statistical Abstract Meghalaya 2016*. Shillong: GoM.

Commerce and Industries Department under the state government is mandated to promote the development of micro, small, and medium enterprises (MSME) based on Meghalaya Industrial and Investment Policy (MIIP) 2012 and North East Industrial Development Schemes (NEIDS). The Department defines a micro enterprise as one that has invested less than Rs 1 million in the case of it engaging in the service sector and less than Rs 2.5 million in the case of it engaging in the manufacturing sector. Under Package Scheme of Incentives for Micro and Small Enterprises, the Department provides any micro enterprise with subsidy up to 35% and additional 10%, for women, of the total amount (up to Rs 700,000) the enterprise has already invested. The Department also supports those individuals or entreprenuers who try to start their businesses through Prime Minister Employment Generation Program (PMEGP). Under PMEGP, they can first borrow a bank loan amounting up to Rs 100,000 if they are engaged in the service sector and up to Rs 250,000 in the manufacturing sector. Then, if they keep running the businesses after 3 years, they can be provided subsidy of 35% of the total loan amount. After using such a bank loan as investment, they can apply for Package Scheme of Incentives and get subsidy of further 35%.

Based on Pre- Detailed Project Report (Pre-DPR) and results of the first field survey in India, the possibility of bamboo, rural tourism, and milk production as a means of local enterprise development in the state are examined in the following sections (The possibilities of milk production is already described abov).

4.2.1. Bamboo

In Meghalaya State, bamboo is one of the NTFPs with the most potential, about which entrepreneurship and enterprise development can be promoted, since it grows all over the state. Specifically, it grows in Garo Hills, Ri-Bhoi, and West Khasi Hills Districts. The area of bamboo forests, which is about 586,300 ha, accounts for 26% of the total area of the state. More importantly, bamboo is in high demand, as both a raw material and in processed products. It varies by use, including for making fences, furniture, mats, baskets, other handicrafts, panels as construction material, and charcoal, as well as bamboo shoots. In Meghalaya State, 5,073,258 bamboo stems and shoots were produced during the period of 2000-2004. The amount of bamboo produced in Khasi Hills between 1995 and 2005 was 12,370,947, whereas that in Garo Hills during the same period was 4,674,500.

Out of the various uses of bamboo, a large quantity is sold to the paper mills in neighboring Assam State. According to data obtained from the paper mills, about 50,000 tons of bamboo were sold to the Nagaon Paper Mill in Jagirod in 2006 and another 20,000 tons were sold to the Cachar Paper Mill in the Hailakandi District of Assam State in 2005. The total annual return gained by exporting bamboo in raw form alone was about Rs 50 million.

In East Garo Hills District, there used to be a bamboo-chip factory, as well as a bamboo-processing factory, both of which were established in 1977 and run by the Meghalaya Industry Development Corporation under the Department of Industry. Due to production and marketing problems, however, they were closed in 2010. In order to meet the demand for mass production, about 750 households were engaged in bamboo production on their own land and produced about 500 tons per month in total, made up of not only naturally-grown bamboo, but also planted bamboo. Currently, a private company in Ri-Bhoi District runs a bamboo-chip factory and manages it well.

In Ri-Bhoi and East Khasi Hills Districts, bamboo handicrafts are traditionally produced. Artisans who make bamboo handicrafts have acquired skills from generation to generation. In Syntian Village, Mawsynram Block, East Khasi Hills District which is famous for bamboo crafts, both women and men are engaged in making of bamboo crafts. These artisans, except some members of a SHG engaged in innovative bamboo crafts, exclusively make traditional crafts, such as 'Knup' and 'Prah' which are used as an ambrella for farmers and a tool for sorting rice at home, respectively. RRTC, Umran and Indian Institute of Technology (IIT), Guwahati have tried to promote more innovative-designed crafts which have value-addition by providing these artisans with skill training and tools, such as molds. The state government, including Commerce and Industries Department and Meghalaya Handlooms and Handicrafts Development Corporation Ltd. (MHHDC), has supported artisans who make handlooms and handicrafts, including bamboo crafts, in terms of marketing. Around 200 bamboo-craft artisans across the state was formed as a cluster, named "Shken, in", in 2015/2016 and can borrow a loan from the revolving fund of Rs 100,000. MHHDC has provided the members with skill development training and molds in cooperation with IIT. MHHDC orders and buys products from artisans across the state and sell them at Meghalaya Handicraft Government Emporium Shop located in Police Bazar.

Bamboo-related enterprise development has both good points and constraints in the state. As mentioned above, bamboo grows all over the state and it can be utilized in many ways. It is fast growing, which is also one of the strengths of bamboo. On the other hand, challenges for bamboo-related enterprise development include a lack of the latest data, so it is not uncertain whether or not existing bamboo species are industrially valuable, how much of industrially valuable species are available, and where as well as who the major market players are. First, there is a needs to conduct the detailed study and market research on bamboo in the state, including current status of production volume and value and SWOT analysis for business potential. More critically, since the number of bamboo enterprises in the state is yet limited, this sector has not reached to the level at which it can attract investors to support a newly developed enterprise both in financial and technical aspects. Since there are a couple of villages in East khasi Hills and Ri-Bhoi Districts where people

have traditionally made bamboo crafts in a small scale and sold them in local markets, the Project might consider to start with the promotion of entreprenurship by providing these people with skill training in terms of innovative designed and value-added handicrafts.

4.2.2. Rural Tourism

Meghalaya State is characterized by a unique climate and very abundant nature, composed of diverse flora and wildlife, large-scale waterfalls, and other things that fully attract tourists both from inside and outside of India. There are around 100 tourist spots across the state, including Cherrapunj Living Root Bridge. Over the decade from 2004 to 2014, the number of tourists visiting the state increased from 445,902 to 726,453 people (Figure 4.2). Out of the total number of tourists in 2014, 8,664 were foreign tourists.

Source: GoM. 2016. *Statistical Abstract Meghalaya 2016*. Shillong: GoM.

Figure 4.2: Trend of the Number of Foreign and Indian Tourists Visiting Meghalaya

Department of Tourism under the state government has developed "Meghalaya Tourism Development and Investment Promotion Scheme 2012" to promote rural tourism or eco-tourism. This scheme provides entreprenuers engaged in rural tourism or eco-tourism with financial supports while the supports are limited to the consutruction of homestay and resort facilities. In the case of homestays, the state government subsidides 30 % of the total cost of up to Rs 1.6 million and in the case of resorts, it subsides 30 % of the total cost of up to Rs 10 million. Those entreprenuers are also supposed to contribute 2 % of the total cost. As a conditionality, the mission requires the entreprenures who apply for the scheme to register with the Department and sign for a formal agreement so that they won't misuse a newly created infrastructure for other purposes before the disbursement of a loan they will take through the mission.

Under the 2018-2019 budget, the state government sanctioned USD 14.41 million for the development of the tourism sector, and established two recreational parks in Mairang and Marngar during that period[150]. To enhance skills and build the capacities of the local people who will be engaged in the tourism sector, 15 training programs were conducted in 2016-2017, and 749 persons were trained in such tourism-related areas as hospitality, food and beverages services, housekeeping, food and beverages production, and basic reception work.[151]

In addition to this state-level activity, many local villages have developed rural tourism or eco-tourism on their own by establishing cooperative societies and collecting shares/donations from the members of the cooperative societies. Pre-existing nature, such as a waterfall, or a

[150] https://www.ibef.org/download/Meghalaya-March-2018.pdf. (last access March 6, 2019).
[151] ibid.

newly-constructed reservoir in the village, tend to be utilized as tourist attractions. In order to attract more tourists, these villages have invested in additional entertaining activities and adventure sports, such as canoeing and rafting. Electricity, generated by using hydropower from the waterfall or reservoir, is used to operate the eco-park at night time. Although the villages collect an entrance fee of Rs 40 from each adult tourist and an additional fee for the activities, the profit gained from the fees seems to be sufficient only for paying the salaries of the local youth employed. How to raise funds or receive a loan in order to make further investments is a challenge faced by most of the villages[152].

[152] Based on Study Team's interviews with representatives of several villages engaged in eco-tourism in Ri-Bhoi on Jan. 22, 2019, in East Khasi Hills on Jan. 30, 2019, in East Garo Hills on Feb. 5, 2019, and in West Garo Hills on Feb. 6, 2019.

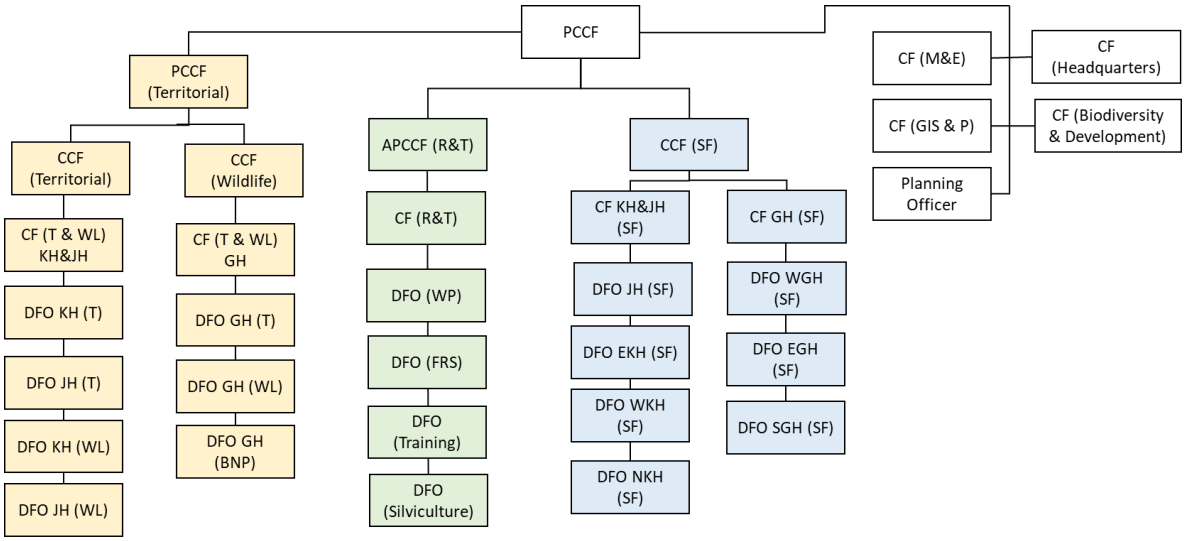
Chapter 5. Institutional Arrangement of the State

5.1. Capacity of Implementing Agencies

To assess the existing capacity of the agencies related to the Project, each agency's human resources, available technical training, and budgetary provisions were examined.

5.1.1. Forest and Environment Department (FED)

FED has its headquarters located in Shillong. At the headquarters level, there are four main wings, namely territorial, social forestry, wildlife, and research and training. Organizational structure of FED is shown below.



T: Territorial, WL: Wildlife, KH: Khasi Hills, JH: Jaintia Hills, GH: Garo Hills

Source: FED

Figure 5.1: Organizational Structure of FED

There are 20 Divisional offices, 55 Range offices, and 147 Beat offices. The Territorial Division of FED mainly deals with protected and reserved forests, whereas the Social Forestry Division is entrusted with degraded forest and works related to plantation. These two divisions have separate field offices at the Division, Range, and Beat levels. Ranges under each Division is listed in Table 5.1.

Table 5.1: Ranges of FED

Sl. No.	Wing	Division	Range	Sl. No.	Wing	Division	Range
1	Territorial	Khasi Hills	Umtasor	28	Social Forestry	West Garo Hills	Tura
2			Shillong (Park Territorial)	29			Dadenggre
3			Shillong (Protection Territorial)	30			Betasing
4		Jaintia Hills	Saipung	31		West Khasi Hills	Mawkyrwat
5			Umkiang	32			Mairang
6			Passadwar	33			Riangdo
7		Garo Hills	Kharkutta	34			Urban Beat Nongstoin
8			Baghmara	35		North Khasi	Nongpoh
9			Simsanggre	36			Byrnihat

Sl. No.	Wing	Division	Range	Sl. No.	Wing	Division	Range
10			Dainadubi	37		Hills	Kyrdemkulai
11			Darugre	38			Umsning
12	Wildlife	Khasi Hills	Nongpoh	39		East Garo Hills	Williamnagar
13			Nongstoin	40			Rongjeng
14			***	41			Bajengdoba
15			Lum Nehru Park	42		East Khasi Hills	Shillong
16		Jaintia Hills	Jowai	43			Cherrapunjee
17			Umkiang	44			Pynursla
18		Garo Hills	Nokrek Northern	45			Mawkynrew
19			Williamnagar	46			Mawkyrwat
20			Nokrek Southern	47			Mawsynram
21			Dadenggiri	48		Jaintia Hills	Jowai
22		BNP	Baghmara	49			Shangpung
23			Rongara	50			Namdong
24			Siju	51			Kliehriat
25			Mahadeo	52			Amlarem
26	R&T	Silviculture	Umsaw	53		South Garo Hills	Baghmara
27			Rongrenggiri	54			Masighat
				55			Khondok

Source: FED

FED's manpower availability is shown in Table 5.2.

Table 5.2: Human Resources of FED

Designation	Sanctioned post	Man in position	Vacancy
Principal Chief Conservator of Forests	1	4	
Addl. Principal Chief Conservator of Forests	1	5	
Chief Conservator of Forests	3	4	
Conservator of Forests	9	6	3
Deputy Conservator of Forests	14	13	1
Assistant Conservator of Forests	19	14	5
Environment Planning Officer	1	1	
Statistical Officer	1	1	
Biometrician	1	1	
Forest Ranger	81	56	25
Deputy Ranger	14	9	5
Forester – I	203	171	32
Forester – II	51	51	
Forest Guard	446	338	108
Registrar	1	1	
Superintendent	7	7	
Upper Division Assistant	22	22	
Accountant	2	2	
Lower Division Assistant	30	17	13
Statistical Assistant	1	1	
Analytical Assistant	1	1	
Environmental Planning & Protection Assistant	2	2	
Typist	14	9	5
Stenographer	8	6	2
Draftsman	1	0	1
Driver	10	8	2
Duftry	3	3	0

Designation	Sanctioned post	Man in position	Vacancy
Grade-IV	40	38	2
Head Assistant	14	8	6
Accountant	17	1	16
UDA	24	20	4
LDA	105	95	10
Grade-IV (Executive)	192	178	14
Grade-IV (Ministerial)	173	171	2
Driver	45	39	6
Civil Overseer	1	0	1
Surveyor	2	1	1
Draftsman	7	7	
Museum Caretaker	1	1	
Electrician	1	0	1
Pump Operator	1	1	
Plumber	1	1	
Lab Attendant	1	1	
Orchid Keeper	2	2	
Orchid Watcher	2	2	
Total	1,576	1,319	265

Note: PCCF, APCCF and CCF staff strength exceeds the sanctioned number of posts because of posts created under State Deputation Reserve and temporary addition in the cadre.
Source: FED

Vacancies in FED are less than 20%. Although they do not seem to have a shortage of staff, at the Deputy Conservator of Forests (DCF) and Assistant Conservator of Forests (ACF) levels, there are some vacancies and allotting personnel from these ranks to the Project on a full-time basis may prove to be difficult. Preliminary discussions with the Territorial Division and Social Forestry Division indicate that field staff from the Social Forestry Division may be able to allocate time for Project implementation.

As regards capacity building of FED personnel, training of Indian Forest Service (IFS) officers, Meghalaya Forest Service officers, and forest rangers is mostly sponsored and conducted by the Ministry of Environment, Forest and Climate Change (MoEF&CC). However, according to FED, the training quota given to the state is comparatively small and therefore only a limited number of officers get an opportunity to attend the trainings. FED also has its own training school where foresters and forest guards are trained.

The training school at Baiza was established in 1994 (originally in Darugiri). In 2015, a GIS training lab was also set up in the Training Division of the Department. Apart from a one-year course offered to foresters and forest guards, the school also conducts short-term courses on subjects like forest accounts, GPS, and nursery techniques. Refresher courses are also conducted by the training school.

The sanctioned budget and expenditure in the fiscal years from 2015 to 2018 are summarized in Table 5.3. In all years, there is a significant discrepancy between budget allocation and actual expenditure. Because budget estimates and proposal are prepared including anticipated allocation from central schemes, and this is reflected in the sanctioned budget. However, only portion of the request is actually sanctioned. For FY 2018, Rs 75 million was included in the budget in anticipation of the proposed Project.

Table 5.3 : Budget and Expenditure of FED

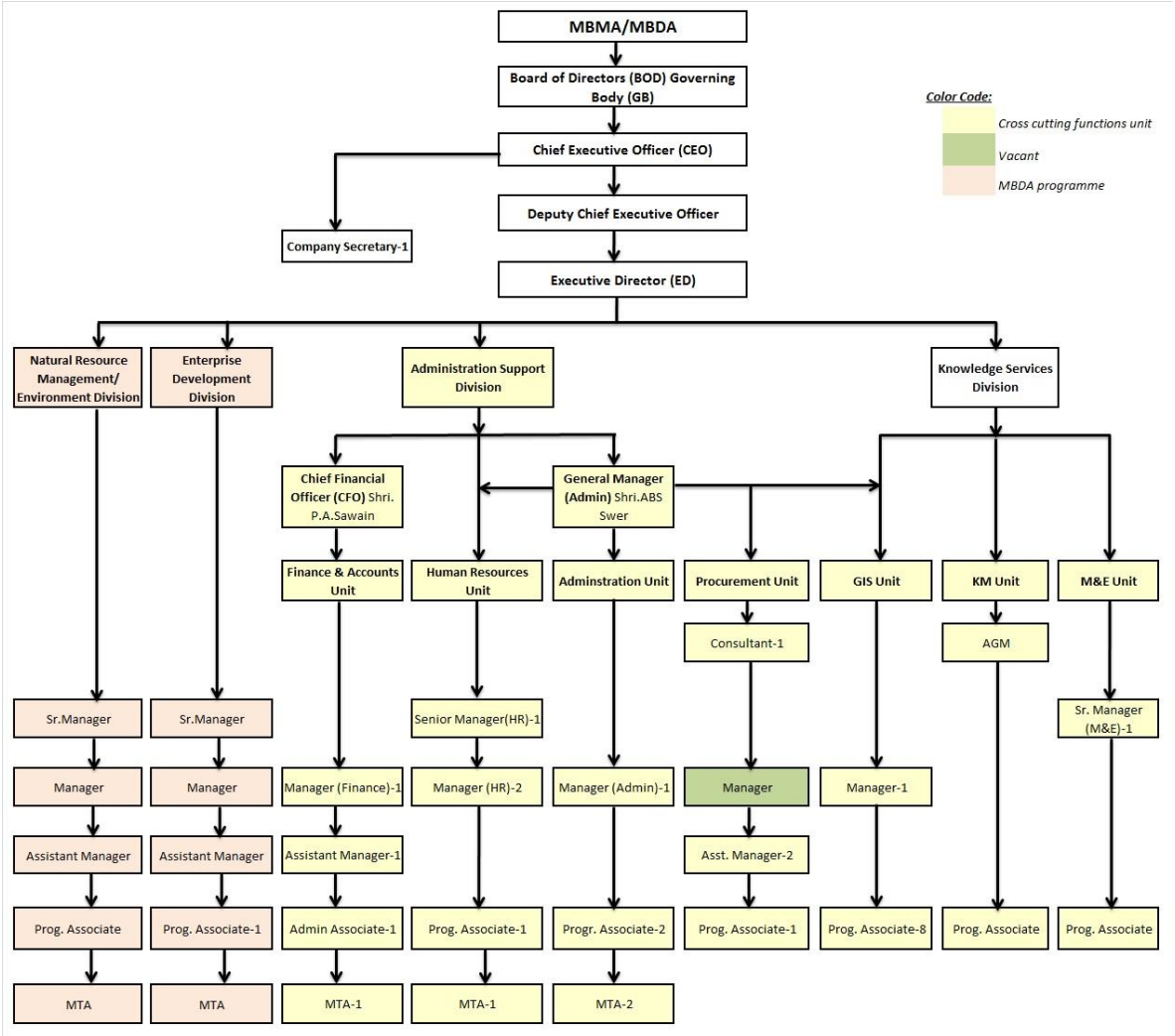
Unit: Rs million

FY	Allocated Budget	Expenditure
2015	594	291
2016	393	297
2017	480	292
2018	1249	345

Source: FED

5.1.2. Meghalaya Basin Development Authority (MBDA)

The Meghalaya Basin Development Authority (MBDA) is an autonomous society set up in 2012 under the Planning Department. While its main focus is on the sustainable management of river basin resources, the other mandate is to create convergence among different government departments. The Chairman of MBDA is the Chief Secretary of the State while the Chief Executive Officer is an Indian Administrative Service (IAS) officer. Organizational structure of MBDA and Meghalaya Basin Management Agency (MBMA) is shown below. MBDA also has field units at district level in the form of BDU and at block level as EFC.



Source: MBDA

Figure 5.2: Organizational Structure of MBDA/MBMA

Currently, MBDA has two externally-aided projects that are being implemented by its sister organization, MBMA[153]. Details of these projects are described in Chapter 2.

The Governing Council (Governing Body) of MBDA consists of following government officials as members:

- Chief Secretary (Chairperson)
- Additional Chief Secretary, Labour Department and SWCD
- Additional Chief Secretary, Finance/Power Department
- Principal Secretary, Planning Department
- Principal Secretary, Forest Department
- Commissioner and Secretary, Public Health and Engineering Department
- Commissioner and Secretary, Water Resources Department, SWCD, FED and Planning Department
- Commissioner and Secretary, Agriculture/Fisheries Department
- Commissioner and Secretary, Personnel Department

In addition to the Governing Council, MBDA has constituted a State Level Project Management Committee (SPMC) for overseeing the implementation of Mega-LAMP in 2015. The members of SPMC are:

- Development Commissioner/Principal Secretary, Planning Department (Chairman)
- Principal Secretary/Commissioner and Secretary, FED/SWCD/Water Resources/ Agriculture/Sericulture & Weaving/Community and Rural Development/Fisheries/Public Health Engineering/Animal Husbandry and Veterinary/Cooperation/Industries/Finance/Public Works/IT
- Project Director
- General Manager, NABARD
- General Manager, RBI
- Two representatives from civil societies
- District Project Manager (on a rotational basis)
- Additional Project Director

While its headquarters are located in Shillong, MBDA has offices in each district in the form of the Basin Development Unit (BDU). BDU is headed by the Deputy Commissioner of the district, while its operation is managed by the District Project Manager, who is recruited for the IFAD-funded Mega-LAMP project. MBDA also has Enterprise Facilitation Centers (EFC) at the block level.

There are about 360 staff members working for MBDA across the state. There are no regular training programmes offered to its employees, as training is conducted on an on-demand basis.

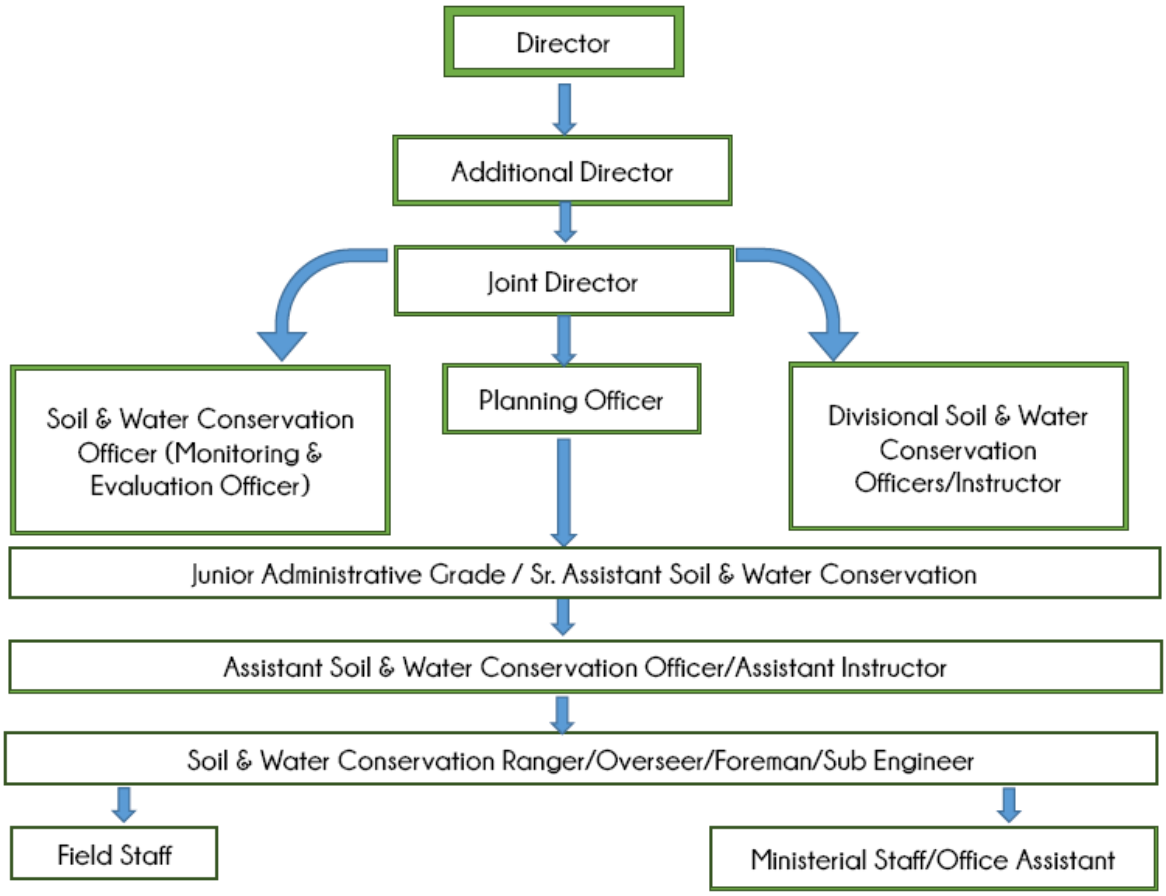
For MBDA, as far as the last several years of finance is concerned, the full amount of its sanctioned budget has been released, and the institution does not have seem to have a shortage of funds.

Apart from most of its staff recruited on contractual basis, some other characteristics of MBDA are; its ability to coordinate with different departments and government agencies in Meghalaya; and its experience in implementing two Externally Aided Projects (EAP) through MBMA. As Section 8 of the Companies Act, 2013, MBMA is regulated by the same Act, which may mean there is higher degree of transparency as the Companies Act has more strict rules on compliance.

[153] Registered under Section 8 of Company Act.

5.1.3. Soil and Water Conservation Department (SWCD)

SWCD's organizational structure and manpower availability are shown in Figure 5.3 and Table 5.4 respectively.



Source: SWCD

Figure 5.3: Organizational Structure of SWCD

Table 5.4 : Human Resources of SWCD

Designation	Sanctioned post	Man in position	Vacancy
Director	1	1	-
Additional Director	1	1	-
Joint Director	3	3	-
Monitoring and Evaluation Officer	2	2	--
Planning Officer	1	1	-
Divisional SWC Officer	21	21	-
Senior Assistant SWC Officer	11	11	-
Assistant SWC Officer	41	12	29
Ranger	80	74	6
SWC Demonstrator (Senior)	65	65	-
SWC Demonstrator (Junior I)	279	235	44
SWC Demonstrator (Junior II)	12	2	10
SWC Field Worker	156	100	56
Plantation Mali	56	50	6
Total	729	578	151

Source: SWCD

Currently, about 20% of the department posts are vacant, mostly at the field level. As in the case of FED, the SWCD does not have an acute shortage of staff. However, according to a discussion with the SWCD, providing their staff members for the proposed project on deputation on a full-time basis would be difficult. The SWCD has field offices at the division and range levels, where divisional offices coincide with the civil district. The geographical coverage of range offices does not necessarily coincide with the range offices of FED.

The SWCD has its own training institute in the state, where the departmental staff can be trained. The Conservation Training Institute mainly conducts two long-term courses for field level officers and middle level technicians.

Sanctioned budget and the actual amount spent during the last four years (FY2014 onwards) are shown in Table 5.5.

Table 5.5: Budget and Expenditure of SWCD

Unit: Rs million

FY	Allocated Budget	Expenditure
2014	2,630	613
2015	1,715	375
2016	1,590	811
2017	1,830	244

Source: SWCD

In all years, the original budget outlay (the sanctioned budget) was revised in due course. For instance, in FY 2015, the budget outlay was around Rs 1,715 million; however, the actually available outlay was Rs 465 million, out of which Rs 375 million was spent. As in the case of FED, the budget is prepared in anticipation of various schemes, but some of the schemes do not get sanctioned, and therefore, the actual expenditure is much lower than the budget.

5.1.4. Autonomous District Councils

The manpower strength of the Forest Department (FD) of each ADC is shown in Table 5.6.

Table 5.6: Human Resources of FD of ADCs

Designation	KHADC	JHADC	GHADC
Chief Forest Officer	1	1	1
Additional Chief Forest Officer	1	-	-
Deputy Chief Forest Officer	2	2	2
Forest Settlement Officer	-	-	1
Assistant Chief Forest Officer	5	3	5
Ranger	8	2	14
Deputy Ranger	8	2	8
Forester	19	60	47
Assistant Forester	25	70	37
Forest Guard	40	81	224
Plantation Chowkidar	24	10	-
Total	133	231	339

Source: ADCs

According to the ADCs, they do not have any vacancies, but current manpower is not necessarily sufficient for their operations. In each ADC, there is a Divisional Forest Officer from FED on deputation, whose main responsibility is to implement state schemes.

ADCs appear to have a number of options for the capacity building of their forest officials.

According to the ADCs, the budgetary provision to the FDs is limited. Particularly in the case of KHADC, it has hardly received any grants from the state government. For instance, KHADC explains that, on average, KHADC receives funds for forest protection of around Rs 800,000 annually from the state government. JHADC seems to be in a better position – on average, their budget estimates for plantation work are around Rs 2,900,000 and as of the FY 2015 record they had received around Rs 2,800,000. The situation in GHADC is similar as there has been no funding under central schemes to date, while the grant from the state government was received last in FY 2013. For GHADC, they have been making annual budget to the tune of Rs 180 million for last three years; however, the actual spending has been around Rs 100 million.

Other resources are also limited in the ADCs. For instance, the FDs of KHADC and JHADC have one or two vehicles for the department to manage the entire ADC areas. The situation is slightly better for GHADC as they have total of three vehicles in the department.

Assessment of ADCs' organizational capacity was conducted using organizational capacity assessment tool. Questionnaire covering core aspects of organizational capacity was distributed to ADCs and CFOs were requested to make self-assessment of their department. Responses from each ADC are shown below. The questionnaire contained ten questions, and the respondents were asked to choose one out of four situations that best describe their organization. Responses are in grade of A, B, C and D, "A" representing better degree of management.

Table 5.7: Capacity Assessment of ADCs

Core aspect	GHADC	JHADC	KHADC
Administration			
Operational policies, procedures and systems	B	B	C
Procurement policies and procedures	B	A	C
Human Resource			
Job descriptions	A	B	C
Staff performance management	B	B	C
Financial management			
Accounting system	B	A	C
Financial planning and budget monitoring	B	A	C
Financial reporting system	B	A	B
Audit	A	A	B
Organizational management			
Annual operational plan	B	A	A
Decision making	A	A	A

Source: developed by Study Team

As seen in the table, GHADC and JHADC appear to have acceptable capacity across core aspects of organizational capacity. KHADC, on the other hand, requires concerted effort to improve its situation, particularly matters related to administration, human resource management and financial management. Particularly, it appears to have a basic accounting system which requires better practice or strengthening of personnel in charge.

5.1.5. GIS Capacity of Implementing Agencies and ADCs

In the context of the Project, GIS plays a key role in various project interventions in different components. In this regard, the existing GIS capacity of the implementing agencies (FED, MBDA, and SWCD) and three ADCs were examined.

(1) FED GIS Lab

The GIS Lab of FED (FED GIS Lab) was set up in 2013 to provide spatial information services to the department. FED originally hired three people who had enough GIS knowledge to conduct daily Lab activities as Project Assistants. After the Lab's establishment in 2013, some personnel relocation took place, but the original staff members are still deputed to the GIS Lab to prepare maps on demand. The Conservator of Forest (CF) in the Research & Training Wing is the nodal officer of the GIS Lab and its operations.

The FED GIS Lab prepared plantation boundary maps for the Social Forestry Wing, a Community Reserved Forest (CRF) Map for the Wildlife Wing, Pre-survey Maps to collect information about Tree Enumeration and Growing Stock for the Working Plan Division. The FED GIS Lab also conducted the preparation of infrastructure maps, forest fire analysis, NDVI, supervised and unsupervised classification, and forest inventory maps. The survey was done by FED field staff at the division level. The GPS devices used are sent to the GIS Lab, and the export of collected data and map-making are conducted by GIS Lab staff members. For the forest inventory, the FED GIS Lab procured LISS- IV images and prepared forest inventory maps for the Khasi Hill ADC area. The FED GIS Lab prepares maps for the FD of the ADC on request, for example for the CRF boundary map.

In addition to this GIS Lab, FED has another GIS Lab in the Training Division, and two contract-based, designated GIS officers are placed to conduct GPS training for local foresters. Resource people in the Training Division receive help from the North Eastern Space Application Centre (NESAC) and the FED GIS Lab described in the previous paragraph. The Training Division manages one forest training school in Baiza in East Garo Hills District, to provide necessary training for forest guards and foresters of FED. The principal of the training school is a person who has attained Additional Chief Forester (ACF) level and is supervised by the Divisional Forest Officer (DFO) of the Training Division. Besides the forest training school, the Training Division also provides outreach training programs on demand.

Further, under the MOU, the GIS Lab is supported by NESAC. For example, NESAC provides training for the GIS Lab for capacity building. The GIS Lab also acquires raw data from NESAC, for example village location data. Map-making tasks are also sometimes outsourced to NESAC.

To understand the current GIS capacity of FED, the data layers, maps, and equipment, including software and hardware, that are available to the FED GIS Lab, are summarized in the following sections.

1) Data Layers and Maps

The FED GIS Lab also has satellite imagery. Table 5.8 shows the six main data layers and five maps currently available at the GIS Lab.

Table 5.8: Data Layers and Maps Available in FED GIS Lab

No.	Name	Coverage	Remarks
1	Administrative boundary (state, district & community & rural development (C&RD) block)	State	-Prepared in 2015 by digitizing from existing georeferenced maps. -Used for the preparation of forest fire risk assessment map
2	Government-owned Forest Land (Reserve Forests (RF) and Protected Forests (PF))	RF & PF within the state.	-Prepared in 2014 by digitizing from the Survey of India Toposheet Maps (georeferenced). -Used for the preparation of forest cover map, forest change detection map, and thematic map.

No.	Name	Coverage	Remarks
3	Community Reserve Forests (CRF), Plantation Sites	Said areas within the state	-Prepared in 2014 or later by GPS demarcation (field survey). -Used for the preparation of the said areas' boundary demarcation map.
4	Sacred Groves	Said areas within the state	-Prepared in 2014 by field survey. -Used for the preparation of the sacred groves boundary map along with the distribution/position of species (flora) within the boundary.
5	Road & Drainage	State	-Acquired from NESAC in 2014. -Used for the preparation of the water catchment map and as an integrated layer for location maps.
6	Settlement / Villages	State	-Acquired from NESAC in 2014. -Used for the preparation of the impact assessment map in relation to forest fire points.
7	Forest density cover classification map (Within RF and PF)	Said areas within the state	-Prepared in 2012 based on Resourcesat-2 LISS III satellite imagery. -Used at a scale of 1:8,000. -Shows four different forest density categories: (1) Dense forest, (2) Moderate forest, (3) Open forest, and (4) Waterbody.
8	Forest Fire Risk assessment Map (District and C&RD Block)	Districts and Blocks within the state	-Prepared in 2005-2014 (10 years) based on Resourcesat-2 LISS III satellite imagery. -Used at a scale of 1:10,000 for blocks and 1:200,000 for districts -Shows four fire vulnerability zones: (1) Very High, (2) High, (3) Moderate, and (4) Low.
9	Forest Fire Incidence Map (District-wise)	Districts within the state	-Developed in 2013 and 2014 (2 years) based on fire points data acquired from FSI. -Used at a scale of 1:200,000 for districts -Shows distribution of forest fire points.
10	Forest Change Detection Map (For RF & PF)	RF and PF within the state	-Developed for the years 2004, 2006, and 2012 based on Resourcesat-2 LISS III (Multi-spectral) satellite imagery. -Used at a scale of 1:200,000 for districts. -Shows forest changes in two categories: (1) Forest to degraded forest and (2) Degraded forest to regenerated forest.
11	Endemic Species Distribution Map	Entire State (Partial Distribution)	-Developed in 2015 based on collected field data. -Used at a scale of 1:300,000 for districts -Shows the distribution of endemic species on the basis of village location.

Source: compiled by Study Team based on interviews with officers of FED GIS Lab

The FED GIS Lab also has satellite imagery. Table 5.9 shows the satellite imagery currently available at the GIS Lab.

Table 5.9: Data Layers Available in FED GIS Lab

No.	Name	Type	Coverage	Remarks
1	Resourcesat 2 LISS IV	Multi-spectral	State	-Observed in 2017 -5.8m spatial resolution -Used for forest inventory mapping. -Forest cover mapping for FED-owned forest land including RF and PF.
2	Resourcesat 2 LISS III	Multi-spectral	State	-Observed in 2004, 2006, 2012 -23.5m spatial resolution -Used for forest change detection within

No.	Name	Type	Coverage	Remarks
				FED-owned forest land including RF and PF.
3	Cartosat I	Panchromatic	State	-Observed in 2008 -2.5m spatial resolution -Used as an integrated layer for various forest resource mapping.

Source: compiled by Study Team based on interviews with officers of FED GIS Lab

2) Equipment

In addition to the data layers discussed above, GIS Lab has software and hardware to conduct spatial data preparation and analysis. Table 5.10 and Table 5.11 show the GIS and RS software and hardware, respectively, that are currently available at the GIS Lab.

Table 5.10: GIS and RS Software Available at FED GIS Lab

No.	Name	Quantity	Remarks
1	ESRI ArcInfo	2	GIS for image processing and vector analysis
2	ESRI ArcView	1	GIS for vector analysis
3	Erdas Imagine 9.2	2	For image processing

Source: compiled by Study Team based on interviews with officers of FED GIS Lab

Table 5.11: Hardware Available at FED GIS Lab

No.	Name	Quantity	Remarks
1	Workstation	1	HP Z820 Workstation, Intel®Zeon®CPU E5-2670 v2 @ 2.5GHz (2 processor), RAM 32GB, 2TB HDD, 64 bit, Windows 7 professional (Stand Alone)
2	Workstation	2	HP Compaq Elite 8300 , Intel® Core i7 CPU @3.40GHz, RAM 4GB, 500GB HDD, 64bit Windows 8.1 Pro (Stand Alone)
3	Plotter	1	HP Designjet T1200 HD MFP, Scanner cum Plotter
4	Printer	1	HP Color LaserJet CP5225 Printer
5	GPS	3	Garmin Etrex 30 (2) and Garmin Etrex Vista (1)

Source: compiled by Study Team based on interviews with officers of FED GIS Lab

(2) MBDA GIS Unit

The MBDA GIS Lab was set up for creating a comprehensive spatial database comprising all possible spatial layers relevant to forest management and natural resource management in the state and also providing spatial information services to MBDA and other line departments. Currently, The MBDA GIS Lab has six experts and mainly supports activities with the Compensatory Afforestation Fund Management and Planning Authority (CAMPA), the Government of India's Scheme, which deals with forest land diversification, KfW, and the Climate Change Centre of MBDA, as well as Megha-LAMP and MCCLMP. In the context of Megha-LAMP, for example, the experts prepared village-wise resource maps and LULC classification for target villages and provided training to MBDA field staff and staff from other line departments.

To understand the current GIS capacity of MBDA, data layers and equipment, including software and hardware, that is available at MBDA GIS Lab are summarized in the following sections.

1) Data Layers

MBDA GIS Lab has a total of 32 data layers, some of which were obtained from various state and national agencies. Data preparation is an ongoing exercise, and these data layers are updated periodically. Table 5.12 shows the data layers for the entire state currently available at MBDA GIS Lab.

Table 5.12: Data Layers Available at MBDA GIS Lab

No.	Layer Description	No.	Layer Description
1	Administrative boundaries (state, district, and block)	17	Mini-watershed
2	Land use and land cover map	18	Micro-watershed
3	Forest cover	19	Agro-ecological regions
4	Forest type	20	Temperature
5	Reserved forests and protected areas	21	Rainfall
6	Forest fire points	22	Catchment area for afforestation
7	Drainage network	23	Community nurseries
8	Soil	24	Automatic weather stations
9	Geology	25	Water quality at monitoring locations
10	Road network	26	Mosaic of Landsat
11	Village locations	27	Mosaic of IRS LISS IV
12	Digital Terrain Model	28	Mosaic of merged IRS LISS IV and Cartosat 1
13	Slope	29	Mosaic of Toposheets (1:25,000 and 1:50,000 scales)
14	Aspect	30	College and school locations
15	Watershed	31	Spring locations
16	Sub-watershed	32	Sacred groves

Source: MBDA GIS Lab

MBDA GIS Lab also has satellite imagery. Table 5.13 shows satellite imagery currently available there.

Table 5.13: Data Layers Available at MBDA GIS Lab

No.	Name	Type	Coverage	Remarks
1	Landsat	Multi-spectral	State	30m, for free of charge
2	Landsat	Panchromatic	State	15m, for free of charge
3	LISS III	Multi-spectral		23m, Indian satellite
4	LISS IV	Multi-spectral		5.8m, Indian satellite
5	SPOT 7	Multi-spectral		6m
6	Quickbird	Multi-spectral		2.44m
7	Quickbird	Panchromatic		0.61m
8	Cartosat	Panchromatic		2.5m, Indian satellite
9	SRTM	Digital Elevation Model (DEM)	State	90m, for free of charge
10	CartoDEM	DEM		Indian satellite
11	ASTER	DEM	State	30m, for free of charge
12	Hyperion	Hyperspectral		30m, 220 bands

Source: compiled by Study Team based on interviews with officers of MBDA GIS Lab

2) Equipment

In addition to the data layers discussed above, MBDA GIS Lab has software and hardware to conduct spatial data preparation and analysis. Table 5.14 and Table 5.15 show the GIS and RS software and hardware, respectively, which is currently available at MBDA GIS Lab.

Table 5.14: GIS and RS Software Available at MBDA GIS Lab

No.	Name	Quantity	Remarks
1	ERDAS Imagine	2	For image processing
2	ENVI	1	For image processing
3	ESRI	2	GIS for image processing and vector analysis
4	Map Info	1	GIS for vector analysis
5	QGIS	7	GIS for vector analysis, free of charge

No.	Name	Quantity	Remarks
6	GRASS	2	GIS for vector analysis, free of charge
7	ILWIS	2	GIS for vector analysis, free of charge
8	Diva	1	GIS for vector analysis, free of charge

Source: compiled by Study Team based on interviews with officers of MBDA GIS Lab

Table 5.15: Hardware Available in MBDA GIS Lab

No.	Name	Quantity	Remarks
1	Workstation	2	N/A
2	Desktop PC	2	N/A
3	Plotter	1	N/A
4	Multi-purpose	1	N/A

Source: compiled by Study Team based on interviews with officers of MBDA GIS Lab

(3) SWCD GIS Unit

SWCD has a GIS Unit that is responsible for the spatial data and information of the department; this unit is called the State Level Nodal Agency (SLNA). Two technicians belong to SLNA; they prepare maps using GIS and conduct classification analysis of satellite imagery. SLNA closely worked with NESAC for the preparation of the Watershed Atlas of Meghalaya 2013. SLNA also works with the Meghalaya Information Technology for the centralized GIS server.

To understand the current GIS capacity of SWCD, the data layers and equipment, including software and hardware, available at SLNA are summarized in the following sections.

1) Data Layers and Maps

SLNA has three data layers and one map with different specifications. Table 5.16 shows the three main data layers and one map for the entire state currently available at SLNA.

Table 5.16: Data Layers and Map Available at SLNA

No.	Layer Description	Year	Coverage	Scale	Layer Description
1	State administrative boundaries	2013	State	1:25,000	-Prepared in the format of shp. -Provided by Central GIS Centre of MITS.
2	Micro watershed	2013	State	1:50,000	-Prepared in the format of shp. -Delineated based on Toposheet map by Survey of India and CartoDEM. -Prepared by SWCD under supervision of NESAC.
3	Micro watershed coded and prioritized	2013	State	1:50,000	-Prepared in the format of shp. -Delineated based on Toposheet map by Survey of India and CartoDEM. -Prepared by SWCD under supervision of NESAC.
4	Watershed Atlas of Meghalaya	2013	State	1:50,000	-Prepared in the format of shp. -Delineated based on Toposheet map by Survey of India and CartoDEM. -Divided the entire state into 2,776 micro watersheds and accordingly coded them as per the guidelines of National Bureau of Soil Sciences and Land Use Planning.

Source: compiled by Study Team based on interviews with officers of SLNA

2) Equipment

In addition to the data layers and map just discussed, SLNA has software and hardware to conduct spatial data preparation and analysis. Table 5.17 and Table 5.18 show the GIS and RS software and hardware, respectively, currently available at SLNA.

Table 5.17: GIS and RS Software Available at SLNA

No.	Name	Quantity	Remarks
1	Supermap iDesktop 7C	2	GIS software for vector analysis.
2	ERDAS Imagine 2010	1	RS software for image processing and analysis.

Source: compiled by Study Team based on interviews with officers of SLNA

Table 5.18: Hardware Available in SLNA

No.	Name	Quantity	Remarks
1	Workstation	1	HP Z600 Workstation Intel ® Xeon CPU @ 2.00 GHz Ram 8.00 Gb, 1TB HDD 64-bit OS, Windows 7 Professional (Standalone)
2	Workstation	1	HP WX460 Workstation Intel ® Core 2 Duo CPU @ 3.00 GHz Ram 4.00 Gb, 1TB HDD (1TB Extended) 64-bit OS, Windows 10 Professional (Standalone)
3	Printer	1	HP Color LaserJet CP 5225
4	Scanner	1	Cortex XD 2490 Scanner
5	Internet (in SLNA)	1 set	Provided by NIC
6	Internet (Field)	1 set	3G or 4G Long Term Evolution (LTE)

Source: compiled by Study Team based on interviews with officers of SLNA

(4) ADCs

Three ADCs (Jaintia Hills ADC, Khasi Hills ADC, and Garo Hills) have very limited GIS capacity. First, the Jaintia Hills ADC has no GIS capacity. The Forest Department has five handheld GPS devices, and seven surveyors who are ranked in the Forester category can use them. The Forest Department has surveyed about 500 registered community reserved forests, a certain number of private/individual forests, sacred groves, and PFs, which exist only in Jaintia Hills area. The collected coordinates are sent to FED in Shillong, along with the GPS devices, and maps are prepared by FED free of charge. As a result, the surveyors of Jaintia Hills ADC do not know how the data are processed and how maps are prepared.

Second, the Khasi Hills ADC does not have GIS capacity, either. Within the FD, only two or three staff members can use handheld GPS devices, and GPS surveys are rarely conducted. Further, mapping based on coordinates collected by GPS surveys are usually outsourced to private companies. The IT Department of the Khasi Hills ADC uses several kinds of software, such as AutoCAD, Expert GPS, and MapSource, for mapping of land boundaries only.

Lastly, the Garo Hills ADC has very limited GIS capacity. The FD has five handheld GPS devices donated by FED and has completed GPS surveys for around 60 Village Reserve Forest (VRF) out of 200 to 300 villages. The FD has no designated surveyors or GIS operators. Only one officer ranked as Forester was involved in the GPS surveys and GIS mapping of the VRF. The FD uses open source GIS software for data downloading and map preparation and has made simple boundary maps for around 60 VRF only. Table 5.19 shows the summary of current GIS capacity in ADC Forest Departments.

Table 5.19: Current GIS Capacity in ADC Forest Department

Name	GIS Capacity	Human Resources	Equipment	Boundary Data	Remarks
JHADC	×	- 7 surveyors in Forester category	- 5 Handheld GPS	- Approx. 500 registered community forests. - Some private/individual forests - Some sacred groves - Some protected forests	- The collected coordinates with GPS devices are sent to FED. - All maps are prepared by FED.
KHADC	×	- 2 to 3 surveyors	N/a	- Some plantations - Some sacred groves - Some community forests	- GPS surveys are usually outsourced to private companies.
GHADC	∆	- 1 officer in Forester category	- 1 Open source GIS - 5 Handheld GPS	- Approx. 60 Village Reserve Forest (VR-)	- Simple boundary mapping for VRF is conducted using open source GIS software internally.

Source: compiled by Study Team based on interviews with officers of ADCs

To sum up, in FED, MBDA, and SWCD altogether, many data and maps are currently available. Besides, not only the data and information sharing between the agencies, but also the means of data acquisition from other institutions, such as FSI and NESAC, were also identified. Therefore, the existing data and maps will be utilized for the Project, recent data will be also acquired from relevant institutions smoothly. On the other hand, the majority of data and maps are available at state level, and community level data, such as village boundaries and community forests, are quite limited. At the same time, when it comes to human resources, except the MBDA GIS Unit, FED and SWCD GIS Units and their local offices are quite limited, and GIS capacities of ADC Forest Departments are practically nothing. In this regard, the Project shall intend to achieve the preparation of timely community level data and the capacity development for the implementing agencies at both the headquarters and local offices.

Further, the JICA annual forestry workshop was held in Tamil Nadu in March 2019, and various case examples in the utilization of GIS for forest planning and monitoring were discussed. Of all the discussions at the workshop, two case examples appeared to be relevant to the Project and also improve the capacities of the existing GIS Units. They included (1) data collection using drones and mobile application and (2) village boundary surveys using differential GPS (DGPS). First, Forest Departments in some other states developed mobile applications and also introduced drones to collect filed data in a timely manner. In the Project, these devices can be also introduced to collect data in the field and prepare community level data through monitoring activities. In Meghalaya State, access to internet is not available in many parts of the state. It is also important to develop the mobile application that can be used for entering and saving data in offline environment. Second, in some other states, DGPS, which can improve locational accuracy compared with regular handheld GPS, were commonly used to conduct boundary surveys. In the Project, village boundary surveys are also needed during the preparatory phase, and surveys with DGPS can enable for improving the accuracy of village boundaries.

5.2. Existing Monitoring and Evaluation Systems

Monitoring and Evaluation (M&E) systems play an important role in organisations to efficiently monitor the progress of activities and achieve targets. M&E systems also enable organizational management to make strategic decisions and correction measures. MBDA has an M&E system to collect data and information and analyse the performance of activities at various levels. MBDA developed its Management Information System (MIS) as part of the M&E system to record the

progress of activities from field level to state level. The MIS enables MBDA's management/authority to make appropriate decisions at various levels based on information available in the MIS. As of March 2019, the M&E systems are managed by the Deputy CEO of MBDA.

MBDA established an MIS team at its headquarters in Shillong, staffed with five technical officers, including computer programmers, MIS officers, and an MIS analyst, for the overall monitoring of work progress. This MIS team is responsible for collecting data from field level officers and analysing and monitoring performance and progress. Using external agencies, MBDA also collected baseline information from approximately 1,700 households in both project and non-project villages in 2017, and these data can be used as the basis of future activities. MBDA hired one expert to conceptualise the dataflow process, draw the outlines of the MIS, and set up the MIS team.

Currently, MBDA is implementing two projects, namely Megha-LAMP and MCLLMP, and has two separate M&E teams at the district and block levels to collect, compile, and upload data into MIS. In this section, the MIS in these two projects and other existing MIS are discussed, focusing on (1) current usage situations, (2) challenges and issues, and (3) future possibilities.

5.2.1. MIS in Megha-LAMP

(1) Current Usage Situations

The MIS team at MBDA headquarters is responsible for the MIS of Megha-LAMP, which has been integrated with the overall MBDA management information system. This MIS was developed by following an M&E framework in the Project Implementation Manual. The Megha-LAMP hired one M&E consultant to develop M&E plans and initiate a rapid assessment survey (pre-baseline). At present, the Megha-LAMP MIS team has four staff members at MBDA headquarters in Shillong and one M&E Program Associate at each BDU, as well as a few Project Associates at each Enterprise Facilitation Centre (EFC). Megha-LAMP has separate reporting systems by component. They include (1) Enterprise development, (2) Integrated Village Cooperative Society (IVCS) and Bank linkage, (3) Capacity building, and (4) INRM progress. For database development and programming of MIS, MBDA is supported by the National Information Centre (NIC) in Shillong. With respect to the hosting of applications, MBDA uses the services of a third party through Government E-Market (GeM).

The EFC Reporting tool is an offline MS Access-based application for the enterprise development component. It consists of three major sections: (1) Partner Registration, (2) Social, Economic, and Psychological Profile, and (3) Service Provided and Enterprise Development. For the Psychological Profile, a separate questionnaire is used to examine the characteristics of interviewees and possible support for their future enterprises.

Using the EFC Reporting Tool, data are transferred from EFCs to headquarters. At EFCs, data are collected from community members by Program Associates in the form of hard copy. Usually, Program Associates visit target villages to conduct interviews. Sometimes, community members come to EFCs and participate in interviews on a voluntary basis. The collected data are compiled and then entered into an off-line MIS application. The entered data are exported in a form of an .xml file from the application. The exported files are sent by email to headquarters and the responsible BDU. The M&E Experts of BDUs are responsible for data collection through Program Associates and uploading the data into the EFC Reporting Tool. Although Program Associates at EFCs can enter data, they are often busy with other duties in the field and cannot spare sufficient time for data entry. In such cases, the M&E Experts at BDUs enter the data. The BDUs' M&E Experts have access to data from all blocks, while Program Associates at EFCs have access only to data from blocks for which he or she is responsible. If any errors are found in the data, the M&E Expert receives information from headquarters and accordingly arranges for correction measures at the district level.

(2) Challenges and Issues

In the context of Meghalaya, the initial conceptualisation and mapping of indicators for data collection, standardisation of formats, and design of data flow take a lot of time due to a lack of specialised local human resources. For example, common indicators include profile information, name, age, village name, and household, which need to be collected every time, while specific indicators are specific to the component and need to be collected on demand only. Existing computers and internet connections are also not available in all places across the state. This situation requires training for operators, the procurement of new equipment such as computers, and internet connectivity. Further, the support of other government agencies, like the National Information Centre (NIC), is also very limited, because these government agencies are often overloaded with work requested by other agencies.

(3) Future Possibilities

Megha-LAMP is currently developing online web-based MIS, and this web-based MIS will be composed of the existing three reporting tools and also integrate the MIS with GIS. With the implementation of this new MIS, data uploading, visualisation, and reporting can be completed online regardless of time and place. At the same time, data analysis is currently conducted only at headquarters. It is desirable to enable BDUs to conduct data analysis for reporting purposes on demand.

5.2.2. MIS in MCLLMP

MCLLMP has a component of monitoring, learning, and reporting for MIS. An MIS-based performance tracking system was recently developed to track implementation progress and other aspects of MCLLMP activities. The structure, indicators, and information flow of the MIS were designed and established by the MBDA's MIS team, and a vendor will be engaged in the development of MIS. This MIS is intended to allow villagers, traditional leaders, farmers, government officials, project team members, and facilitating NGOs to understand their roles and responsibilities for more efficient natural resource management. It is expected that this MIS will result in linkages with other MIS of different departments, because other state and central government schemes are being digitized for future data verification and information sharing. Because this MIS was recently developed, information about the features of data flow, such as where data will be generated, who will enter the data, and who will verify the data, are still under examination. However, an online Android-based application is being developed in house for further integration into the mainframe MIS.

5.2.3. Other Existing MIS

Central government schemes like the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), the Prime Minister Rozgar Yojana (PMRY), the National Social Assistance Programme (NSAP), the National Rural Livelihood Mission (NRLM), and the Pradhan Mantri Gram Sadak Yojana (PMGSY) each have their own MIS. Data and information is being collected directly from blocks and district offices, and the maintenance of their MIS are supported by NIC.

The Soil and Water Conservation Department also has MIS for M&E purposes as a part of the IWMP. District level officers, including demonstrators and watershed development team members, collect field data using mobile applications developed by the Ministry of Rural Development. The data include information about financial and physical progress in target micro watersheds. Collected data are entered into the MIS at district level and sent directly to the Ministry of Rural Development database. When it comes to FED, monitoring and evaluation systems do not exist.

Chapter 6. Review of the Pre-Detailed Project Report (Pre-DPR)

6.1. Outline of the Pre-DPR

The Pre-Detailed Project Report (Pre-DPR) consists of five chapters, (1) Background, (2) Necessities and Priority of the Project, (3) Project Rational and Objectives, (4) Project Implementation and Organization, and (5) Project Components, followed by supportive information in eight relevant annexures, namely (1) Land tenure system in Meghalaya, (2) Categories and management of community forest in Meghalaya, (3) Selection criteria, (4) Project management consultancy, (5) Megha-LAMP, (6) Terms of reference for developing operational manual & accounting procedure, (7) Consultancy studies on commodities by Institute of Livelihood Research and Training (ILRT) for MBDA, and (8) Some important medicinal plants of Meghalaya.

6.2. Methodology of the Review

At the beginning of the Study, the Pre-DPR was initially examined as a part of the domestic work done in Japan in order to understand the overall picture of the Project. After the first field survey, which included a series of discussions with implementing agencies and other relevant agencies, as well as field visits, the Pre-DPR was further examined based on the outcomes of these activities. This chapter shows the results of the Pre-DPR review, by chapter, from Section 6.3.1 to 6.3.5. At the same time, the development of selection criteria plays a vital role in the preparation of the Project. Thus, the review about Annexure (3) in particular is summarized in Section 6.3.6.

6.3. Pre-DPR Review

6.3.1. Chapter 1: Background

The Pre-DPR discusses basic information about Meghalaya to illustrate current physical and socioeconomic conditions of the state. These include geography, demography, socioeconomic status, administrative system, forest areas, biodiversity, and livelihood. Although this chapter describes the current situations in the state in detail, based on the observations made during the first field survey, it seems that an examination of the following points is also needed, because they have much influence on Project objectives, as well as its design. These points include (1) data availability, including data about the number of villages, (2) regional differences between ADCs, and (3) possible causes of land degradation.

First, the number of villages needs to be determined in order to correctly select target villages. Throughout this chapter, the number of villages appears several times, but these numbers vary each time. For example, the Census 2011 states that the number of villages is 6,839, while the table "Meghalaya at a Glance" shows the number of villages at 7,800. At the same time, the third page of this chapter gives the number of villages at 5,780. In the context of this Project, the number of villages is critical because target area selection will be conducted by village. Therefore, it is important to determine and refer to the most up-to-date and correct number of villages for future discussions.

Second, regional differences within the state need to be considered. Meghalaya consists of three ADCs, and each ADC has unique features in many aspects. During the first field survey in India, it was observed that each ADC has unique land tenure and forest management systems, as well as unique causes of forest degradation and deforestation. At the same time, although the Pre-DPR discusses literacy rates in this chapter, according to the field observations in the three ADC areas, literacy rates also vary depending on the ADC; moreover, this situation results in different socioeconomic conditions for each ADC. These features further imply that regional differences between the three ADCs need to be understood and that different local issues need to be addressed accordingly.

Third, monoculture plantation can be a driving factor in land degradation in Meghalaya. Shifting cultivation is discussed in Pre-DPR as one of the major driving factors of forest degradation, and it has been largely replaced by monoculture plantation (e.g. areca nuts). As the Pre-DPR indicates, monoculture plantation is commonly conducted in some areas of the state. In the short term, monoculture plantation can become an important income source for local people. In the long term, however, monoculture plantation can have negative impacts, such as the degradation of soil, on the local environment. For this, it is important to address not only those areas with degradation for new development work, but also areas that have Project interventions, including monoculture plantations for further improvement.

6.3.2. Chapter 2: Necessity and Priority of the Project

The Pre-DPR discusses the key environmental concerns. They include deforestation; the fragmentation of forests; soil degradation; biodiversity loss; and the contamination and silting of water bodies caused by unregulated and unscientific mining, deforestation, and unsustainable short cycles of shifting cultivation, or *jhum*. Due to the number of unfavourable conditions, the Project should be implemented urgently. It is also important to understand that these unfavourable conditions are closely linked with each other by cause-and-effect relationships. Because socioeconomic conditions, including livelihood, have much to do with the above unfavourable conditions, they are also evidence of the necessity and priority of the Project.

The Pre-DPR proposes a participatory site specific forest development approach. From the first field survey in India, it was clear that physical conditions, as well as management systems, vary depending on the region. Therefore, this approach seems appropriate to the Project in Meghalaya.

6.3.3. Chapter 3: Project Rationale and Objectives

The Project is consistent with the directions shown in the following state development policies. Meghalaya Vision 2030 emphasizes the necessity of promoting scientific forest management in community- and privately-owned forests. The Meghalaya Human Development Report 2008 suggests the necessity of intervention to check the further degradation of natural resources through persuasion and regulations that encourage land- and resource-owning communities to become involved in conservation programmes in which government agencies participate. The Project aims at embodying these state policies.

The principal goal of the Project is "to conserve and develop forests and biodiversity resources of the state through preparation and execution of area specific management plan by the concerned communities/individuals (forest owners) and enhancing their capability in sustainable management of forest and biodiversity along with natural streams and springs and poverty alleviation of local communities". This goal has been developed to address the issues of environmental degradation based on circumstances in the state. Though Meghalaya State has a forest cover rate of as high as 76.5%, 42.6% of the total forest area is open forest; moreover, total forest area decreased by 142 km², in comparison with 2013, according to the FSI Report 2017. As a result, soil erosion and water scarcity for domestic and agricultural purposes have become major problems there[154]. In order to prevent further degradation of forests and mitigate the adverse impact of forest degradation on local community livelihood, forest conservation is urgently needed. On the other hand, the state has unique conditions in terms of its land tenure and forest management systems, in that over 90% of forest land belongs to communities or individuals and that strong traditional community organizations exist and manage land and natural resources. In these circumstances, a focus on community-led forest management is adequate. From the aforementioned points of view, the Project seems to be rational.

On the other hand, the following points have weaknesses as regards their rationality.

[154] Department of Environment and Forest, Government of Meghalaya (2005) *Sate of the Environment Report 2005: Meghalaya*. http://www.moef.nic.in/soer/state/SoE%20report%20of%20Meghalaya.pdf

- The rationality of forest management by concerned communities/individuals, through enhancement of their capabilities, is explained by the shortage of FED staff. However, it is stipulated by regulations that the management of forests belonging to communities or individuals is a mandate of the ADCs, although in practice FED intervenes in community forest management through such schemes as JFM and Community Reserve. Therefore, the Project shall include the ADCs as targets of capacity development for the strengthening of community forest management.
- Four points, namely those about how (1) to restore ecological balance, (2) to enhance ecosystem services, (3) to enhance livelihood and income-generating opportunities, and (4) to adapt to climate change, which are shown in a box in Chapter 3 of the Pre-DPR, under the title of "Rationale", sound too general and hardly explain the relationship between these four points and the Project. Further explanation is needed as to how these four points support the rationality of the Project.
- Poverty alleviation is listed as a long-term goal of the project. On the other hand, biodiversity conservation has been set as one of the project objectives. The logical consequence of how biodiversity conservation contributes to poverty alleviation is not clear. In Chapter 2 of the Pre-DPR, it is explained that the root causes of poverty are pre-dominantly small and marginal operational land holdings, rain-fed cultivation, stagnant agricultural production, soil erosion, low level of skill development, and poor infrastructure. It needs to be explained how biodiversity conservation will be helpful in addressing these causes.

6.3.4. Chapter 4: Project Implementation

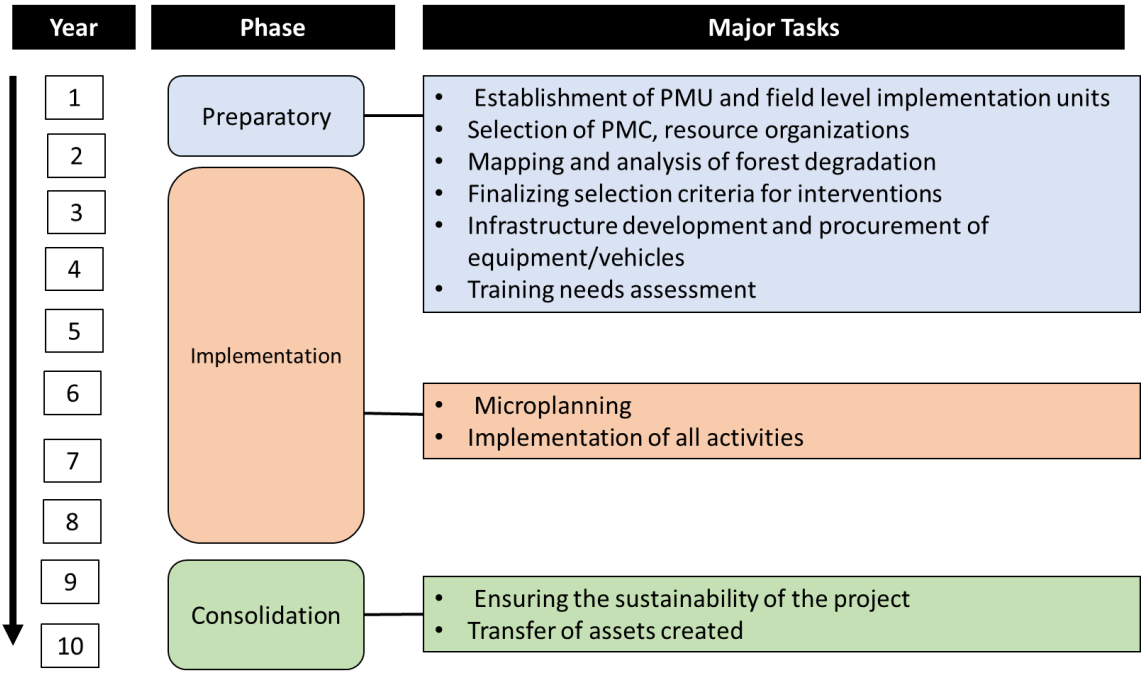
In Chapter 4 of the Pre-DPR, the phasing of the Project and overall framework of Project implementation arrangement are discussed. A summary of these two topic and observations is given below.

(1) Phasing of the Project

The Project is proposed for a duration of ten years divided into three phases. The different phases of the Project, along with major tasks to be undertaken in each, are indicated in

Source: Pre-DPR

Figure 6.1.



Source: Pre-DPR

Figure 6.1: Phasing of the Project Mentioned in Pre-DPR

Considering the experience of other forestry projects in India, the phasing of the Project appears to be practical. Given that the Project will be the first Japanese ODA Loan project in this sector in Meghalaya State, sufficient time should be given for each of its phases. Particularly, more time may be required for the preparatory phase. For instance, in the case of the IFAD-funded Mega-LAMP, it has taken about two years to kick-start the project, despite having some personnel who earlier were part of IBDLP. Therefore, it is probably practical to allocate at least two years for the preparation phase. From this perspective, ten years for project implementation would be a minimum requirement for the Project.

(2) Overall Framework of Project Implementation

The institutional arrangement for the Project is discussed both in Chapter 4 and Chapter 6 of the Pre-DPR. The Project is to be implemented in a society-mode by establishing a Project Management Unit (PMU). However, instead of creating a new society, it is proposed that the PMU be housed in the Meghalaya Basin Development Authority (MBDA). A separate by-law for the PMU will be drafted and operation and accounting manuals and procedures will be prepared. In other states in India where forestry projects have been implemented with a Japanese ODA Loan, the executing agency is the FD, and the PMU is established as an autonomous society thereunder. In Meghalaya, however, while the executing agency is FED, the PMU for this Project will be attached to an existing society that is an entity separate from FED. Therefore, the flow of project funds and commands of instruction needs to be given due consideration. In the Government of Meghalaya, budget outlays for each department are decided between the Finance and Planning Departments in consultation with each other, and the funds are released from the Finance Department to each department through the Planning Department. Because MBDA is a subordinate organization of the Planning Department, it appears practical to follow this fund flow process.

The Pre-DPR also proposes the constitution of a High Power Committee (HPC) headed by a Chief Secretary, which makes policy-level decisions and coordinates among the government departments. The Pre-DPR also proposes the constitution of a separate Governing Body (Governing Council) for the PMU. However, the PMU would be a division in MBDA and should be administered by the same Governing Body. According to the requirement of the project, some members may need to be added to the Governing Body. In addition, the Governing Body of MBDA is already headed by a

Chief Secretary, with representation from various departments (see Chapter 5 for the list of members in the Governing Council of MBDA). Therefore, the necessity of an HPC needs to be carefully examined.

The Project Director would be responsible for the overall management and implementation of the Project. Four Joint Project Directors in the fields of administration and finance, forestry, livelihood improvement and enterprise development and monitoring and evaluation would be posted at headquarters. While MBDA plays a critical role in coordination with various departments, the Project is that of the forestry sector. Therefore, as suggested in the Pre-DPR, appointing a PCCF/APCCF-rank forest official as Project Director is appropriate, especially if the district level project implementation unit is headed by Divisional Forest Officers (DFOs).

The Pre-DPR suggests having district-level implementation units for the project, which would be attached FED DFO office. The Pre-DPR mentions only a requirement for the District Project Manager to have domain expertise in forestry, and who in turn would be assisted by one or two Project Assistants. Because the Project requires the involvement of ADCs and the SWCD, apart from FED, representation from these as well as MBDA at the district level needs to be considered. A District Level Advisory Committee, (DLAC), chaired by the District Collector in each district, can act as a forum for various departments to come together and coordinate. A DLAC appears to be functional in most of the districts, so the existing structure can be utilized.

Below the district level, there is no mention of a Project Implementation Unit. In order for communities to have better access to the Project implementation body, as well as the Project itself to monitor the ground level situation on regular basis, it is necessary to have field presence below district level.

At the community level, the formation of a Village Level Executive Committee (VLEC) for the purpose of Project implementation and monitoring is proposed. Eight to ten office bearers are suggested, out of which 50% would be reserved for women. Because representation of women in village level institution appears limited, despite many of the communities being matrilineal, having a quota system for the representation of women is important. VLEC will also have a representative from the Project side. As there are a number of village level institutions, such as JFMC, the Watershed Development Committee, and the Village Employment Council, that are already in existence, the possibility of utilizing such institutions needs to be considered, along with the creation of new institutions. The Pre-DPR also suggests that local youth will be appointed and trained to be the interface between the target communities and the Project. Having an animator or facilitator at the village level who is versed in the concerns of the respective communities is essential.

The Project will require extensive social mobilization at the community level. To meet this requirement, the involvement of NGOs and/or other resource organizations is suggested. The availability and capacities of NGOs and other resource organizations need to be assessed, and areas in which their services can be utilized need to be given due consideration.

Project Management Consultants (PMC) would be hired to assist the PMU in Project implementation. Although the Pre-DPR indicates requirements for international consultants in the fields of biodiversity, eco-tourism, REDD+/carbon finance and community development for the total of 20 man/months (M/M), the fields of expertise to be provided by the international consultants should be examined in line with Project components and particular requirements related to the scopes of the various aspects of the Project. A total of 272 M/M is also indicated for the national consultants.

In addition to PMC, the Pre-DPR suggests hiring short-term consultants at the beginning of Project implementation to develop accounting procedures for the PMU. MBDA has its own accounting manuals, so the short-term consultants can review the existing manuals and also develop

operational manuals for the PMU.

6.3.5. Chapter 5: Project Components

In this section, four major Project components are reviewed, and the outcomes from each examination are summarized below.

(1) Core Forest Activities

1) Overall Review

First of all, although some causes of forest degradation, such as shifting cultivation and forest fires, are mentioned in Chapter 2, a driver analysis of forest degradation and deforestation has not been sufficiently conducted in the Pre-DPR. Without the driver analysis, it is difficult to propose effective forest activities for the achievement of the Project goals.

Through the first field survey in India, it was observed that each ADC has unique land tenure and forest management systems and unique causes of forest degradation and/or deforestation. Thus, core forest activities should be designed according to causes in line with the land tenure and the forest management systems in each ADC.

2) Review of Each Activity

The Pre-DPR proposes two types of forest activities: A1 (Reclamation of shifting cultivation areas) and A2 (Restoration of degraded community forests). Under these two types of activities, two and four models are proposed respectively, as shown in the table below.

Table 6.1: Types and Models of Core Forest Activities Proposed in Pre-DPR

Type	Model
A1: Reclamation of shifting cultivation area	RSCA Model 1: Agroforestry in current *jhum* lands
	RSCA Model 2: Conversion of *jhum* lands to forests
A2: Restoration of Degraded Community Forests	RDCF Model 1: Assisted Natural Regeneration
	RDCF Model 2: Assisted Natural Regeneration with enrichment plantations
	RDCF Model 3: Improvement/Revitalization of bamboo brakes
	RDCF Model 4: Fuel wood & fodder plantation

Source: Pre-DPR

With the two types and six models above, it is difficult to deal with some types of forest degradation and deforestation caused by certain drivers. For example, the restoration of vast deforestation areas, caused by forest fires coupled with grazing that has been observed in the Khasi Hills ADC jurisdiction area, is difficult to accomplish with Assisted Natural Regeneration (ANR), which is proposed as RDCF Model 1. Other models are also not applicable for dealing with this type of deforestation. Stone quarrying largely conducted on private lands is another major driver of deforestation in the same ADC area. However, the Pre-DPR does not propose any measurement to restore this type of deforestation.

In the first place, it seems that Type A2 was designed based on an insufficient understanding of the reasons for the degradation of community forests. The Pre-DPR mentions that a lack of scientific and technological input and adequate investment, coupled with over harvesting, have resulted in the degradation of community forests. Although this may be true in some cases, as a result of the first field survey in India, it has been suggested that weak enforcement of customary rules of forest management and regulations to control the conversion of forests to other kinds of land use was one of the major reasons for forest degradation or deforestation. Therefore, activities to strengthen forest management or land use management by communities shall be included in the Project. For example, the facilitation of registering community forests in existing schemes, such as Village

Reserve Forest (VRF) and Community Reserve (CR), shall be included to prevent further degradation and restore forest vegetation. In order to mitigate the conversion of forests to other kinds of land uses on private lands, to take another example, participatory land use planning shall be included as one of the Core Forest Activities though a similar activity, village micro planning, is described as one of the Community Development Activities.

Regarding Type A3: Biodiversity conservation, as pointed out in Section 6.3.3 of this report, logical consequence between the proposed activities for biodiversity conservation and the long-term goal, poverty alleviation, is weak. In particular, among the proposed activities, (i) Identification of core areas for conservation of unique bio-diversity with MSBB, and (ii) Preparation of peoples' biodiversity registers hardly contributes to poverty alleviation. Pertaining to Activity III (Expansion of existing sacred groves), it may be difficult to practically expand the area of existing sacred groves. Rather than do this, it is effective to facilitate the registration of existing sacred groves as CR for maintaining biodiversity across the state. Regarding Activity V (Identification and mapping the gaps in the corridor connecting the Protected Areas), five corridors of elephants in the Garo Hills ADC jurisdiction area have already been identified, and maps have already been prepared. Thus, as the next step, activities to link the corridors should be introduced in the Project.

3) REDD+/Carbon Finance

In Meghalaya State, two REDD+ pilot projects has been carried out as described in the section 3.4. One is the Khasi Hills Community REDD+ Pilot Project at Mawphlang Village, East Khasi Hills District, initiated by Hima and NGO, and the other is the Community REDD+ Pilot Project at Umket Village, Ri-Bhoi District, initiated by FED.

Against this background, the Pre-DPR proposed to formulate a state REDD+ strategy in accordance with the National REDD+ Strategy and develop REDD+ methodologies including MRV and Safeguards that involve communities. Moreover, it proposed to conduct at least two REDD+ pilot projects in each district to raise awareness about REDD+ in the state.

However, GoI only recently announced the National REDD+ Strategy in August 2018, and it does not mention REDD+ methodologies such as MRV or Safeguards. In these circumstances, it is assumed that it takes a substantial amount of time to develop MRV methodologies and Safeguards at the national level. If GoM developed the REDD+ methodologies prior to their development at the national level, it would cause many conflicts, and the methodologies developed at the state level would accordingly need to be adjusted to those at the national level in the future. Hence, it is difficult to incorporate REDD+ related activities in the Project considering the aforementioned limited time frame.

In addition, it has been pointed out that the introduction of REDD+ in Meghalaya State needs to be considered carefully, since the trend in forest cover change in the state is different from that in India as a whole. If the results-based payment apprioach is adapted to Meghalaya State as well as the rest of India, it is likely that Meghalaya State will not receive much profits.

Considering the situations detailed above, it appeared to be inappropriate to incorporate REDD+ related activities into the Project.

(2) Water Resource Augmentation

Water Resource Augmentation (Section 2 in Chapter 5) has not yet been described in the Pre-DPR (as of February 2019). However, the significance of water resources in Meghalaya is emphasized in various places throughout the Pre-DPR. For example, "To offset the adverse impact of developmental activities, [the] need [for] conservation of natural resources, basically forest & water resources, are of paramount importance.", "There seems to have been no attempt to objectively [assess] … the changes in the availability of utilizable water resources in the state." It continues by stating the important of, "particularly, revitalizing the streams and springs to augment the depleting

[of] water resources and to provide enhanced livelihood opportunities to the forest dependent tribal communities." The quotations exemplify the significance of water resources. Furthermore, at the outset of formulating Selection criteria (in Annexure 3) also implies their significance by explaining that "The first step towards identification of project target villages will be prioritisation/selection of landscapes, comprising mini watersheds, through an objective analysis of Remote Sensing satellite and other ancillary data related to forest degradation status and [the] rate of change of forest degradation, [the] overall situation of water stress, and [the] potential to augment water resources." Because the augmentation of water resources is certainly an essential issue for the improvement of the living environment for local residents through forest management activities, strategies and measures should be considered during the Study based on discussions with stakeholders.

(3) Community Development and Livelihood Improvement

The Pre-DPR proposes community development comprising the following activities: 1) Entry Point Activities (EPAs); 2) micro-planning; 3) income generation; and 4) enterprise development. First, in the Pre-DPR, EPAs are considered as a tool for mobilizing villagers and involving them with the Project up to its commencement. Since the process by which a micro plan is made in a participatory way at the village level and approved by the Project is very long, EPAs should work out as expected in the Pre-DPR.

Apart from the Pre-DPR, however, EPAs should not be focused only on community mobilization, but should also be pre-conditions to create an enabling environment for the target groups of people, specifically women, to easily join income generation activities or enterprise development, in spite of the gender-based division of labor, such as fetching water, collecting firewood, and carrying agricultural products to the nearby market and selling them there. Though the Pre-DPR proposes EPAs to include even not-directly related activities, such as primary health care and primary education, EPAs should be confined to more directly-related activities, such as drinking water, energy-efficient smokeless cooking stoves, and rural connectivity.

Secondly, the Pre-DPR suggests that the Project provide each selected village with technical assistance from resource organizations/contracted NGO teams, a large-scale (1:5,000) land use and vegetation/forest map of the village area, and "micro-planning manuals" in order to facilitate people in the selected villages to make micro plans in a participatory manner. Micro-planning might function as a learning process by which people in the selected villages can learn about participatory problem identification, problem prioritization, and micro plan decision-making. However, this will largely depend on the quality of the assistance and interventions given by resource organizations/contracted NGO teams. The resource organizations/contracted NGO teams should keep in mind that in the pre-existing decision-making structure at the village level, women are often excluded from decision-making processes. Based on this recognition, they should ensure that all villagers, including women and other marginalized groups of people, be involved in the process of micro-planning and that their voices be heard and reflected in micro-planning. For this, the Project needs to carefully select and contract with resource organizations/NGOs which have sufficient expertise and experience with participatory community development.

For micro-planning, the Pre-DPR suggests that the selected villages take five steps: 1) forming a community working group by the VEC with assistance by resource organizations/contracted NGO teams; 2) conducting a baseline survey comprising socio-economic and forest resources surveys; 3) collecting necessary information on special plans, including a pre-existing land use plan, forest development plan, potential income generation activities, and a village perspective plan; 4) making a plan on income generation activities, based on existing/available infrastructure, resources, SHG/cluster, etc.; and 5) making a micro plan in a converged/integrated manner. As to Step 1, forming a community working group, the group should not necessarily be newly-formed if there is a pre-existing group or committee, such as JFMC and VEC. However, if a pre-existing committee comprises only men or elderly men, it should be reformed to become more diverse by adding a certain number of active women and youth. This should also be facilitated by the contracted NGOs

in an appropriate way. Within Step 2, the survey should include gender analysis in terms of gender-based division of labor, daily and annual activities, accessibilities to and decision-making power over resources, networking with government organizations and NGOs, etc. Based on the results of gender analysis, the Project should address both women's practical and strategic gender needs and reflect them in the planning for the Project, Furthermore, Step 5, convergence with the Government's relevant schemes, such as the construction of a watershed and irrigation, and a road to the nearby market, will be essential for promoting income generation.

Thirdly, the Pre-DPR proposes to implement income generation activities through existing SHGs or common interest groups (CIGs), or newly formed SHGs/CIGs. According to the Pre-DPR, the Project will provide each selected village with Rs 200,000 as a source for the revolving fund, to be used for providing loans to members of the SHGs and ICGs. As the members' accessibility to a financial service is one of the crucial pre-conditions for their starting income generation and entrepreneurship, this micro-credit activity should be appropriate. However, the Project should make sure that the funds, as well as micro-credit activities, are properly managed

The Pre-DPR suggests that out of existing and newly-formed SHGs and ICGs in each selected village, two SHGs/ICGs will be selected as a target for the Project in accordance with the eligibility criteria. According to the Pre-DPR, the Project will facilitate the selected SHGs/ICGs to select a product (NTFP, farm- or non-farm product) for income generation, and closely monitor their activities for the first two years. The Pre-DPR also suggests that the Project organize the cluster of SHGs/ICGs working on the same product and promote their business by assisting them in receiving further loans from financial institutions. Here, the Project should not allow selected SHGs or CIGs to work on whatever they like for income generation activities. Instead, it should strategically select more commercially valuable and potential NTFPs, farm-products, or non-farm activities which are context-specific. This will be the way by which the Project can let the selected SHGs/CIGs working on the same product or same activity form a cluster by which they can promote marketing through large-scale shipment.

Finally, the Pre-DPR proposes enterprise development as a sub-component. The demarcation of enterprise development for income generation activities within the same component can be determined by the formation of cooperative societies for enterprise development, while SHGs and CIGs are targeted for income generation activities. By registering as a cooperative society, it can apply for a large loan from the Cooperative Apex Bank.

The Pre-DPR proposes to focus on bamboo for enterprise development because of its availability in a large area of the state. For this, the Pre-DPR suggests that the PMU hire a special agency and let it conduct relevant studies to assess the feasibility of introducing new bamboo species and establishing bamboo enterprises in the state, by collecting information on bamboo resource availability, potential for value-added bamboo products, technology required for such intervention, and the marketing linkages required. The Pre-DPR also mentions the possibility of studies to be conducted on other natural resource-based enterprise development, if there is potential for them. However, it is important to carefully consider the feasibility of planting and growing valuable species of bamboo, because existing bamboo that is available all over the state might not necessarily be economically valuable species. Furthermore, since there are only a few cases in which private bamboo enterprises have been developed and functioned in the state, the Project should carefully examine the feasibility of bamboo enterprise development. The Project also needs to explore other potential activities, including eco-tourism and floriculture.

To sustain these income generation and enterprise development activities, the Pre-DPR proposes to establish a Forest-based Livelihood Resource Center (FLRC) in the second or third year. First, this is problematic in terms of limiting income generation activities and enterprise development to forest-based products or activities. There might be a high possibility that no NTFPs, except for some commercially valuable plantation spices, will be selected as a target product for income generation activities or enterprise development, based on the result of the first field survey in India.

According to respondents to the interviews conducted during the survey, they do not sell firewood, bamboo, edible wild plants or fruits, or medicinal plants; rather, they are only for domestic use. Respondents said they depend for their cash income exclusively on some spices, such as bay leaf, cardamom, cinnamon, and black pepper, and other plantation crops. Thus, it might not be appropriate for the Project to focus on NTFPs for income generation activities and enterprise development.

Furthermore, it seems problematic from a sustainability perspective to newly establish an FLRC. In addition, there are similar supporting structures, such as Enterprise Facilitation Centers, established for IBDLP and still utilized at the block level. According to the Pre-DPR, FLRC is supposed to take responsibility for capacity building/training programs focused on livelihood improvement and convergence with other relevant sectors and other government schemes/programs. However, these might be taken up by the team in charge of relevant departments, including the Department of Soil and Water Conservation, Department of Agriculture, and their divisional offices. Though the Pre-DPR proposes setting up a livelihood development fund and others and to let FLRC manage the funds, it also should be carefully examined whether they are really needed and sustainable.

(4) Institutional Arrangement and Strengthening

Capacity building, monitoring and evaluation, publicity and communication, and research comprise the institutional strengthening of the component.

Capacity building will be a continuous effort during the Project both for the officials associated with Project implementation and for beneficiaries. At the beginning of the Project, a training needs assessment will be conducted by PMC, followed by the preparation of training modules and materials. An overseas training and tour for Project officials is also proposed, the details of which need to be worked out by PMC.

Since the Project is the first Japanese ODA Loan project in the state and involves several different agencies, a strong monitoring system will be required. In the Pre-DPR, the importance of having a sound monitoring and evaluation system is recognized, and it proposes to have a GIS-enabled system in place. An Annual Plan of Operation (APO) will be prepared each year. At the beginning of the Project, formats will be developed for quarterly and annual monitoring to track physical and financial progress.

In publicity and communication, it is proposed that knowledge management, internal and external communications be focused on. For this purpose, a dedicated website will be designed, while quarterly newsletters will be also prepared and circulated.

Research is another activity proposed. Research on the development of nursery technologies such as adopting root-trainers and raising quality planting stock, including NTFP spp., and a package of agroforestry systems are proposed in the Pre-DPR. Research topics shall be consistent with activities and approaches implemented in the Project.

6.3.6. Selection Criteria

Selection criteria plays a vital role in the preparation of the Project. The Pre-DPR proposes three criteria for excluding inappropriate areas and nine criteria for selecting target villages. Although the proposed selection criteria seem to be appropriate as a whole, some modifications can be made. From previous experience in other states, the following four points to note are summarized below.

First, data availability has much to do with the finalization of selection criteria. Target areas need to be selected fairly using objective data and information. To exclude arbitrary selections, it is important to check the availability of data that properly express indicators used in criteria and to use authentic and objective information whenever possible.

Second, as the Pre-DPR proposes, a step-wise approach enables the selection of appropriate target areas. To select target areas, various criteria are used, and these criteria have different weights depending on their importance. In this regard, it may not be appropriate to use the criteria all at once. In those cases, target areas can first be narrowed down by major criteria, and then target sites can be selected from only the narrowed target areas. For example, target areas that need Project interventions for development (e.g. areas with degradation) and preservation and conservation (e.g. areas that have already initiated and can become models for other villages) can be appropriately selected.

Third, the block is a possible unit to select candidate villages because all villages correspond to blocks. Watershed boundaries completely depend on physical conditions and do not correspond to any administrative boundaries. At the same time, in the context of Meghalaya, village boundaries are not available. Under these circumstances, the use of block boundaries can make it possible for relevant agencies to efficiently operate and manage Project interventions.

Lastly, to finalize target area selection, site verification is required before the commencement of Project implementation. This site verification is conducted separately from the other steps because its outcomes are subjective data from communities. During the site verification, the willingness of candidate villages is examined because Project interventions cannot be conducted without the communities' active participation and commitment. At the same time, land conflicts and disputes are also checked to avoid unsecured situstions for the project activities.

6.4. Concluding Observations

All chapters and annexures of the Pre-DPR were reviewed based on the preliminary analysis as a part of the first domestic work done in Japan as well as the first and second field surveys in India. Although the major part of the Pre-DPR was tentatively agreed upon by the Study Team, further discussion is still needed with the implementing agencies and other relevant organizations, as is, accordingly, improvement to the contents of the Pre-DPR.

Chapter 7. Proposed Project Outline and Scope of Work

7.1. Project Needs and Rationale

7.1.1. Relevance and Linkage with Government Policies

The proposed project (the Project) is consistent with the state government development policy as well as the regional and central government forest policies, including Meghalaya Vision 2030, North Eastern Region Vision 2030, and Green India Mission. The relevance of these policies is examined below.

(1) Meghalaya Vision 2030

Meghalaya Vision 2030[155], which was issued by the state government in 2012, puts forward a set of seven strategic initiatives to accelerate economic growth, alleviate poverty, enhance human development, and bring peace and prosperity to the people of the state in a sustainable manner, while considering their traditions and cultures. The seven strategic initiatives are as follows;

1. Empowerment of the people through participatory planning and inclusive governance
2. Development of institutions and systems to promote markets in the state
3. Sustainable development based on comparative advantage, so that the natural resources are harnessed for the benefit of the population in the state
4. Infrastructure development to promote markets and attract investment into the region
5. Expanding trade and investment opportunities within the region, with neighbouring countries, and beyond
6. Development of the capacity of people and institutions for accelerating growth and ensuring employment security to the people.
7. Inclusive development to provide access to education, healthcare, and employment opportunities to vulnerable sections of the population, such as youth and women.

The Project is in conformity with these strategic initiatives, especially the first, third, and sixth initiatives, since the Project aims at sustainable community forest management through participatory planning and inclusive governance, while developing the capacities of the people and institutions concerned.

(2) North Eastern Region Vision 2020

North Eastern Region Vision 2020[156], which was developed by the North Eastern Council in 2008, also aims to alleviate poverty from the region by 2020 and emphasizes inclusive and sustainable development. The vision has the following six development strategies, most of which are similar to those of Meghalaya Vision 2030.

- Empowerment of the people by maximizing self-governance and participatory development through grass-roots planning.
- Rural development with a focus on improving agricultural productivity and the creation of non-farm avocations and employment.
- Development of sectors with comparative advantage agro-processing industries.

[155] National Institute of Public Finance and Policy (2013) A Vision Document for the State of Meghalaya 2030 (available at http://megplanning.gov.in/report/vision2030/vision2030.pdf (last access 2019/03/21)

[156] North Eastern Council, Ministry of Development of North Eastern Region (2008) North Eastern Region Vision 2020 (available at http://www.satp.org/satporgtp/countries/India/document/papers/Vision_2020.pdf (last access 2019/02/23)

- Maximising self-governance, introduction of participatory planning, rural development and development of capacity of the people and institutions both in the government and private sector.
- Augmenting infrastructure including rail, road, inland water and air transportation facility.
- Ensuring adequate flow of resources for public investments.

As shown above, the strategies stress the empowerment of people by participatory development through grassroots planning and also prioritize rural development by improving agricultural productivity and generating non-farm employment opportunities. They also include the capacity development of people and institutions both in the government and the private sector.

(3) Green India Mission

Green India Mission, one of the eight missions outlined under the National Action Plan on Climate Change formulated in 2014, aims to increase five million ha of forest areas to restore forest cover and another five million ha to improve forest quality in ten years throughout the nation. Green India Mission in Meghalaya was constituted by government notification No.Env.1/2012/155 in March 2012, and FED created the Green India Mission cell in the office of the PCCF & HoFF Meghalaya. The first phase perspective plan was prepared along with sub-missions such as quality enhancement, ecosystem restoration, increase in forest cover, and agroforestry. These activities have been implemented by JFMCs. The implementation of Green India Mission in Meghalaya is still in its initial stage.

The Project will contribute to realization of the aforementioned policies, aiming at sustainable development, the empowerment of rural people, and the improvement of forest quality through participatory planning, inclusive governance, and capacity development for the people and institutions concerned.

(4) Mission on Shifting Cultivation[157]

Mission on Shifting Cultivation prepared by the central government in 2018 shows a direction to transform from shifting cultivation to other agriculture practices or other land use gradually while respecting practice of shifting cultivation. It encourages promotion of home gardens and agroforestry which secure food and nutrition of households practicing shifting cultivation while reducing dependency on shifting cultivation. At the same time, it proposes combining traditional knowledge on agriculture or natural resource management and modern scientific approaches to improve the productivity of the existing practices.

The Mission also points out contradiction of the forestry policy and agriculture polices in terms of shifting cultivation. Forest Policy, 1988 aims to stop or reduce shifting cultivation and restore forest vegetation by planting trees on shifting cultivation lands through the implementation of the schemes including National Afforestation Programmes. However, it is pointed out that tree plantations returned to shifting cultivation areas after the termination of the schemes in most cases. On the other hand, agriculture departments in many states including Meghalaya State intend to promote conversion of shifting cultivation to settled agriculture. However, it is not necessarily suitable for hilly areas because it requires fertilizers, high yield varieties, and irrigation which are not accessible for most households practicing sifting cultivation. Under these circumstances, the Mission proposes development of an institutional mechanism that ensures inter-ministerial convergence involving MoEF&CC and other related ministries. It also proposes land use planning at village level involving community representatives and concerned officials.

[157] NITI Aayog (2018) Report of Working Group III . Shiftnig Cultivation: Towards a Transformational Approa ch (available at https://niti.gov.in/writereaddata/files/document_publication/doc3.pdf (last access 2019/05/03))

In Meghalaya State, Garo Hills ADC issued the Garo Hills District (Jhum) Regulation, 1954 that prescribes the Executive Committee to instruct proper ways of shifting cultivation in terms of location and rotation cycles. The enforcement of the regulation is urgently needed to rectify shifting cultivation practice with short rotation cycle which causes decrease in soil fertility and forest degradation.

7.1.2. Necessity of Restoration and Conservation of Forest

Meghalaya State is rich in forest with a forest cover ratio of 75.6%. However, 42.6% of the total forest area is open forest in 2017 and its area increased by 157 km² between 2013 and 2017, while the total forest area decreased by 142 km² during the same time period. This trend implies that forest degradation has been increasingly progressed in the state[158] and this situation requires interventions to mitigate the negative impacts on the local communities' livelihood and biodiversity.

Forest degradation causes social and environmental problems because it impairs those functions of the forest that prevent soil erosion and recharge water. Since 80% of the population live in rural areas and rely for their livelihoods on forest resources and agriculture, such forest degradation or deforestation adversely affect their lives through the loss of access to NTFPs, shortages of water for domestic and agriculture purposes, and soil erosion. For instance, it is estimated that 120 tons of soil per ha are eroded every year in the state, as discussed in the Pre-DPR. It is also reported that communities have realized that there has been a deterioration in the availability of water in streams and springs in many areas. Those problems make community members, especially the poor, increasingly vulnerable to the loss of their livelihoods.

Such forest degradation also damages local biodiversity and causes human-animal conflicts in the state, especially in the western part, which is recognized as a core habitat of elephants. The state is rich in biodiversity, and 47 threatened fauna, including Western Hoolock Gibbon and Asiatic Elephant, and 1,237 endemic plant species, can be found in the state. Due to forest degradation, however, most of the endemic and threatened species are now confined to protected forests and sacred groves. At the same time, it is reported that 8,087 cases of man-animal conflicts including 7,384 cases of crop raiding, 613 cases of damage to houses, and 47 cases of human injury or death occurred during the last five years[159].

Under these circumstances, in order to prevent the aforementioned social and environmental problems, mitigate their negative impact on local conditions, and conserve biodiversity, the restoration and conservation of forests is urgently needed in the state.

7.1.3. Significant Effects of the Proposed Project Activities for Restoration and Conservation of Forests

The proposed project activities such as livelihood enhancement and land use planning will effectively contribute to the aforementioned required restoration and conservation of forests because these activities can potentially reduce pressure on forests and prevent disordered conversion from forest to other land use. In Meghalaya State, approximately 52,000 households make a living by shifting cultivation[160], which is one of the major drivers of forest degradation. If alternative livelihood means are provided to the local people, they can become less dependent on shifting cultivation. At the same time, the proposed project activities can also potentially enable for effectively controlling land use changes especially on private lands in rural areas. Most of forest lands belong to individuals in the state, especially in Jaintia Hills ADC and Khasi Hills ADC[161], and

[158] FSI report 2013, 2017
[159] Data provided by FED
[160] North Eastern Council Secretariat, Government of India (2015) *Basic Statistics of North Eastern Region 2015*. http://necouncil.gov.in/sites/default/files/uploadfiles/BasicStatistic2015-min.pdf
[161] Information provided by some officials of Jaintia Hills ADC and Khasi Hills ADC

the land owners can decide how to use their own land freely. In these lands, forests are frequently converted to other land use such as monoculture plantations and quarries in a disorderly manner. In this regard, participatory land use planning at community level may work to prevent uncontrolled changes from forest to other land use with consensus of community members.

7.1.4. Necessity of Enhancement of Community-based Forest Management

The state has unique characteristics in terms of forest tenure. Around 90% of the forest belongs to communities, individuals, or clans. According to the Sixth Schedule of the Constitution of India, the Garo Hills District (Forest) Act, 1958, and the United Khasi Hills and Jaintia Hills Autonomous District (Management and Control of Forest) Act 1958, these forests shall be managed by ADCs administratively. In this regard, the Forest Departments (FDs) of the ADCs control and support management of the forests by communities or individuals through such interventions as the registration of the forests to the ADCs, the preparation of working schemes, and the provision of incentives to the communities.

In the past, communities have managed their forests following their customary rules for a long time. With the increasing pressure on forest lands and forest resources from current population growth and economic development, however, their traditional forest management has become less effective in recent years. In this situation, not only ADCs but also FED has made interventions in the management of community-owned or private forests through government schemes such as Joint Forest Management and Community Reserve. In practice, the interventions by FED as well as the ADCs have contributed to the enhancement of the community-based forest management and, as a consequence, to the improvement of forest conditions and revival of wild animals.

In such ways, though both communities and the institutions concerned have been involved in the implementation of forest management for community-owned or private forests, there is still room for increasing efficiency and ensuring sustainability of the forest management through capacity development for the communities and concerned institutions and the introduction of new, advanced scientific techniques.

7.2. Project Objective and Approaches

7.2.1. Project Objective

Project Title: Project for Community-Based Forest Management and Livelihoods Improvement in Meghalaya

Project objective: To restore and conserve natural resources within the villages by sustainable forest management, livelihood improvement, and institutional strengthening, thereby contributing to conservation of environment, biodiversity, and uplifting of socio-economic conditions of people in the State of Meghalaya.

7.2.2. Project Approaches

Based on the analysis of causes of forest degradation in the state, the following approaches are developed and adopted in the Project to achieve the project objective. In the following section, the causes of forest degradation in the state are, firstly, analysed and categorized into direct causes and root causes, which lead to the direct causes. Secondly, approaches to addressing each group of causes are presented.

(1) Causes of Forest Degradation

Causes of forest degradation and/or deforestation in the state are categorized into two groups depending on their relationship to forest changes: direct causes and root causes. The direct causes include shifting cultivation with short rotation cycle, stone quarrying, forest fires, forest fragmentation due to disorderly and excessive economic development, conversion to monoculture

plantations, and over-extraction of forest products, including timber and NTFPs.

On the other hand, root causes include a lack of land use planning at the community level, a lack of alternative livelihood means, and weak institutional arrangements due to change to individualism in communities on the background of economic development. Among the direct causes, conversion to monoculture plantation, stone quarrying, shifting cultivation with short rotation cycle, and forest fragmentation by economic development happen due to a lack of land use planning at the community level. Forest fires caused by lighting fires to regenerate grasses for grazing also partially owe to a lack of land use planning. Conversion to monoculture plantations, shifting cultivation with short rotation cycles, and stone quarrying also have a lot to do with a lack of alternative livelihood means. Insufficient enforcement of customary rules, uncontrolled forest fires that occur by lighting fires for fun, and unscientific forest management result from inappropriate institutional arrangements.

(2) Approaches

1) Measures for Direct Causes

First of all, the Project will deal with the direct causes identified above and existing problems such as forest degradation, soil erosion, and shortages of water. Measurements to deal with these shall be developed and undertaken following the approaches below.

a. Site Specific Approach in Designing and Implementation of Project Activities

Direct causes of forest degradation and deforestation, and the surrounding natural and social conditions vary depending on ADCs. For example, major drivers of forest degradation in Jaintia Hills ADC are listed in order of the degree of impact as follows; forest fire, charcoal burning, quarrying, and shifting cultivation, while shifting cultivation, quarrying, conversion to monoculture plantations, and illegal felling are known as major causes of forest degradation in Garo Hills ADC. In case of Khasi Hills ADC, major drivers are forest fire, quarrying, and charcoal burning. Basic mechanisms of forest degradation caused by these drivers are as follows. First, these drivers damage primary forest vegetation, and this decreases forest cover rate and also changes tree species composition. Subsequently, in case of forest fire and shifting cultivation with a short rotation cycle, natural root-stock is also damaged, and sometimes soil fertility are deteriorated. This makes it difficult for forests to regenerate primary tree species while allowing successional weed-dominated vegetation to grow. At the same time, quarrying and monoculture plantations will cause fragmentation of forest areas. Small patches of forest are vulnerable to environmental changes and human intervention due to their narrow buffer zones.

Forest management systems are also unique in each ADC. In Jaintia Hills ADC, for instance, community forests are categorized into six forest types including Protected Forest, Community Forest, Sacred Grove, Religious Forest, Clan Forest, and Private Forest, and each forest type is managed under different specific rules. Garo Hills ADC, on the other hand, has its own scheme to support community-based forest management known as Village Reserved Forest (VRF). Under these circumstances, project interventions for the existing causes of forest degradation will be designed and implemented in accordance with the unique local situations in each ADC.

b. Harmonization among Project Interventions in Different Components

The harmonization of project interventions in each component is important since activities on sustainable forest management, soil and water conservation, and livelihood improvement are closely related to each other. Thus, the activities carried out on the ground will be designed and implemented while maintaining harmonization among the different components. Soil and water conservation measures, for example, will be designed and carried out focusing on farm lands that contribute not only to environmental conservation, but also to livelihood improvement by increasing agricultural productivity. Soil and water conservation measures will mitigate risks of soil erosion and surface runoff, and as a result, soil fertility of farm lands is maintained. In the same

manner, agroforestry will be designed and conducted from both viewpoints of forest restoration and livelihood improvement. By carrying out these project interventions in different components in a harmonized manner, the project objective will be achieved more efficiently.

2) Measures to Address Root Causes

Measures to address root causes can be categorized into the following three approaches: (a) participatory land use planning by using GIS, (b) enhancement of livelihood through promoting women's motivation and participation, and (c) institutional strengthening. Details of each approach are explained below.

a. Participatory Land Use Planning Using GIS

Land use planning at community level is necessary to prevent forest fragmentation, disorder quarrying, and conversion to monoculture plantations. The community-based land use planning should be conducted in a participatory manner because most of the lands belong to communities or individuals or clans. Through the exercise of the participatory land use planning, it is expected that proper land use plan will be prepared with the agreement between community members including individual land owners. The land use planning may provide benefits to not only an entire community but also land owners since there is possibility that soil and water conservation measures, such as construction of irrigation facilities and establishment of contour terraces, are undertaken as a result of the land use planning. This may work as an incentive for land owners to participate in the land use planning because such measures contribute to maintenance and improvement of productivity of their own lands.

GIS plays a key role to implement community-based participatory land use planning. In Meghalaya State, many kinds of spatial data, such as satellite images and land use and land cover maps (LULC maps) were prepared, and necessary equipment were procured by the past or ongoing projects. Further, in the Project, more updated and detailed data such as land use and land cover maps, forest density maps, forest/vegetation type maps, and topographic maps along with necessary equipment will be also prepared. Unlike the existing paper-based, community social and resource maps prepared based on the community members' subjective perception, these existing spatial data can provide community members with objective information obtained from the sky. The Project will make the best use of the aforementioned spatial data to initiate community-level land use planning and monitoring interventions. Accordingly, the use of GIS as well as spatial information will make it possible for communities to prepare scientific land use plans and share the information between not only community members but also officials of concerned institutions.

b. Enhancement of Livelihoods through Promotion of Women's Motivation and Participation

In order to reduce pressure on forest lands and forest resources, it is needed to introduce new livelihood means or improve productivity of the existing livelihoods including clustering producers and marketing. Enhancement of women's participation in decision making on practice of new livelihood means or methods is essential since women are main actors of livelihood activities. In Meghalaya State, shifting cultivation is one of major livelihood means, particularly in Garo Hills ADC, and shifting cultivation with a short rotation cycle often results in forest degradation. As of 2008, approximately 53,000 ha of land was used for shifting cultivation with 5-7 year rotation cycle[162]. Therefore, alternative livelihood means to shifting cultivation such as horticulture and agroforestry will need to be introduced to local communities. Monoculture plantations of such products as rubber and areca nut have become popular as livelihood means in the state. The total area of rubber plantations increased from 4,029 ha in 2000-01 to 9,196 ha in 2009-10. The total area of areca nut plantations increased from 14,611 ha in 2010-11 to 16,768 ha in 2014-15[163]. However,

[162] North Eastern Council Secretariat, Government of India (2015) Basic Statistics of North Eastern Region 2015. http.//necouncil.gov.in/sites/default/files/uploadfliles/BasicStatistic2015-min.pdf

[163] Directorate of Economics & Statistics, Government of Meghalaya (2017) Statistical Hand Book Meghalaya 2017

it is pointed out that monoculture plantations lose the richness in biodiversity and also decrease soil capacity for water retention. This is supported by the analysis results of the State of the Environment Report 2005[164]. To mitigate these negative impacts, monoculture plantation sites should be improved through mixed planting that plant other tree species among the single dominant plants. For example, forest tree species such as *Albizia* sp. and *Eucalptus* sp. may be planted between areca nut trees[165].

In Meghalaya State, women play an important role in maintaining household livelihoods, but their involvement in decision making in public situations is limited. According to the assessment reports on the past forestry projects conducted in other states of India[166,167], although women participated in implementation of project activities, particularly income generation activities, their participation in decision making was insufficient. Without their participation in decision making regarding planning and benefit sharing, it is difficult for women to have a motivation for introducing new livelihood means or improving methods of the current livelihoods. In order to address the issue effectively, the Project will promote women's participation in decision making process through the enhancement of women's capacity and leadership while transferring unequal gender relations and gender roles rooted in the target areas. In the state, although women inherit land, they do not have control over those inherited land. Besides, women are excluded from membership in traditional hierarchical institutions, such as village councils or *Dorbar*, *Raid/Sordor*, and *Hima*. Under these circumstances, such unequal gender relations need to be addressed.

c. Institutional Strengthening

Institutional strengthening also plays an essential role to address the root causes of forest degradation and deforestation. Institutional strengthening includes three sub-approaches: (1) facilitation to implement the existing schemes, (2) capacity development for communities and institutions concerned, and (3) introduction of advanced scientific techniques for data collection and monitoring.

c.1 Facilitation to Implement the Existing Schemes

Various schemes regarding forest management and livelihood improvement, which were developed by the central governments or ADCs, are adopted in the state. The existing schemes can be used as powerful tools to realize sustainable forest management and livelihood improvement. Thus, the Project facilitates the implementation of the existing schemes. In terms of livelihood improvement, for example, there is a centrally sponsored scheme, called "Mission for Integrated Development of Horticulture" (MIDH). It is important to address livelihood improvement in an integrated and comprehensive way. For this, local people need to not only increase the productivity of cash crops with the inputs of irrigation, quality seeds and other agricultural inputs, but also enhance their marketing skills. MIDH covers these areas holistically. Utilizing such existing schemes is more efficient and effective than creating new schemes or systems to improve livelihoods or forest conditions and eventually contribute to the achievement of the project objective.

c.2 Capacity Development of Communities and Institutions Concerned

Capacity development for the communities and institutions concerned including PMU in MBDA, the Forest Departments of ADCs, and FED and SWCD of the State Government is essential for smooth implementation of project activities and ensuring sustainability of the Project after the

http://megplanning.gov.in/handbook/2017.pdf

[164] Department of Environment and Forest, Government of Meghalaya (2005) *State of the Environment Report 2005*: Meghalaya. http://www.moef.nic.in/soer/state/SoE%20report%20of%20Meghalaya.pdf

[165] Singha, S. et al. 2018. "Homestead Agroforestry Systems Practiced at Kamalgani Upazila of Moulvibazar District in Bangladesh". *Asian Journal of Research in Agriculture and Forestry* 2 (2):1-8.

[166] JICA. 2017. *Gender Mainstreaming into JICA's Loan Programs Focused on Forest Resource Management*. Tokyo: JICA.

[167] JICA. 2015. *Country Gender Profile for Republic of India*. Tokyo: JICA.

project period. Thematic trainings on conceptual and practical knowledge and skills regarding gender, financial management, and land use planning will be provided to community members and officials of institutions concerned. Moreover, mechanisms of decision-making and a reporting within one institution or between multiple institutions need to be improved at each level for proper planning and monitoring of the project activities.

c.3 Introduction of Advanced Scientific Techniques for Data Collection and Monitoring

As a part of the capacity development for the communities and institutions concerned, new advanced techniques will be introduced to effectively conduct project activities and finally achieve the project objective. In particular, GIS related technologies will be a powerful tool for the implementation of participatory land use planning. They will be also effective for not only planning, but also monitoring and evaluating project activities at community level in a quantitative manner. Spatial data newly collected using new advanced technologies and existing data in the database established by the ongoing projects will be used in combination, and various thematic maps will be effectively prepared. The prepared thematic maps and their attribute information will be further displayed online, and this will make it possible for major stakeholders to conduct efficient planning, monitoring, and evaluation of the project activities.

7.3. Prioritization of Project Sites

7.3.1. Target Area and Potential Beneficiaries

The Project aims to restore and conserve natural resources within the villages by sustainable forest management, livelihood improvement, and institutional strengthening, thereby contributing to conservation of environment, biodiversity, and uplifting of socio-economic conditions of people in the State of Meghalaya. As the Project shall be implemented in a participatory manner, target area is selected on village basis. The villages which needs to improve degraded forests and to raise people's level of living conditions shall be prioritized in the Project. These areas/villages can be characterized by low vegetation cover, high exposure of soil surface, steep slope, and forest degradation. Therefore, target area shall be selected based on high level of degradation, high level of vulnerability to soil erosion and severity of socio-economic conditions. These villages will require basic infrastructure including water supply facilities and livelihood activities due to unfavourable living conditions, in addition to conservation activities such as the development of community forests, water conservation, and catchment area protection.

The Project will also select villages which shall become models for other villages. Villages that have already initiated forest conservation activities shall be selected as model in the Project. Villages/village clusters with community forests and private forests registered to ADC shall become the project target, and advanced interventions including agroforestry and horticulture shall be conducted. Table 7.1 shows different features of the first group (Group 1) and second group (Group 2) villages/village clusters respectively. This table also shows proportion of the number of villages/village clusters between the two groups.

Table 7.1: Different Features of the First and Second Groups Villages

	Group 1	Group 2
Purpose	To enhance the quality of forest and reduce risks of soil erosion in degraded areas. To improve poor living conditions due to the above environment.	To create a model for Group 1 villages/village clusters that are backwards in respect of project interventions.
Typical Features	Physical/Natural: - Low vegetation cover - High exposure of soil surface - Steep slope	Physical/Natural: - Rich vegetation cover Socioeconomic: - Registered forests to a government

	Group 1	Group 2
	- Degradation of forest <u>Socioeconomic:</u> - High rate of deprivation	scheme or ADC - High accessibility to road networks and market
Expected Interventions	<u>Conservation activities:</u> - Development of community forests - Soil and water conservation - Catchment area protection	<u>Advanced interventions:</u> - Agroforestry - Non-Timber Forest Products - Supply chain development
Proportion (%)	90	10

Source: developed by Study Team

Further, in order to implement the project interventions effectively, the Project shall be implemented by Block because all villages/village clusters are located within one of any block boundaries that also matches ADC boundaries.

7.3.2. Selection Method

(1) Block Selection

Blocks are prioritized based on soil erosion and forest degradation. Blocks whose the ratio of total areas categorized as "Very High", "High" and "Medium" in the soil erosion vulnerability map[168] are 70% and above, and whose rate of change of total areas from 'Medium Dense Forest' to 'Open Forest', and from 'Very Dense Forest' to 'Open Forest' are one km^2 and above are prioritized as target Block in the Project[169]. For efficient implementation of the Project, Blocks where the number of eligible villages is less than 25 which have not been supported by IFAD and World Bank projects are excluded. Furthermore, for appropriate regional distribution, adjustment shall be made in order to include all the three ADCs. The result of selection exercise is as per Annexure 4. As a result of Block selection, 22 Blocks from 11 Districts are identified for the project target (Table 7.2).

Table 7.2: Project Target Districts and Blocks

District	Block
12. West Garo Hills	Dalu Rongram Tikrikilla Gambegre
13. South West Garo Hills	Zikzak Betasing
14. North Garo Hills	Resubelpara Kharkutta
15. East Garo Hills	Songsak Rongjeng Samanda
16. South Garo Hills	Rongra Baghmara Gasuapara
17. West Khasi Hills	Mairang

[168] The vulnerability to soil erosion map produced by North Eastern Space Applications Center (NESAC) is referred. This map shows prioritization of sub-watersheds based on vegetation cover derived from Normalized Difference Vegetation Index (NDVI), exposure of soil surface derived from Soil Brightness Index (SBI), and slope.

[169] In FSI reports, the entire state is classified into five forest cover classes based on density: (1) Very dense forest (> 70%), (2) Moderately dense forest (40 to 70%), (3) Open forest (10 to 40%), (4) Scrub (< 10%), and (5) Non forest. In this context, forest degradation is defined by forest cover change from Very dense or moderately dense forests (40% or over) to Open forest (10 to 40%).

District	Block
18. South West Khasi Hills	Mawkyrwat
19. Ri-Bhoi	Umsning Umling
20. East Khasi Hills	Mawryngkneng Mawkynrew
21. West Jaintia Hills	Thadlaskein
22. East Jaintia Hills	Saipung
Total 11 Districts	**Total 22 Blocks**

Source: developed by Study Team

(2) Village Selection

Villages/village clusters that have already been supported by the other external programs namely Megha-LAMP and MCLLMP shall be excluded from the selection target. At the same time, whenever applicable, villages/village clusters in unsecured/land conflict areas and those located in areas where relocation is required are also excluded from the selection target. Village/village clusters for the first group are prioritized based on the deprivation rate using the latest census[170]. For the second group, villages with community forests and private forests registered to ADC and distance up to 2 km from village roads are selected from the Blocks prioritized according to ratio of area categorized as "Low" and "Very Low" in the soil erosion vulnerability map. Adjustment shall be made in order to select villages/village clusters from all three ADCs. Finally, site verification is conducted in candidate villages/village clusters. In the site verification, villages/village clusters that do not meet requirements in terms of the local physical/natural environment and socioeconomic conditions are excluded from the project target. At the same time, villages/village clusters that do not express willingness to participate in the project are also excluded from the project target (Table 7.3).

Table 7.3: Selection Criteria for Target Blocks and Villages/Village Clusters

No.	Criteria
Step 1: Selection of Blocks	
1	Select blocks based on vulnerability to soil erosion: 1) Blocks whose total 'very highly vulnerable', 'highly vulnerable' and 'medium' rate of vulnerability to soil erosion areas are 70 % and above. Prioritize blocks based on degradation rate: 2) Blocks whose rate of change of total areas from 'Medium Dense Forest' to 'Open Forest', and from 'Very Dense Forest' to 'Open Forest' are 1 km^2 and above. Exclude blocks based on the number of villages supported by other donor projects: 3) Exclude the block which has below 25 number of villages which have not been supported by IFAD and World Bank projects. Include blocks under all ADC's jurisdiction: 4) Include 'Thadlaskein' and 'Saipung' blocks which are closest to threshold (the total 'very highly vulnerable', 'highly vulnerable' and 'medium' rate of vulnerability to soil erosion are 70 % and above) from Jaintia Hills Blocks because there is no Jaintia Hills block in the selected blocks.

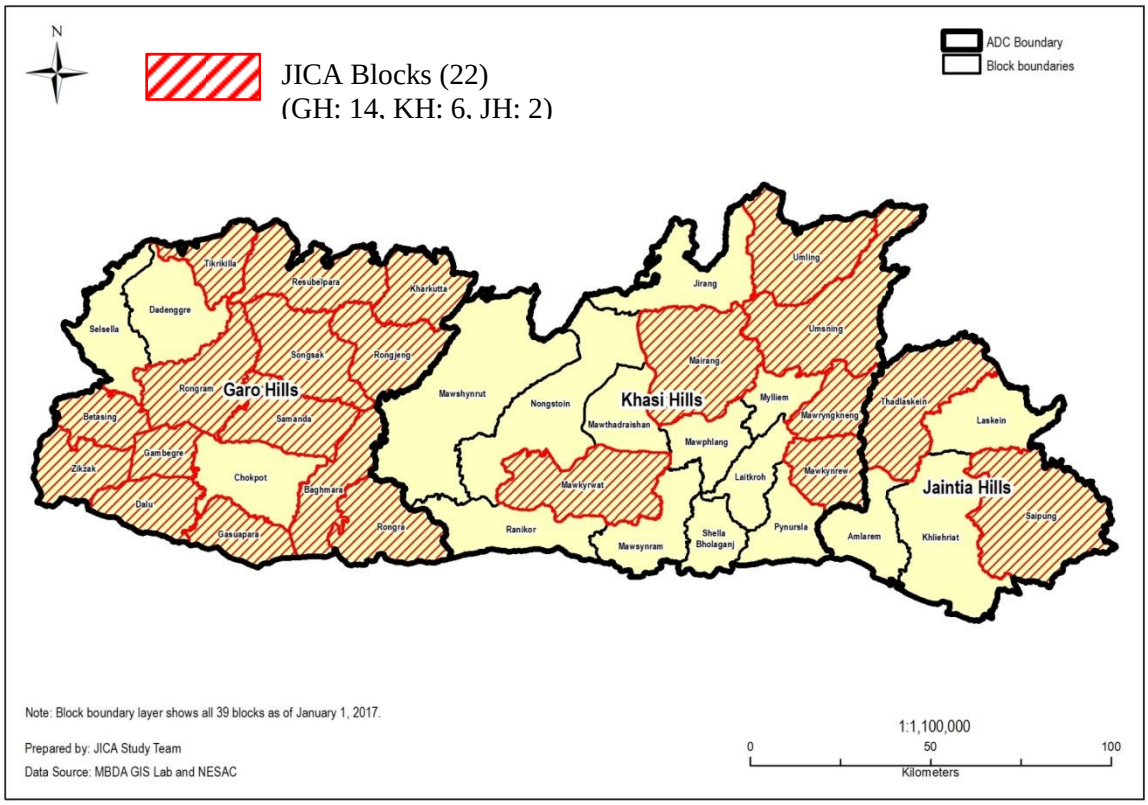
[170] In this site selection, deprivation is described by all or some of the following parameters: (1) households with only one room, kuccha walls and kuccha roof, (2) No adult member in household between age 18 and 59, (3) Female headed household with no adult male member between 16 and 59, (4) Households with differently able member with no other able bodied adult member, (5) Households with no literate adult above age 25 years, and (6) Landless households deriving a major part of their income from manual labour.

No.	Criteria
Step 2: Exclusion of villages/village clusters	
2	Exclude villages/village clusters previously supported by Megha-LAMP or MCLLMP. Exclude villages/village clusters in unsecured/land conflict areas (if applicable) Exclude villages/village clusters in areas where relocation is required.
Step 3: Selection/Prioritization of villages/village clusters for Group 1	
3	Select villages based on deprivation rate: - Prioritize villages in descending order of deprivation rate from selected Blocks. - Conduct site verification. - Exclude villages/village clusters that do not meet requirements in local environment and conditions. - Exclude villages/village clusters that do not express willingness to participate in the Project. - Select 20 ~ 25 villages per one Block in descending order of deprivation rate from selected Blocks.
Step 4: Selection/Prioritization of villages/village clusters for Group 2	
4	Prioritize Blocks based on vulnerability to soil erosion: - Prioritize Blocks in descending order of total areas of vulnerability to soil erosion are 'Very Low' or 'Low' from selected Blocks. Select villages with forest conservation schemes and accessibility to road networks - Select 50 villages with community forests and private forests registered to ADC and distance up to 2 km from village roads.

Source: developed by Study Team

7.3.3. Prioritized Project Sites

Figure 7.1 illust rates the selected target Blocks of the Project.



Source: developed by Study Team

Figure 7.1: Target Blocks of the Project

7.4. Overview of the Proposed Project

7.4.1. Logical Framework

Logical framework of the entire scope of the Project is presented in the following page. The Project will be designed according to this logical framework.

Logical Framework

Project for Community-Based Forest Management and Livelihoods Improvement in Meghalaya

Original Draft (Prepared on 2019.07.16) Project Duration: 2019 to 2029

Version history: Version 0 Target Group: Communities in Meghalaya State

NARRATIVE SUMMARY	OPERATION AND EFFECT INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Overall GOAL To contribute to conservation of environment and biodiversity, and uplifting of socio-economic conditions of people in Meghalaya State.			
PROJECT PURPOSE To restore and conserve natural resources within the target villages in Meghalaya State.	1. Accessibility to water is increased by 40 % 2. Soil erosion is decreased by 50 %	1. Baseline survey and impact assessment 2. Records of FD of ADCs budget and interviews to ADCs	There is no major natural disaster that adversely affect the project areas.
OUTPUTS 1. Restoration of degraded forest areas and forest conservation is implemented through sustainable community forest management.	1.1 500 of CR/VRF/CF are registered 1.2 22,500 ha of forests are managed. 1.3 22,500 ha of community/privately owned forests are demarcated with maps	1.1 Baseline survey and records of FD of ADCs 1.2 Records of FED/FD of ADCs 1.3 Records of FED/FD of ADCs	- There is continuing commitment from the Government of Meghalaya and Jaintia Hills, Khasi Hills, and Garo Hills Autonomous District Councils - Laws and policies related to the project are not changed adversely - Security and political conditions are stable

2. Inclusive community development is promoted by facilitating women and youths' active participation and livelihoods of community people is improved by providing alternative livelihood means.	2.1 Women occupy more than 33 % of the project sub-committee members, specifically chairperson and vice chairperson on average. 2.2 The portion of women and youths' participants in the project activities, including forest management, GIS mapping, micro-planning, IGA, etc. is increased.Target will be decided in the time of baseline survey. 2.3 Average number of household income sources are increased and annual total household income of target villages is increased by 30 % 2.4 On at least 22 kinds of enterprise, feasibility study and market research are conducted, based on which enterprise development are promoted.	2.1 Record of Village Implementation Committees 2.2 Baseline survey and impact assessment 2.3 Baseline survey and impact assessment 2.4 Impact assessment	
3. Capability and capacity of community and governmental institutions is strengthened.	3.1 100 % of concerned institutions uses GIS related techniques for planning and monitoring	3.1 Report of SPMU/DPMU/BPMU	

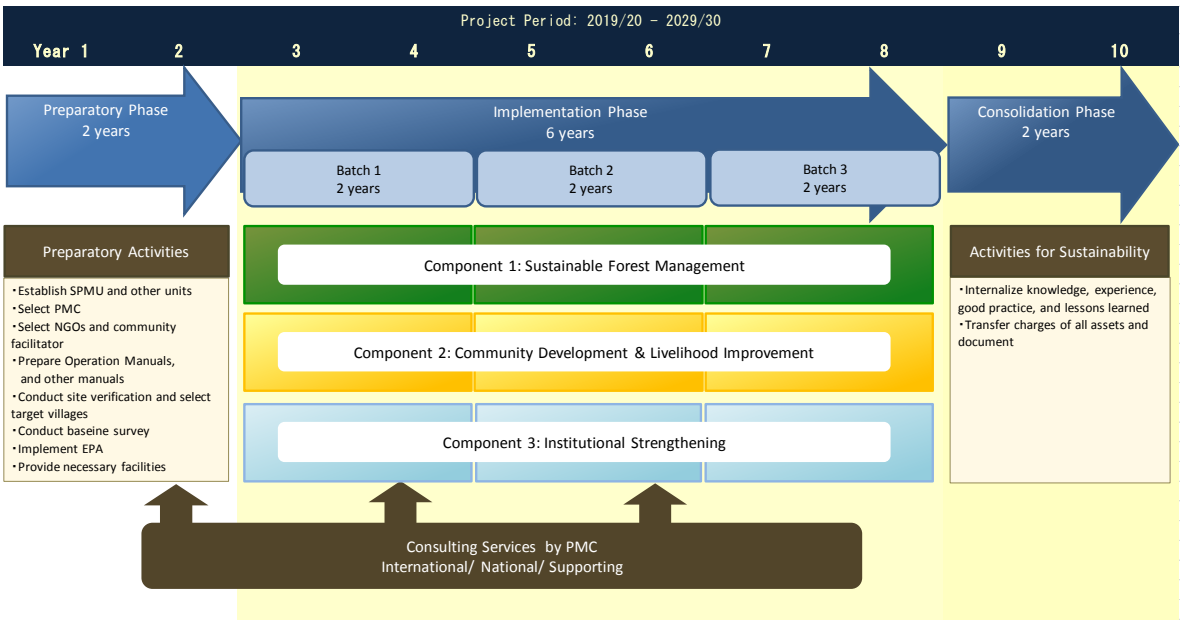
Activities	**Inputs**		
0. Preparation 0.1 Setting up State Project Management Unit (SPMU) and other required units. 0.2 Selection of Project Management Consultant (PMC) 0.3 Preparation of all manuals including O&A, procurement, and micro-planning 0.4 Selection of NGOs and community facilitators 0.5 Site verification and selection of target villages 1. Sustainable Forest Management (Component 1) 1.1 Participatory land use planning 1.2 Restoration of degraded forest areas 1.3 Forestry nursery 1.4 Conservation and protection of existing forests and biodiversity 1.5 Forest research 1.6 Soil and water conservation for forest management 2. Community Development and Livelihood Improvement (Component 2) 2.1 Community mobilization and gender sensitization 2.2 Micro planning 2.3 Entry Point Activities (EPAs) 2.4 SHG Activities 2.5 Soil and water conservation for livelihood improvement 3. Institutional Strengthening (Component 3) 3.1 Capacity development 3.2 Monitoring and evaluation 3.3 Infrastructure and mobility 3.4 PR and publicity 3.5 PMU establishment	1. International Experts in the following field: 1) Co-Team Leader/Community Forestry (16M/M) 2) GIS & Remote Sensing (7M/M) Sub-Total: 23M/M 2. National Experts in the following field: 3) Team Leader/Livelihood (47M/M) 4) Capacity Development and Gender (26M/M) 5) MIS and M&E (20M/M) 6) Forestry and Biodiversity (14M/M) 7) Soil and Water Conservation (11M/M) 8) Marketing (16M/M) 9) Community-based Enterprise Development or Ecotourism (11M/M) 10) Agriculture/Agforestry (21 M/M) Sub-Total: 166M/M 3. Equipment: Equipment necessary for the project implementation such as office equipment 4. Trainings/Workshops:		

Source: developed by Study Team

7.4.2. Project Phase

Figure 7.2 shows the organizations of project components and flow of three phases. The Project under formulation is planned to have implementation period of 10 years, whereas the loan agreement period will be 13 years after the loan agreement becomes effective. The entire project implementation period will consist of three phases including: Preparatory Phase (24 months), Implementation Phase (72 months), and Consolidation Phase (Phase out) (24 months).

The Project has three key components including: (1) Sustainable Forest Management, (2) Community Development and Livelihood Improvement, and (3) Institutional Strengthening. A supplemental component to the Project is Project Management Consultant.



Source: developed by Study Team

Figure 7.2: Organizations of Project Components and Flow of Three Phases

Preparatory Phase

The Preparatory phase is crucial for successful implementation of the Project and involves various activities. This phase will start with institutional arrangement. State Project Management Unit (SPMU) and other required units including District Level Project Management Unit (DPMU) and Block Level Project Management Unit (BPMU) will be established. Orientation for SPMU and the other units will be conducted. Project Management Consultants (PMC) and NGOs will be selected. Target villages/village clusters will be selected through site verification by batch. Community mobilization workshops will be conducted at the selected villages/village clusters in prior to preparing for land use plans and micro plans. Entry Point Activity (EPA) will be conducted while waiting for approval of the micro plans. All manuals including Operation & Accounting procedure, procurement and micro planning manuals, and compendium of on-going government programmes/schemes will be prepared. Remote sensing satellite data will be also procured, and necessary maps will be prepared using the remote sensing satellite data.

Implementation Phase

In the Implementation phase, activities for all components including sustainable forest management and community development and livelihood improvement will be carried out. Based on the land use plans and micro plans, forest management activities, livelihood improvement and enterprise

development activities, and soil and water conservation activities will be conducted in the first batch of villages. These project activities will be also conducted in subsequent batches of target villages in a phased manner. Moreover, monitoring and evaluation of the progress of the project activities will be conducted in this phase.

Consolidation Phase (Phase-out)

In the Consolidation phase, the sustainability of assets created under the Project will be ensured by internalizing lessons learnt from the project activities, experiences, and procedures, and transferring charges of all assets and documents.

Table 7.4 shows tentative project phases and main activities during each phase.

Table 7.4: Tentative Project Phases and Activities

Phase	Year	Project Activities
Preparatory phase	2019/20-2021/22 (two years)	Setting up State Project Management Unit (SPMU) and other required units, selection of Project Management Consultants (PMC), preparation of all manuals including Operational & Accounting procedures (Operation Manual providing detailed guidelines for project implementation), procurement and micro planning manuals, compendium of on-going government programs/schemes, selection of resource organizations/teams of NGOs, detailed remote sensing satellite data based mapping and analysis, finalization of selection criteria, orientation of SPMU and other required units, finalization of the first batch of target villages, initiating required strengthening/development of infrastructure, site preparation, and selection of sites for raising nurseries for quality planting material and baseline surveys in the first batch.
Implementation phase	2021/22-2027/28 (six years)	Preparing implementation plans in the first batch of villages and activities, including forestry interventions as well as community development and IGAs (livelihood improvement and enterprise development), selection of remaining project village, and implementing project activities in subsequent batch of villages in phased manner.
Consolidation phase	2028/29-2029/30 (two years)	Ensuring sustainability of assets created under the Project, internalizing project learning, experiences, procedures, and best practices evolved in the course of project implementation, and transferring charges of all assets created under the Project and documents.

Source: Pre-DPR

7.4.3. Implementation by Batches

Considering the other states' cases, the implementation phase will be tentatively divided into several batches; each batch has a two-year period.

Table 7.5: Image of Batch-wise Target Outputs

	Batch 1	Batch 2	Batch 3
Year	2019/20-2021/22	2021/22-2023/24	2023/24-2025/26
Implementation activities conducted	30 %	40 %	30 %

Source: developed by Study Team

7.4.4. Preparatory Works for Participatory Approach

Activities under the Project are site-specific in order to address the diverse needs which differ from one village to another. Therefore, the Project will apply a participatory approach throughout the life of the Project starting from planning, implementing, and operating to maintenance by sensitizing and engaging people. Preparatory works will be conducted in the following order in the two-year preparatory phase.

Community Mobilization and Constitution of Committee for the Project (Component 2.1)

The first step of preparatory works to engage people is community mobilization. Block Project Management Unit (BPMU) will invite village elders and Village Employment Council (VEC) for the first contact and explain the Project. Once they show willingness to participate in the Project, BPMU will support communities to formulate Village Project Implementation Committee (VPIC) as a sub-committee of VEC.

BPMU will conduct sensitization workshops to ensure that all the stakeholders including minor groups such as women and youth.

Participatory Land Use Planning (Component 1.1)

Once VPIC is formulated in a village, NGOs and BPMU will facilitate VPIC to develop participatory land use plan. Officers from FED, SWCD and ADCs, who are members of VPIC will also provide technical support for participatory land use planning. Land use plan is a fundamental document based on which all the project activities will be planned and carried out.

Micro Planning (Component 1.1 and 2.2)

VPIC will make Micro Plan in a participatory manner based on participatory land use plan. NGOs and BPMU will provide VPIC with technical support to formulate Micro Plan. Micro Plan under the Project is an integrated plan comprising three plans, namely forest management plan, watershed conservation plan and income generation plan. In making Micro Plan, VPIC may choose implementing mode in terms of sustainable forest management and create appropriate sub-committee depending on the objectives. In case VPIC choose to implement sustainable forest management by Joint Forest Management supported by FED, VPIC will formulate JFM Committee and prepare micro plan according to relevant guidelines and Government Order. VPIC will constitute Community Reserve Management Committee (CRMC) in case they decide to register the forest to Community Reserve. If VPIC will decide to register their forests to ADCs' conservation schemes, they will constitute required committee including Village Reserve Committee (VRC)

7.5. Project Components

The Project has three core project components and one supplemental component to achieve the project objective.

- Component 1. Sustainable Forest Management
- Component 2. Community Development and Livelihood Improvement
- Component 3. Institutional Strengthening
- Supplemental Component. Project Management Consultant

The overview of the components of the Project for Community-Based Forest Management and Livelihoods Improvement in Meghalaya is as given below (Table 7.6).

Table 7.6: Outline of the Project

Key Work Quantities
District: 11 Block: 22 Target Village: 500 Target Area of Sustainable Forest Management: 22,500 ha SHGs to be Covered: 1,000
1. Sustainable Forest Management
1.1 Participatory Land Use Planning 1.1.1 Land Use Planning of Selected Sites at 1:10,000 Scale 1.1.2 Facilitation of Participatory Land Use Planning at Communities 1.2 Restoration of Degraded Forest Areas 1.2.1 Constitution of JFMC and Preparation for JFMC Micro-Plan 1.2.2 Registration of VRF/CF and Preparation for Resolution 1.2.3 Restoration of Timber Resources (ANR with Enrichment Plantation) 1.2.4 Restoration of Natural Vegetation (ANR) 1.2.5 Afforestation on Barren Land (AR) 1.2.6 Restoration of Shifting Cultivation Areas (ANR) 1.2.7 Restoration of Degraded Lands due to Quarrying (ANR) 1.2.8 Improvement of Corridors (ANR) 1.3 Forestry Nursery 1.3.1 Creation of Permanent Nurseries 1.3.2 Improvement of Existing Nurseries 1.3.3 Creation of Community Nurseries 1.4 Conservation of Forests in Good Conditions 1.4.1 Constitution of Community Reserve and Preparation for Community Reserve Management Plan 1.4.2 Preparation for Working Schemes 1.4.3 Establishment of New Check Points 1.5 Forest Research 1.6 Soil and Water Conservation for Forest Management 1.6.1 Bench Terracing (Eathen Structures) 1.6.2 Earthen/Loose Boulder Contour Bunds 1.6.3 Earthen/Loose Boulder Box Terracing 1.6.4 Construction of RCC Check Dam 1.6.5 Construction of Minor Irrigation Check Dam 1.6.6 Construction of Conservation Pond (which can be also used for fishery) 1.6.7 Construction of Conservation Pond/Dug out Pond 1.6.8 Construction of RCC Water Storage Tank for Drinking Water 1.6.9 Construction of Spring Tapped Chamber
2. Community Development and Livelihood Improvement
2.1 Community Mobilization and Gender Sensitization 2.1.1 Community Mobilization Workshops 2.1.2 Gender-sensitization Workshop/Gender Training 2.2 Micro-planning 2.2.1 Training/Workshops on How to Make a Micro Plan 2.2.2 Conducting PRA 2.2.3 Planning a Micro Plan Converged with Available National/State Schemes

2.3 Entry Point Activities (EPAs)
- 2.3.1 Prioritization of EPAs
- 2.3.2 Conducting EPAs

2.4 SHG Activities
- 2.4.1 Selection of SHGs in Each Selected Village
- 2.4.2 Micro-credit Activity
  - 2.4.2.1 Providing Revolving Fund per Village
  - 2.4.2.2 Training/Workshop on Micro-credit Activity
- 2.4.3 Income Generation Activities (IGAs)
  - 2.4.3.1 Training Needs Assessment/Market Research
  - 2.4.3.2 Training and Exposure Visits
  - 2.4.3.3 Provision of Seed Money for Each Selected SHG
  - 2.4.3.4 Construction of Facility/Infrastructure Necessary for IGAs
- 2.4.4 Enterprise Development Activities
  - 2.4.4.1 Feasibility Studies & Pilot Projects for Enterprise Development

2.5 Soil and Water Conservation for Livelihood Improvement
- 2.5.1 Construction of Rainwater Harvesting Structure
- 2.5.2 Construction of Drinking Water Tank

3. Institutional Strengthening

3.1 Capacity Development
- 3.1.1 Training Needs Analysis
- 3.1.2 Training, Exposure Visits and Workshops
- 3.1.3 JICA Forestry Sector Annual Workshop
- 3.1.4 NGOs/Resource Organizations

3.2 Monitoring and Evaluation
- 3.2.1 Baseline Survey
- 3.2.2 Setting Target for the Operation and Effect Indicators
- 3.2.3 Annual Planning and Review Meetings
- 3.2.4 Concurrent Monitoring
- 3.2.5 Statutory Audit
- 3.2.6 Mid-term Evaluation
- 3.2.7 Terminal Evaluation
- 3.2.8 MIS and GIS Monitoring

3.3 Infrastructure and Mobility
- 3.3.1 Office Buildings
- 3.3.2 Vehicles and Motorbikes
- 3.3.3 GIS/MIS
  - 3.3.3.1 Enhancement of GIS/MIS Facilities
  - 3.3.3.2 Map Preparation

3.4 PR and Publicity

3.5 PMU Establishment
- 3.5.1 Establishment of SPMU/DPMU/BPMU
- 3.5.2 Deployment and Recruitment of Staff
- 3.5.3 Establishment of Management Bodies
  - 3.5.3.1 Governing Body
  - 3.5.3.2 Executive Committee
  - 3.5.3.4 External Advisory Committee
- 3.5.4 Preparation of Manuals and Accounting Systems

3.6 Procurement of PMC

3.7 Overseas Training

Source: developed by Study Team

7.5.1. Component 1: Sustainable Forest Management

To restore and conserve natural resources within villages aiming at conserving the environment and biodiversity and improving socio-economic conditions of community members, the following activities will be conducted under Component 1. Sustainable Forest Management during the project period (Table 7.7).

Table 7.7: Activities for Sustainable Forest Management

Sec. No.	Activity	Site selection	Survey/ design	Construction/ O&M
C1.1	Participatory Land Use Planning			
C1.1.1	Land Use Planning of selected site at 1:10,000 Scale	FED/ADC	FED/ADC	FED/ADC
C.1.1.2	Facilitation of Land Use Planning at Communities	FED/ADC	Community with support from NGO	Community
C1.2	Restoration of Degraded Forest Areas			
C1.2.1	Constitution of JFMC and Preparation for JFMC Micro-plan	FED/ADC/ JFMC	FED/ JFMC	JFMC
C1.2.2	Registration of VRF/CF and Preparation for Resolutions	Community	ADC	Community
C1.2.3	Restoration of Timber Resources (ANR with Enrichment Planting)	FED/ADC/ Community	FED/ADC/ Community	Community
C1.2.4	Restoration of Natural Vegetation (ANR)	FED/ADC/ Community	FED/ADC/ Community	Community
C1.2.5	Afforestation of Barren Land (AR)	FED/ADC/ Community	FED/ADC/ Community	Community
C1.2.6	Restoration of Shifting Cultivation	FED/ADC/ Community	FED/ADC/ Community	Community
C1.2.7	Restoration of Degraded Lands due to Quarrying	FED/ADC/ Community	FED/ADC/ Community	Community
C1.2.8	Improvement of Corridors	FED/ADC/ Community	FED/ADC/ Community	VRC
C1.3	Forestry Nursery			
C1.3.1	Creation of New Permanent Nurseries	ADC	ADC	ADC
C1.3.2	Improvement of Existing Permanent Nurseries	FED	FED	FED
C1.3.3	Creation of Community Nurseries	FED/ADC	FED/ADC	Community
C1.4	Conservation of Forests in Good Conditions			
C1.4.1	Constitution of Community Reserve and Preparation for Community Reserve Management Plan	FED	FED	CR Management Committee
C1.4.2	Preparation for Working Schemes	ADC/Forest owner	ADC with support from FED	Forest owner under supervision of ADC
C.1.4.3	Establishment of New Check Points	ADC	ADC	ADC
C1.5	Forest Research	FED	FED	FED

Source: developed by Study Team

"Community" in Table 7.7 indicates either VPIC, JFMC, CRMC or VRC depending on the

activities to be implemented. In making Micro Plan, community will decide which scheme they apply according to their needs and objectives. Activities related especially to soil and water conservation under this component (Section C1.6) are summarized in Table 7.11

(1) C1.1 Participatory Land Use Planning

Before making a micro plan including a forest management plan and a livelihood improvement plan, which is described in detail in C.2.2, it is necessary to make a frame of land use plan to identify which part of a village will be used for what purpose covering the entire area of a village. In other words, land use zoning at village level shall be prepared before making a micro plan. This land use planning shall be conducted by community members including men and women in a participatory manner. Thus, this activity is called Participatory Land Use Planning (PLUP).

PLUP is quite similar to making a micro plan prepared by a JFMC according to the guideline developed by the central government agency. However, in the Project, JFM scheme will be adopted to only some part of the project target area. In other areas, other schemes such as Village Reserve Forest (VRF) and Community Forest (CF) registered to the ADC concerned will be adopted for sustainable forest management. VRF or CF does not require preparation for a micro plan regulated by the JFM guideline. Therefore, PLUP needs to be conducted in a uniformed manner in the Project in all target villages to conduct proper land use zoning at village level from long-term view.

1) C1.1.1 Land Use Planning of Selected Sites at 1:10,000 Scale

For the land use planning, the Project prepares the four sets of maps: (1) Land use/land cover maps, (2) Forest density maps, (3) Forest/vegetation type maps, and (4) Topographic maps (e.g. roads, rivers, streams, contours, and settlements). Based on the inputs from land use zoning, a new set of maps are produced as "land use zoning map," which intends to display future plan of zoning. First, the land use/land cover maps can be used for the study and estimation of land use patterns of selected sites. Second, the forest density maps can be used for the study and estimation of the size of areas that conservation activities are needed and the availability of open areas for plantation and other treatments in each selected site. Third, the vegetation type maps can be used for the study and estimation of existing vegetation types, potential NTFPs, and needs for planting materials. Fourth, the topographic maps can be used for planning of assets under Entry Point Activity (EPA) and measures for soil and water conservation.

For effective use in land use planning, these maps need to be printed. These maps are printed by block before target villages/village clusters are selected. After the target villages/village clusters are selected and their boundaries are surveyed, these maps are printed by village/village cluster at the 1:10,000 scale. In this regard, it is important to remember that some villages/village clusters, areas outside the surveyed boundaries may be involved for their local activities, and maps are printed accordingly.

One GIS operator is involved in meetings by a sub-committee organized under Village Employment Council (VEC) for the Project, to explain the map to the community and assist the sub-committee in detailed planning. The micro plans are to be prepared using Participatory Rural Appraisal (PRA) method involving the community members and these maps can be used as reference for the accurate planning. The suggestions/outcomes of the micro plans can be incorporated into GIS for future reference.

2) C1.1.2 Facilitation of Participatory Land Use Planning at Communities

PLUP shall be conducted by involving community members including women and men. NGOs hired will facilitate discussion and activities by villagers, specifically members of the micro-planning team or the sub-committee, with support from forest officials of FED or the Forest Department of the ADCs, officials of SWCD, and a GIS operator. The facilitation will be conducted following the guideline prepared by SPMU for the Project, which is described in detail in C2.2.

Major steps of the facilitation of PLUP are shown in Table 7.8.

Table 7.8: Steps of Facilitation for PLUP

Step	Work Item	Activities
1	Preparatory meeting	BPMU officers and NGO concerned will organize a preparatory meeting with the village head and other representatives of the village to explain the purpose and outlines of PLUP.
2	Orientation meeting	NGO will hold an orientation meeting for villagers, especially the members of the sub-committee, to explain the objective, procedure, and methods of each activity for PLUP. During the meeting, the villagers will also discuss a vision of the village, including what kind of the environment and livelihood they want to have in 30 years.
3	Community sketch map preparation	Villagers, mainly the sub-committee members, will prepare a community sketch map including information on current land use, forest conditions, water resources, and farm lands in order to understand the current land use and natural resources and develop a shared understanding on them among villagers.
4	Comparison between the community sketch map and the map prepared using GIS	The community sketch map will be compared to the 1:10,000 scale map prepared using GIS in order to understand the current land use, forest conditions, and natural resources objectively in terms of area and location.
5	Land use zoning	Based on the objective understanding and spatial information visualized on the land use base map, villagers will discuss appropriate land use zoning to achieve their vision while maximizing benefits for the entire community including land owners from long-term view. If there is possibility for land owners to receive negative impacts of the land use zoning, measures to avoid them will be discussed. Finally, a land use zoning map will be prepared.
6	Identification of sites for the project intervention	Based on the land use zoning map, the villagers will identify target areas of the Project for sustainable forest management, soil and water conservation, and livelihood improvement.

Source: developed by Study Team

(2) C1.2 Restoration of Degraded Forest Areas

To achieve the project objective, degraded forest areas shall be restored through forest operations such as assisted natural regeneration (ANR) and artificial regeneration (AR). Since most of forests in the state belong to communities or individuals, such forest operations will be conducted by communities with support from FED or the Forest Departments of the ADCs. In this regard, an agency or committee for the implementation of forest restoration activities at village level shall be first constituted. The constituted agency or committee will prepare a plan of forest management including use. In the following sections, organization of the agency or committee and preparation for the management plan will be first explained. Next, detail implementation plans of each type of restoration activity categorized by the drivers of forest degradation will be described.

1) C1.2.1 Constitution of JFMC and Preparation for JFMC Micro-Plan

Justification and Objectives

According to the Joint Forest Management (JFM) Circular issued by the Government of India (GoI) in 1990 and the JFM guidelines subsequently issued in 2000 and 2002, the Government of Meghalaya introduced JFM in 2003 by promulgation of the notification No. FOR. 64/99/186. As of February 2019, 366 Joint Forest Management Committees (JFMCs) were developed covering 30,741 ha of forests in total. This achievement implies that JFM is applicable in the state and that FED has enough experience for implementation of JFM, so that it is reasonable to adopt JFM as one of schemes for the implementation of community-based forest management in the Project.

JFMCs will be constituted for the implementation of restoration of degraded forests conducted by FED's initiatives.

Steps and Method

A JFMC will be constituted in target villages of the Project according to the aforementioned notification by the Divisional Forest Officer in consultation with ADC concerned. JFMC shall consist of General Body (GB) and Executive Committee (EC). The former consists of an adult member from each household and the latter consists of a chairman, a vice chairman and seven other members. Out of seven, five members shall be elected by GB, one member shall be nominated by the ADC concerned, and another member shall be nominated by FED, who shall be the member secretary of EC as well as the secretary of the GB.

After the constitution, JFMC shall prepare a micro plan according to the JFM guidelines issued by Ministry of Environment and Forest in 2000. In the Project, detail methods and procedure of making a micro-plan shall follow the guideline prepared by the Project for keeping uniformity in all target villages including those which manage forest by other schemes. The methods and procedure are described in C2.2 in detail.

Responsibility

FED will be responsible for constitution of JFMCs. Active participation of ADCs will be required in constitution of JFMCs. Regarding the preparation for a micro-plan, JFMCs will primarily be responsible for formulation of a JFMC micro plan, which replaces a forest management plan of a micro plan uniformly prepared in the Proejct, but other members of the sub-committee or the micro-planning team will also be responsible for making a micro plan including a livelihood improvement plan and a soil and water conservation plan. Forest officials of Beat office and NGOs will facilitate preparation of a JFMC micro-plan by the JFMC and other members of the sub-committee with support from other officials concerned.

2) C1.2.2 Registration VRF/CF and Preparation for Resolution

Justification and Objective

More than 90 % of forest areas belong to communities or individuals in the state and such forest area is administered by the ADCs. According to the Garo Hills ADC (Forest) Act 1958, communities can register their community forest as a Village Reserve Forest (VRF) to the ADC. Although the Khasi Hills ADC and Jaintia Hills ADC do not have any specific schemes like VRF in Garo Hills ADC, communities can register their own forests to the ADCs as "Community Forest (CF)". Communities which have registered their own forests as either VRF or CF to the ADCs will be used as an implementation agency at village level for the implementation of restoration of degraded forests in the Project.

Steps and Method

Registration of VRF or CF and preparation for resolution in each VRF or CF will be proceeded following steps and methods. Major steps of constitution of VRF in Garo Hills ADC are described below:

Step 1: The Forest Department of Garo Hills ADC will explain target villages of the Project about constitution of VRF, and identify target villages for the restoration of forest vegetation.

Step 2: The Forest Department of the ADC will make a survey and demarcate the target area in collaboration with communities concerned and prepare a digital map of the area with support from FED upon necessity.

Step 3: A Village Reserve Committee (VRC) shall be organized chaired by *Nokma* for management of the VRF.

Step 4: The VRC prepares a resolution to manage the VRF.

At the same time, the procedure for the registration of CF in Jaintia Hills ADC and Khasi Hills ADC is as follows:

Step 1: The Village Head fills out an application form for the registration of community forest.

Step 2: Traditional Authority, *Dolloi* (*Aking*), which is a vested authority from the District Council, approves the application.

Step 3: The Forest Department of ADCs dispatches their staff to the site and conduct survey and inquiry.

Step 4: After the survey, the Forest Department issues a letter of claim and objection within 30 days.

Step 5: The Forest Department issues a certificate with TOR on forest management which the village needs to follow. The village also prepares their own detailed rules of forest use.

Step 6: Village Head implements forest management with the Executive Committee. Village Head holds a village meeting, *Dorbar*, with all villagers once per year and discuss the implementation of forest management activities

3) C1.2.3 Restoration of Timber Resources (ANR with Enrichment Planning)

Justification and Objectives

ANR with enrichment planning shall be applied to degraded areas by illegal felling or over felling in order to restore timber resources either for domestic or commercial purposes for the future. In case an owner of the forest is willing to fell trees for commercial purpose, the forest shall be registered to Working Scheme.

Steps and Method

ANR with Enrichment Planting will be conducted following the below steps and methods every year (Table 7.9).

Table 7.9: Steps and Methods of Restoration of Timber Resources

Step	Work Item	Method
Preliminary Year		
1	Site selection	A site for ANR with enrichment planting will be selected through discussion among community members by the following criteria: (i) a site degraded due to illegal felling, or disordered or over felling for timber production, and (ii) a site will be used for timber production either for domestic or commercial purposes.
2	Tree species selection	Tree species suitable for timber will be selected considering natural conditions in the planting site by community members with advice from forest officials. Major candidate species are *Piunus kesiya* for Jaintia Hills and Khasi Hills ADCs' areas, and Sal (*Sorea robusta*) for Garo Hills ADC area.
3	Survey and demarcation	The selected site will be surveyed using GPS, and the boundary will be marked at strategic points.
4	Jungle clearance and land preparation	Unnecessary trees and shrubs will be cut and removed to create space for planting timber species. Pits of 30 cm x 30 cm x 30 cm size will be dug in blank areas for planting seedlings. In case of ANR, 200 seedlings will be planted per ha.

Step	Work Item	Method
5	Fencing	A fence will be made along the boundary with peripheral earthen bunds and local materials such as bamboo and timber.
First Year of Plantation		
1	Vacancy filling	Mortality areas will be identified and new seedlings will be planted in the areas.
2	Weeding	Weeding will be conducted three times in the same manner as the first year.
3	Fire protection	Fire line clearance and fire watch will be conducted in the same manner as the first year.
Second Year of Plantation		
1	Vacancy filling	Mortality areas will be identified and new seedlings will be planted in the areas.
2	Weeding	Weeding will be conducted three times in the same manner as the first year.
3	Fire protection	Fire line clearance and fire watch will be conducted in the same manner as the first year.
Third Year of Plantation		
1	Vacancy filling	Vacancy filling will be conducted whenever necessary in the same manner as the second year.
2	Weeding	Weeding will be conducted two times in the same manner as the first year.
3	Fire protection	Fire line clearance and fire watch will be conducted in the same manner as the first year.
Fourth Year of Plantation		
1	Weeding	Weeding will be conducted one time in the same manner as the first year.
2	Fire protection	Fire line clearance and fire watch will be conducted in the same manner as the first year.
Fifth Year of Plantation		
1	Weeding	Weeding will be conducted one time in the same manner as the first year.
2	Fire protection	Fire line clearance and fire watch will be conducted in the same manner as the first year.
3	Singling Out	Singling out will be conducted to provide proper spacing from one plant to another.

Source: developed by Study Team

Responsibility

Community members in target villages play a main role to create and maintain the plantation with technical advice and support from forest officials of FED or the Forest Department of ADCs.

4) C1.2.4 Restoration of Natural Vegetation (ANR)

***Justification* and Objective**

Vast areas in the state are degraded due to over extraction of forest resources including firewood, materials for charcoal making, and other NTFPs. Such degraded forests need to be restored and conserved in order to fulfil communities' needs and wishes. Although the areas are degraded, they still have some trees and high potential of natural regeneration. Thus, ANR by planting indigenous tree species including bamboo and NTFP species shall be adopted to restore natural vegetation on

the degraded forest areas. Communities are encouraged to register the forest to conservation schemes including VRF and CF.

Steps and Method

ANR for restoration of natural vegetation will be implemented in the same manner as those mentioned in C1.2.1 except tree species to be planted. Instead of timber species, indigenous tree species including bamboos and NTFP species will be planted in this activity. Tree species to be planted will be decided by communities.

Responsibility

In the same manner as C1.2.1, the community members play a main role to create and maintain the plantation with technical advice and support from forest officials of FED or the Forest Department of ADCs.

5) C1.2.5 Afforestation on Barren Land (AR)

***Justification* and Objective**

There are vast barren lands in the state, especially in Khasi Hills ADC areas, which are caused by forest fires, sometimes coupled with over grazing. Under these circumstances, natural regeneration of tree species is hardly expected since grass is infested and soil is compacted. Thus, AR shall be adopted to re-generate forests on such barren lands. Communities are encouraged to register the forest to conservation schemes including VRF and CF.

Steps and Method

Following the Cost Norms for creation and maintenance of Plantations & Nurseries 2018-2019, the steps and method for the implementation of AR for afforestation on barren lands are basically the same as those mentioned in C1.2.1 except the number of trees planted per hectare, spacing of tree planting, and selection of tree species. In case of AR, 1,100 seedlings will be planted per hectare with spacing of 3m by 3m. Tree species to be planted will be selected by community members and vary depending on their needs.

Responsibility

In the same manner as C1.2.1, community members play a main role to create and maintain the plantation with technical advice and support from forest officials of FED or the Forest Department of ADCs.

6) C1.2.6 Restoration of Shifting Cultivation Areas (ANR)

***Justification* and Objective**

Shifting cultivation with a short rotation cycles (e.g. 3 to 5 years) is one of major drivers of forest degradation in the state, especially in the Garo Hills ADC area. If fallow lands will be left alone, forest vegetation will naturally revive under the climate of Meghalaya, since root stocks remain on the land, and seeds will be provided from surrounding forests. In order to accelerate restoration of forest vegetation and introduce tree species useful for livelihood improvement, ANR will be further adopted to restore fallow lands or degraded forest areas in the Project. Communities are encouraged to register the forest to conservation schemes including VRF and CF.

Agroforestry will be another option to improve the forest ecosystem on fallow land and support the livelihoods of local communities. In the Project, agroforestry will be carried out under Component 2 in the Project.

Steps and Method

Steps and methods for the implementation of ANR for restoration of shifting cultivation are the same as those mentioned in C1.2.1 except tree species to be planted. Tree species will be selected by community members and vary depending on their needs and wishes. They include bamboos and NTFP species.

Responsibility

In the same manner as C1.2.1, community members play a main role to create and maintain the plantation with technical advice and support from forest officials. However, in case of restoration of shifting cultivation areas, forest officials of the Forest Department of Garo Hills ADC play a particularly important role to support communities since shifting cultivation is conducted mainly in the Garo Hills ADC areas as mentioned above.

7) C1.2.7 Restoration of Degraded Lands due to Quarrying (ANR)

***Justification* and Objective**

Quarrying is another major driver of deforestation and land degradation in the state, especially in the Khasi Hills ADC area. Though surface soil is removed in quarrying, pioneer trees such as pine can grow naturally under such conditions. Fortunately, in the Khasi Hills ADC area, vast pine forests are expanding and, in fact, it was observed that pine trees naturally grew on denuded land after quarrying in some areas. However, in order to accelerate or ensure the restoration of forest cover, ANR will be adopted in the Project. Communities are encouraged to register the forest to conservation schemes including VRF and CF.

Steps and Method

ANR for restoration of degraded lands due to quarrying are implemented basically in the same manner as those mentioned in C1.2.1 following the Cost Norms for creation and maintenance of Plantations & Nurseries 2018-2019. However, considering unique conditions of the areas where surface soil was removed, pioneer trees such as pine will be planted at the initial stage. Several years after growing pine trees, mixed trees species will be planted among pine trees.

Responsibility

Basically, the community members play a main role to create and maintain the plantation with technical advice and support from forest officials of FED or the Forest Department of the ADCs like C1.2.1. At the same time, because it is supposed that the majority of degraded lands due to quarrying belong to individuals, individual land owners also play a major role to restore forest vegetation through ANR. In this regard, particularly forest officials of the ADCs need to approach and encourage individual land owners to restore forest vegetation on the degraded areas.

8) C1.2.8 Improvement of Corridors (ANR)

Justification and Objective

Man-animal conflicts, wild elephants in most cases, are one of major issues to be addressed in the state. A main cause of the conflicts is the fragmentation of forests due to economic development and the expansion of shifting cultivation areas. In order to mitigate negative impacts of the conflicts, the linkages of elephant corridors need to be improved. Specifically, forests within the corridors shall be improved by planting tree species preferred by wild elephants, such as jackfruit, which provide canopies for wild elephants to move and prevent wild elephants from straying into residential areas or farm lands. Jackfruit will also contribute to improvement of livelihood of local people by providing fruit and timber.

Steps and Method

Steps and methods for the improvement of corridors are basically the same as those mentioned in C1.2.1 since it is carried out through ANR. Obviously, sites for this activity shall be selected in five elephant corridors already identified in Garo Hills ADC areas.

Responsibility

Communities in target corridors take a responsibility for planting trees. As of May 2009, the five elephant corridors have been identified in Garo Hills ADC area, and as a result, the Forest Department of Garo Hills ADC plays a vital role to support the communities for this activity. In addition, since both ends of each corridor are located within a National Park, Reserve Forest, or Wildlife Sanctuary, which are managed by FED, the collaboration between the Forest Department of the ADC and FED is required.

(3) C1.3 Forestry Nursery

To meet demands for seedlings required for the implementation of aforementioned forest restoration or afforestation through ANR and AR, new permanent forestry nurseries will be created under management of the ADCs and existing permanent nurseries managed by FED will be improved. According to the policy of using quality planting materials (QPM) by FED, seedlings with a certain quality will be produced at permanent nurseries managed by FED or the ADCs in order to ensure high survival rate and vigorous growth of seedlings after being planted in the field. However, because it is difficult to procure all necessary seedlings for the plantations from the permanent nurseries and transport seedlings to all plantation sites, community nurseries will be also established near plantation sites in some areas where nurseries can be established

1) C1.3.1 Creation of Permanent Nurseries

As of May 2019, out of three ADCs in the state, only Jaintia Hills ADC has a permanent nursery. Based on the proposal of the ADCs and upon necessity of producing seedlings for the implementation of aforementioned ANR and AR in forests registered as VRF or CF to the ADCs, permanent nurseries shall be established under the ADCs. Tentative target is the establishment of eight nurseries in the ADCs: one in Khasi Hills ADC, one in Jaintia Hills ADC, and six in Garo Hills ADC in accordance with the estimated ratio of plantation areas in each ADC area and based on the proposal of nursery establishment from each ADC.

Land availability and conditions of candidate sites will be examined from the following aspects: accessibility to road, permanent water supply, proper drainage with gentle slope, supply of suitable soil materials, and low possibility of flooding.

The specifications of the permanent nurseries are as follows: permanent nursery beds, manure mixing space, frame and shade for protection of seedlings from frost during winter and direct sunlight in warm areas, and fence. They correspond to the specifications indicated in the Cost Norms for Creation and Maintenance of Plantations & Nurseries 2018-2019 prepared by FED and also adopted in the Forest Department of the ADCs.

At the permanent nurseries newly constructed under the ADCs, seedlings will be produced by the staff of the Forest Department of each ADC. In case of Khasi Hills ADC and Garo Hills ADC, which do not have any nurseries at this moment, technical support may be provided by FED upon necessity. Steps and methods of the seedling production in the first and second years are shown in Table 7.10.

Table 7.10: Steps and Methods of Seedling Production

Step	Work Item	Activities
First Year		
1	Preparation for seeds	Collect or procure seeds from reliable sources.
2	Preparation for nursery beds	Prepare standard-sized nursey beds (13 m x 1.3 m) for placing the polythene bags.
3	Construction of fence	Construct fence with posts made from wood or bamboo.
4	Preparation for mother beds	Prepare mother beds including breaking clods, removing foreign materials, mixing sand with decomposed cow dung/compost, and sow seeds and make watering.
5	Preparation for polythene bags	Collect top soil, break clods, remove foreign materials, mix soil with sand and manure, and fill up poly bags with the mixed soil.
6	Construction of shade	Construct shade for protecting seedlings from frost during winter and direct sunlight during summer.
7	Pricking out	Prick out seedlings from mother beds and transplanting in poly bags, and make watering.
8	Maintenance	Conduct weeding and make watering.
Second Year		
1	Weeding	Conduct weeding three times.
2	Watering	Conduct watering during dry season.

Source: developed by Study Team

2) C1.3.2 Improvement of Existing Nurseries

Seedlings required for the implementation of aforementioned ANR and AR on JFM target areas will be produced mainly at nurseries managed by FED. As of May 2019, there are 4 permanent nurseries (central nurseries) in 3 divisions, two high tech nurseries (HTNs) in East Garo Hills District and Ri-Bhoi District, 29 range level nurseries, and 7 beat level nurseries. In order to meet increasing demands of seedlings for the implementation of aforementioned ANR and AR, it is necessary to improve some of the existing nurseries by installing new facilities including a mist chamber, vermi-compost, and sprinklers.

A tentative target is the improvement of 15 nurseries in 7 Division Forest Offices. This means that 2 to 3 existing nurseries will be upgraded in each division. DFOs will choose candidate nurseries to be improved and decide in consultation with the FED Headquarters.

In the improved nurseries, Range Officers will be responsible mainly for seedling production under supervision of DFO. Steps and methods of seedling production in improved nurseries are the same as those at the newly constructed nurseries described in C1.3.1.

3) C1.3.3 Creation of Community Nurseries

Community nurseries will be established to complement shortfall of seedlings produced at the nurseries managed by the ADCs or FED. Location of community nurseries shall be decided from the following aspects: accessibility to road, permanent water supply, proper drainage with gentle slope, supply of suitable soil materials, and low possibility of flooding. The location will be decided by communities in consultation with forest officials of the ADCs or FED.

The specifications of a community nursery are as follows: temporary nursey beds, manure mixing space, shed, mother beds, and fencing. Community nurseries will be established by community members, especially members of committees in charge of restoration of forest vegetation, such as JFMC and VRC, with technical support by forest officials of the ADCs or FED.
Seedling production at community nurseries will be also conducted by the community members with technical support by forest officials of the ADCs or FED. Steps and methods of seedlings

production at community nurseries are the same as those at the permanent nurseries described in C1.3.1.

(4) C1.4 Conservation of Forests in Good Conditions

To achieve the project objective, it is necessary to conserve forests in good conditions while planting trees in degraded forests or barren lands to restore forest vegetation. Because more than 90 % of forests in the state belong to communities or individuals, the following three activities will be appropriate measures for conservation of forests in good conditions.

1) C1.4.1 Constitution of Community Reserve and Preparation for Community Reserve Management Plan

Based on section 36 of the Wildlife (Protection) Amendment Act, 2002, Community Reserve (CR) can be constituted to protect fauna and flora, and traditional or cultural conservation rules and practices. As of February 2019, 64 CRs have been declared by the state government.

The Wildlife Division of FED has responsibility for constitution and declaration of CR and ADCs have responsibility for the registration. In order to constitute CR, the Wildlife Division first conducts awareness raising for communities. Next, upon interest of a community in constitution of CR, the Wildlife Division facilitates the procedure of CR constitution. Specifically, the Division conducts a survey on fauna and flora, demarcates boundaries, and establishes boundary pillars.

After the declaration of CR, Community Reserve Management Committees (CRMC) shall be organised by five representatives of the community to manage CR. CRMC needs to prepare and implement a management plan for CR with support from the Wildlife Division. The Division also provides incentives to the communities including construction of infrastructure in CR such as paved trails, toilets, and signboards.

2) C1.4.2 Preparation for Working Schemes

Working Schemes need to be prepared for timber harvesting for commercial purposes according to the Supreme Court Order of 1996 that bans the felling of trees in any forests, except as per the prescriptions of a scientifically-prepared Working Scheme approved by GoI. At the same time, Working Scheme contributes to realization of sustainable forest management since it identifies sustainable annual yield in a scientific manner and restricts permittable annual yield to half of the sustainable annual yield. It also regulates that trees with the girth of its trunk less than 90 cm should not be harvested.

In principle, the ADCs have a responsibility for preparing Working Schemes. In practice, Working Schemes are prepared by collaboration with forest owners and FED, particularly the GIS laboratory and Working Plan Division. The procedure and main actors of preparation for Working Schemes are shown in Figure 3.3.

Though a new Working Scheme of Jaintia Hills ADC that is pending approval covers only one block due to financial constraints, in principle, a Working Scheme covering the entire ADC area shall be prepared at each ADC. Thus, it is expected to prepare three Working Schemes in total in three ADCs during the project period.

3) C.1.4.3 Establishment of New Check Points

Illegal logging is one of the major drivers of forest degradation. The Forest Departments of the ADCs have several check points to inspect whether logs or timber transferred was legally harvested. The number of the existing check points is not enough to control illegal logging and transferring. In case of Jaintia Hills ADC, there are only three check points in its jurisdiction areas. Thus, new check points will be established in three ADCs' jurisdiction areas. The location of new check points

will be strategically decided by the Forest Department of the ADCs. Design and construction of new check points will be conducted by the Forest Departments of the ADCs.

(5) C1.5 Forest Research

FED has very limited experience with forest research except orchard and pitcher plant propagation due to insufficient human and financial resources. It is necessary to enhance research or thematic study and develop new technologies on forest management in order to restore forest vegetation and conserve forest and biodiversity efficiently. There are many potential themes, such as inventory of NTFPs including medicinal plants, value addition of NTFPs, effective charcoal making methods, and bamboo charcoal making.

Regarding charcoal making, at present, though villagers can make charcoal by a conventional and primitive method by mounding soil on woods placed on the ground, there is still room for improvement of the method with modern technologies. Charcoal making from bamboo also has possibility to be developed since some experiment on charcoal making from bamboo was tried in the state[171]. If charcoal can be made from bamboo, this contributes to minimizing use of wood for charcoal making.

Another potential theme is to develop restoration technologies of degraded areas due to coal mining. Top soil was removed, and remaining soil was compacted in such areas, therefore, special technologies are required to restore ecosystem of the areas. For example, a small scale experimental plot for restoration of ecosystem of post coal mining land will be established to develop methods of the restoration.

Research themes to be treated under the Project will be decided by FED in consultation with SPMU and the Forest Departments of the ADCs in the preparatory phase of the Project. Tangible or measurable outputs shall be set when research themes are decided. Research activities should be action-oriented. Thus, although FED will be mainly responsible for implementation of the research, collaboration with relevant departments or institutions and involvement of communities, if possible, will be required.

In addition to the above potential themes, the following research topics shall also be prioritized.

Biological Control of Invasive Weed

In fact, the research on biological control of invasive weed has just begun by FED in collaboration with Rain Forest Research Institute (RFRI). Since the state has huge areas affected by forest fires and covered with invasive weeds that prevent natural regeneration of tree species, it is urgently needed to enhance and promote this research. In case that this topic is addressed in the Project, this research will be conducted continuously in collaboration with RFRI. Especially, Silviculture Division of FED will be responsible for making a plan and coordination with RFRI in implementation of this research.

Establishment of Experimental Seed Production Area (SPA)

Establishment of Seed Production Area (SPA) such as seed orchards is important to secure supply of genetically superior seeds for production of high quality seedlings which is essential for success of restoration of forest vegetation by tree planting through ANR or AR. At present, seedlings purchased from suppliers in Assam State are frequently used for tree planting in Meghalaya State, but their genetic resources are unknown. Most of FED's nurseries use seeds collected locally including those collected from mother trees in Reserved Forests or community forests. This situation does not ensure stable supply of high quality seeds. Under such circumstances, it is useful to establish an experimental SPA and study proper methods of establishment and management of SPA or a seed orchard. Silviculture Division of FED will be responsible for this research in

[171] Results of interview with DFO Territorial on 18th June, 2019.

collaboration with Divisional Forest Office in which an experimental SPA is established.

Conservation of Endangered and Threatened Species

Though Meghalaya is rich in biodiversity, 47 species of fauna and 436 species of flora are endangered and threatened or rare species. In order to conserve the rich biodiversity in the state, research on endangered and threatened species shall be conducted. First, target species for the research will be identified considering priority of protection. Then, natural habitat mapping for the species will be conducted. This research shall be conducted by involving communities since most of endangered species are confined to sacred groves that are protected and managed by communities. At the same time, community people are sometimes engaged in exploitation of endangered species for selling them to traders from some neighbouring countries without proper understanding on the species. Therefore, it is important to involve communities particularly in this research and conservation of endangered and threatened species. Wildlife Division of FED will be responsible for the implementation of this research.

(6) C1.6 Soil and Water Conservation for Forest Management

Meghalaya State has extremely erosive soil with intensive rainfall. Soil erosion is deemed as one of the most contributing factors of forest degradation and sediment disasters in streams and rivers. Therefore, intensive countermeasures for the soil and water conservation are required in addition to the sustainable forest management activities in the Project. To contribute sustainable forest management in the target areas, the following activities for the soil and water conservation will be conducted as one of the Component 1 of the Project (Table 7.11).

Table 7.11: Soil and Water Conservation Activities

<table>
<tr><th>Sec. No.</th><th>Activity</th><th>Site Selection</th><th>Survey/ Design</th><th>Construction/ O&M</th></tr>
<tr><td>C1.6.1</td><td>Bench Terracing (Earthen Structures)</td><td rowspan="9">SWCD and DPMU</td><td rowspan="5">DPMU</td><td rowspan="9">Construction: DPMU

O&M: BPMU & Communities</td></tr>
<tr><td>C1.6.2</td><td>Earthen/Loose Boulder Contour Bunds</td></tr>
<tr><td>C1.6.3</td><td>Earthen/Loose Boulder Box Terracing</td></tr>
<tr><td>C1.6.4</td><td>Construction of Check Dam</td></tr>
<tr><td>C1.6.5</td><td>Construction of Minor Irrigation Check Dam</td></tr>
<tr><td>C1.6.6</td><td>Construction of Conservation Pond (which can be also used for fishery)</td><td>DPMU (in consultation with WRD*)</td></tr>
<tr><td>C1.6.7</td><td>Construction of Conservation Pond/Dug Out Pond</td><td rowspan="3">DPMU</td></tr>
<tr><td>C1.6.8</td><td>Construction of RCC Water Storage Tank for Drinking Water</td></tr>
<tr><td>C1.6.9</td><td>Construction of Spring Tapped Chamber</td></tr>
</table>

*WRD: Water Resources Department, Government of Meghalaya
Source: developed by Study Team

Respective activities as listed above are described and provided examples of existing projects hereunder:

1) C1.6.1 Bench Terracing (Earthen Structures)

Bench terraces (Figure 7.3) are series of flat beds constructed across the hill slope separated at regular intervals in a step like formation. Manual labour as well as bulldozer can be engaged to form bench terraces. Bench terraces with inward slopes should be adopted in the high rainfall areas such as Meghalaya State. The alignment of bench terraces on slope should be made to obtain convenient width making deviations wherever necessary for depressions; sharp turn's field boundaries and so forth. However, the loss of surface area due to bench levelling under bunds, risers' outlets is by far the largest loss in terracing. Such measures are normally adopted where soil

depth is more than 1.0 m. Terracing of the entire hill slope is not necessary since trees and horticultural crops can be raised without terraces. Only the lower portion of the hills needs to be terraced for agricultural crops. The terrace risers, which constitute 30% to 40% of total area, can be utilized for growing perennial fodder grasses and legumes, which not only help in conservation but also provide enough fodder.

Figure 7.3: Bench Terracing

(Source: IWMP-IV)

2) C1.6.2 Earthen/Loose Boulder Contour Bunds

In Meghalaya State, where steep slopes are widely distributed with heavy annual rainfall, there is a need for forest management measures that can promote forest conservation and restoration while preserving the water environment for holding easily effective available water. Earthen/Loose boulder contour bunds (Figure 7.4) are low cost structures of soil conservation that promotes water retention and helps prevent soil erosion. They were originally constructed in the cultivated land on gentle slope other than paddy fields where the farmers planted different types of vegetables. However, even in forest management, especially in the transplanting of seedlings/saplings, this countermeasure is an important preservation technique to prevent soil runoff in planted areas and retain effective water content. With the construction of such bunds along the contour lines, the loss of precious top soil in the afforestable land is greatly reduced to a considerable extent which could be understood from the better crop production as compared to earlier situation.

Figure 7.4: Earthen/Loose Boulder Contour Bund

(Source: IWMP-IX)

3) C1.6.3 Earthen/Loose Boulder Box Terracing

The box terracing method is usually in combination with contour ridges of afforested areas. Partitions in between ridges are made so that rain water can be held in the box, and sheet erosion which occurs in parallel direction with the ridges can be prevented. Generally, the process of the construction will be divided into two (2) steps: 1). Earthwork in excavation for structures by manual means as per drawing and technical specification clause 305.1 (Figure 7.5) including setting out, construction of shoring and bracing, removal of stumps and other deleterious materials and disposal up to a lead of 50 m including dressing the side and bottom and back filling in trenches with excavated suitable material, 2) Providing stone pitching with one man size boulders not less than 25 cm x 25 cm x 30 cm long including filling the interstices with spoils and carriage of stone within 200 m complete as the technical specification.

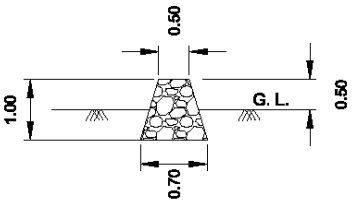


Figure 7.5: Loose Boulder Box Terracing

(Source: IWMP-XV)

4) C1.6.4 Construction of RCC Check Dam

In the Project, two (2) models of check dams will be built in valleys related to the sustainable forest management activities in target catchment areas: RCC Check Dam and Minor Irrigation Check Dam. Site condition, main purpose and stakeholders of activities of respective check dams are summarized in Table 7.12 below:

Table 7.12: Check Dams Applied in the Project

	RCC Check Dam (C1.6.4)	Minor Irrigation Check Dam (C1.6.5)
Type	 (Source: IWMP-XI)	 (Source: IWMP-I)
Proposed site condition	Lower part Terrain: wide valley Slope: gentle, less than 10% Catchment less than 20 ha (less than 447 m square), with water spread area around 2 ha	Upper part Terrain: narrow valley (just downstream site of gully) Slope: 10-20 % or > 20% Catchment less than 5 ha (less than 223 m square)
Main purpose	Water conservation in the forest and plantation areas	Water conservation and domestic water use
Site selection	DPMU in consultation with SWCD	
Survey/design	DPMU under assistance of SWCD and BPMU	
Construction	Construction by VPIC and SWCD under supervison of DPMU	
Operation	Communities with technical support of SWCD	
Maintenance	Communities with technical support of SWCD	

There are many remarkable bank erosion sites along streams in the forest. The bank erosion is not only cause of the excessive sediment discharge, but also cause of loss of cropland for villagers' livelihood and risk of slope failure. According to the existing report[172], the procedure of site selection, survey and design, construction, operation and maintenance of the check dams are as follows:

Site selection

Step 1: To screen small catchments by area (<5ha, <10ha, and <20 ha) with points where are the streams related to the sustainable forest management activities using satellite imagery/aerial photos and GIS by SWCD and DPMU of the Project.

Step 2: To identify the potential sites by DPMU of the Project, in consultation with BPMU and representative members of the target community, in consideration of the following matters:

- The water storage area of the check dam should be as large as possible.
- The length of the check dam (the width of valley) should be as short as possible.
- Soil materials should be available on site.
- Sites should be with appropriate accessibility from villages.
- Sites should be appropriate for the proposed activities.

[172] JICA. 2018. *Interim Report of Preparatory Study on Tripura Sustainable Forest Management Project in Republic of India*

Step 3: To confirm the potential sites and to finalise proposed check dam sites by the joint inspection of BPMU and representative members of the target community, in consideration of the numbers of respective check dams per a community and the characteristics in the area.

Survey and design

Topographic survey of the check dam sites of the target community shall be conducted by DPMU.

Design of each check dam shall be prepared by SWCD in accordance with the revised guideline for the soil and water conservation. Base on the design, required cost shall be estimated by the SWCD under the assistance of DPMU. DPMU will approve the proposed design and amount sanctioned, and minutes of understandings shall be signed between DPMU and VPIC as occasion arises.

Construction

Construction of the each check dam shall be conducted by sub-division level SWCD with communities under the supervision of district level SWCD.

Operation/monitoring

Each check dam will be operated and monitored by SWCD and the community under assistance of DPMU.

Maintenance

Meghalaya has extremely erosive soil with intensive rainfall. Due to this condition, the earthen part of the check dams, especially downstream slope of embankment, will deteriorate. Therefore, periodical maintenance works are indispensable to maintain the function of the check dams. Required repair works of the periodical maintenance will be conducted once in every two years with repair of embankment slope and its vegetation cover, especially downstream slope of the check dam, and removal of sediment in the pond. Design of the maintenance works of all models shall be prepared by DPMU. The Periodical maintenance works for each check dam will be conducted by BPMU and community under the technical assistance of DPMU.

In addition to the periodical maintenance works of the check dams, repair of the vegetation cover of the embankment slope shall be conducted at any time.

5) C1.6.5 Construction of Minor Irrigation Check Dam

While the purpose of the RCC Check Dam is to irrigate to a certain area, this type of dam mainly intends to conduct water into small-scale plantation areas with low water retention capacity. In addition, it is a secondary effect that it provides water sources for the daily life of the local residents. The construction procedure of the dam is as described in C1.6.4.

6) C1.6.6 Construction of Conservation Pond (which can be also used for fishery)

The water conservation ponds managed by communities help in lifting water supply for forest areas and irrigation for cultivation of vegetables such as cabbage, carrot, potato and ginger. It also can be used for pisciculture and as a breeding centre of local fish varieties (Figure 7.6). Invariably, the pond has an impact on the micro-climatic condition of the catchment besides increasing the water table status and filtration rate of water movement. The community can derive optimum benefits from the conservation pond on a sustainable basis. Besides, a concrete example of benefit that the fishery pond brought is described in C2.5.

7) C1.6.7 Construction of Conservation Pond/Dug-out Pond

Conservation Pond/Dug-out ponds (Figure 7.7) are constructed by excavating soil from an area to form a hole which is then filled with water. They are usually undrainable and fed by rainfall, surface runoff or groundwater. Dug-out ponds can sometimes be built near a flowing stream or river to utilize

groundwater, instead of surface water. The excavated soil can then be used to make a berm around the dug-out if the area is prone to flooding, reducing the chance of unwanted fish entering the pond.

The ponds usually aim at providing irrigation water to seedlings and crops particularly during the dry periods between rains. They are low cost and highly efficient structures and enable the farmers to earn extra income. These are also in good working condition, and some have been further improved and renovated by the beneficiaries themselves.

Figure 7.6: Conservation Pond (for Fishery)

(Source: IWMP-I)

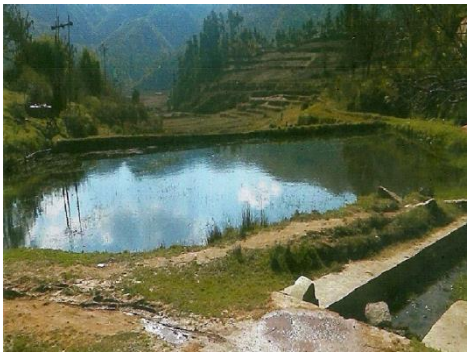


Figure 7.7: Conservation Pond/Dug-out Pond

(Source: IWMP-VII)

8) C1.6.8 Construction of RCC Water Storage Tank for Drinking Water

This storage tank can be stored drinking water for local residents (Figure 7.8), but it can also be used as extinguishing water in the event of a forest fire to minimize the damage. Especially, RCC water tanks can always withstand bushfire, it is known for the best option for fire-prone area in dense forests. Thus, it is so important to install this type of reservoir in the forest area to achieve sustainable forest management.

Figure 7.8: RCC Water Storage Tank for Drinking Water

(Source: IWMP-IV)

At sites for the RCC reservoirs, the ground will be levelled and excavated for foundation with cement concrete. Walls and floor will be constructed with RCC. Roof slab will also be provided with RCC. Boundary wall will be constructed with bricks and plastered with cement plaster, and gate will be provided for all the reservoirs. All the excavations will be conducted manually, and the excavated soil will be used for levelling the reservoir compound. The force analysis of the reservoirs or tanks is about the same irrespective of the chemical properties of the product[173].

9) C1.6.9 Construction of Spring Tapped Chamber

The Spring Tappd Chambers which serve as a major water source is usually a part of the entry level activities in most watershed programs (see Figure 7.9 as an example). The chambers can be used as drinking water source for local people as well as the above-mentioned RCC water storage tanks. It is also functioned as a sprinkle-water over for transplanting sites of seedlings especially during the drought period.

Figure 7.9: Spring Tapped Chamber

(Source: Megha-LAMP, MBDA)

In Meghalaya State, there are two departments of the government, SWCD and the Public Health Engineering (PHED), providing facilities for ensuring water for forest/agricultural area and

[173] Department of Civil Engineering, Gokaraju Rangaraju Institute of Engineering and Technology. 2012. *DESIGN OF R.C.C. OVER HEAD TANK*.

communities. While the PHED constructed gravity based piped water supply schemes for the local communities, SWCD promoted spring tapped chambers which also play a major role in ensuring water conservation for fields.

Incidentally, the unfavorable terrain features and the high labour cost in laying pipelines make the capital investment high in the piped water supply schemes. According to results of the existing study , the annual operating expenditure is about Rs 51 per person in the case of the best practice at the state level and both departments work intensively at capital investment hardware, in building the necessary infrastructure for the community. However, there is no software input at the implementation or pre-implementation stage to involve the community or to educate them about the operation and maintenance of the facilities. If the systems remain unchanged, the community can manage by themselves. This may not be the case when they have to adopt new technologies such as using an electric pump to lift water from the source that is unavoidable if the service is to meet the growing demand for water associated with the changing life-styles. This will necessitate incorporating a software component at the preparation and implementation stages of capital investment.

7.5.2. Component 2: Community Development and Livelihood Improvement

Under this component, the Project aims at promoting inclusive community development and improving the livelihoods of people in selected villages. To achieve these objectives, the Project will need to actively involve women and youths in the Project, who have often been excluded from the decision-making processes of existing traditional community institutions, as well as introducing alternative income sources to people in selected villages and providing them with skill development, marketing, and financial supports. The Project will hire external resource organizations or NGOs to promote inclusive community development and income generation activities. The details of each activity to address the objectives are described below.

(1) C2.1 Community Mobilization and Gender Sensitization

In the preparatory process of the Project, community mobilization and gender sensitization are the most important processes because these are essential for the success of the Project. In order to involve and motivate people in selected villages, specifically women and youths, in the activities of the Project, the Project will need to mobilize these people and sensitize them in terms of gender by breaking their stereotyped ideas on gender roles through village-based workshops.

Based on the uniqueness of existing traditional community institutions in Meghalaya State, the Project should first approach to a village head of each selected village in Khasi and Jaintia Hills and *Nokma* of each selected village/cluster in Garo Hills, explain the details of the Project to him, and get his acceptance of the Project to work in the village. Only after getting his acceptance, the Project can start the preparatory processes of the Project, including community mobilization and gender sensitization workshops, as described below.

1) C2.1.1 Community Mobilization Workshops

Community mobilization will target all people of selected villages, including women and youths. Therefore, the Project should first request the village head or *Nokma* of each selected village/cluster to call all villagers for the first meeting in particular. Otherwise, he might decide all, including the contents of activities to be undertaken in the Project and who will participate in these activities, by himself or with the members of existing traditional community institutions. Many people of selected villages have never participated in any foreign donor's project or even central or state scheme and might not know what a participatory development approach means. Therefore, BPMU will need to conduct the meetings and workshops at the initial stage of the Project and thoroughly explain to participants in the meetings and workshops what the Project will provide them, what they might be able to benefit from the Project's interventions, and what they are supposed to do. Main objective of these meetings and workshops are to encourage and motivate them to actively participate in the activities of the Project. Through their active participation, they can not only

benefit from the Project, but also contribute to inclusive community development and income generation by themselves. To continuously encourage and motivate the people, specifically at the initial stage of the Project, the Project will utilize local women and men, including youths, as community facilitators.

2) C2.1.2 Gender-sensitization Workshop/Gender Training

In Meghalaya State, there is the strict gender-based division of labor and sphere deeply embedded in tribal societies of all Khasi, Jaintia, and Garo Hills. Based on such social norms, women are supposed to do household chores and child care at home and not to participate in public meetings or take up a decision-making role there because these are men's sphere and men's roles. As a result, women tend to be excluded from the decision-making processes of existing community/village institutions, such as *Hima*, *Raid*, *Dorbar*, and *Nokma* council. As a matter of a fact, women in rural areas play an important role not only in doing household chores and child care, but also in maintaining their household livelihoods by taking responsibilities for agriculture, animal rearing, and forest management work. For example, they do land preparation, sow, weed, harvest, do post-harvest treatments, and carry products to the market and sell them in the market. In terms of forestry, they have community forests and their own forests, and they collect firewood as well as mushroom and edible wild leaves for a domestic or commercial purpose. They also help men build fire line. Unfortunately, such women's roles and contribution are usually ignored or overlooked, and women tend to be deprived of an opportunity to raise their voice or integrate their needs in the planning processes of community development led by existing traditional community institutions.

Based on a right-based approach and the critical roles played by women, the Project should involve women from the planning process to implementation and monitoring & evaluation processes of the Project. However, the strict social norms might make women hesitate to actively participate in the decision-making processes of the Project and its activities. Moreover, as many women in rural areas take multiple responsibilities on a daily and yearly basis, they might not be able to spare a time to participate in the activities of the Project. Thus, the Project should make strategic interventions to promote not only women's active participation, but also their taking a leading role, not an assisting role for men. From the initial stage of the Project, it is important for the Project to approach to both women and men in each selected village and break their stereotyped ideas of gender-based division of labor/role and sphere through gender sensitization workshops. They will need to persuade both the women and men that women are also main actors for community development, so the men will need to assist the women to actively participate in the activities of the Project by sharing the household chores and child care taken up by women.

In order to involve women in the decision-making processes of the Project and promote inclusive community development, the Project's staff members also need to be free from stereotyped ideas of gender-based division of role and sphere and become more gender responsive. For this purpose, the Project needs to provide them with gender training in the beginning of the Project in particular. Gender training should be focused on how to integrate a gender perspective in the processes of planning, implementation, and monitoring & evaluation and how to ensure women's participation in decision-making processes of the Project in terms of not only quantity, but also quality. The Project's staff members should not be satisfied with the ratio of women selected or involved in the committees developed in each selected village, but make it sure that women's voice be heard in the decision-making processes of the Project and their needs be integrated in the planning of the Project at the village level. Each staff member should learn from gender training the importance of integrating such a gender perspective in all processes of the Project.

(2) C2.2 Micro-Planning

The NGOs hired by the Project will undertake the activity of making a Micro Plan as a learning process of participatory community development in all selected villages. This Micro Plan is an integrated development plan of each selected village, composing forest management plan, watershed conservation plan, and income generation plan. As described previously, the Project/SPMU will make and provide necessary maps of each selected village as a pre-condition for

micro-planning. Based on the maps provided, each selected village is supposed to make a land-use plan in a participatory way. Within the process of micro-planning, the Project, specifically the NGOs hired, should prevent a village head/*Nokma*, members of traditional community institutions, or other village authority from dominating the decision-making processes of making a Micro Plan. For this purpose, the NGO hired first needs to facilitate each selected village to newly establish a sub-committee under Village Employment Council (VEC) developed for Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) in all villages of the state and the entire country. The sub-committee should be consisted of representatives of diverse groups in each selected village, specifically socio-economically disadvantaged groups, such as women, youths, landless people, and a minor clan.

The necessary steps for making a Micro Plan to be taken by each selected village are as shown in Table 7.13 below:

Table 7.13: Steps to Make a Micro Plan

Step	Contents	Time to Spend
1	To select members and form a sub-committee in a participatory way with the assistance of a hired resource organization/NGO.	through 1 or 2 meetings
2	To conduct a PRA, as well as village socio-economic survey if necessary, as a baseline survey, to identify the types of existing forests, the condition of forest and other natural resources, gender roles and gender relations, and problems/needs faced by the village.	for 1 month, including the time to conduct training/workshops at the village level
3	To make a forest management plan, identifying forests to be intervened by the Project and adopting proper forest operation to the forests for maximizing ecological and economical benefit for the entire village.	through 1 or 2 meetings
4	To make a watershed conservation plan, based on the land-use plan made, the results of the PRA conducted, land condition such as degree of slope and depth of soil, available labour and others.	through 1 or 2 meetings
5	To make an income generation plan, considering the potential of possible activities which fit in the climate and other conditions of a village, as well as the availability of relevant central or state on-going schemes/missions, and referring to the land-use plan made and the results of the PRA conducted.	through 1 or 2 meetings
6	To make an integrated micro plan, composing of a forest management plan, watershed conservation plan, and income generation plan each of which converges with any relevant central or state on-going schemes/missions.	through 1 or 2 meetings

Source: developed by Study Team

Most of people in selected villages might not be familiar with micro-planning or participatory development planning. Thus, the Project will provide them with some technical supports and facilitate them to make an appropriate integrated development plan in a participatory manner as described below.

1) C2.2.1 Training/Workshops on How to Make a Micro Plan

The Project will first prepare for the guidelines or manual for making a Micro Plan and the GIS maps of each selected village/cluster and provide such materials for each selected village/cluster. By utilizing these materials, the members of the sub-committee established in each selected village, as well as other villagers if necessary, are supposed to make a Micro Plan at the initial stage of the Project. The Project will hire two NGOs per district and 22 NGOs in total as external resource organizations that are mandated to facilitate the villages selected in the district to first mobilize people and make a Micro Plan, as well as to conduct the activities planned, by giving necessary technical supports. The NGOs are also supposed to conduct training or workshops, at the village level, on how to make a Micro Plan, specifically how to make an income generation plan by converging

with relevant on-going schemes/missions based on the information provided and the land-use plan made.

2) C2.2.2 Conducting PRA

Within the activity of making a Micro Plan, the Project will suggest that each selected village conduct a PRA, as well as a socio-economic survey if necessary. If a village is large, composing a couple of localities, the Project needs to suggest that the village conduct a PRA in a couple of places. Through PRA, the Project can expect people of each selected village to recognize and share with other participants' ideas on the present border, land-use pattern, changes in the availability of natural resources, gender-based access to/control over natural resources, daily and seasonal calendar by gender, social networks available for women and men, and prioritized problems/needs. The result of the PRA conducted in each selected village can be utilized for its people's making a Micro Plan, composing a forest management plan, watershed conservation plan, and income generation plan, as well as for prioritizing Entry Point Activities (EPA) of which details are described in C2.3.

3) C2.2.3 Planning a Micro Plan Converged with Available National/State Schemes

The Project needs to prepare the guidelines for micro-panning in advance as mentioned previously. The guidelines are mainly on how to make a Micro Plan in a participatory manner with the assistance of the NGO hired. They should also include information on available national and state schemes/missions provided by relevant departments so that each selected village can consider the convergence of such schemes/missions with their forest management, watershed conservation, and income generation activities. The departments which implement relevant schemes/missions include Forest & Environment Department, Department of Agriculture, including Directorate of Horticulture, Animal Husbandry & Veterinary Department, Soil & Water Conservation Department, Fisheries Department, Department of Sericulture & Weaving, Cooperation Department, Department of Tourism, Community and Rural Development Department, Commerce & Industries Department, and Meghalaya Institute of Entrepreneurship.

(3) C2.3 Entry Point Activities (EPAs)

It will take a certain period of time until the Micro Plan of each selected village gets approved by the Project/SPMU. To prevent people in selected villages from losing their interest in the Project and keep them involved in the Project, the Project will provide each selected village with EPAs. EPAs should not be any activities, but confined to the activities relevant to the contents of the Project. For example, construction or repair of a canal/irrigation, multi-purpose pond/reservoir, energy-efficient smokeless stoves, and drinking water facility are directly or indirectly relevant. A canal or irrigation can promote agricultural cultivation more than two times in a year while multi-purpose pond/reservoir can enable people to practice both agriculture and fisheries through Integrated Farming System (IFS). On the other hand, energy-efficient smokeless stoves and drinking water facility can reduce the time women spend for collecting firewood and fetching water and enable women to spend more time for income generation activities.

1) C2.3.1 Prioritization of EPAs

The NGOs hired by the Project should facilitate each selected village to identify critical problems faced by the village through a PRA and prioritize one or two most critical problems to be addressed as EPAs through discussion among participants in the meetings or workshops. As described in C2.3, the NGOs will need to lead the participants to prioritize among only EPAs candidates which are relevant to the contents of the Project. As the Project will equally allocate a certain amount of budget for each selected village, each selected village can choose any number of activities within the budget.

2) C2.3.2 Conducting EPA

The Project/SPMU will send a technical team, composing at least one engineer, to each selected village and let the team to check if each of the EPAs proposed is technically and financially feasible. If it is feasible, the team will make a cost estimate for the EPAs. The NGOs hired are supposed to

persuade each selected village to contribute to EPAs from the village side by providing unskilled labor work and locally available materials. The NGO can also suggest that each selected village should consider the possibility of converging with relevant central or state schemes/missions, such as MGNREGA and Pradhan Mantri Gram Sadak Yojana (PMGSY), so that the village can save the cost.

(4) C2.4 SHG Activities

The Project will undertake Self-help Group (SHG) activities which are consisted of two types of activities: 1) micro-credit activities; and 2) income generation activities (IGAs). The details of each activity are described below.

1) C2.4.1 Selection of SHGs in Each Selected Village

Both micro-credit and income generation activities will be undertaken by the SHGs selected by the Project. The Project will need to make the guidelines, including selection criteria for SHGs, in prior to the implementation of SHG activities. The SHGs which work on potential crops or products and have expertise and skills might be more preferable as target groups. However, in the case there is no existing SHG in the selected village and SHGs will be newly established, the Project should suggest that socio-economically disadvantaged groups of people, such as widows and people with disability, should be involved in the SHG. Under the SHG activities, the Project will select two SHGs per village.

2) C2.4.2 Micro-credit Activity

Accessibility to financial services, including micro-credits, is essential for anyone to start up or scale up her/his business. Thus, the Project will undertake micro-credit activities for the members of selected SHGs at the village level. Selected SHGs are supposed to open their bank account where they will save the deposit collected by themselves on a weekly or monthly basis. After the deposit reaches a certain amount, any member of the SHG will be able to take a loan from their deposit if she/he makes a business plan and other members accept it. The Project/BPMU and community facilitators will need to carefully check if the money borrowed is really used for a member's business, not for her family's living cost or for her husband's or son's sake.

a. C2.4.2.1 Providing Revolving Fund per Village

In addition to the money saved by each selected SHG, the Project will enable the members of selected SHGs to borrow a larger amount of money from the revolving fund set up at the village level. For this, the Project will provide a certain amount of money as a revolving fund for each selected village. Similar to the loan from the deposited money, the member of selected SHGs are supposed to make a business plan and get an approval from not only other members, but also the Project/BPMU or anyone who is in charge of micro-credit activities at the village level. However, the revolving fund should not be provided all at one time for each selected SHG. The Project should set up a few levels by years when each selected SHG has spent for micro-credit activity and been functional as a SHG: 1) 6 months; 2) 1 year; and 3) 2 years. Then, the Project can give a part of the revolving fund allocated for each selected SHG only if it reaches the level 1, level 2, and level 3. How to manage the micro-credit activity is described below.

b. C2.4.2.2 Training/Workshop on Micro-credit Activity

The Project will need to develop guidelines on how to operate micro-credit activities in advance. The guidelines should include the conditions or levels which each selected SHG will need to clear and reach to receive all the revolving fund, as described above. Based on the guidelines, the Project will provide the members of selected SHGs with training or workshops in prior to their starting the activities so that the members can operate the activities by themselves or with a little assistance by community facilitators hired by the Project at the village level.

3) C2.4.3 Income Generation Activities (IGAs)

The types of IGAs can vary by selected SHGs. However, the Project should narrow down the focus to some crops and products which are available in Meghalaya State and more potential. This is because the Project can suggest that the selected SHGs which are located nearby and work on the same crop or product should form a cluster so that members of all these SHGs can ship their crops or products together and sell at a higher price to traders/middlemen. For that purpose, the Project will conduct market research to identify profitable crops. This is critically important in case the beneficiaries intend to switch from shifting cultivation to settled agriculture. Alternative livelihoods need to be sustainably profitable, otherwise they will restart shifting cultivation. Moreover, the Project can conduct skill and business training in one place, targeting the members of all SHGs which form a cluster.

Based on the characteristics of agriculture and land tenure system in the state, the Project can categorize the possible types of IGAs into following three models. The BPMU or NGO hired can introduce them to selected SHGs and facilitate them to select any if any of these models can well fit a selected SHG based on the background of the members of the SHG and climatic and market conditions around the SHG. These are just possible models, so the Project can let each selected SHG consider and choose what they want to do and they can do, as well as what is potential.

Model 1 (Forest-based activities): SHGs whose members have access to an individual or community forest are target of this model. In addition to SHG members, VPIC members who are interested in the activities are also able to participate. They are supposed to plant seedlings of multi-purpose tree species, fast growing species, and fruits trees/cash crops all together in forest area as agroforestry. Agroforestry is also recommended for the replacement of shifting cultivation, as this can contribute to restoring soil fertility and regenerating plants in the forest. They can earn income by selling seedlings if they make a nursery. Production of non-Timber Forest Products (NTFP) is another activity under Model 1.

Model 2 (Integrated Farming System: IFS): IFS, a combination of cultivation of cash crops, animal rearing, and aquaculture, targets members of a SHG who own some land. Under IFS, the members of a SHG can utilize waste of harvested crops as feed for animals, and manure of animals can be utilized as organic compost for cultivating cash crops and as feed for fish. This can also contribute to an increase in productivity of the crops.

Model 3 (Non-land based activities): Landless people are the target of this model. Activities which do not require land are introduced. The activities include mushroom cultivation, apiculture, animal-rearing, weaving, and handloom/handicraft-making.

The Project/BPMU or NGO hired should regularly monitor and evaluate the processes and outcomes/impacts of each selected SHG's activities. Drawing from the results of monitoring and evaluation, the Project/SPMU also should make a report on case studies on good practices and bad practices, focusing on the difficulty or constraints of group work and leadership, technical skills, and logistics/marketing. Such a report and lessons learnt from the experiences of the SHGs which the Project initially supported should be incorporated or reflected in the plans on training and exposure visits for the next batches of SHGs.

a. C2.4.3.1 Training Needs Assessment/Market Research

Based on the types of IGAs on which selected SHGs work, the Project/SPMU will need to conduct training needs assessment and market research in the beginning. The training needs assessment should be made from the aspects of selected SHGs' members' technical skills, business skills, bargaining power, marketing, and leadership. In terms of the aspect of technical skills, the Project/SPMU should analyze the level of their knowledge and skills on scientific technology, as well as that of their indigenous knowledge. As to the aspect of business skills, the Project/SPMU will need to identify the level of their mind-set-up for business and their ability to make a business plan. Regarding the aspect of marketing, the Project/SPMU should thoroughly look into the present

situation of selected SHGs, specifically their logistics ability, including connectivity to the market, availability of transportation to the market or traders, access to the market's information, packaging, and value addition. In addition to these training needs assessment, the Project/SPMU should conduct market research in order to identify profitable crops and products. SHGs will decide the crops to cultivate, when the Project informs SHGs of the result of market research.

Drawing from the results of the training needs assessment and market research, the Project/SPMU can make a plan on training and exposure visits for selected SHGs. The Project/SPMU will need to list up the possible training institutes and places for exposure visits which can provide relevant training programs for the members of selected SHGs and show them the cases of good practices as role models. Similarly, the Project/SPMU and DPMU should consider the possibility of convergence with relevant national or state schemes/missions which provide training and exposure visits. Taking into account that value chain enhancement is required for sustainable alternative livelihoods, training should be considered along with value chains of selected products.

b. C2.4.3.2 Training and Exposure Visits

Based on the plan on training and exposure visits, the Project/DPMU/BPMU will conduct them for selected SHGs. The training and exposure visits should be provided mainly in the initial stage of IGAs. However, in accordance with necessity, follow-up training and advanced training courses can be provided in the middle stage of IGAs. In particular, when it comes to agriculture activities technical support and training by Department of Agriculture is critically important for sustainability of the Project. SHGs performing better than others may be considered for an oversea exposure visit to be sensitized by advanced technology.

c. C2.4.3.3 Provision of Seed Money for Each Selected SHG

In order for the members of selected SHGs to begin their businesses, they will need some seed money to buy start-up tools and materials. For such a purpose, the Project should provide a certain amount of money as seed money equally for each selected SHG. How to use the seed money will depend on the choice of each selected SHG. However, the Project/BPMU and NGO hired can give an advice in terms of effectively using it by utilizing existing national or state schemes/missions which provide start-up tools.

d. C2.4.3.4 Construction of Facility/Infrastructure Necessary for IGAs

In addition to start-up tools and materials, SHGs might need some facility and infrastructure to begin their businesses or IGAs. For example, they might need to construct a nursery, pig pen, henhouse, hut for mushroom cultivation, sericulture, or weaving, storehouse for crops, or pond/reservoir/water tank. The Project can allocate some budget for the construction of such facility and infrastructure. The Project/BPMU and NGO hired will also suggest selected SHGs to utilize or converge with available national or state schemes/missions since the Project' budget might not be sufficient.

4) C2.4.4 Enterprise Development Activities

The Project/SPMU will consider the possibility of micro, small, and medium enterprise (MSME) development. If there is potential for any field, the Project/SPMU will promote to develop MSME in that field. The possible fields and procedure for MSME development are described below.

a. C2.4.4.1 Feasibility Studies & Pilot Projects for Enterprise Development

In addition to IGAs, the Project/SPMU will consider the potential of MSME development in a couple of possible fields, including bamboo processing or crafts, rural tourism, and milk production. Bamboos are available across over the state, and bamboos in a processed and raw condition are utilized in diverse ways, such as for a fence, construction material, furniture, baskets, and other crafts. Similarly, there are many spots with outstanding nature which have not been developed, but can be

utilized for rural tourism or ecotourism in the state. Moreover, potential for enterprise development in milk production is high because demands for milk are high, but production is limited.

In order to develop MSMEs and/or societies in any of these fields, the Project/SPMU will need to conduct feasibility study and market research on each possible field at the initial stage of the Project. Since detailed data on present conditions are not available in any field, the Project/SPMU should first conduct a detailed study and look into the feasibility of any possible field for the implementation of pilot projects in any two to three villages where villagers have access to raw materials, skills and knowledge, and connectivity to the market. Through market research, the Project/SPMU will do SWOT analysis of the state, that is strengths, weaknesses, opportunities, and threats, in each of the possible fields for MSME development. The Project/SPMU will also need to search available national or state schemes/missions in terms of not only technical supports, but also investment opportunities or financial supports by Commerce and Industries Department and Cooperative Apex Bank or private banks.

Figure 7.10: Water Conservation Pond for Livelihood Improvement
(Source: NABARD RIDF,SWCD)

Based on the results of the feasibility study and market research, the Project/SPMU will make a plan and undertake a pilot project per one Block. Pilot project's sites can be selected based on the availability of raw materials and supply chain, existing SHGs or skilled persons, and connectivity to the village road or motorable road as mentioned above. The pilot project can be implemented mainly by the Project/BPMU for two to three years and during the pilot project period, the Project/BPMU will facilitate the people of pilot sites to form and register as an enterprise under Commerce and Industries Department or as a cooperative society under Department of Cooperation, depending on the purpose, size and feature of the business, and make a business plan at the initial stage of the pilot project on each field. In accordance with technical and financial needs assessment on each field for villagers in pilot sites, the Project/SPMU/DPMU/BPMU will also connect the villagers of the pilot sites to training institutions and the market, including traders, middlemen, and retailers/whole salers. The Project/BPMU and DPMU will monitor the process of MSME development in each field and make a report on case studies about good and bad practices and the lessons learnt from them.

(5) C2.5 Soil and Moisture Conservation for Livelihood Improvement

Water conservation is essential for livelihood improvement in the Project. For example, according to the Annual Report 2016-17 of SWCD, one of the beneficiaries of water harvesting pond constructed under Rural Infrastructure Development Fund (RIDF) scheme during 2015-16 said that they have received 15 kg of fingerlings from the scheme on that very year. The community has been rearing fish for the last two years and harvested more than 75 kg of fish from the Water Harvesting Farm Pond constructed under RIDF scheme. By selling them by Rs 200-250 per kg, the community people of that area have earned about Rs 15,000-16,000 in the first catch in that year (Figure 7.10).

Now, to contribute livelihood improvement in the target areas, the following activities for the soil water conservation will be conducted as part of the Component 2 of the project (Table 7.14).

Table 7.14: Soil and Water Conservation Activities for Livelihood Improvement

Sec. No.	Activity	Site Selection	Survey/ Design	Construction/ O&M
C2.5.1	Construction of Rainwater Harvesting Structure	SWCD and DPMU	DPMU	Construction: DPMU O&M: BPMU & Communities
C2.5.2	Construction of Drinking Water Tank	SWCD and DPMU	DPMU	Construction: DPMU O&M: BPMU & Communities

Source: developed by Study Team

1) C2.5.1 Construction of Rainwater Harvesting Structure

Rainwater harvesting (RWH) is a simple method by which rainfall is collected for the dry season. The collected rainwater may be stored, utilised in different ways or directly used for recharge purposes. With depleting groundwater levels and fluctuating climate conditions, RWH can go a long way to help mitigate these effects. Capturing the rainwater can help recharge local aquifers, reduce urban flooding and most importantly ensure water availability in water-scarce zones. Figure 7.11 shows an example of RWH by Indian Council of Agricultural Research (ICAR) in the Ri-Bhoi District.

Figure 7.11: RWH Technique
(Source: RWH Program by ICAR)

In Meghalaya State, despite having a sufficient rain in summer, there is acute shortage of drinking water. Although collecting rainwater from the roof is widespread, an appropriate management plan with required knowledge and skills of RWH system is not enough. Hence, massive awareness and efficient planning for RWH, conservation and watershed management is the necessity of the region. The traditional water harvesting system in the region can be modified using appropriate techniques. Appropriate water resource planning needs to be executed for proper use of the huge water bodies of the region. Watershed management in Meghalaya has been defined as rational utilization of land and water resources for optimum and sustained production with minimum hazards to natural resources. It is essentially related to soil and water conservation. It involves proper land use, protecting land from all forms of degradations, building and maintaining soil fertility, conserving water for agricultural use, proper management of water for drainage, flood protection, sediment reduction, and increasing the productivity of land use.

In the Project, various types of RWH ponds will be constructed for livelihood improvement. Size of a pond is usually determined by the availability of adequate land in the vicinity of the village. Besides, desired size and design can meet the water requirements of the community. Unless otherwise prescribed for an area, the following general guidelines[174] developed by PHED may be used to determine the water requirements of a village community and the gross storage capacity of the pond.

1) Irrigation Needs: About 0.67 metric ton for a hectare of irrigation.

2) Animal Needs:

   Beef cattle: 54-68 litres/day, Dairy cows (drinking): 68 litres/day, Dairy cows (drinking and barn needs): 158 litres/day, Pigs: 18 litres/day, Sheep: 9 litres/day

3) Domestic Water Needs: 40 litres per head per day

4) Fish Culture Needs: Ensure about 1.85 m depth to provide proper temperature environments.

All structures will be constructed by DPMU, and operation and maintenance will be conducted by BPMU and communities.

2) C2.5.2 Construction of Drinking Water Tank

In Meghalaya, the traditional water harvesting system of tapping flowing streams and spring water for use in irrigation is popular. Many villages of Ri-Bhoi District collect flowing stream water through bamboo pads for domestic use. In Jowai, West Jaintia Hills District, the flowing stream water are stored in small cement plastered pond through bamboo which is used by the whole community, and the overflowing water is used in the catchments areas for farming. Several water harvesting systems are practiced in some parts of the state which combines water conservation and forestry using local topographical chain. For example, certain system has forest land at the top of the hill,

[174] http://megphed.gov.in/RWHManual.htm (cited 03 June, 2019)

water harvesting tanks for drinking further down the hill slope, followed by livestock enclosures and then terraced rice fields at the foot of the hill. The forerst area on the hilltop serves as a small catchment to supply the tank with rainwater and is hardly loss of soil through erosion due to permanently under vegetation even though the slope in the area is steep. The system is a unique combination of forest, agriculture, livestock and fisheries with a water and soil conservation base, which encourages the sustainability of the environment, besides increasing crop productivity. In reference to this type of the practice,, drinking water tanks (an example is shown in (Figure 7.12) will be introduced to communities as one of the component for improvement of livelihood and hygiene environment in Meghalaya..

Figure 7.12: Drinking Water Tank
(Source: IWMP VI)

7.5.3. Component 3: Institutional Strengthening

Institutional strengthening will be a vital part of project implementation. This includes infrastructure required for project implementation, building capacity of personnel who implement and monitor the Project (capacity building of beneficiaries are discussed in Component 2), system of monitoring and evaluation, and publicity for the Project.

(1) C3.1 Capacity Development

1) C3.1.1 Training Needs Analysis

Training Needs Analysis (TNA) will be conducted at the beginning of the project, either by outsourcing the contract or by PMC (if PMC commences its work without delay). TNA should consider the capacity development requirements of different stakeholders as well as different components of the Project based on the available competencies. Once the gap analysis is conducted and requirement becomes clear, consultants who are in charge of conducting TNA and SPMU's capacity development officer should work in collaboration to develop a capacity development plan that details how and where the stakeholders should be trained, what would be the expected outcome, and how to measure the impact (on a sample basis). It should be kept in mind that capacity development needs to change over the time.

2) C3.1.2 Training, Exposure Visits and Workshops

Capacity building in the forms of training, workshops, and exposure visits addresses issues associated with inadequate knowledge, skills, and awareness. Trainings for project personnel will be organized in the areas of management, technical skills, community mobilization, GIS and MIS, remote sensing, M&E, and gender. Some trainings will be conducted in-house while others can be conducted with specialized agencies. Most of the training courses will be conducted for the duration of several days so the project personnel will not be away from the Project for a prolong time period. However, for some of the specialized trainings such as remote sensing where a standard short-term course is offered by external agency, the duration may be up to two months.

At the same time, a short trip in the form of exposure visits will be planned for the project staff outside the state to get acquainted to similar projects. Workshops, particularly for project orientation for new recruits for the Project and gender related workshops will be further conducted.

3) C3.1.3 JICA Forestry Sector Annual Workshop

As has been the practice in other JICA assisted forestry projects, the Project may consider hosting an annual workshop in the latter stage of the project implementation when there are some achievements from the Project to share with other government departments and institutions implementing JICA forestry projects.

4) C3.1.4 NGO/Resource Organizations

The Project will need to hire two NGOs per district, in other words 22 NGOs in total, as resource organizations to mainly implement the component of community development and support communities to conduct income generation activities under the Project. The period when the Project might continuously contract with each of NGOs might be 84 months. These NGOs hired are mandated to mobilize the people of selected villages, conduct gender sensitization workshops which target both women and men in the selected villages, and facilitate them to make a micro plan, prioritize and undertake EPAs, and undertake IGAs, including training and exposure visits. Through these activities, the NGOs are supposed to lead the selected villages to the achievement of inclusive community development and the improvement of livelihoods.

As selection criteria for the NGOs, the Project should prioritize the experiences and expertise of a NGO in terms of community mobilization, gender sensitization, and skill development for income generation. Since the Project targets around 500 villages across over the state, one selected NGO will need to cover around 22 villages in total through three batches within the district on which each NGO is supposed to work. In order for the NGOs to proceed necessary activities efficiently and effectively, the NGOs hired should be familiar with the ways of a foreign donor's project and have the sufficient number of staff members who have expertise and experiences on the subjects raised above. This is because the NGOs hired might need to form a couple of teams, each of which is consisted of a key expert/facilitator and non-key expert/facilitator, to work together on three or four villages during each of three batches.

The performance of each NGO should be monitored and evaluated regularly by the Project and beneficiaries of the Project. Based on the results of monitoring and evaluation, the Project should consider and replace the NGOs of which performance is lower than the Project's or beneficiaries' expectation with better ones.

(2) C3.2 Monitoring and Evaluation

Monitoring and evaluation of project progress and achievement will mainly involve the following events:

- Baseline survey
- Annual planning and review meeting
- Concurrent monitoring
- Annual statutory audit
- Mid-term evaluation
- Terminal evaluation
- Thematic studies and documentation

1) C3.2.1 Baseline Survey

To grasp the starting point of the Project in terms of physical and economic conditions, and the status of the target area, a baseline survey would be conducted. The types of data to be collected and the method for collection to be used need to be decided in accordance with the operation and effect indicators of the Project. The baseline survey should be designed and conducted in such a manner that the data captured in it can be used for future assessment of the Project. About 10% of the beneficiaries, households or villages should constitute the samples for the baseline survey.

2) C3.2.2 Setting Target for the Operation and Effect Indicators

The operation and effect indicators for the Project are shown in Annexure 7. For each of the indicators, target value needs to be set at the beginning of the project implementation. These indicators and their target values will be the basis on which the Project will be eventually evaluated for its effectiveness. Therefore, the targets should be not only realistic and achievable, but also reasonable considering the size of investment being made.

3) C3.2.3 Annual Planning and Review Meetings

To plan for the operation in the year ahead, with due consideration to the previous year's performance, annual planning and review meetings will be convened each year. The meetings should be held at the SPMU level, but a requirement for the meetings at district/divisional level will be also considered based on the geographical spread of the Project target villages. Progress and specific achievements for the year will be reviewed in the meeting, while any issues and challenges may be identified. Based on the progress review, the implementation plan for the following year will be worked out. However, during the first 2 to 3 years of the Project, emphasis should be given on laying the foundation of the Project, for example, motivating communities and establishing relationships between Project personnel and the communities, rather than simply meeting physical and financial targets. Therefore, the realistic targets should be set for the initial years of the Project.

4) C3.2.4 Concurrent Monitoring

Regular monitoring of project progress is necessary to ensure that implementation of project activities is on right track. Output-related parameters for monitoring to indicate physical and financial progress should be established. The following Table 7.15 shows an indicative interval of concurrent monitoring at different levels of the Project implementation.

Table 7.15: Frequency of Concurrent Monitoring

Implementing/Monitoring Body	Frequency
Governing Body	Half yearly
Executive Committee	Quarterly
DPMU	Monthly
BPMU	Monthly
Community	Monthly

Source: developed by Study Team

Frequency mentioned in above table is the minimum recommendation. When the project activities are at its busiest, and/or the particular body are having issues to resolve, the frequency can be increased as per the requirement.

5) C3.2.5 Statutory Audit

Transparency, particularly related to the utilization of project funds, is important. Implementation bodies of all levels in the Project must have statutory financial audit conducted every year. There will be both internal and external audits. MBDA already has audit practice in place, so the Project will also follow the same practice. Internal audits will be conducted half-yearly while the external audit will be conducted annually. A qualified chartered accounting firm should be identified and appointed for this purpose.

6) C3.2.6 Mid-term Evaluation

In some projects, mid-term evaluation is conducted to monitor the progress up to that point. A mid-term evaluation will identify issues and constraints faced by the Project and chart a way forward for the remaining duration of the Project. In this Project, since it is the first Japanese ODA Loan project in the forestry sector in the state and has a different pattern of implementation from other forestry sector projects funded by JICA, conducting a mid-term evaluation is highly recommended. The evaluation should be conducted by a third party around the fifth year of the Project. Timing and terms of reference for the third party evaluation shall be discussed between SPMU and JICA.

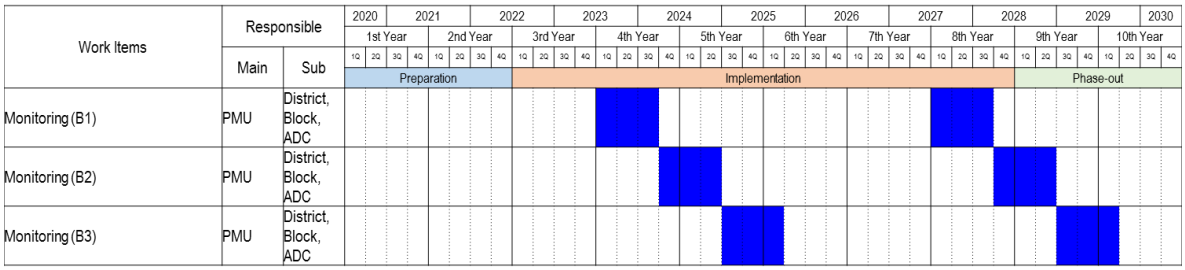
7) C3.2.7 Terminal Evaluation

Towards the end or at the end of the Project, a terminal evaluation may also be conducted. An evaluation study at the end of the Project can take stock of project outputs and achievements in

quantitative and qualitative terms. It can also obtain lessons learnt from the experience of project implementation and document them. Data collected and organized through the terminal evaluation can help prepare the Project Completion Report, a requirement for Japanese ODA Loan projects. The same information can also be referred to when ex-post evaluation is conducted by JICA two to three years after the project completion.

8) C3.2.8 MIS and GIS Monitoring

Besides the above monitoring, to understand spatial changes over the project period, each target site is monitored using drones and tablets periodically. Data or image collected by a sensor mounted on drones are orthorectified and superimposed on the base dataset for change/progress monitoring. The monitoring team composes the drone expert (the leader), district level GIS operator, program associate, two community members, and implementing officer. The drone expert needs to prepare monitoring reports for each target site after each visit for future reference. GIS monitoring using drones is conducted at least at the beginning and end of the project period, and supplementary surveys are conducted once every two years. The periodic monitoring makes it possible for the Project to implement activities smoothly and make necessary correction in a timely manner. Figure 7.13 illustrates tentative monitoring cycles for three batches throughout the entire project period. In this figure, blue indicates survey periods before project activities while light blue indicates survey periods after the project activities.



Source: developed by Study Team

Figure 7.13: Tentative GIS Monitoring Schedule Using Drones

Drones and Tablets used for Monitoring

Drones are used for data collection and monitoring of project activities only. For flying drones, Unmanned Arial Vehicle (UAV), or Remotely Piloted Aircraft (RPA), the Director General of Civil Aviation, GoI, issued the guidelines named as "Civil Aviation Requirements" vide F. No. 05-13/2014-AED Vol. IV in August 27, 2018 and became effective in December 1, 2018. As per the guidelines, the drones, UAVs, or RPAs are categorised into five types based on the weight of aircraft as follows (Table 7.16):

Table 7.16: Types of Drones and Weight of the Aircraft

Type	Weight of the Aircraft
Nano	Less than or equal to 250 g
Micro	Greater than 250 g and less than or equal to 2 kg
Small	Greater than 2 kg and less than or equal to 25 kg
Medium	Greater than 25 kg and less than or equal to 150 kg
Large	Greater than 150 kg

Source: DGCA Guidelines "Civil Aviation Requirements"

Before flying or using drones or RPAs, PMU needs to obtain the Unique Identification Number (UIN) and Unmanned Aircraft Operator Permit (UAOP) along with permission for flying based on the size of category of drone by submitting all required documents shown on the guidelines. The requirements and restrictions regarding the use of drones or RPAs mentioned in the guidelines need to be followed by drone operators. In the context of the Project, the operators are trained at NESAC

before handling drones or RPAs. The images collected by a sensor mounted on drones are orthorectified in SPMU to use the data for further analyses.

During the phase-out period (after implementation of activities), site wise maps are prepared based on data obtained by drones and from the latest satellite imagery to examine changes or impacts of the Project in target sites by comparing these maps with those prepared before the project implementation.

In addition to the GIS monitoring using drones and tablets, MIS based monitoring for each site is conducted once a quarter for regular data collection using tablets or specific forms. The MIS monitoring will be conducted at a block level. One program associate and two community members are involved in a monitoring team. Collected data are uploaded into the MIS application using tablets on site. If the application is unavailable while offline in remote areas, the collected data are tentatively saved and then entered and uploaded to the MIS application immediately after the application becomes available online. A dash board in the MIS application displays the progress and outcomes of monitoring and update them every three months for all stakeholders.

Standard Operation Procedure

The collected data and information are organized in the form of Standard Operation Procedure (SOP). SOP is developed to monitor the progress of project activities and understand the outcomes from the Project. SOP includes not only observations and information of target sites, but also photos taken on site at the beginning and end of the Project. The template will be prepared, and division of roles, including authors, modifiers, and approvers, will be discussed between key stakeholders in advance in order to maintain and standardize SOP.

(3) C3.3 Infrastructure and Mobility

Availability of infrastructure and mobility is a basic requirement for efficient project implementation. The necessity of office buildings and means of transport need careful consideration at all levels.

1) C3.3.1 Office Buildings

Since SPMU will be housed in MBDA, it would be good to have SPMU physically located on MBDA's existing office premises, particularly where Mega-LAMP and MCLLMP projects are located. This allows all the projects to facilitate better communication among the projects. The availability of sufficient space in the MBDA building needs to be examined in synchronization with the number of personnel that will be working at SPMU headquarters in Shillong.

In case sufficient space cannot be secured in existing MBDA office in Shillong, either renting of alternative space or construction of MBDA office in a government land may be considered.

At district level, existing BDU offices do not necessarily have extra space to accommodate DPMU as they housed in existing government buildings of other departments/agencies. This would be case for block level offices for BPMU. Situation for each BDU and EFC offices should be examined and the Executive Committee should determine accordingly which DPMU/BPMU should get office space on lease or make construction to existing offices for additional space. In addition, proper accommodation facilities are required at Block level in order to ensure effective monotoring. For that purpose the Project will extend existing accommodation facilites of concerned departments at Block level.

As the Project will be implemented in a phased manner, the DPMU and BPMU offices which have the first batch of implementation should be given priority in giving orders for construction work, in case that construction is needed.

2) C3.3.2 Vehicles/Motorbikes

In terms of mobility, enhancing the existing fleet of vehicles and motorbikes needs to be considered. Several vehicles need to be procured for SPMU, while at least one vehicle should be allocated to each DPMU and BPMU office. The ADCs also require one for each ADC.

The exact number of vehicles and their types to be procured should be decided by the Executive Committee of SPMU in the first year of the Project. This should be also approved by the Governing Body. At the same time, the maintenance of vehicles procured for the Project should be borne by the Project during the duration of its implementation.

3) C3.3.3 GIS and MIS Enhancement

To strengthen GIS/MIS capacities for the Project, two major activities are conducted: (1) the enhancement of GIS/MIS facilities focusing on equipment and human resources and (2) map preparation.

a. C3.3.3.1 Enhancement of GIS/MIS Facilities

GIS and MIS play a key role to support the proposed project activities and attain various objectives such as spatial visualization, documentation of progress, and long-term impact assessment. To efficiently introduce new GIS and MIS technologies and enhance GIS and MIS facilities/capacities, existing GIS and MIS need to be strengthened particularly in (a) equipment and (b) human resources. In the Project, GIS/MIS Unit will be established under the Knowledge Management Division of the SPMU.

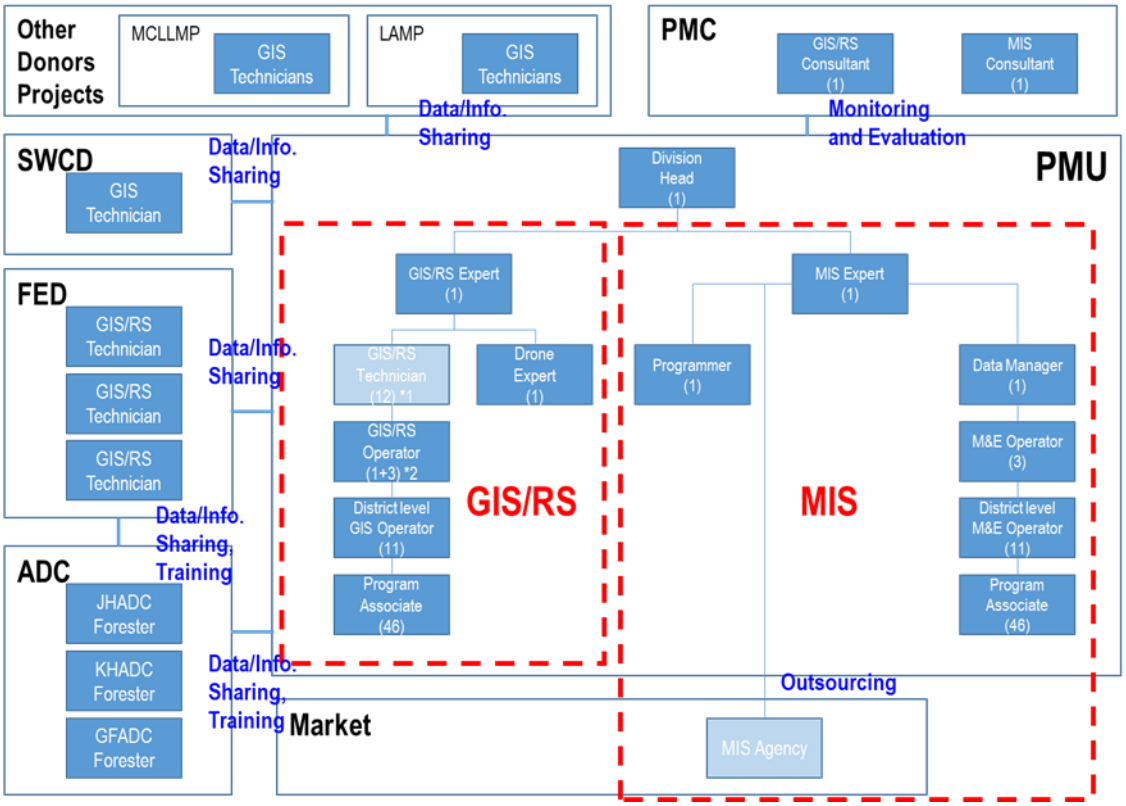
Equipment

The GIS/MIS Unit is set up with an entire set of hardware and software for smooth implementation of project activities. Workstations are used by the GIS/RS operators to prepare data and maps and conduct spatial analysis. Server is used for storage, sharing and webhosting of the data. LAN/Wi-Fi facility is used for better communication using systems. Other equipment such as DGPS, GPS, drones, plotters, scanners, MFP, and ADF are also the part of proposed equipment for the GIS/MIS unit.

The set of equipment can be procured from the Government e-Marketplace (GeM). GeM is the National Public Procurement Portal and an end-to-end online marketplace for Central and State Government Ministries/Departments, Central and State Public Sector Undertakings (CPSUs and SPSUs), Autonomous institutions and Local bodies, for procurement of common use goods & services. The portal is owned and managed by the GeM Special Purpose Vehicle (SPV) which is a Section 8 (Non-Profit) Company registered under the Companies Act, 2013. The GeM SPV operates, monitors, and supervises all the business transactions on the portal through the managed service provider as per roles and responsibilities defined in the legal framework document available on the GeM portal. The state government of Meghalaya also signed a Memorandum of Understanding (MoU) with GeM in July 9, 2018 for the use of GeM facility by state government offices.

Human Resources

To implement the Project, various officers with different expertise are needed in the GIS/MIS Unit of PMU (Figure 7.14).



Source: developed by Study Team

Figure 7.14: Proposed Organization Structure of GIS/MIS Unit

As per the proposed organisation structure of GIS/MIS unit, the proposed officials have different roles and responsibilities (Table 7.17). For GIS, the proposed officials with technically sound knowledge are deputed or hired from the market or combination of both for expected project activities. The above mentioned base maps such as land use/land cover maps, forest density maps, forest/vegetation type maps, and topographic maps need to be prepared using the latest satellite image during the preparatory phase. These maps are used as base for micro-planning and to have the GIS ready micro plans of all the sites for future project activities. For this, a team of experts from an outside specialised agency need to be hired for 12 to 18 months to increase the speed and efficiency of proposed map making. The experts from the outside specialized agency and officials from the SPMU at state level (GIS/RS operators) and district level (GIS operators) work together at SPMU for timely production of base maps, and the works include data acquisition, data preparation, ground verification, attribute updating, and final map preparation. After the preparation of base maps, the in-house team conducts boundary survey and prepares site specific land use base map. The role of drone expert is limited to monitoring of assets and infrastructure using procured drones and produces monitoring reports for each site, produce GIS/RS inputs, and assist the GIS/RS expert for monitoring.

For MIS, the Web-based MIS application is developed during the preparatory phase. This makes it possible for PMU to utilise the MIS application from the beginning of the project implementation and also avoid back log of data collection and data entry. For this, an outside specialized agency is hired for the development of MIS application. The design and process need to be finalised in consultation of all the divisions/sections of PMU before the assignment of the work. The MIS expert can conduct a need assessment study together with a programmer and a data manager and design the MIS process accordingly. Considering the local conditions in the state, both online and offline modes of MIS application are developed. After the development and the launch of MIS application, the programmer and the data manager are responsible for the maintenance of the application for smooth functioning. The programme associates collect the data from field and enter in the application, while the monitoring and evaluation officials supervise the process and help the

programme associates for the collection of data.

Table 7.17: Expected Roles and Responsibilities of the Proposed PMU Staff

Position	Level	Expected Roles and Responsibilities
GIS/RS Expert	SPMU	・ Conduct needs assessment on the GIS-based systems. ・ Assess available data (availability in geographical extent, frequency, etc.). ・ Supervise GIS/RS unit operators under direction of PMC in cooperation with GIS and MIS experts. ・ Plan and design outsourcing works for mapping agencies. ・ Manage mapping agencies to complete proposed map preparation on time. ・ Provide GIS training with GIS/RS unit operators periodically at demand. ・ Prepare GIS operation manuals and monitoring guidelines. ・ Give technical advice to the Division Head for their project activities. ・ Standardize the quality controls of outputs. ・ Provide technical support and assist in site boundary survey and ground verification ・ Coordinate and monitor the activities of district-level GIS operators. ・ Conduct monitoring the assets and infrastructure created in the Project using GIS/RS. ・ Lead the GIS and MIS team at SPMU and report progress to Division the Head of Knowledge Management Division.
Drone Expert	SPMU	・ Conduct field survey using a drone for monitoring of the assets and infrastructure created under project. ・ Process the drone data. ・ Prepare site wise reports on monitoring outputs.
MIS Expert	SPMU	・ Coordinate with the Software development agency to monitor the progress of outsourced work related to the development of web enabled software application. ・ Conduct roll out and implementation of the developed MIS software through SPMU and other departments and daily activities and maintenance. ・ Coordinate with GIS/RS Unit (GIS/RS Expert) in data/information integration with developed MIS. ・ Carry out daily activities in MIS, including report generations. ・ Organize training and capacity building for field officers. ・ Assist and submit updated information to the Division Head in Management and supervision of the MIS-related activities. ・ Procure IT related equipment. ・ Coordinate with Forest officials other than PMU for utilization of MIS & GIS Units for various activities of the department. ・ Prepare the MIS forms for data collection in coordination with different section in SPMU and PMC experts. ・ Prepare the MIS based monitoring guidelines. ・ Monitor entire MIS activities and coordinate with the field level MIS operators/program associates.

Position	Level	Expected Roles and Responsibilities
GIS/RS Technicians (short term)	Outside Agency work at PMU	・Prepare GIS/RS data for land use/land cover maps, forest density maps, forest/vegetation type maps, and topographic maps using high resolution satellite imagery at 1:10,000 scale. ・Conduct satellite imagery data processing ・Carry out ground verification.
Programmer	SPMU	・Report to the MIS expert in daily activities for update of the modules, reports by updating the developed software codes. ・Carry out daily activities from record update to report generation. ・Carry out field visits to solve issues and smooth running of the system. ・Assist the MIS Expert in maintenance & administration of MIS developed under the project, coordinate and monitor the smooth warning of the system. ・Coordinate with the software development agency who is responsible for its development and maintenance. ・Write and edit codes.
M&E Operator	SPMU	・Maintain/improve MIS system under the direction of the MIS Expert and Programmer.
Data Manager	SPMU	・Maintain overall data coverage, quality for MIS data to ensure the relevance and usability of the systems and forestry data integrated to the platform. ・Maintain and upgrade the database activities whenever required. ・Assist MIS Expert and coordinate with the GIS Unit for the integration and verification of the data. ・Maintain the quality of data received from field offices at district and block levels. ・Coordinate and monitor the data entry in MIS.
GIS Operator	SPMU	・Undertake daily GIS operations for data preparation, data processing, and data analysis, and report generation. ・Process the satellite data, DGPS data, and drone data. ・Supervise GIS operators at district level and program associates at block level. ・Assist GIS/RS Expert to provide GIS training to Working Plan Division staff at demand. ・Assist GIS Expert for preparing GIS operation manuals, training manual and guidelines. ・Assist quality control of GIS outputs. ・Assist site boundary surveys and ground verification. ・Assist microplanning teams and prepare microplanning maps. ・Prepare post-treatment maps. ・Coordinate and monitor the activities at district level. ・Conduct monitoring for the assets and infrastructure created in the Project using GIS/RS.
GIS Operator	DPMU	・Analyze the data received from the field/departments. ・Maintain quality of field level data. ・Develop mechanisms for data verification based on the findings. ・Ensure that the data received from the field are properly entered into the system (Validation and verification). ・Conduct follow-ups for pending or discrepancy of the data/information. ・Coordinate the field level operators under districts/divisions. ・Assist site boundary survey and ground verification.

Position	Level	Expected Roles and Responsibilities
		・Assist monitoring the assets and infrastructure under Project. ・Assist preparation of microplanning maps. ・Assist preparation of post-treatment maps. ・Carry out field visits and collect GIS information.
M&E Operator	DPMU	・Ensure timely data collection from blocks and monitor the progress. ・Ensure the quality of MIS data. ・Coordinate between MIS Expert and Program Associates. ・Assist MIS Expert for solving the data collection issues. ・Conduct follow-ups for pending or discrepancy of the data. ・Carry out field visits for verification of MIS data if necessary.
Program Associate	BPMU	・Compile and input data to MIS. ・Assist site boundary survey and ground verification. ・Assist monitoring the assets and infrastructure under the Project. ・Collect primary data for MIS. ・Assist GIS/M&E operator during field visits. ・Carry out field visits.

Source: developed by Study Team

b. C3.3.3.2 Map Preparation

Satellite imagery are utilized for many project activities. In the Project, to conduct land cover/land use classification, multispectral satellite imagery are needed. To interpret detailed land features including streams and roads, very high resolution optical satellite imagery are needed. To prepare contour maps and conduct watershed analysis, high resolution digital elevation model data are required. Table 7.17 shows an example of Indian high-resolution satellite imagery available at the National Remote Sensing Centre (NRSC), and considering the data availability and their conditions, the following satellite imagery are examined as target satellite imagery by SPMU. In this regard, SPMU is responsible for the selection of satellite imagery as well as their procurement, and the end user license of the satellite imagery is owned by SPMU. In addition to the above satellite imagery, freely available very high resolution satellite imagery on Google Earth are also used for visual interpretation using designated applications.

Further, the first procurement needs to be scheduled at the beginning of the Preparatory Phase in 2020 because these data are used in base map preparation work. Other satellite imagery are procured in multiple batches to monitor forest cover conditions periodically. With regard to NRSC, satellite imagery are obtained by advance payment only, and the time required for ordering satellite imagery usually varies from one day to a few days

Table 7.18: Example of High-resolution Satellite Imagery Specifications

Sensor	Spatial Resolution	Application example in the Project	Indian Satellite Examples
Panchromatic/Pan-sharpened imagery	2.5m or similar	・Visual interpretation of forest density for forest base map making, field survey planning, and digitalization of surface features such as road and narrow streams and roads and residential/settlement areas for land use zoning maps and microplans.	CartoSat-1

Sensor	Spatial Resolution	Application example in the Project	Indian Satellite Examples
Multi-band imagery	5 m or similar	・Land use/land cover classification, forest canopy density and forest/vegetation type classification for selected blocks and state and detection of forest cover changes using multiple datasets for monitoring. ・Visual interpretation for land use zoning maps and micro-plans.	LISS-4
Digital Elevation Model	2.5m or similar	・Contour map (5m interval) making, slope analysis, and watershed analysis.	CartoDEM

Source: developed by Study Team

Four data sets of entire state, including land use/land cover, forest density, forest/vegetation type, and topographic maps with such features as roads, rivers, streams, contours, and slope, are prepared at 1:10,000 scale using high resolution satellite data during the preparatory phase. After site selection, site boundaries are surveyed and then overlaid on these data sets for site wise map preparation. These site wise maps (land use base maps) are used for participatory land use planning, and become land use zoning maps after adding information on planning to the land use base maps. Currently, some of the data available with the line department are very old, and the scales vary from map to map. In view of size of site, accuracy and consistency, all data sets are prepared at the same scale.

After the preparation of various required map data, thematic maps are produced by combining the above mentioned map data at block and selected site levels. These maps are printed and stored at SPMU, DPMU, BPMU, and villages for future reference and use.

(4) C3.4 Public Relations and Publicity

Orientation workshops should be conducted by the core members of SPMU for other project personnel. Personnel from FED, MBDA, SWCD, the ADCs and those recruited for the Project who will be vital parts of project implementation should know that the quality of service delivery depends on them. None of them should think they are implementing the Project on behalf of someone else. In this regard, project personnel should also be aware that they are the PR agents for the Project, especially those who work in the field and act as the interface between the Project and beneficiaries. Orientation workshops should be conducted several times as Project personnel may be recruited in batches.

A series of orientations or workshops for the communities is also required. When project implementation is initiated before community mobilization and gender sensitization workshops are conducted, there should be community awareness programmes to acquaint beneficiaries as well as other people in the locality with the Project. Particularly, because the benefits of forestry projects may only be reaped in years to come, people should be aware of and must be reminded of the long-term benefits of the Project.

Apart from the above activities, the following should be undertaken as part of communication and PR for the Project:

- Development of Project website
- Preparation of brochures and leaflets
- Preparation of Annual Report

(5) C3.5 PMU Establishment

The first thing that needs to be done in the Project is to establish bodies that will drive the project. This will include establishing offices of SPMU, DPMU and BPMU, as well as deploying and recruiting personnel. Constituting management bodies as per the requirement of the project is another important task. In addition, manuals and accounting systems for the project also need to be prepared.

Implementation structure of the Project is detailed in Annexure 8.

1) C3.5.1 Establishment of SPMU/DPMU/BPMU

SPMU for the Project will be established and located in Shillong. As the SPMU will be embedded in MBDA, it will make use of existing structure. Some of the administrative personnel, particularly those related to finance, general administration, human resources and procurement will have multiple duties among the Project and other MBDA projects.

At district level, DPMU will be established. At the very beginning, the DPMU may temporarily operate out of the BDU space. While the project personnel are recruited, suitable space for DPMU must be identified at district headquarters. Deputy Commissioner of the respective district may be consulted for the identification of office space.

Similarly, BPMU will be established at block level, which can be operated out of EFC until it finds a suitable space. There will be the large number of BPMU to be established; the offices should be established in accordance with the batch-wise implementation plan. For instance, priority should be given to the block that has more number of target villages in a block.

The formation of SPMU, DPMU, and BPMU should be notified by MBDA, and the offices should be provided with facilities required for smooth implementation of the Project.

2) C3.5.2 Deployment and Recruitment of Staff

In the Project, some of the personnel will be posted to the project from the Government of Meghalaya while some others need to be recruited on contract basis from the open market. A list of suggested personnel is found in Annexure 8.

Project Director of SPMU shall be Secretary to GoM or above rank level official. Leadership of the project director makes a lasting change on the pace and course of the project implementation. Therefore, an individual who has high commitment to his/her work, strong leadership skill, and good interpersonal skill should be appointed to Project Director. In addition to Project Director, an Additional Project Director shall be posted on full-time basis.

Wherever possible, preference should be given to depute civil servant for director level position in SPMU. Personnel posted in these key positions should be full-time, especially in the preparatory stage of the Project and during the peak of project implementation. Posting personnel who are holding multiple offices/duties out of the Project should be avoided as it will hamper the project implementation. They should also be able to work for the Project in the long term, for example, four to five years without transfer.

Other positions in the Project will be recruited through advertisement from open market on contractual basis renewable each year after performance evaluation. Personnel for key positions of DPMU and BPMU such as district project managers and block managers should be selected by SPMU. Support staff of DPMU and BPMU may be selected by each office manager.

Community facilitators for the community level institutions will be engaged on short-term basis. These individuals should be youth from target villages. Minimum educational qualifications of the university are required, with the recommendation of the village that he/she belongs to. Community

facilitators shall assist in organizing meeting, record keeping, and implementation of activities at village level.

3) C3.5.3 Establishment of Management Bodies

a. C3.5.3.1 Governing Body

As there is an existing Governing Body in MBDA, SPMU will be governed by the same governing body. At the same time, MBDA has its own mandate and the objective, and requirement in the project may not be fully aligned to that of MBDA. Since the Governing Body will be the highest decision-making body for the Project, the Project Director should be included in the Governing Body to represent the Project. At the same time, as the Project attempts to involve ADCs, a representative from the Department of District Council Affairs should be also included in the member of the Governing Body. A decision must be made in the Governing Body at the beginning of the Project to include new members to the Council.

b. C3.5.3.2 Executive Committee

While the Governing Body looks after the entire MBDA, a separate committee will be formed specifically to look after the day to day operation of the Project. The Executive Committee will ensure efficient management of the Project such as quick decision making, trouble shooting, close supervision etc. The Executive Committee shall be formed at the state level at the beginning of the Project and shall function until the completion of the Project.

In addition, an Executive Committee shall also be established at the district level to provide technical advice to District Project Manager and review the reports from technical points of view and so forth. The members of the Executive Committee are district level officers of concerned departments.

c. C3.5.3.3 External Advisory Committee

To help smooth project implementation, establishing External Advisory Committee may be considered in the Project. The committee is expected to review the implementation arrangement of the Project, its strategies and actual practices on the ground and provide suggestions and recommendations impartially. The committee may have three to five experts in and out of the state who have either substantial knowledge of local situations in Meghalaya and/or experience in other forestry projects.

4) C3.5.4 Preparation of Manuals and Accounting System

MBDA has draft Administrative and Financial Rules that are pending the approval of its Governing Body. These rules are expected to be approved by the Governing Body by the middle of 2019. Since the Project will be spearheaded by MBDA, the same rules will be applied to SPMU. The rules should be reviewed, and amendments should be made in the context of the Project if required.

A financial manual pertaining to the Project needs to be prepared separately. Specific requirements in terms of JICA procedure should be addressed in the manual. Short-term consultant(s) may be appointed to develop the manual along with other operation manuals at the onset of the Project. This task should be completed within the first five months of the Project.

At the same time, accounting system for the Project will be set up. Based on the requirement, customization of accounting system can be outsourced to an external agent.

SPMU will open a separate bank account from MBDA, exclusively for the Project. DPMU and BPMU will also open a bank account for the purpose of the Project as their offices are established.

The assets created during the project implementation will be managed most by the Project. After the project completion, the responsibility of operation and maintenance (O&M) will be transferred to different relevant institutions (Annexure 9).

7.5.4. Supplemental Component: Project Management Consultants

To assist SPMU in project management, PMC will be hired. PMC will be procured following the JICA guidelines. The main tasks of PMC are envisaged as follows:

- Assist SPMU in managing the project in an effective and efficient manner.
- Assist SPMU in periodically monitoring the project activities with the monitoring formats and improving the project design, framework, and systems based on the monitoring data stored in the MIS/GIS-based monitoring system.
- Assist SPMU in preparing annual work and budget plans based on the appropriate estimation of work quantity as well as unit costs of the respective inputs.
- Assist SPMU in enhancing the capacity of stakeholders in sustainable forest, soil and water conservation, and community development and livelihood improvement
- Assist SPMU in proper fund management and smooth communication/coordination with JICA and preparing reports for submission to JICA and other stakeholders.
- Assist SPMU in developing a GIS- and MIS- based monitoring system and operationalize at the SPMU/ DPMU/ BPMU level with a user friendly database and simplified monitoring formats necessary for regular monitoring.
- Assist SPMU in monitoring the process of microplanning by community organizations.
- Assist DPMU/ BPMU to strengthen their technical, managerial, and administrative capacities for implementation and management of the project.
- Facilitate implementation of Environmental and Social Management System Framework (ESMSF) and Scheduled Tribe and Forest Dependents Plan Framework (STFDPF)

(1) C3.6 Procurement of PMC

Preparation for procurement of PMC must start at the earliest possible. Team composition of the PMC is given below. Team leader of the PMC is expected to be particularly strong in project management to effectively assist SPMU. Suggested man-months (M/M) and a list of supporting staff for the PMC is indicated in Table 7.19.

Table 7.19: PMC Team Composition

Sl no.	Position	M/M
Pro A (International)		
1	Co-Team Leader/Community Forestry	16
2	GIS and Remote Sensing	7
Pro B (National)		
3	Team Leader/Livelihood	47
4	Capacity Development and Gender	26
5	MIS and M&E	20
6	Forestry and Biodiversity	14
7	Soil and Water Conservation	11
8	Marketing	16
9	Community-based Enterprise Development or Ecotourism*	11
10	Agriculture/Agroforestry	21
Supporting Staffs		
11	Field Coordinator 1	66
12	Field Coordinator 2	66
13	Field Coordinator 3	66
14	Office Manager	68
15	Office Assistant	68

*Requirement for community-based enterprise development or ecotourism expert will be determined after enterprise development scoping study.
Source: developed by Study Team

(2) C3.7 Overseas Training

The necessity of overseas training or exposure visit will be considered by PMC in consultation with SPMU. The purpose of having such opportunity for the project personnel is to get exposure to the latest technological and management interventions in the field relevant to the Project. During the implementation phase of the Project, PMC will determine the requirement for such training/exposure visit, and plan and organize the training/exposure visit. Participants of overseas training/exposure visit are expected to learn new technologies and practices, share their learning with the rest of project personnel and stakeholders upon their return, and put them into practice. Therefore, the participants should be selected from those who have been working for the project on full-time basis at least two years before the selection and have willingness and commitment to stay on the position for the remaining duration of the project.

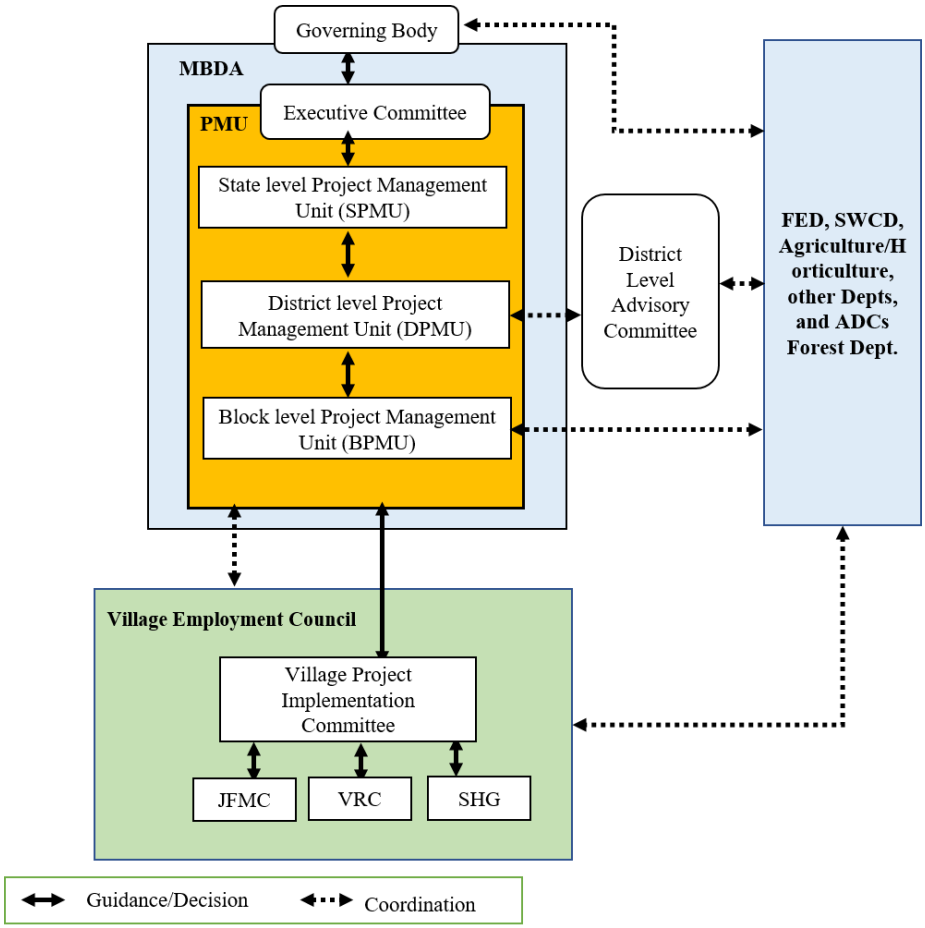
7.6. Implementation Structure

For the Project for Community-Based Forest Management and Livelihoods Improvement in Meghalaya, a tripartite agreement has been made earlier among the MoEF&CC, JICA, and the Government of Meghalaya, that the executing agency would be MBDA and the SPMU will be housed in MBDA.

MBDA already has experience in implementing externally-aided projects, particularly those requiring coordination with various government departments and institutions, it is an organization established under the Planning Department. The strength of MBDA lays in its authority and ability to strike synergies with other stakeholders. On the other hand, keeping in mind that it is a forestry sector Project and that there will be a need for the operation and maintenance of various assets created in the Project beyond its implementation period, FED's (as well as the ADC's and communities') ownership in the project will be most essential. Therefore, a primary role will be given to FED viz-a-viz the other line departments in project implementation.

In addition, securing an institutional structure for efficient decision making and fund flow is essential for the smooth implementation of the Project. It has been seen in other development projects that autonomous societies facilitate an efficient management process. MBDA is an autonomous society registered under the Meghalaya Societies Registration Act, and therefore, Project can be implemented through this society. Because the Project has its own goals, targets, and plans to meet, a separate PMU will be established within MBDA.

Considering these circumstances, the following is the proposed implementation structure for the Project. Fund flow among the different implementing bodies is discussed below.



Source: developed by Study Team

Figure 7.15: Implementation Structure

7.6.1. Implementing Bodies

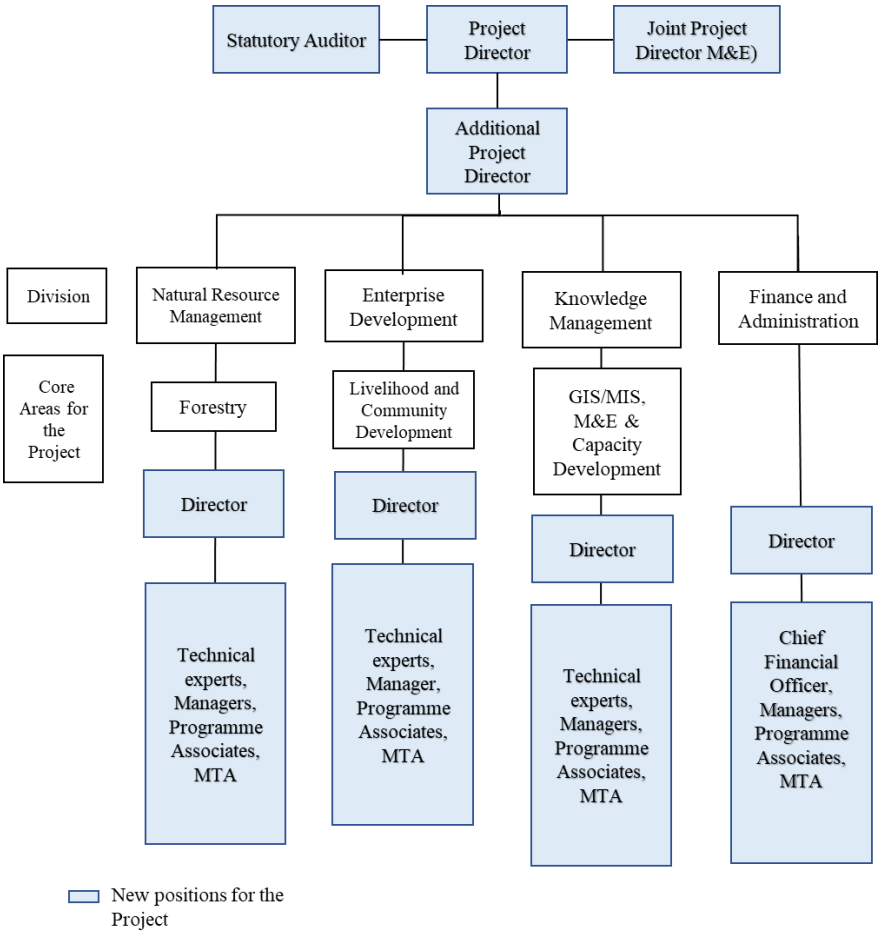
(1) State Level Project Management Unit (SPMU)

SPMU housed in MBDA will oversee the management and implementation of project at State level. The project will be headed by Project Director. The Project Director should be appointed on full-time basis ideally, however, it seems to be realistically difficult due to constraints of human resources of GoM. In order to compensate for the shortfall, Additional Project Director shall be posted on full-time basis.

Project Director will be supported by three Directors and one Chief Financial Officer, who will be managing different units of the Project that are divided based on components and managerial section of the Project (i.e. forestry management, livelihood, accounts etc.). Director level posts shall be filled by deputation from technical departments.

1) Structure of SPMU

SPMU will be formed using the existing structure of MBDA by placing the personnel for the Project in each of the divisions of MBDA. The structure for SPMU is shown below:



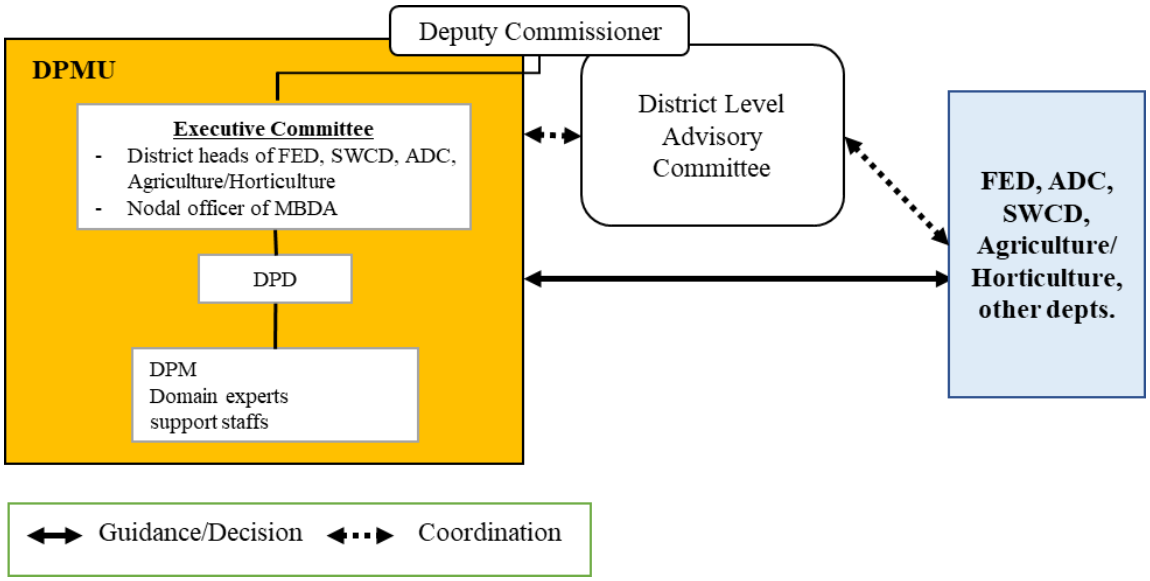
Source: developed by Study Team

Figure 7.16: Structure of SPMU

Some of the existing personnel in MBDA will hold multiple duties, allocating part of their duty time to the Project. One of such position will be Chief Financial Officer. In Finance and Administration Division, there will be several existing officers who will divide their time for the Project and other duties.

(2) District Level Project Management Unit (DPMU)

DPMU shall be established at District level. Keeping in mind that the Project requires coordination with various stakeholders, the Project will be chaired by Deputy Commissioner at District level. Deputy Commissioners are already heading the Mega-LAMP and CCLAMP at respective district and are also the chairperson for District Level Advisory Committee. The actual implementation will be spearheaded by District Project Director, who will work as a nodal officer under the Deputy Commissioner. District Head of a line department will be appointed as District Project Director. District Project Manager (DPM) will be in-charge of day to day operation of the Project under the guidance of Deputy Commissioner and District Project Director, as and when necessary. DPMU will also establish Executive Committee, which will approve and sanction activities posed by District Project Director. Executive Committee will coordinate with concerned departments through District Level Advisory Committee, when technical support is required. A structure of district level implementation is shown below.



Source: developed by Study Team

Figure 7.17: District Level Implementation Structure

(3) Block Level Project ManagementUnit (BPMU)

Office at block level called Block Level Project Management Unit (BPMU) shall be established at at Block level, where frontline officers of the project are stationed. BPMU will be chaired by Block Development Officer (BDO). BDO may appoint a Block Manager, to manage day-to-day operation of the BPMU. While BDO will be responsible to make the decision and coordinate between the Project and government departments, actual implementation at Block level will be taken care by the Block Manager.

(4) Community Level Organization

Slight variation among Khasi Hills, Jaintia Hills and Garo Hills areas may be made as each of these ADC areas has different degree of traditional community organization exercising their power and have different relationship between the people and the land. In general, Village Council/*Dorbar* or village headman (*Rangbah Shnong* or *Nokma*) should be the first point of contact at the onset of the project implementation. Since they are important traditional institutions, they need to be kept informed of developments in the Project whenever the village is selected for the Project. Village Council or its headman can guide the project team in convening public meetings, identifying potential beneficiaries and resources. However, they are not the implementing body for the project activities.

Village Employment Council (VEC) is a body to implement the Mahatma Gandhi National Rural Employment Guarantee Act (NREGA) in Meghalaya State, and has been established in every village across the State. The Project shall utilize VEC for project implementation. A sub-committee of VEC will be created known as Village Project Implementation Committee (VPIC). The mandate of VPIC is to guide and supervise the project implementation in the respective village and to manage the project account which will be opened exclusively for the Project. Members of the committee are suggested below; however, adjustment may be made based on the size, demography, and condition of each selected village.

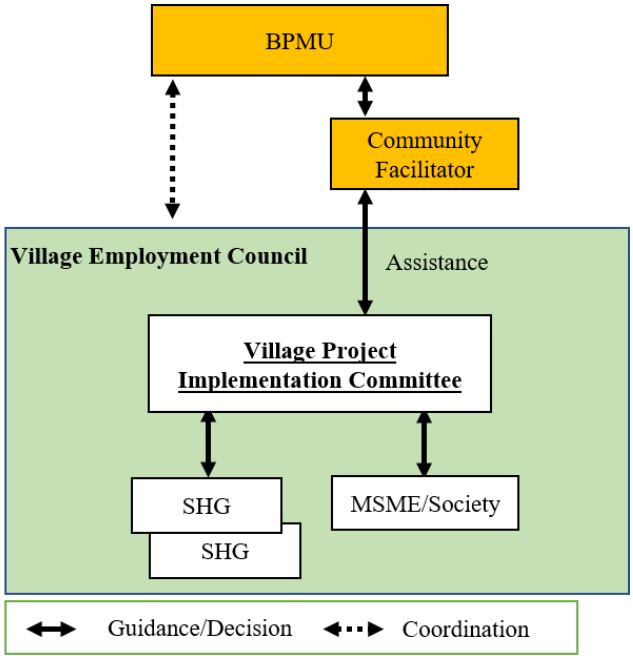
- Village headman
- Field officer of FED (Forester)
- Field officer of MBDA (Programme Associate for EFC)

- Field officer of concerned ADC (Forester)
- Filed officer of SWCD (Soil and Water Conservation Demonstrator)
- Field officer of Agriculture (Assistant Agriculture Inspector)
- Community facilitator of the project
- Woman
- Youth
- Representative of SHGs in the village
- Landless
- Landholding beneficiary
- Sub-headman (in case the target village is large in size)

To empower women in decision-making, 50% of VPIC members represented by villagers shall be reserved for women.

Apart from VPIC, community facilitator shall be appointed to motivate the community, guide and assist the community in project activities and act as a link between the project and the community. Community facilitator will work following instruction by BPMU and report the progress of activities conducted in the villages to BPMU. Community facilitators shall assist in organizing meeting, record keeping, and implementation of activities at village level. These individuals should be youth from the target village. Minimum educational qualification of matriculate is required, with the recommendation of the village he/she belongs to. Community facilitators for the community level institutions will be engaged on short-term basis.

VPIC may have different committees in order to accommodate various activities to be implemented in the village. Committees such as JFMC and Watershed Committee may be required to be created under VPIC for implementation and maintenance of village level activities. For livelihood related activities, SHG shall be identified or formulated through the VPIC. In some villages Micro, Small and Medium Enterprises (MSMEs) /Societies are also established. Once the Project makes entry to the community, potential beneficiaries or promising entrepreneurs can be identified in other ways as well. General structure for community level project implementation is shown below.



Source: developed by Study Team

Figure 7.18: Community Level Implementation Structure

7.6.2. Management of the Project

(1) Governing Body

According to the Societies Registration Act of 1860, management of a society is vested with the Governing Body, which exercises its power and functions as decision-making body. Governing Body is the highest decision-making body within the society. In the case of MBDA, there is an existing GB, and since SPMU will be formed within an existing society, it will be governed by the same Governing Body. At the same time, MBDA has its own mandate and the objective, and requirement in the Project may not be fully aligned to that of MBDA. Therefore, following officers are to be added to the members of the Governing Body in addition to existing Governing Body members, when Governing Body makes decision on the Project.

- A representative from the Department of District Council Affairs
- Project Director of JICA funded Project for Community-Based Forest Management and Livelihoods Improvement in Meghalaya

Composition of Governing Body shall be as follow:

Table 7.20: Composition of Governing Body

Sl. No.	Rank of Officers and Department	Membership
1	Chief Secretary	Chairperson
2	Additional Chief Secretary, Labour Department and SWCD	Member
3	Additional Chief Secretary, Finance/Power Department	Member
4	Principal Secretary, Planning Department	Member
5	Principal Secretary, Forest Department	Member
6	Commissioner and Secretary, Public Health and Engineering Department	Member
7	Commissioner and Secretary, Water Resources Department, SWCD, FED, Planning Department, and Community & Rural Development Department	Member
8	Commissioner and Secretary, Agriculture/Fisheries Department	Member
9	Commissioner and Secretary, Personnel Department	Member
10	Commissioner and Secretary, District Council Affairs Department	Member (new)
11	Project Director (JICA project)	Member (new)
12	JICA representative	Invitee

Source: developed by Study Team

The Governing Body meeting shall be convened half yearly or more frequently, as it has been doing so. More frequency of meeting may be required particularly in the initial stage of the project. A minimum of two-thirds of the members will form the quorum for the Governing Body meetings..

(2) Executive Committee of PMU

While the Governing Body's responsibility is to look after overall management of MBDA, day to day operation of the project will be entrusted to Executive Committee (EC) created specifically catering for the PMU. The EC will ensure efficient management of the project such as quick decision making, trouble shooting, close supervision etc. Composition for the EC is shown below. The composition may be adjusted based on the executive positions created in the SPMU and other government departments/agencies that may have significant association to the Project.

Table 7.21: Composition of Executive Committee

Sl. No.	Rank of Officers and Department	Membership
1	Project Director	Chairperson
2	Additional Project Director	Member Secretary
3	All Division's chairperson of SPMU	Members
4	Director, SWCD	Member
5	Chief Forest Officer (CFO), JHADC	Member
6	CFO, KHADC	Member
7	CFO, GHADC	Member

Source: developed by Study Team

The committee will be exclusively for the project and should meet at least once every month, or more frequently if the need arises, particularly during preparatory phase of the project. In case the members are not available on the day of the meeting, they may nominate senior rank officers in the department/section as their representatives to attend the meetings with authorization for decision making.

As far as possible efforts will be made that meetings are organized when all of the members can participate in EC meetings, however minimum of 2/3rd members will form the quorum of the EC meetings. Agenda of the meeting and proposals will be circulated by the Member-Secretary well in advance to all members, at least three days ahead of the meeting date. Proceedings of the EC meetings will be circulated to all the members/ attendees within reasonable timeframe, after the meeting is concluded.

7.6.3. Coordination with Oher Departments

(1) District Level Advisory Committee (DLAC)

While Governing Body has function of coordinating with other departments and agencies, at field level, DLAC will be a forum where DPMU can make convergence with other government schemes and coordination. DLAC chaired by respective Deputy Commissioner is already in existence across the State, dealing with convergence issues among various departments. The project can make use of this existing body as a forum to coordinate with other departments at district level, as and when required.

7.6.4. Involvement of Other Major Stakeholders

(1) Forest and Environment Department (FED)

Because the Project is a forestry sector project, involvement of FED is essential. Deputation of forest officials to SPMU and DPMU, and working together in areas where FED is operating shall be arranged. Involvement of FED will be important not only in the implementation of the Project, but also to provide support to the communities in the operation and maintenance stage.

(2) Autonomous District Councils (ADCs)

As a link between the project and community, ADCs will have important role to play. However, in some places, ADCs have had limited involvement due to paucity of funds and other resources. Empowering ADCs through active participation will be a key. To do so, components of the project where ADCs can take leadership must be first identified. As each ADC's authority and relationship with communities are unique, their intervention will not be necessarily the same. Kind of intervention and quantum of work to be carried out by ADCs will be determined individually.

(3) Soil and Water Conservation Department (SWCD)

Another major stakeholder to the project implementation is SWCD. In relation to the volume of work implemented by SWCD, deputation of officer(s) from the department to SPMU needs to be

considered.

For all the stakeholders where the project fund will be channelized from SPMU/DPMU to respective office, they will be responsible in keeping records of and reporting the fund utilization to the SPMU/DPMU on regular basis. Fund flow is discussed in subsequent section.

(4) Agriculture/Horticulture Department

Agriculture and agroforestry is one of major livelihood activities in the Project. Agriculture/Horticulture Department is expected to provide technical support to beneficiaries. Training on agroforestry for SHG members can be conducted at an experimental farms of the department.

7.6.5. Fund Management

(1) Budgetary Provision

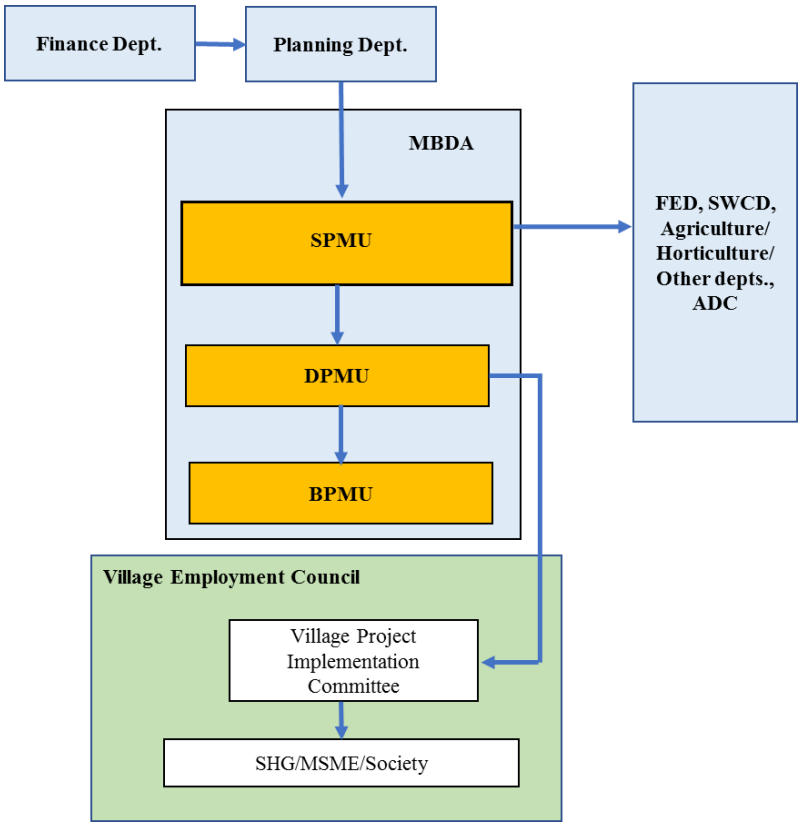
For smooth implementation, the Government of Meghalaya will make sure that required fund is secured and released on time. This applies to not only Japanese ODA loan portion but also for State share. At SPMU and its field offices, exclusive bank accounts for the project will be opened.

(2) Annual Plan of Operation (APO)

SPMU will prepare APO for each financial year starting from first year, and get it approved by the Governing Body prior to commencement of new financial year. SPMU will guide, capacitate and make efforts to ensure that the plans are prepared in timely manner through a consultative process starting from the lowest level of project implementation. An orientation workshops should be held by SPMU in first two to three years of the Project to acquit ant filed functionaries on how to draft APO at Block and District levels.

(3) Fund Flow

From SPMU, fund flow will have two channels; a) fund for procurement and operations at respective departments/institutions, the fund will be transferred to respective departments/institutions, while b) the fund for activities implemented by VPIC will be transferred from SPMU to DPMU, and then to DPMU to VPIC of VEC. Among the various levels and bodies of project implementation, following shows the direction of fund flow.



Source: developed by Study Team

Figure 7.19: Fund Flow

A rule should be made in the operation manual that once the fund is released from one project implementation body to another, maximum number of days it can be parked in the concerned project account so as to ensure fast transfer of funds to the field level. It is deemed that wherever one body is receiving fund from another, the recipient body is obliged to furnish the details of fund utilization and its progress on regular basis as part of project monitoring as well as upon the request of superior body.

(4) Compliance with General Financial Rules

Government departments in Meghalaya follow Meghalaya Financial Rules. To comply with the prevailing rules, an experienced finance officer shall be posted to SPMU, a civil servant within the State on full-time basis as Chief Finance Officer.

Chief Finance Officer shall be a key officer in facilitating preparation and submission of Statement of Expenditures (SOEs) to JICA through Controller of Aids, Accounts and Audit (CAAA) of the Ministry of Finance. The officer should be in charge of ensuring coordination among the Finance Department of Meghalaya, CAAA and JICA for getting clearance on reimbursement claims in timely manner.

(5) Administrative and Financial Manuals

MBDA has draft Administrative and Financial Rules that are pending the approval of its Governing Body. Since the project will be spearheaded under the aegis of MBDA, the same rules will be applicable to SPMU. These rules are expected to be approved by the Governing Body by mid-2019. The rules should be reviewed and amendments should be made in the context of Project for Community-Based Forest Management and Livelihoods Improvement in Meghalaya, if required any.

Finance and accounting manual need to be prepared separately pertaining to the project. Specific requirement in terms of JICA procedure should be addressed in the manual. Short-term consultant(s) may be appointed to develop the manual along with other operation manuals at the onset of the project.

(6) Accounting Procedures Accounting Procedures

As mentioned in 7.5.3(5)4), SPMU, ADC, DPMU will have exclusive bank account for the Project. Similarly, separate bank account should be opened for VPIC as well, if they don't have existing account. For the community level implementation bodies, in addition to the committee's president, treasurer and secretary a member-secretary represented by an officer from BPMU should be one of signers for the bank account.

Accounting procedure will be unified based on double accounting system at SPMU and all its field offices. Finance and accounting manuals for the Project should be prepared with first six months of the Project from the signing of the Loan Agreement.

Funds for the Project will be released from SPMU to respective departments/institutions as well as to DPMU on regular basis, based on APO. The fund from SPMU to concerned departments will be transferred to the Director of the department, while the fund from SPMU to ADCs will be in the project account of Chief Forest Officer. DPMU will release fund to VPIC of VEC.

The funds from the state government to SPMU, as well as its field offices, ADC, concerned department and VPIC of VEC are provided as grant-in-aid. None of the fund reserved for the Project must be used or diverted by SPMU or any of its field offices for purpose other than the Project.

Utilization certificated and Statement of Expenditures (SOE) will be submitted from community level institution to DPMU, ADC or concerned departments depending on the nature of work. The same will be submitted from DPMU to SPMU on the regular basis. Utilization certificates and SOE of any funds released to and utilized by ADCs and concerned departments will be submitted by each institution to SPMU. Preparation and submission of utilization certificates and SOE will be made on regular basis.

(7) Audits

Transparency, particularly related to utilization of project fund, is important. All levels of implementation bodies (SPMU, DPMU and VPIC of VEC) in the proposed project must have annual statutory financial audit conducted each year. Qualified chartered accountant firm should be identified and appointed for this purpose. This will be done in compliance with Comptroller and Audit General's (Duties, Powers and Conditions of Services) Act, 1971.

(8) Procurement

Procurement of goods and services for the Project will be done in accordance with the "Guidelines for Procurement under Japanese ODA Loans" dated April 2012 and project management consultants will be selected in accordance with "Guidelines for Employment of Consultants under Japanese ODA Loans" dated April 2012. The PMU may make use of the state procurement rules, but JICA's guidelines shall overrule whenever such procurement rules are in conflict.

Quality and Cost Based Selection (QCBS) method will be adopted by PMU that generally has following stages of selection, viz., a) Notice publication and invitation for Expression of Interest (EOI), b) Screening of proposals and preparing Short-list, c) Inviting Technical and Financial Proposals through Request for Proposal (RfP), d) Evaluation of Technical proposals, e) Opening and evaluation of Financial Proposal based on the qualifying Technical Score, and f) Inviting top

ranked agency/organization of Negotiations abased on the combined Technical and Finance Score. Before, evaluation of technical proposals, sometimes presentation on the Technical Proposal is also required by the Client, and accordingly reflected in the 'Special Conditions' of the RfP.

(9) Revolving Fund

SPMU shall develop elaborate policy and system of accessing and utilizing of revolving funds to be created under the Project. The policy will also spell out to deal with the interests earned out of such revolving funds and include it as a section in the Operation Manual. The policy will be approved by the GB, and systematic record of utilization of such funds will be maintained at SPMU and at field offices, as well as community level whenever applicable. The guidelines based on the approved policy will be published and disseminated amongst stakeholders to facilitate access to these funds as well as to keep transparency.

7.6.6. Project Management Consultant (PMC)

To assist SPMU in project management, PMC will be hired. PMC will be procured following the JICA guideline. Main tasks of PMC are envisaged as follow:

- Assist SPMU in managing the Project in an effective and efficient manner.
- Assist SPMU in periodically monitoring the project activities with the monitoring formats and improving the project design, framework, and systems based on the monitoring data stored in the MIS/GIS-based monitoring system.
- Assist SPMU in preparing annual work and budget plans based on the appropriate estimation of work quantity as well as unit costs of the respective inputs.
- Assist SPMU in enhancing the capacity of stakeholders in sustainable forest, soil and water conservation, and community development and livelihood improvement
- Assist SPMU in undertaking works and procuring the necessary equipment, goods & services for the project implementation.
- Assist DPMU/ BPMU to strengthen their technical, managerial, and administrative capacities for implementation and management of the Project.
- Assist DPMU/ DPMU/ BPMU in providing orientation, technical guidance, and advice to community organizations for the effective implementation of the project activities.
- Facilitation of implementation of Environmental and Social Management System Framework (ESMSF) and Scheduled Tribe and Forest Dependents Plan Framework (STFDPF)

7.7. Environmental and Social Considerations

7.7.1. Overview of the Present State of Meghalaya State

(1) Pollution Control

1) Air Quality

a. Ambient Air Quality

The National Ambient Air Quality Standards of India and guideline values of World Health Organization (WHO) are given in Table 7.22.

Table 7.22: National Ambient Air Quality Standards of India

Pollutants	Time Weighted Average	Industrial, Residential, Rural and Other Area*		Ecologically Sensitive Area	Method
SO_2 ($\mu g\ m^{-3}$)	Annual	50	(20)	20	- Improved west & Gacke method - Ultraviolet fluorescence method
	24 hours	80	(500)	80	
NO_2 ($\mu g\ m^{-3}$)	Annual	40	(40)	30	- Modified Jacab&Hochheister method - Chemiluminescene method
	24 hours	80	(200)	80	
PM10 ($\mu g\ m^{-3}$)	Annual	60	(20)	60	- Gravimetric method - TEM - Beta attenuation method
	24 hours	100	(50)	100	
PM2.5 ($\mu g\ m^{-3}$)	Annual	40	(10)	40	
	24 hours	60	(25)	60	

*Note: Numbers in parentheses indicate WHO Guideline Values (2017)
Source: NATIONAL AMBIENT AIR QUALITY STATUS & TRENDS (2012), CPCB

The Meghalaya State Pollution Control Board (MSPCB) is monitoring the Ambient Air Quality at seven stations in the state under the National Air Monitoring Programme (NAMP), sponsored by the Central Pollution Control Board (CPCB). The frequency of monitoring is twice a week. Particulate Matter (PM10), Sulphur Dioxide (SO_2), Oxides of Nitrogen (NOx), and meteorological parameters viz. such matters as wind speed, wind direction, ambient air temperature, and humidity were monitored at these stations. The observations are presented below in Table 7.23. The permissible limits of PM10, SO_2 and NOx are 60 $\mu g\ m^{-3}$, 50 $\mu g\ m^{-3}$ and 40 $\mu g\ m^{-3}$, respectively. Monitoring results which exceeded the limits are indicated in bold.

Table 7.23: Ambient Air Quality in Meghalaya State

(1) Board's Office Premises, Lumpyngngad, Shillong (Station 1)

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.
PM10 ($\mu g\ m^{-3}$)	49.1	45.9	48.9	36.8	40	39.7	37.7	37.6	36.1	32.1	39.5	39.2	40.2
SO_2 ($\mu g\ m^{-3}$)	2	2	2	2	2	2	2	2	2	2	2	2	2.0
NOx ($\mu g\ m^{-3}$)	4.7	4.5	4.7	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5

(2) MUDA Complex, Police Bazar, Shillong (Station 2)

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.
PM10 ($\mu g\ m^{-3}$)	**92.3**	**93.2**	**94.7**	**93.2**	**87.5**	**89.2**	**88.6**	**85.3**	**86.7**	**85.3**	**85.8**	**82.9**	88.7
SO_2 ($\mu g\ m^{-3}$)	2.1	2.7	2.3	2.4	4.9	3.8	3.7	3.2	2.8	2.3	2.2	2.5	2.9
NOx ($\mu g\ m^{-3}$)	18.0	17.6	18.1	18.6	18.1	16.9	16.1	17	16.9	16.6	13.8	13.8	16.7

(3) Export Promotion Industrial Park (EPIP), Byrnihat, Ri-Bhoi District (Station 3)

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.
PM10 ($\mu g\ m^{-3}$)	**149.1**	**140.1**	**125.6**	**139.4**	**92.9**	**115.4**	**116.3**	**121.4**	**119.4**	**135.2**	**99.5**	**98.3**	121.0
SO_2 ($\mu g\ m^{-3}$)	28.9	25.0	20.3	16.7	16.8	14.4	17.9	18.3	16.8	17.1	38	26.3	21.3
NOx ($\mu g\ m^{-3}$)	19.0	13.7	16.3	14.5	14.2	13	15	14.9	12.6	13.2	13	13.3	14.3

(4) Dawki, West Jaintia Hills District (Station 4)

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.
PM10 ($\mu g\ m^{-3}$)	49.8	47.5	48.0	41	26.7	32.5	34.2	39.1	43.8	46.7	46.4	46.4	41.8
SO_2 ($\mu g\ m^{-3}$)	2	2	2	2.4	2	2	3.1	2.7	2	2.3	2	2.1	2.5
NOx ($\mu g\ m^{-3}$)	13.0	9.1	10.6	9.9	7.7	8.3	8.4	9.4	12.6	10.1	10.9	8.9	9.9

(5) Tura, West Garo Hills District (Station 5)

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.
PM10 ($\mu g\ m^{-3}$)	55.1	46.7	34.3	31.8	33.8	35	24.4	37.9	34.1	36.4	49	31.5	37.5
SO_2 ($\mu g\ m^{-3}$)	2	2	2	2	2	2	2	2	2	2	2	2	2.0
NOx ($\mu g\ m^{-3}$)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5

(6) Khliehriat, Jaintia Hills District (Station 6)

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.
PM10 ($\mu g\ m^{-3}$)	52.2	51.2	47.7	42.6	40.4	40.7	19.6	16.4	27.2	33	39.9	48.3	38.2
SO_2 ($\mu g\ m^{-3}$)	2	2	2	2	2	2	2	2	2	2	2	2	2.0
NOx ($\mu g\ m^{-3}$)	11.3	11.0	10.4	9	8.7	5.8	4.5	4.5	4.5	6.6	4.5	4.5	7.1

(7) Nongstoin, West Khasi Hills District (Station 7)

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.
PM10 ($\mu g\ m^{-3}$)	29.3	31.0	30.3	27.2	27.2	25.3	24	23.2	22.8	21.3	22.9	21.1	25.4
SO_2 ($\mu g\ m^{-3}$)	2	2	2	2	2	2	2	2	2	2	2	2	2.3
NOx ($\mu g\ m^{-3}$)	4.9	5.9	5.5	5.9	5.1	6.5	8.4	8.2	7.8	6.6	5.2	4.5	6.2

All Data Sources in the Tables: Meghalaya State Pollution Control Board Annual Report 2013-2014

Ambient air quality monitoring data during 2013 monitored at the seven stations revealed that the Annual Average concentrations of SO_2 and NOx were within the prescribed standards of the National Ambient Air Quality standards. On the other hand, PM10 levels in Police Bazar, Shillong (Station 2) and Byrnihat, Ri-Bhoi District (Station 3) exceed the standard substantially due to heavy traffic, even at night (Figure 7.20).

(Source: Study Team)

Figure 7.20: Traffic Situation in Police Bazar, Shillong

b. Assessment of Vehicular Pollution

MSPCB is operating a fixed/permanent Vehicular Emission Testing Station on its office premises, Lumpyngngad, Shillong, which was established in 1994 for testing of Petrol- and Diesel-driven vehicles (Light Motor Vehicles: LMV). This was done only at the request of the Transport Department for the purpose of obtaining an exhaust emission certificate, as required by the Transport Authority for the granting and renewal of registrations and permits. Mostly, commercial driven vehicles (LMV) are tested at this station. Vehicular testing is as shown below:

Table 7.24: Results of Vehicular Monitoring

Period	01/04/2012 - 31/03/2013		01/04/2013 - 31/03/2014		01/04/2014 - 31/03/2015		01/04/2015 - 31/03/2016		01/04/2016 - 31/03/2017	
Type of vehicles	Petrol	Diesel	Petrol	Diesel	Petrol	Diesel	Petrol	Diesel	Petrol	Diesel
Total no. of vehicles tested	2,231	1,497	3,725	1,473	3,506	1,428	6,524	2,399	8,085	2,573
Percentage of vehicles complying to emission standards	93.00 %	91.60 %	95.00 %	92.90 %	98.80 %	95.40 %	99.00 %	93.20 %	99.00 %	97.40 %
Percentage not complying to emission standards	6.90 %	8.40 %	5.00 %	7.00 %	1.20 %	4.60 %	1.00 %	6.80 %	1.00 %	2.60 %

Source: http://megspcb.gov.in/vehicular.html (as of February 2019)

2) Water Quality

Meghalaya State is endowed generously by nature as far as water resources are concerned. A number of perennial rivers, lakes, and waterfalls grace this land with eternal charm and beauty. There are several rivers and streams, which have comparatively smaller stretches but which are quite important for water utilization, as most of these are exploited for the such things as drinking water, irrigation, industries, and waste disposal. For the last few decades or so the state has started facing serious problems of surface and groundwater pollution due to the indiscriminate discharge of untreated municipal effluents, industries, and agricultural runoff. Open defecation and dumping of solid wastes on river banks also contribute to water pollution. Unorganized mining activities on a large scale in almost all the parts of the state, mainly of coal, is another major source of water pollution. In order to obtain information regarding the overall health and general environmental state of the rivers and ground water resources in the state, MSPCB is monitoring on a regular basis the water quality of selected water bodies in the state under National Water Monitoring Programme (NWMP). This monitoring covers 20 rivers and streams, four lakes, and seven springs/wells. A total of 54 sampling locations (47 points of surface water and 7 points of ground water) are monitored. The monitoring of water quality is one of the purposes of prevention and control of water pollution and maintaining or restoring the wholesomeness of water, as indicated in the Water (Prevention and Control of Pollution) Act 1974. Monitoring is done on monthly basis for surface water and on a half-yearly basis for ground water. The regular parameters analyzed include pH, Conductivity, Turbidity, Total Suspended Solids, Total Dissolved Solids, Nitrite Nitrogen (NO_2-N), Nitrate Nitrogen (NO_3-N), Ammonia Nitrogen (NH_4-N), Kjeldahl Nitrogen (as total N), Sulphate (as SO_4), Chloride (Cl), Hardness, Calcium (Ca), Magnesium (Mg), Sodium (Na), Potassium (K), Total Phosphate, Acidity, Alkalinity, Fluoride (F), Dissolved Oxygen (DO), Bio-Chemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Coliform, and Fecal Coliform. The metals, namely Iron (Fe), Zinc (Zn), Manganese (Mn), Copper (Cu), Lead (Pb), Cadmium (Cd), Chromium (Cr), and Nickel (Ni) are analyzed once a year in April. The National Water Quality Standards of India, with international reference values, and details of monitoring stations with regard to location, is as mentioned in Table 7.25 and Table 7.26, respectively.

Based on the monitoring data, the water quality of the sampling stations district-wise is as described below.

a. Water Quality of Rivers in East Khasi Hills District

Seventeen sampling stations are located in East Khasi Hills. In all monitored locations, pH levels were observed to be in the normal range of 6.5 to 8.5. Dissolved Oxygen was found to be very low in the rivers of Umkhrah and Umshyrpi, with a minimum value of Nil recorded at Umshyrpi River (Law college) and Umkhrah River (Demthring, near a slaughter house and Mawpdang) during the dry winter months of February and March. In contrast, concentration in other rivers was always above 4 mg L^{-1}, which is the minimum oxygen requirement for the propagation of, among other things, wildlife and fisheries. The Bio-chemical Oxygen Demand was observed to be above 3 mg L^{-1} in Ward's Lake, Umkhrah and Umshyrpi Rivers. The total coliform count was observed to be above 5000mpn/100ml in Umkhrah and Umshyrpi Rivers. The Ammonia Nitrogen concentration was observed to be above 1.2 mg L^{-1} in the same rivers, which is the maximum limit for propagation of wildlife and fisheries. The monitoring results indicated that organic materials and Bacteria are the main pollutants in the water bodies. This is mainly due to direct discharge of waste water in an untreated form from residential and commercial centres. The amount of waste received by the two rivers, namely Umkhrah and Umshyrpi, is much beyond their assimilative capacity and thus has water quality has deteriorated to the extent that the water in these two rivers cannot be put to any beneficial uses. The water quality of Ward's Lake meets the criteria for propagation of wildlife and fisheries. The water quality of other water bodies is relatively good and can still be used for various beneficial purposes, although it is not recommended for direct use as drinking water, unless first treated and disinfected by an organized water supply system.

b. Water Quality of Rivers in West Khasi Hills District

Eight sampling stations are located in West Khasi Hills. In all monitored locations, pH levels were observed to be in the normal range of 6.5 to 8.5.The dissolved Oxygen content in all monitored rivers was always above 4 mg L^{-1}, which is the minimum oxygen requirement for the propagation of wildlife and fisheries. The Bio-chemical Oxygen Demand was observed to be above 3 mg L^{-1} and total coliform count above 500 mpn/100 ml in Nanbah River at Nongstoin. Located in the centre of district headquarters, this river is also subjected to pollution arising out of such sources as the direct disposal of solid and liquid waste from residential & commercial areas, automobile workshops and servicing centres, as well as agricultural runoff. However, the water of this river can be used for the propagation of wildlife and fisheries, and for irrigation purposes. The water quality of other water bodies is relatively good and can still be used for various beneficial purposes, although it is not recommended for direct use as drinking water, unless first treated and disinfected by an organized water supply system.

c. Water Quality of Rivers in Ri-Bhoi District

Six sampling stations are located in Ri-Bhoi. In all monitored locations, pH levels were observed to be in the normal range of 6.5 to 8.5. The dissolved Oxygen content in all the stations was found to be above 4 mg L^{-1}, which is the minimum oxygen requirement for propagation of wildlife and fisheries. The Bio-chemical Oxygen Demand was observed to be above 3 mg L^{-1} in Umiam Lake and Umtrew River at Byrnihat. The total coliform count in these water bodies was also observed to be high. Umiam Lake received waste that is generated in the Shillong through Umkhrah and Umshyrpi Rivers, whereas the Umtrew River is subjected to pollution originating from residential, commercial, and industrial areas. The water of Umiam Lake and Umtrew river can be used for propagation of wildlife and fisheries, and irrigation purposes. The water quality of other water bodies is relatively good and can still be used for various beneficial purposes, although it is not recommended for direct use as drinking water, unless first treated and disinfected by an organized water supply system.

Table 7.25: National Water Quality Standards

Item	Acceptable	Cause for Rejection	WHO (2011)	USEPA (1996)
Turbidity (JTU scale)	2.5	10	—	1 (NTU)
Color (Pt-Co scale)	5.0	25	—	5 (color units)
Taste & Odor (mg L^{-1})	Unobjectionable			3 (TON)
pH	7.0 - 8.5	6.5 - 9.2	—	6.5 – 8.5
TDS (mg L^{-1})	500	1500	500	1,000
Total hardness (mg L^{-1})	200	600	—	—
Cl (mg L^{-1})	200	1000	—	—
SO_4 (mg L^{-1})	200	400	250	250
F (mg L^{-1})	1.0	1.5	1.5	2.0
NO_3 (mg L^{-1})	45	45	50	10
Ca (mg L^{-1})	75	200	—	250
Mg (mg L^{-1})	30	150	—	—
Fe (mg L^{-1})	0.1	1.0		0.3
Mn (mg L^{-1})	0.05	0.5	—	0.05
Cu (mg L^{-1})	0.05	1.5	2.0	1.0
Zn (mg L^{-1})	5.0	15.0	—	5
Phenol (mg L^{-1})	0.001	0.002	—	—
MBAS (mg L^{-1})	0.2	1.0	—	0.5
Oil (mg L^{-1})	0.01	0.3	—	—
As (mg L^{-1})	0.05	0.05	0.01	0.01
Cd (mg L^{-1})	0.01	0.01	0.003	0.005
Cr^{+6} (mg L^{-1})	0.05	0.05	0.05*	0.1*
CN (mg L^{-1})	0.05	0.05	—	0.2
Pb (mg L^{-1})	0.1	0.1	0.01	0.015
Se (mg L^{-1})	0.01	0.01	0.04	0.05
Hg total (mg L^{-1})	0.001	0.001	0.006**	0.002
PAH (µg L^{-1})	0.2	0.2	—	—
DO (mg L^{-1})	5 mg L^{-1} or more		—	—
BOD (mg L^{-1})	30-100		—	—
COD (mg L^{-1})	250	250	—	—
Ammonia (mg L^{-1})	0.5***	0.5***	—	—
Total Coliform (MPN 100 mL^{-1})	Must not be detectable			(see marginal note****)

Note: * as total Cr. ** as inorganic Hg. *** as NH_4^+

**** A system collecting fewer than 40 samples per month, has greater than 1 ROUTINE/REPEAT sample per month which is total coliform-positive. A system collecting at least 40 samples per month, has greater than 5.0 percent of the ROUTINE/REPEAT samples in a month total coliform-positive.

Source: http://www.mdws.gov.in/sites/default/files/Drinking_water_quality_standards.pdf (as of February 2019)

Table 7.26: Water Quality in Meghalaya State

Districts	Name of River	Location	pH			DO ($mg\ L^{-1}$)			BOD ($mg\ L^{-1}$)			Total Coliform (MPN 100 mL^{-1})			NH_4^+ ($mg\ L^{-1}$)		
			min.	max.	avg.	min.	max.	avg.	min.	max.	avg.	min.	max.	avg.	min.	max.	avg.
East Khasi Hills	Umiam Mawphlang River	Nongkrem	6.7	7.1	6.9	5.5	7.7	6.4	1.5	2.8	2.4	39	84	63	0.28	0.5	0.36
		Umtyngngar	6.9	7.3	7.13	6.8	8.4	7.57	1.0	2.2	1.7	29	70	53	0.13	0.35	0.23
		Mawphlang	6.8	7.3	7.0	7.2	8.3	7.8	0.8	2.0	1.36	23	46	35	0.1	0.22	0.15
		Shella	7.2	7,8	7.5	6.8	8.5	7.7	1.0	2.2	1.56	25	93	56	0.12	0.32	0.21
	Umngot River	Smit	6.7	7.0	6.8	6.6	8.8	7.3	0.85	2.3	1.65	30	84	55	0.10	0.36	0.24
		Dawki	6.9	7.3	7.1	7.2	9.0	7.9	0.8	1.5	1.2	32	70	50	0.1	0.3	0.2
	Umkhen River	Wah Kdait	6.8	7.2	7.0	6.5	9.0	7.1	0.9	2.2	1.7	26	59	44	0.2	0.35	0.27
		Ksehpongdeng	6.7	7.2	7.0	6.5	9.2	7.5	0.9	2.2	1.6	27	53	38	0.17	0.27	0.21
		Diengpasoh	7.0	7.5	7.24	6.6	9.2	7.5	1.0	2.25	1.69	33	70	47	0.2	0.30	0.25
	Ward's Lake	Shillong	7.1	7.7	7.4	6.0	8.0	6.9	6.0	9.6	7.6	2,900	5,000	4,025	0.21	0.5	0.35
	Umkhrah River	Demthring, Shillong	6.8	7.4	7.15	0	5.2	2.7	11.8	45.0	22.6	20×10^3	30×10^3	32×10^3	5.2	20.0	11.0
		Umkaliar, Shillong	7.0	7.4	7.15	3.0	6.0	4.55	10.2	20.5	14.2	12×10^3	29×10^3	20×10^3	2.5	8.0	4.94
		Mawlai, Slaughter, Shillong	7.0	7.4	7.15	3.0	6.0	4.55	10.2	20.5	14.2	34×10^3	112×10^3	68×10^3	4.0	19.2	10.9
		Mawpdang, Shillong	7.0	7.5	7.2	0	3.3	1.6	17.5	72.0	40.9	63×10^3	170×10^3	102×10^3	6.6	30.6	15.0
	Umshyrpi River	Risa colony, Shillong	6.7	7.5	7.15	0	2.8	1.6	23.2	78.4	43.4	30	59	46	0.12	0.30	0.21
		Law college, Dhanketi, Shillong	6.7	7.2	6.19	5.6	8.4	6.85	0.6	2.7	1.82	53×10^3	140×10^3	92×10^3	5.4	18.0	10.5
		Umshyrpi, Bridge, Shillong	6.8	7.2	7.0	0.2	4.0	1.73	21.0	58.2	36.1	20×10^3	84×10^3	45×10^3	2.4	10.2	5.7
West Khasi Hills	River Kynshi	Sohiong	6.8	7.4	7.1	7.0	8.5	7.3	1.0	1.5	1.3	21	56	36	0.1	0.3	0.2
		Nongkhnum	6.8	7.5	7.17	7.2	8.8	7.64	1.0	1.8	1.2	22	55	37	0.03	0.31	0.21
		Ranikor	6.6	7.3	6.88	7.2	9.0	8.0	1.0	2.8	1.8	33	67	50	0.16	0.4	0.31
	River Rilang	Mawkyrwat	7.2	7.4	7.25	7.4	8.8	7.85	0.6	1.8	1.4	20	40	29	0.14	0.25	0.22
	River Nanbah	Nongstoin, Market	6.7	7.1	6.9	3.4	6.8	5.5	2.4	4.2	3.2	190	1,200	525	0.27	0.48	0.38
		Phod sohsat	7.0	7.5	7.2	6.8	8.8	7.5	1.2	2.0	1.38	19	46	33.2	0.03	0.28	0.17
	River Wahblei	Riangdo	7.1	7.5	7.27	5.8	8.5	7.4	1.0	2.5	1.82	17	44	32	0.17	0.34	0.25
		Shdaddkhar	6.9	7.5	7.3	7.2	8.4	7.7	1.0	2.3	1.67	16	53	35	0.15	0.35	0.24
Ri-Bhoi	Umiam Lake	Outfall of Umiam river into lake	6.5	7.5	7.2	2.0	6.2	5.1	8.8	12.5	10.0	3,400	5,500	4,700	0.35	1.4	0.61
		Middle point	6.8	7.6	7.3	6	7.7	6.5	6	9.5	8.35	2,800	4,400	3,608	0.3	0.45	0.39
		Near United Christian College	7.0	7.5	7.3	5.8	7.5	6.4	6.2	10.2	8.5	2,700	4,400	3,641	0.27	0.5	0.39
		Exit point	6.9	7.5	7.2	5.5	7.4	6.35	6.4	10.4	9.0	2,900	5,300	4,108	0.28	0.45	0.39
	River Umtrew	Umran	6.8	7.2	7.0	6.6	8.8	7.5	0.8	2.8	2.0	53	220	110	0.17	0.34	0.23
		Byrnihat	6.9	7.4	7.1	6.8	8.2	7.46	6	7.2	6.75	330	750	505	0.17	0.47	0.29
Jaintia Hills	River Lukha	Lunar at Myndihati	2.2	3.2	2.6	6.2	8.4	6.88	1.4	4.2	3.1	4	20	10	0.2	0.42	0.3
		Sunapur	4.5	7.8	6.4	7.0	8.0	7.4	1.0	3.0	2.41	220	600	378	0.21	0.35	0.27
	River Myntang	Nartiang	6.6	7.3	7.0	6.5	8.0	7.4	1.2	2.4	1.7	27	63	48	0.14	0.28	0.19
		Mynso	6.8	7.3	7.0	6.4	8.2	7.4	1	2.5	1.73	24	60	45	0.1	0.3	0.20

Districts	Name of River	Location	pH			DO ($mg\ L^{-1}$)			BOD ($mg\ L^{-1}$)			Total Coliform ($MPN\ 100\ mL^{-1}$)			NH_4^+ ($mg\ L^{-1}$)		
			min.	max.	avg.	min.	max.	avg.	min.	max.	avg.	min.	max.	avg.	min.	max.	avg.
Jaintia Hills (cont.)	River Myntdu	Jowai	6.2	7.6	7.0	5.6	7.2	6.4	2.4	3.1	2.77	1,900	3,500	2,825	0.09	0.36	0.26
		Leshka	4.5	7.2	5.6	7	8.2	7.5	1	2	1.55	14	40	22	0.08	0.27	0.19
	Thadlaskein Lake	Mukhla	6.6	7	6.8	6.8	8	7.28	1.4	2.4	1.9	35	75	58	0.03	0.25	0.14
	River Kyrhukhla	Khliehriat	2.5	3.3	2.8	3	6.8	4.97	5.8	11.2	8.1	20	50	33	0.13	0.4	0.26
Garo Hills	Damring River (Krishnei)	Resubelpara	7	7.5	7.3	7	8.2	7.57	1.1	4.5	1.85	32	93	60.	0.2	0.4	0.27
	Manda (Dudhnai) River	Jampa	6.5	7.6	7.2	7	8.4	7.6	1.2	3.5	1.68	20	63	44	0.18	0.32	0.225
		Wagaisi	7.1	7.7	7.4	6.4	8	7.26	1.2	2.6	2.0	24	79	50	0.03	0.38	0.24
	Tasek Lake	Songsak (Naphak)	6.9	8	7.4	6.8	8	7.34	1.2	2.5	1.7	21	53	39	0.15	0.26	0.22
	Simsang River	Williamnagar	7	7.5	7.3	7.2	8	7.72	1.5	2.4	1.95	290	630	470	0.2	0.35	0.28
	Bugi River	Mibanpara	7	7.9	7.4	6.8	8	7.2	1.2	2.6	2.15	32	84	60	0.16	0.4	0.29
		Dalu	7.2	7.8	7.4	6.8	7.8	7.2	1.3	2.7	2.2	28	87	59	0.12	0.36	0.29
	Ganol River	Tura	7.4	7.8	7.5	7	8.5	7.5	1.5	2.6	2.24	240	600	440	0.2	0.32	0.26

All Data Sources in the Tables: Meghalaya State Pollution Control Board Annual Report 2013-2014

d. Water Quality of Rivers in Jaintia Hills District

Eight sampling stations are located in Jaintia Hills. The pH in Myntdu River at Leshka, Lunar River at Myndihati, Kyrhukhla River at Lad-Rymbai, and Lukha River in Sonapur was observed to be very low, with a minimum value of 2.2 recorded at Lunar River in Myndihati during the dry month of April. Low pH indicates that water is acidic in nature, which is mainly due to acid effluent from coal mines located on the catchment. On the upstream side, the dissolved Oxygen in all monitored rivers was always above 4 mg L^{-1}, which is the minimum oxygen requirement for propagation of wildlife and fisheries. The Bio-chemical Oxygen Demand was observed to be above 3 mg L^{-1} in Kyrhukhla River and Lunar River at Myndihati the total coliform count was observed to be above 500mpn/100 ml in Myntdu River mainly due to contamination from the domestic waste water/sewage. Due to low pH, the water of Myntdu River in Leshka, Lukha River in Sonapur, Lunar River in Myndihati, and Kyrhukhla River at Lad-Rymbai cannot be put to any beneficial uses. The water quality of other water bodies is relatively good and can still be used for various beneficial purposes, although it is not recommended for direct use as drinking water, unless first treated and disinfected by an organized water supply system.

e. Water Quality of Rivers in Garo Hills District

Eight sampling stations are located in Garo Hills. In all monitored locations, pH levels were observed to be in the normal range of 6.5 to 8.5. The dissolved Oxygen content in all the stations was found to be above 4 mg L^{-1}, which is the minimum oxygen requirement for propagation of wildlife and fisheries. The Bio-chemical Oxygen Demand was observed to be below 3 mg L^{-1} in all monitored water bodies. The total coliform count was observed to be moderately high in Simsang and Ganol Rivers. The water quality of all monitored water bodies is relatively good and can still be used for various beneficial purposes, although it is not recommended for direct use as drinking water, unless first treated and disinfected by an organized water supply system.

3) Noise Environment

The ambient noise standards for various categories are given in Table 7.27.

Table 7.27: National Standards of Ambient Noise

Category of Area	Limits in dB (A) Leq	
	Day time*	Night time**
Industrial Area	**75**	70
Commercial Area	**65**	55
Residential Area	**55**	45
Silence Zone***	**50**	40

Note: * Daytime 6 AM and 10 PM ** Night time is 10 PM and 6 AM
*** Defined as Environment (Protection) Third Amendment Rules, 2000 Gazettee notification, Government of India, date 14.2.2000.
Source: Status of Ambient Noise Level in India, CPCB (2016)

MSPCB conducted Ambient Noise Level tests during the Diwali festival on the 25th October (for pre-Diwali) and on the 3rd November, 2013 (on Diwali Day).The monitoring was in pursuance to a Government of India Notification and the interim directions of the Hon'ble Supreme Court. The city selected for this monitoring was Shillong, being the largest city and capital of Meghalaya. The city is cosmopolitan, with a sizeable portion of its residents celebrating Diwali. The two locations selected in the city were the Police Bazar (on the Meghalaya Legislative Assembly premises; hereinafter called "Location-A") and Lumpyngngad (on the Meghalaya State Pollution Control Board's premises; hereinafter called "Location-B"). The monitoring team was equipped with a Larson-Davis DSP 80 Sound Level Meter. The noise levels were measured in dB (A), i.e. the level of sound in decibels on scale – A, as per human ear sensitivity requirements. The result was expressed in Lmin, Lmax and Leq, wherein Lmin indicates the minimum value of the sound level

in decibels and Lmax the maximum value of sound level in decibels occurring during the single event, and Leq denotes the A weighted energy mean of the noise level averaged over the measurement period. The noise level was monitored for a continuous 6 hour duration, i.e. from 18:00 hours (i.e. 6:00 P.M.) to 24:00 hours (i.e. 12:00 A.M.), where Lmin, Lmax and Leq readings were recorded at every hourly interval. This was as per the Protocol specified by the CPCB, Delhi.

The findings of the monitoring are detailed in Table 7.28 and in the discussion below:

Table 7.28: Results of Noise Monitoring in Meghalaya State

(1) Lumpyngngad (Location-A)

Time duration	Normal Day			Diwali Day		
	Lmin	Lmax	Leq dB(A)	Lmin	Lmax	Leq dB(A)
18:00 to 19:00 Hr.	44.4	95.3	45.4	47.2	110.0	68.7
19:00 to 20:00 Hr.	44.7	97.0	47.4	48.2	113.4	69.0
20:00 to 21:00 Hr.	48.4	93.3	48.9	46.7	109.5	66.5
21:00 to 22:00 Hr.	48.1	89.9	49.1	48.5	106.3	63.8
22:00 to 23:00 Hr.	39.3	91.1	41.7	47.8	108.5	59.4
23:00 to 24:00 Hr.	38.5	88.2	39.1	42.4	98.9	51.2

(2) Police Bazar (Location-B)

Time duration	Normal Day			Diwali Day		
	Lmin	Lmax	Leq dB(A)	Lmin	Lmax	Leq dB(A)
18:00 to 19:00 Hr.	63.5	110.8	69.9	60.6	115.8	70.8
19:00 to 20:00 Hr.	62.2	107.6	65.6	66.7	118.1	72.4
20:00 to 21:00 Hr.	61.8	108.1	63.8	68.1	116.7	72.1
21:00 to 22:00 Hr.	57.5	103.5	59.8	72.0	119.0	73.5
22:00 to 23:00 Hr.	56.2	104.9	59.7	80.1	118.9	81.5
23:00 to 24:00 Hr.	57.0	99.3	58.2	76.9	112.2	80.3

All Data Sources in the Tables: Meghalaya State Pollution Control Board Annual Report 2013-2014

a. Location-A: Lumpyngngad (MSPCB's Office Premises)

The monitored Ambient Noise Level on a normal day (i.e. the 25th of October, 2013) from 18:00 Hrs. to 22:00 Hrs. (6:00 pm to 10:00 pm) was well within the Ambient Noise Level standard of 55.0 dB (A) Leq for daytime in residential areas. The night time noise level from 22:00 Hrs. up to 24:00 Hrs. (10:00 pm to 12:00 midnight) was also well below the night time Ambient Noise Level standard of 45.0 dB (A) Leq. On Diwali day (i.e. 3rd of November 2013), however, it was observed that there was an overall increase in the Ambient Noise Level at the location. The average equivalent noise level (Leq) was comparatively higher as compared to that on the normal day (again, the 25th October, 2013). As per monitored observations, the noise level exceeded the ambient noise standards at all times falling within daytime as well as night time durations. It can be seen that the level is above 55.0 dB(A) standard at all measured hourly intervals, with the minimum monitored level being 63.8 dB(A), monitored from 21:00 Hr. to 22:00 Hr. (9:00 pm to 10:00 pm). The highest or maximum monitored Leq value of 69.0 dB(A) was measured during the time slot from 19:00 Hr. to 20:00 Hr. (7:00 pm to 8:00 pm). This is the time when such activities as the burning and bursting of firecrackers was at its peak. During the night time period from 22:00 Hr. to 24:00 Hr. (10:00 pm up to 12:00 midnight), it was found that the noise is very much above the night time residential standard of 45.0 dB(A) Leq. The measured values are above the said standard during both daytime and night time monitored hourly intervals. The maximum level during the night watch was 59.4

dB(A), measured during the hourly interval from 22:00 Hr. to 23:00 Hr. (10:00 pm to 11:00 pm). The higher level of noise monitored at the location during Diwali Day is attributed to activities such as the bursting of firecrackers and burning of sparklers on the occasion.

b. Location-B: Police Bazar (Meghalaya Legislative Assembly Office's Premises)

The noise level at Location-B (Police Bazar), on a normal day (i.e. on the 25th of October, 2013) was above the standard limits of 65.0 dB (A) Leq (for daytime) during the periods from 18:00 to 19:00 Hrs. (6:00 pm to 7:00 pm) and 19:00 to 20:00 Hrs. (7:00 pm to 8:00 pm), while it was within the same standard during the durations of 20:00 to 21:00 Hrs. (8:00 pm to 9:00 pm) and 21:00 to 22:00 Hrs. (9:00 pm to 10:00 pm). During the night time duration of 22:00 Hrs. to 23:00 Hrs. (10:00 pm to 11:00 pm) and 23:00 Hr. to 24:00 Hr. (11:00 pm to 12:00 midnight), the noise level was above the night time standard limit of 55.0 dB(A) Leq. The higher level of sound monitored was due mainly to vehicular noise, including horn noise. On Diwali Day (i.e. the 13th of November, 2013), it was observed that the overall average equivalent noise level (Leq) was comparatively higher than that on the normal day. For all durations between 18:00 Hrs. and 24:00 Hrs. (6:00 pm until 12:00 midnight), the monitored sound level was above the standard limits of 65.0 dB(A) Leq for daytime (up to 22:00 Hrs.) and 55.0 dB(A) Leq for night time (from 22:00 Hrs. onwards). As noted from the Leq, Lmin and Lmax, it can therefore be inferred that the cause for the higher ambient noise level monitored at the location on Diwali Day is due to such activities as the bursting and burning of firecrackers and sparklers on the occasion.

4) Soil Pollution

According to its website[175], MSPCB also carried out an analysis of soil and solid wastes, including hazardous wastes. The details of the samples analysed are stated in Table 7.29.

Table 7.29: Soil/Sediment and Solid Waste Monitoring by MSPCB

Monitoring stations/sampling source	Purpose	Parameters Analysed
Mawiong Municipal dumping ground, Shillong	Quality of the Compost	Heavy Metals
National Water Monitoring Programme (NWMP)	Quality of the Sediment	Heavy Metals
Umtrew River	Quality of the Sediment	Heavy Metals
Kyrhukhla River	Quality of the Sediment	Heavy Metals
Umiam Lake	Quality of the Sediment	Heavy Metals
Ward's Lake	Quality of the Sediment	Heavy Metals
Thadlaskein Lake	Quality of the Sediment	Heavy Metals
Myntdu River	Quality of the Sediment	Heavy Metals
Ganol River	Quality of the Sediment	Heavy Metals
Simsang River	Quality of the Sediment	Heavy Metals

Source: http://megspcb.gov.in/soil.html (accessed in February 2019)

(2) Natural Environment

1) Protected Areas

The Protected Area (PA) Networks in Meghalaya occupy 1133.9 km^2 area, which constitute about 5.06 % of the State's Geographical Area. The Protected Area Network includes four National Parks, four wildlife Sanctuaries, and one Biosphere Reserve, playing an important role in in-situ conservation of Biodiversity (Table 7.30).

The PA Networks still support a viable population of the Endangered Western Hoolock Gibbon (*Hoolock hoolock*); the Bengal Slow Loris (*Nycticebus coucang*; Vulnerable on the IUCN Red List) on the other hand is patchily distributed. Primates include the Stumped tail macaque (*Macaca arctoides*; Vulnerable), Assamese Macaque (*Macaca assamensis*; Near Threatened), Northern Pig tail Macaque (*Macaca leonina*; Vulnerable), Rhesus macaque (*Macaca mulatta*; Least Concern),

[175] http://megspcb.gov.in/soil.html

capped langur (*Trachypithecus pileatus*; Vulnerable) and the blonde bellied langur (*Trachypithecus p. pileatus*; Vulnerable). Among the carnivores the Bengal Tiger (*Panthera tigris tigris*; Endangered) and the Clouded Leopard (*Neofelis nebulosa*; Vulnerable) have become extremely rare while the adaptable leopard is still widely distributed. Bears include Sun Bear (*Helarctos malayanus*; Vulnerable), Asiatic Black Bear (*Ursus thibetanus*; Vulnerable), and the sloth bear (*Melursus ursinus*; Vulnerable). Smaller cats like the jungle cat (*Felis chaus*; Least Concern), marbled cat (*Pardofelis marmorata* Near Threatened), and leopard cat (*Prionailurus bengalensis*; Least Concern) are still found in these PAs. Smaller carnivores also abound, among them mongoose (Herpestidae), badger (Meles), binturong (*Arctictis binturong*), dhole (*Cuon alpinus*), jackle (*Canis aureus*), weasel (Mustela), otter (Lutrinae), fox (Vulpes) and marten (Martes).

Nokrek Ridge National Park is the core of the Nokrek Biosphere Reserve and is located on the Tura Mountain Range. Nokrek Peak (1418 m Asl) is the tallest in the range. Nokrek National Park covers an area of 47.48 Km^2. The buffer zone is about 227.92 Km^2 and the transition zone is about 544.60 Km^2. Located in the buffer zone is the first gene sanctuary set up to preserve the rare citrus, *Citrus indica*, commonly known to the locals as Memang Narang.

The Indian elephant (*Elephas maximus*) population in Meghalaya is 1181 in 2007. The Garo Hills Elephant Reserve covers a total area of 3500 Km^2, which includes 402 Km^2 of Protected Area sustaining a population of about 1047 elephants, according to the Elephant Task Force Report of MoEF, August 2010.

Table 7.30: Protected Areas in Meghalaya

Protected Areas	Area in Sq. Km	District	Est.
Siju Wildlife Sanctuary	5.81	South Garo Hills	1979
Nongkhyllem Wildlife Sanctuary	29	Ri-Bhoi District	1981
Baghmara Pitcher Plant Sanctuary	0.02	South Garo Hills	1984
Balpakram National Park	220	South Garo Hills	1985
Nokrek Ridge National Park	47.78	East Garo Hills	1986
Nokrek Biosphere Reserve	820	East, West and South Garo Hills	1988
Narpuh Wildlife Sanctuary	59.90	East Jaintia Hills	2014

Source: Official Website of Meghalaya Biodiversity Board, http://megbiodiversity.nic.in/protected-areas (accessed in February 2019)

2) Biodiversity

Meghalaya is situated in the North East India Bio-geographic zone (along with Assam, Nagaland, Manipur, Mizoram and Tripura) which is a significant region, as it represents a transition zone between the Indian, Indo-Malayan, and Indo-Chinese bio-geographic regions, as well as a meeting place of the Himalaya Mountains and Peninsular India. The region is one of the richest in biological value, with vegetation types ranging from tropical rain forest in the foothills to Alpine meadows and cold deserts. The state also represents an important part of the Indo-Burma biodiversity hotspot, which is one of the four bio-diversity hotspots present in India and 34 in the world (see the Official Website of Meghalaya Biodiversity Board). Meghalaya State has been identified as a key area for biodiversity conservation, due to its high species diversity and high level of endemism.

(3) Social Environment

1) Cultural Heritage: Garo Hills Conservation Area (GHCA)

The permanent delegation of the Indian government to the United Nations Educational, Scientific and Cultural Organization (UNESCO) nominated, in July 2018, the Garo Hills Conservation Area for a place as the World Heritage Site in the mixed-site category, opening the doors for a major conservation movement of the selected site, which lies in the West and South Garo Hills Districts.

The criteria for selection and justification of outstanding universal values[176] are as follows:

I. **Criterion (v)**: to be an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change

The Garos are an indigenous tribe, the majority of whom inhabit the Garo Hills of Meghalaya, while some live in parts of Assam and in a few pockets in Bangladesh adjoining Meghalaya. Their language is Tibeto-Burman in origin, with several dialects, and was exclusively oral until set to Roman Script in the 1800s. They are also one of the few matrilineal societies. Their traditional method of agriculture is called *jhum,* i.e. slash and burn shifting agriculture, best suited to the hilly terrain. In this system, the community clears a patch of forest for cultivation for a few years, then leaves it fallow for several subsequent years for natural regeneration to take place. This practice is followed under community rules and is one of the classical examples of traditional methods of sustainable land-use for cultivation of the landscape. The faith and practices of the Garo people are integrally linked with the land and nature around which they reside, demonstrating intimate linkages between the people and the environment.

II. **Criterion (vi)**: to be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance. (The Committee considers that this criterion should preferably be used in conjunction with other criteria);

The Garo traditional faith centers around land, nature, *jhum* cultivation, and traditional healing, and is understood by the term Songsarek, which encompasses principles, rituals, celebrations, and deities. The practitioners are also called Songsareks. Conversion to Christianity since the late 1800s has resulted in majority of the Garos in Meghalaya now identifying as Christian (95%), with the Songsareks being a minority of 2% of Garos, or about 17,000 in absolute numbers. The decline has also been marked from 16% of Garos in 2001 to 2% remaining in 2011. There have been some attempts at reviving and safe-guarding the Songsarek religion in view of its imminent extinction, and with it many associated cultural beliefs and practices of music, dance, taboos, and ethno-medicine.

Despite the large-scale conversion to Christianity, many Garos continue to hold traditional beliefs. Several of these are associated with actual locations, especially in and around Balpakram. Nearly 50 locations connected to specific myths have been documented. The entire Balpakram plateau and gorge are believed to be the resting place of spirits of the Garo dead, before their rebirth, and thus sacred to the tribe. Other sites include the Memang Anti Cha.Ram or the Market place of the Spirits; Goera Rong. Jaleng or The Rock Ledge of Goera, God of Thunder and Lightning; Mebit-Mebang or the Oracle Rock whose stone pebbles are 'read' to predict harvests; and the Dikkini Ring or Dikki's Canoe, a mound of earth that resembles an upturned canoe. On declaration of Meghalaya as a new State in 1972, its first Chief Minister Captain Williamson Sangma, who was a Garo, visited Ganchi Soram (a series of small hillocks on the Balpakram Plateau which was a cremation site) to give thanks and pay respects to ancestors.

III. **Criterion (viii)**: to be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features;

Northeast India is significant in the study of the India-Asia continent collision, estimated to have happened 56 - 60 million years ago (mya). This collision precipitated significant upheavals of geology, climatology, oceanography and paleobiology. Sediments are well developed in the eastern Tethyan realm in the Garo, Khasi, and Jaintia Hills and makes Meghalaya globally significant in the understanding of early foreland basin evolution. (*The rest is omitted by JICA Study Team).

[176] https://whc.unesco.org/en/tentativelists/6356/ This website has been quoted for all that follows in this section.

IV. **Criterion (x)**: to contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.

The nominated property falls under Biogeographic Zone 8B i.e. North-eastern India, which is one of the biologically most diverse regions of India. The Garo Hills are also the western-most part of the Indo-Malayan Biodiversity Hotspot and harbors a range of endangered species. The GHCA has 'tropical Moist Evergreen, Tropical Semi-evergreen, and Tropical Moist Deciduous Forests. There are also three large grasslands (Balpakram, Agal Bisa and Pindengru), and riparian 'shola' forests on the plateau in Balpakram. The terrain is hilly with limestone formations, plateaus, cliffs and deep gorges.

2) Scheduled castes and scheduled tribes[177]

Meghalaya has got a very small Scheduled Caste (SC) population of just 11,139 persons, out of a total population of 2,318,822, as per 2001 Census. The SC population of the state constitutes just 0.5 per cent. It may be relevant to mention that there is no indigenous SC in Meghalaya. The list of SCs of Assam is applicable to Meghalaya. As such, sixteen communities are designated as SCs in the state. The state registered 22.8 per cent decadal growth of its SC population in 1991-2001. The SC population of Meghalaya, being that of migrants from neighbouring states like Assam and West Bengal, exhibits a skewed demographic trend. Individual SC-wise, Namasudra, having 2,754 persons, is numerically the largest group among the SCs in Meghalaya, followed by Muchi (2,037), and Jhalo (1,469). These three SCs together constitute 56.2 per cent of the total SC population. The rest of the thirteen SCs are small in size, having less than one thousand persons each. Of these, six SCs, namely Patni, Hira, Mahara, Jalkeot, Dugla, and Lalbegi, each have a population of less than a hundred (Table 7.31).

Table 7.31: Scheduled Caste Population, 2001 Census

SL. No.	Name of the Major Scheduled Caste	Total population	Proportion to the total SC population
1	All Scheduled Castes	11,139	100 (%)
2	Namasudra	2,754	24.7
3	Muchi	2,037	18.3
4	Jhalo	1,469	13.2
5	Mehtar	726	6.5
6	Bhuinmali	410	3.7
7	Brittial Bania	349	3.1
8	Bansphor	325	2.9
9	Sutradhar	300	2.7
10	Dhupi	188	1.7
11	Kaibartta	113	1.0

Source: http://censusindia.gov.in/Tables_Published/SCST/dh_sc_meghalaya.pdf (accessed in February 2019)

As regards district-wise distribution, the majority of the SC population is concentrated in the West Garo Hills (66.8 per cent) and East Khasi Hills (20.9 per cent) Districts. The SC population living in rural areas accounts for 63.4 per cent. Thus, 36.6% of the SCs are urban by residence. Individual SC-wise, of the three main SCs the highest urban population has been recorded among Muchi (68.5 per cent). Namasudra (80.2 per cent) and Jhalo (92.3 per cent) live primarily in rural areas of the state.

[177] Office of the Registrar General & Census Commissioner, Ministry of Home Affairs (http://censusindia.gov.in/ Tables_ Published/SCST/dh_sc_meghalaya.pdf; accessed in February 2019)

7.7.2. System/Organizations related to Environmental and Social Considerations

(1) Relevant Statutes

1) Federal Law of India

The main federal laws of India regarding natural environment protection and pollution control are given in Table 7.32.

Table 7.32: Indian Federal Statutes regarding Environmental Protection

Issue	Name of Legislation	Year
Basic Statutes	The Environment Protection Act	1986
	The Environment Protection Rules	1986
	Environment Impact Assessment Notification	1994
Air Quality	The Air (Prevention and Control of Pollution) Act	1981
	The Air (Prevention and Control of Pollution) Rules	1982
	The Air (Prevention and Control of Pollution) (Union Territories) Rules	1983
	Revised National Ambient Air Quality Standards, Notification	2009
Water Quality	The Water (Prevention and Control of Pollution) Act	1974
	The Water (Prevention and Control of Pollution) Rules	1975
	The Water (Prevention and Control of Pollution) Cess Act	1977
	The Water (Prevention and Control of Pollution) Cess Rules	1978
Noise & Vibration	The Noise Pollution (Regulation and Control) Rules	2000
Environmental Tribunals	Public Liability Insurance Act	1991
	Public Liability Insurance Rules	1991
	The National Environment Tribunal Act	1995
	The National Environment Appelate Authority Act	1997
	The National Environment Appellate Authority(Appeal) Rules	1997
	The National Green Tribunal Act	2010
Forest Conservation	The Indian Forest Act	1927
	The Forest (Conservation) Act	1980
	The Forest (Conservation) Rules	2003
	The National Forest Policy	1988
Wildlife Conservation	The Wild Life (Protection) Act	1972
	The Wild Life (Transactions and Taxidermy) Rules	1973
	The Wild Life (Protection) Licensing (Additional Matters for Consideration) Rules	1983
	Recognition of Zoo Rules	1992
	The Wild Life (Protection) Rules	1995
	The Wild Life (Specified Plants – Conditions for possession by Licensee) Rules	1995
	National Zoo Policy	1998
	The Wild Life (Protection) Amendment Act	2002
	The Declaration of Wild Life Stock Rules	2003
	The National Board for Wild Life Rules	2003
Biological Diversity	Biological Diversity Act	2002
	Biodiversity Rules	2004
Wastes Managements	The Hazardous Wastes (management and handling) Rules	1989
	The Bio-medical Waste (Management and Handling) Rules	1989
	The Municipal and Solid Wastes (Management and Handling) Rules	2000
Chemical Manufactures/ Byproducts Managements	The Manufacture, Storage, and Import of Hazardous Chemical Rules	1989
	The Ozone Depleting Substances (Regulation and Control) Rules	2000
	The Rules for the Manufacture, Use, Import, Export and Storage of Hazardous Micro-organisms / Genetically Engineered Organisms or Cells	1989
	The Chemical Accidents (Emergency Planning, Preparedness and Response) Rules	1996
	The Recycled Plastics Manufacture and Usage Rules	1999
	The Plastics Manufacture, Sale and Usage Rules	1999
	The Batteries (Management and Handling) Rules	2001
Others	Protection of Plant Varieties and Farmers' Rights (PPVFR) Act	2001
	Scheduled Tribes Traditional Forest Dwellers Act	2006
	National Green Tribunal Act	2010

Source: Study Team

The Constitution of India obligates the state, as well as citizens, to protect and improve the environment. The Constitution (Forty-Second Amendment) Act, 1976 and Article 51A (g) cites, "The requirement of the time is that we should be real citizens of the country striving towards excellence in all spheres of individual and collective activity including the protection of environment."

Environmental laws consist of all legal guidelines that are intended to protect our environment. The objective of environmental law is to preserve nature's gifts and protect them from pollution. Further, the objective of environmental law is to protect the fundamental human rights of freedom, equality, and to adequate conditions of life in an environment of quality that permits a life of dignity and well-being.

The Environment Protection Act is the basic environmental law in India. It stipulates the central government's responsibility for the prevention, control, and reduction of environmental pollution, and has the authority to prepare appropriate rules to achieve these objectives. The Environment Protection Rules 1986 is a specific law established under the provisions of the Environment Protection Act, and set standards for environmental pollutants discharged from establishments. Environment Impact Assessment Notification 1994 defines procedures and restrictions for preventing environmental impact from new or existing projects.

On the other hand, individual laws regulate air quality, water quality, noise, environmental courts, forest conservation, wildlife protection, biodiversity, wastes, managements of chemical products, and treatments of by-/ industrial products.

2) State Statutes in Meghalaya

According to Law Department's website[178], Meghalaya State has many of its own acts and rules, which are classified into North Eastern Areas (Reorganisation), Executive Business, Civil Services, Cinema, Education, Food Civil Supplies Consumer, Fisheries, Boiler, Cooperative, Building and Other Construction Workers, Forest, Finance, High Court of Meghalaya, Health Service, Judicial, Labour, Land, Legal, Marriage, Medical Attendance Rules, Meghalaya Minister's, Meghalaya Legislative Assembly, and Others. The main state acts and rules regarding environmental and social considerations are as follows.

a. Assam Forest Regulation, 1891 (Assam Regulation 7 of 1891) as applied vide Meghalaya Forest Regulation (Application & Amendment) Act, 1973 (Meghalaya Act 9 of 1973)

These are regulations relating to forest, forest produce and the duty leviable on timber in Assam and composed of Preliminary (CHAPTER I), Reserved Forest (CHAPTER II), Village Forests (CHAPTER III), General protection of forest and forest produce (CHAPTER IV), Duty on imported forest produce (CHAPTER V), Collection of drift stranded and other timber (CHAPTER VII), Penalties and procedure (CHAPTER VIII), Cattle trespass (CHAPTER IX), Forest Officer (CHAPTER X), Supplemental provisions (CHAPTER XI). Besides, CHAPTER IV stipulates that control over forests and waste lands not being the property of Government and makes relation to Protection of forests for special purposes (36-A), Power to assume management of forest (36-B), Expropriation of forests in certain cases (36-C) and Protection of forests at request of owners (36-D).

b. The Meghalaya Forest Regulation (Application and Amendment) Act, 1973

This is an act to provide for the extension and application of, and to amend, the Assam Forest Regulation, 1891 (Regulation 7 of 1891) and the Meghalaya Forest Regulation, and for matters connected therewith or incidental thereto. By virtue of this Act, the Assam Forest Regulation, 1891

[178] http://meglaw.gov.in/acts.html

has been extended in its application to the State of Meghalaya and the Assam Act, being now named as the Meghalaya Forest Regulation, with certain amendments as detailed in the body of this act.

c. Tree Preservation Act, 1976

This is an act to make provisions for regulating the felling of trees for the purpose of protecting catchment areas and soil from erosion and to preserve the special characteristics of the hilly areas as regards landscape, vegetal cover, and climate, and to provide for matters connected therewith and incidental thereto.

d. Meghalaya Forest (Ejectment of Unauthorised Person) Rules, 1979

These are additional clauses of Assam Forest Regulation and prescribe for the ejection of unauthorised persons.

e. Meghalaya Removal of Timber Regulation Act, 1982

This is an act to regulate and control the removal of timber outside the state for the preservation of forests and to prevent their indiscriminate destruction, and for the matters connected therewith and incidental thereto. The act constitutes the following: Removal of timber outside the State (Chapter 3), Application for licence and its disposal (Chapter 4), Licence fee and period of its validity (Chapter 5), Appeal (Chapter 6), Penalty (Chapter 7), Power to direct submission of report or return (Chapter 8), Power to enter, search, arrest and detain (Chapter 9), Searches and arrests how to be made (Chapter 10), Production of persons arrested and things seized (Chapter 11), Report of arrest and seizure (Chapter 12), Erection of check-posts (Chapter 13), Penalty for refusal to produce things or furnish information (Chapter 14), Power to compound offence (Chapter 15), When Court to take cognizance of offence (Chapter 16), Bar of suit in Civil Courts (Chapter 17) and Suit, etc., against authority, officers or persons acting in good faith (Chapter 18).

f. Forest Based Industries - Rules, 1988

These are rules that regulate licensing of the wood processing industry throughout the state and are composed of the following: Procedure for Obtaining License, Grant of License, Period of Validity of License, Renewal of License, Revocation of License, Fees for Grant or Renewal of License, and Exception. It also includes a Form for Application or for Grant of License (SCHEDULE - I).

g. Appeal & Procedures Rules, 2007 (Notification No IPR.112/96/Pt.IV/331 dt 1-Aug-2007)

This provides procedures for information disclosure and constitutes the following: Appeal (Rule 3), Documents to accompany appeal (Rule 4), Procedures in deciding appeal (Rule 5), Service of notice by Commission (Rule 6), Personal presence of the appellant or complainant (Rule 7), Order of the State Information Commission (Rule 8), and Payment of the penalty amount imposed by the Commission (Rule 9).

h. Meghalaya Biodiversity Rules, 2010

These provides rules regarding organizational operations of Meghalaya Biodiversity Board (Rule 3 - 16 and 23), Procedure for access to/collection of biological resources (Rule 17), Revocation of access/approval (Rule 18), Restriction on activities related to access to biological resources (Rule 19), Operation of State Bio-diversity Fund (Rule 20), Annual Report and Annual Statement of Accounts (Rule 21), Establishment and Management of Bio-diversity Heritage Site (Rule 22), Local Bio-diversity Fund (Rule 24), Appeal for settlement of disputes (Rule 25) and Interpretation of Rules (Rule 26).

i. Meghalaya Biological Diversity Amendment Rules, 2015

In Rule 23 of the Meghalaya Biological Diversity Rules, 2010 mentioned above, in sub-rule (1), for the words "or any other similar body recognized by the Khasi Hills Autonomous District Council, Jaintia Hills Autonomous District Council and Garo Hills Autonomous District Council as well as at Municipality and Municipal Corporation level", the following words shall be substituted: "or at the village level, recognized by the Government of Meghalaya or the Autonomous District Councils in the State as well as at the Municipality and Municipal Corporation level".

(2) Laws and Regulations on Environmental Impact

1) Outline of Environmental Impact Assessment (EIA)

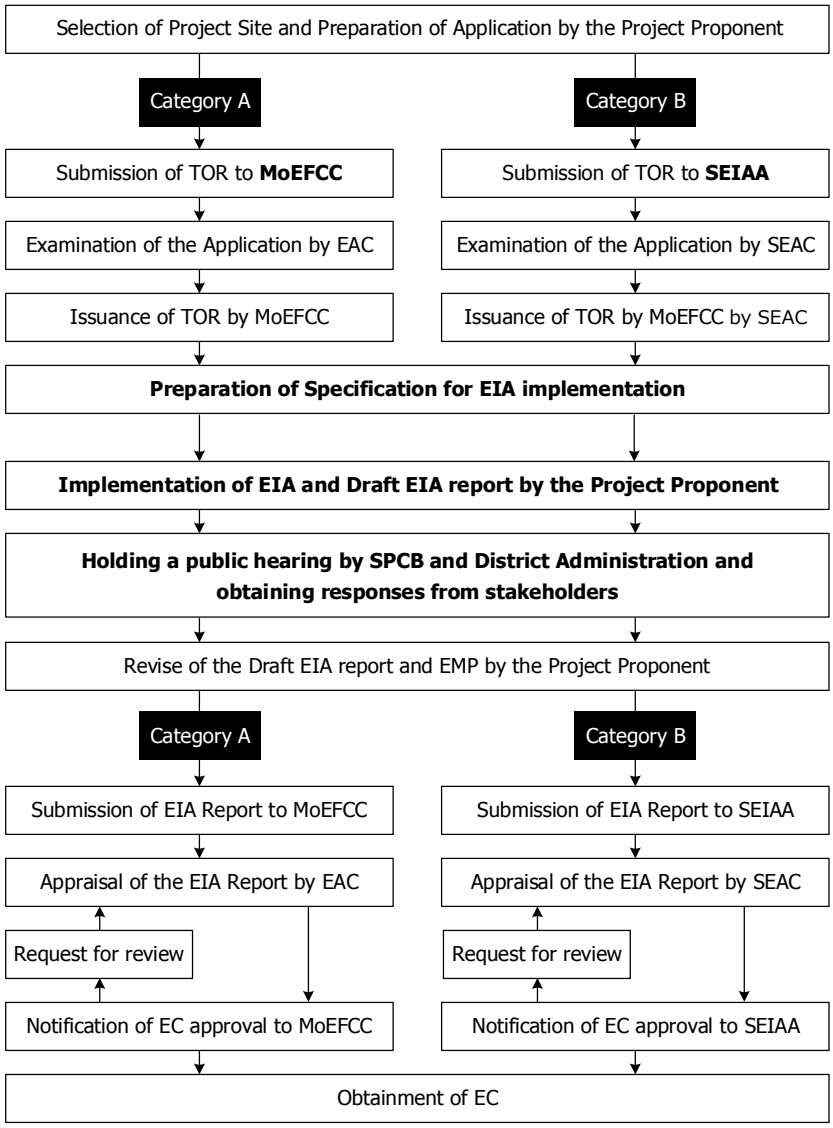
In India, environmental clearance is mandatory for implementation of projects which may have a significant impact on the environment under EIA Notification 2006, amended in 2009. The EIA Notification has notified 39 developmental sectors which require prior environmental clearance. The following projects or activities shall require prior environmental clearance from the concerned regulatory authority, which shall hereinafter referred to be as the Central Government in MoEF&CC for matters falling under Category A in the Schedule, and at State Level the State Environment Impact Assessment Authority (SEIAA), for matters falling under Category B in the said Schedule, before any construction work, or preparation of land by the project management except for securing the land, is started on a project or activity:

I. All new projects or activities listed in the Schedule to this notification;
II. Expansion and modernization of existing projects or activities listed in the Schedule to the notification with addition of capacity beyond the limits specified for the concerned sector, that is, projects or activities which cross the threshold limits given in the Schedule, after expansion or modernization;
III. Any change in product-mix in an existing manufacturing unit included in Schedule beyond the specified range.

All projects or activities included as Category A shall require prior environmental clearance from MoEF&CC on the recommendations of an Expert Appraisal Committee (EAC), to be constituted by the Central Government for the purposes of the notification. Besides these, all projects or activities included as Category B in the Schedule will require prior environmental clearance from SEIAA. The SEIAA shall base its decision on the recommendations of a State or Union Territory (hereinafter referred to as "UT") level Expert Appraisal Committee (SEAC), to be constituted for in the notification. In the absence of a duly-constituted SEIAA or SEAC, a Category B project shall be treated as a Category A project.

2) Summary of EIA Procedure

The flow of obtaining environmental clearance is given in Figure 7.21, and a summary of the procedure, divided into application stage and acquisition stage, respectively, is outlined below.



Source: Study Team

Figure 7.21: Flow of Obtaining Environmental Clearance

a. Application Stage

The acquisition process for environmental clearance differs according to project category. It is stipulated that applications for projects falling under Category A will be made to MoEF&CC and those for projects falling under Category B to SEIAA. In the applications, the following information is to be submitted to the relevant office first.

I. Information mentioned in Appendix I to the EIA Notification (Form 1)

i) Basic Information (Name of the project, location/site alternatives under consideration, size of the project, expected cost of the project, contact information, and screening category)
ii) Activity (1. Construction, operation or decommissioning of the project involving actions, which will cause physical changes in the locality such as topography, land use, changes in water bodies, etc.; 2. Use of natural resources for construction or operation of the project such as land, water, materials or energy, especially any resources which are non-renewable or in short supply; 3. Use, storage, transport, handling or production of substances or materials, which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health; 4. Production of solid wastes during

construction or operation or decommissioning (MT/month); 5. Release of pollutants or any hazardous, toxic or noxious substances to air (Kg/hr); 6. Generation of noise and vibration, and emissions of light and heat, 7. Risks of contamination of land or water from releases of pollutants into the ground or into sewers, surface waters, groundwater, coastal waters or the sea; 8. Risk of accidents during construction or operation of the project, which could affect human health or the environment; 9. Factors which should be considered such as consequential development which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality.)

iii) Environmental Sensitivity
iv) Proposed Terms of Reference (TOR) for EIA studies

II. Pre-feasibility project report (in the case of construction projects or activities in item 8 of the Schedule, in addition to Form 1 and the Supplementary Form 1A, a copy of the conceptual plan shall be provided, instead of the pre-feasibility report)

III. In the case of projects or activities in item 8 of the Schedule, information mentioned in Appendix II to the EIA Notification (Form 1A) (land environment, water environment, vegetation, fauna, air environment, aesthetics, socio-economic aspects, building materials, energy conservation, and environment management plan)

b. Acquisition Stage of Environmental Clearance

The environmental clearance process for new projects will comprise of a maximum of four stages, all of which may not apply to particular cases as set forth below in this notification. These four stages in sequential order are:

- Stage (1) Screening (only for Category B projects and activities)
- Stage (2) Scoping
- Stage (3) Public Consultation
- Stage (4) Appraisal

I. Stage (1) Screening

In case of Category B projects or activities, this stage will entail the scrutiny of an application seeking prior environmental clearance made in Form 1 by the concerned SEAC for determining whether or not the project or activity requires further environmental studies for preparation of EIA for its appraisal prior to the grant of environmental clearance depending up on the nature and location specificity of the project.

II. Stage (2) Scoping

The EAC or SEAC concerned shall determine the TOR on the basis of the information furnished in the prescribed application Form 1/Form 1A, including Terms of Reference proposed by the applicant, a site visit by a sub-group of EAC/SEAC concerned, only if considered necessary by the EAC/SEAC concerned, TOR suggested by the applicant if furnished, and other information that may be available with the EAC/SEAC concerned. All projects and activities listed as Category B in Item 8 of the Schedule (Construction/ Township /Commercial Complexes/Housing) shall not require Scoping and will be appraised on the basis of Form 1/Form 1A and the conceptual plan. Applications for prior environmental clearance may be rejected by the regulatory authority concerned on the recommendation of the EAC or SEAC concerned at this stage itself. In case of such rejection, the decision together with reasons for the same shall be communicated to the applicant in writing within sixty days of the receipt of the application.

III. Stage (3) Public Consultation

The public hearing at, or in close proximity to, the site(s) in all cases shall be conducted by the State Pollution Control Board (SPCB) or the UT Pollution Control Committee (UTPCC) concerned in the specified manner, and forward the proceedings to the regulatory authority concerned within 45 (forty-five) of a request to the effect from the applicant. For obtaining responses in writing from other concerned persons having a plausible stake in the environmental aspects of the project or activity, the concerned regulatory authority and the SPCB or UTPCC shall invite responses from such concerned persons by placing on their website the Summary EIA report prepared by the applicant within seven days of the receipt of a written request for arranging the public hearing. Applications for prior environmental clearance may be rejected by the regulatory authority concerned on the recommendation of the EAC or SEAC concerned at this stage itself. In case of such rejection, the decision together with reasons for the same shall be communicated to the applicant in writing within sixty days of the receipt of the application.

IV. Stage (4) Appraisal

Appraisal means the detailed scrutiny by the EAC/SEAC of the application and other documents like final EIA report, outcome of public consultations including public hearing proceedings, submitted by the applicant to the regulatory authority concerned for grant of environmental clearance. This appraisal shall be made by EAC/SEAC concerned in a transparent manner in a proceeding to which the applicant shall be invited for furnishing necessary clarifications in person or through an authorized representative. On conclusion of this proceeding, the EAC/SEAC concerned shall make categorical recommendations to the regulatory authority concerned either for grant of prior environmental clearance on stipulated terms and conditions, or rejection of the application for prior environmental clearance, together with reasons for the same.

3) Generic Structure of EIA Document

Descriptions of the following items are indispensable in the EIA report.

I. Introduction (Purpose of the report, identification of project & project proponent, brief description of nature, size, and location of the project and its importance to the country and region, scope of the study details of regulatory scoping carried out as per TOR)
II. Project Description (Type of project, need for the project, location, maps showing general location, specific location, project boundary & project site layout, size or magnitude of operation including associated activities required by or for the project, proposed schedule for approval and implementation, technology and process description, description of mitigation measures, assessment of new & untested technology for the risk of technological failure)
III. Description of the Environment (Study area, period, components & methodology, establishment of baseline for valued environmental components, as identified in the scope, base maps of all environmental components)
IV. Anticipated Environmental Impacts and Mitigation Measures (Details of investigated environmental impacts due to project location, possible accidents, project design, project construction, regular operations, final decommissioning or rehabilitation of a completed project, measures for minimizing and/or offsetting adverse impacts identified, irreversible and irretrievable commitments of environmental components, assessment of significance of impacts such as criteria for determining significance, assigning significance, mitigation measures)
V. Analysis of Alternatives: Technology and Site (Description of each alternative, summary of adverse impacts of each alternative, mitigation measures proposed for each alternative and selection of alternative)

VI. Environmental Monitoring Program (Technical aspects of monitoring the effectiveness of mitigation measures including measurement methodologies, frequency, location, data analysis, reporting schedules, emergency procedures, detailed budget & procurement schedules)
VII. Additional Studies (Public consultation, risk assessment, SIA)
VIII. Project Benefits (Improvements in the physical infrastructure, improvements in the social infrastructure, employment potential, other tangible benefits)
IX. Environmental Cost Benefit Analysis
X. EMP (Description of the administrative aspects of ensuring that mitigation measures are implemented and their effectiveness monitored, after approval of the EIA)
XI. Summary & Conclusion (the summary of the EIA report)
XII. Disclosure of Consultants engaged (The names of the Consultants engaged with their brief resume and nature of consultancy rendered)

4) Public Consultation

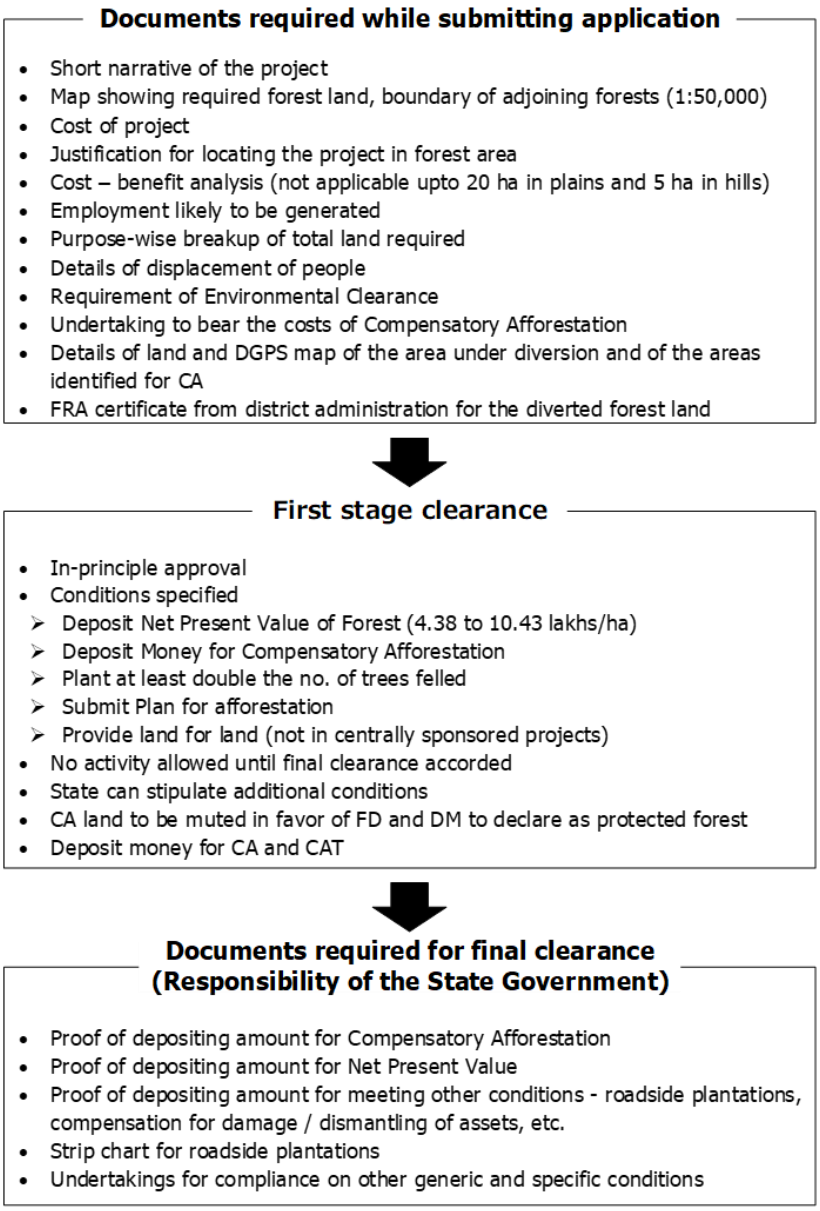
All Category A and Category B1 projects or activities shall undertake Public Consultation, except the following:

I. Modernization of irrigation projects;
II. All projects or activities located within industrial estates or parks approved by the concerned authorities, and which are not disallowed in such approvals;
III. Expansion of roads and highways which do not involve any further acquisition of land;
IV. All building/construction projects/area development projects and townships;
V. All Category B2 projects and activities; and
VI. All projects or activities concerning national defense and security or involving other strategic considerations as determined by the Central Government.

For obtaining responses in writing from other concerned persons having a plausible stake in the environmental aspects of the project or activity, the concerned regulatory authority and SPCB or UTPCC shall invite responses from such concerned persons by placing on their website the Summary EIA report within seven days of the receipt of a written request for arranging the public hearing.

5) Contents of EIA required for Project Implementation

Here acquisition flow of the forest clearance is illustrated in Figure 7.22.



Source: Study Team

Figure 7.22: Acquisition Flow of Forest Clearance

In India, areas that have been recognized as having special protection needed are designated as National Parks or Sanctuaries based on the Wildlife (Protection) Act mentioned above; however, forests in the project areas are not subjected under the Act.

Formal approval will be issued by the Central Government after receiving a report which certified the indicated compensation had been implemented by the State Government concerned. This phase is called the 'Approval' or 'Final Approval' of the second stage. The forest clearance will be issued by the regional office or MoEF&CC in Delhi.

The forest clearance will be issued by:

I. Regional office in the case of less than 5 ha forest area,

II. MoEF&CC in Delhi in the case of between 5 ha and 40 ha, after handling by the regional office,

III. MoEF&CC in Delhi directly in the case of more than 40 ha.

As per Chapter 4 of the Forest (Conservation) Act 1980, as far as possible, the non-forest land for

compensatory afforestation is to be identified as contiguous to or in the proximity of Reserved Forest or Protected Forest. In the case that non-forest land of compensatory afforestation is not available in the same district, non-forest land for compensatory afforestation is to be identified anywhere else in the State/UT. If non-forest land is unavailable in the entire State/UT, funds for raising compensatory afforestation in double the area in extent of the forest land diverted has to be provided by the user agency. The non-availability of suitable non-forest land for compensatory afforestation in the State/UT is to be accepted by the Central Government only on the Certificate of the Chief Secretary to the State/UT Government to that effect.

(3) Differences between Indian Environmental Legislation and JICA Guidelines

In addition to compliance with the Indian environmental laws and regulations, differences with the JICA Guidelines 2010 are described in the table below to meet the requirements for obtaining a Japanese ODA loan to implement the project.

Table 7.33: Comparison between JICA Guidelines and EIA Notification in India

Content	JICA Guidelines for Environmental and Social Considerations 2010	Environment Impact Assessment Notification 2006 and its Amendment in 2012	Gap between JICA Guidelines and Indian legislations /Action to be taken
Introduction	N/A	N/A	No gap.
Executive Summary	Concisely discusses significant findings and recommended actions.	APPENDIX III A: The Summary EIA shall be a summary of the full EIA report condensed to ten A-4 size pages at the maximum. It should necessarily cover in brief the following Chapters of the full EIA report.	No gap.
Legal framework on environmental and social considerations	Confirms that projects do not deviate significantly from the World Bank's Safeguard Policies and refers as a benchmark to the standards of international financial organizations.	SCHEDULE: List of Projects or Activities Requiring Prior Environmental Clearance	A few gaps: - Indian legal provisions regarding environmental conservation, e.g. Forest Conservation Act (1980), Supreme Court Order (1996), National Environment Policy (2006), etc., should be explained. - The EIA guidelines and standards in global treaties, international organizations and/or international development partners should be referred to.
Environmental Impacts	Predicts and assesses the project's likely positive and negative impacts in quantitative terms, to the extent possible. It identifies mitigation measures and any negative environmental impacts that cannot be mitigated and explores opportunities for environmental enhancement. It identifies and estimates the extent and quality of available data, essential data gaps and uncertainties associated with predictions, and it specifies topics that do not require further attention.	- Paragraph 7 - APPENDIX III: Generic Structure of Environmental Impact Assessment Document 4 Anticipated Environmental Impacts & Mitigation Measures	A few gaps: - The process leading up to the scoping and background of EIA item selection needs to be explained. - The degree of uncertainty in EIA and additional future environmental impact caused by such uncertainty needs to be mentioned. - Some environmental/social information can be added based on the final scoping drafts and results of the supplemental survey.
Analysis of Alternatives	Systematically compares feasible alternatives to the proposed project site, technology, design, and operation including "Zero-Option" (without project)	- Paragraph 7 III. Stage (3) - Public Consultation (vii) - APPENDIX III: Generic Structure of Environmental Impact Assessment Document	A few gaps: - "Zero-Option" (without project) needs to be examined. - The degree of environmental impact of each alternative plan

Content	JICA Guidelines for Environmental and Social Considerations 2010	Environment Impact Assessment Notification 2006 and its Amendment in 2012	Gap between JICA Guidelines and Indian legislations /Action to be taken
	situation in terms of the following: the potential environmental impacts; the feasibility of mitigating these impacts; their capital and recurrent costs; their suitability under local conditions; and their institutional, training, and monitoring requirements. For each of the alternatives, it quantifies the environmental impacts to the extent possible, and attaches economic values where feasible. It also states the basis for selecting the proposed project design and offers justification for recommended emission levels and approaches to pollution prevention and abatement.	5 Analysis of Alternatives (Technology & Site)	needs to be assessed in a quantitative manner.
Mitigation Measures	Identifies mitigation measures and any negative environmental impacts that cannot be mitigated and explores opportunities for environmental enhancement.	- APPENDIX III: Generic Structure of Environmental Impact Assessment Document 5 Analysis of Alternatives (Technology & Site)	No gap.
Environmental Management Plan	Describes mitigation, monitoring, and institutional measures to be taken during construction and operation to eliminate adverse impacts, offset them, or reduce them to acceptable levels.	- Paragraph 10. Environment Management Plan	No gap. However, in the case of monitoring items being added or changed based on supplementary findings, it is necessary to deal with the plan
Budget, financial sources and implementation arrangements	Appropriate follow-up plans and systems, such as monitoring plans and environmental management plans, must be prepared; the costs of implementing such plans and systems, and the financial methods to fund such costs, must be determined. Plans for projects with particularly large potential adverse impacts must be accompanied by detailed environmental management plans.	- APPENDIX III: Generic Structure of Environmental Impact Assessment Document 6 Environmental Monitoring Program	No gap. However, in the case of mitigation measures and/or monitoring items being added or changed based on supplementary findings, it is necessary to modify the cost.
Public Consultation with Stakeholder Meeting	In preparing EIA reports, consultations with stakeholders, such as residents, must take place after sufficient information has been disclosed. Records of such consultations must be prepared.	- Paragraph 7 III. Stage (3) - Public Consultation (vii) - APPENDIX IV Procedure for Conduct of Public Hearing	A few gaps: - Another stakeholder meeting needs to be conducted at the preparation stage of scoping drafts.
Information Disclosure	Discloses the results of such categorization on its website—including the name of each project and its country, location, project outline, category, and its reason—before making the decision to undertake preparatory surveys.	- APPENDIX IV Procedure for Conduct of Public Hearing 2.0 The Process	No gap.

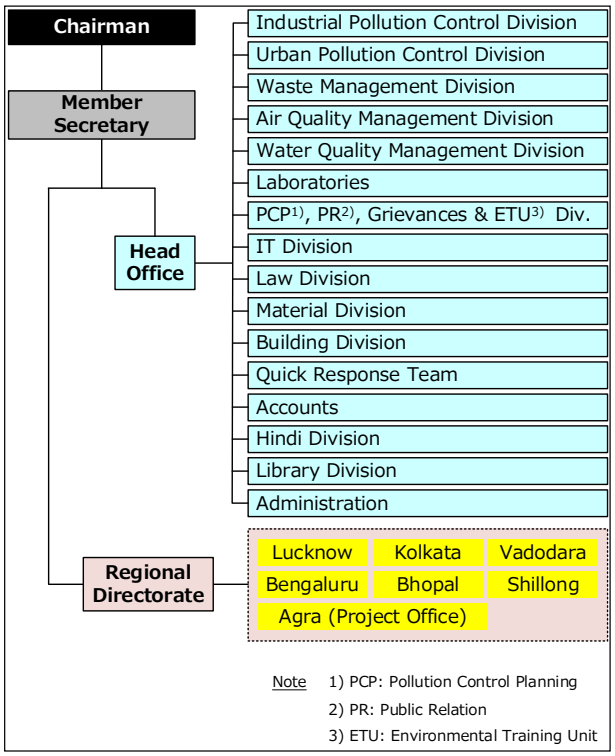
Source: Study Team

(4) Related Organization to Environmental and Social Considerations

1) Central level: MoEF&CC and CPCB

Ministry of Environment, Forest and Climate Change (MoEF&CC) is the nodal agency in the administrative structure of the Central Government for the planning, promotion, co-ordination and overseeing the implementation of India's environmental and forestry policies and programs.

According to the official website[179], the primary concerns of the Ministry are implementation of policies and programs relating to the conservation of the country's natural resources, including its lakes and rivers, its biodiversity, forests and wildlife, ensuring the welfare of animals, and the prevention and abatement of pollution. While implementing these policies and programmes, the Ministry is guided by the principle of sustainable development and enhancement of human well-being. As of February 2019, MoEF&CC is divided into two sectors, namely, the Environmental Wing[180] and Forest & Wildlife Wing[181]. The former consists of 28 divisions, the latter has 15 divisions.



Source: Study Team

Figure 7.23: Organization Chart of CPCB

The Central Pollution Control Board (CPCB), statutory organization, was constituted in September, 1974 under the Water (Prevention and Control of Pollution) Act, 1974. Further, CPCB was entrusted with the powers and functions under the Air (Prevention and Control of Pollution) Act, 1981. According to the official website, it serves as a field formation and also provides technical services to the Ministry of Environment and Forests of the provisions of the Environment (Protection) Act, 1986. Principal Functions of the CPCB, as spelt out in the Water (Prevention and Control of Pollution) Act, 1974, and the Air (Prevention and Control of Pollution) Act, 1981, (i) to promote the cleanliness of streams and wells in different areas of the states by prevention, control, and abatement of water pollution, and (ii) to improve the quality of air and to prevent, control, or abate air pollution in the country. Figure 7.23 shows organization Chart of CPCB as of February 2019.

2) State level

a. Meghalaya State Pollution Control Board (MSPCB)

a.1 Basis Statutes

The Meghalaya State Pollution Control Board (MSPCB) was constituted by the Government of Meghalaya on the 16th November, 1983 in pursuance of the Water (Prevention & Control of Pollution) Act, 1974. After the enactment of the Air (Prevention & Control of Pollution) Act, 1981, enforcement responsibility for the Act was entrusted to the Board. The Board was later renamed as the Meghalaya State Pollution Control Board in 1988. The functions of the Board are as laid down under Section 17 of the Water (Prevention and Control of Pollution) Act, 1974 and Section 17 of the Air (Prevention and Control of Pollution) Act, 1981. Besides the enforcement of the Water Act and the Air Act, the Board is also enforcing the following Acts, Rules and Notifications:

- The Water (Prevention and Control of Pollution) Cess Act, 1977, and as amended by Amendment Act in 1991.

[179] http://www.moef.nic.in/about-ministry/about-ministry (accessed in February 2019)
[180] http://www.moef.nic.in/about-ministry/chart1-environment-wing (accessed in February 2019)
[181] http://www.moef.nic.in/about-ministry/chart2-forests-and-wildlife-wing (accessed in February 2019)

- The Water (Prevention and Control of Pollution) Cess Rules, 1978.
- The Hazardous Waste (Management and Handling) Rules, 1989.
- The Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989.
- The Manufacture, Use, Import, Export & Storage of Hazardous Micro Organism or Cells Rules, 1989.
- The Public Liability Insurance Act, 1991.
- The Environmental Impact Assessment Notification, 1994.
- The Chemical Accidents (Emergency Planning, Preparedness & Response) Rules, 1996.
- The Bio-Medical Wastes (Management & Handling) Rules, 1998
- The Recycled Plastics Manufacture and Usage Rules, 1999.
- The Fly Ash Notification, 1999.
- The Noise Pollution (Regulation and Control) Rules, 2000.
- The Ozone Depleting substances (Regulation) Rules, 2000.
- The Municipal Solid Wastes (Management & Handling) Rules, 2000.The Batteries (Management & Handling) Rules 2001.

The Central Office of the Board is located in Shillong. At present, the Board does not have any Regional or District Offices. The Central Office is responsible for framing general policies relating to enforcement of the Acts and Rules. It also looks after general administration and coordination with other agencies. Besides these, it conducts public awareness programmes on matters relating to environment protection and pollution control. The Central Laboratory is well equipped and carries out analyses including those of samples of water, waste water, stack emission, ambient air, and bacteriological tests.

a.2 Activities

i) Activities under Water and Air Acts

- Assessment and monitoring the quality of water and wastewater.
- Assessment and monitoring the quality of ambient air and stack emissions.
- Inspection of sites proposed for setting up of industries to verify the suitability of the same from environmental point of view.
- Water bodies monitoring under National Water Quality Monitoring (NWQM) Programme.
- Ambient air quality monitoring under National Air Monitoring Programme (NAMP).
- Offering guidance to industries and local bodies on statutory provisions.
- Issue of "Consents to Establish" and "Consents to Operate" in respects of industries, mining projects specified developmental projects and municipal bodies.

ii) Activities under the Environment (Protection) Act and Rules

➢ Hazardous Waste Management

- Identification of Sources
- Characterisation & Quantification of Wastes

➢ Bio-Medical Waste Management

- Identification of Sources
- Characterisation & Quantification of Wastes
- Enforcement of Provisions of the Rules

➢ Municipal Solid Waste Management

- Identification of Sources
- Characterisation & Quantification of Wastes
- Enforcement of provisions of the Rules

- Monitoring of Compliance to Standards
- Characterisation & Quantification of Wastes
- Enforcement of Provisions of the Rules

➢ Batteries Management

- Identification of Sources
- Characterisation and Quantification of Wastes
- Enforcement of Provisions of the Rules

➢ Plastic Waste Management

- Identification of Plastic manufacturing units
- Characterisation & Quantification of Wastes
- Enforcement of Provisions of the Rules in respect of manufacturing

➢ E-Waste Management

- Identification of Sources
- Characterisation & Quantification of Wastes
- Enforcement of Provisions of the Rules

➢ Noise Pollution Management

- Identification of Sources in respect of industries.
- Enforcement of Provisions of the Rules in respect of industries.
- Monitoring the Compliance of Standards by industries.

➢ Environmental Impact Assessment

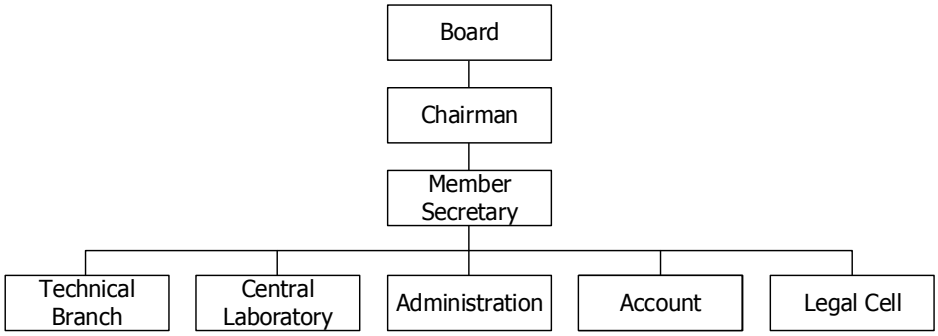
- Conduct of Environmental Public Hearing in respect of industries, development projects, etc. requiring Environmental Clearance under the Environmental Impact Assessment Notification dated 14th September, 2006.

➢ Activities under the Water Cess Act:

- The levy, assessment and collection of a cess on water consumed by persons carrying on certain industries and by local authorities
- Crediting the proceeds of the water cess levied to the Consolidated Fund of India for the purpose of prevention of water pollution.

a.3 Constitution

Figure 7.24 shows organization chart of MSPCB as of February 2019.



Source: Study Team

Figure 7.24: Organization Chart of MSPCB

MSCPB was constituted under Section 4 of the Water (Prevention & Control of Pollution) Act, 1974 by the Government of Meghalaya vide Notification No. PHE. 161/83/1 Dated the 16th November, 1983. The Government of Meghalaya vide Notification No.ENV.6/2008/106 Dated the 15th May, 2014 has transferred the Meghalaya State Pollution Control Board from the Administrative Control of the Public Health Engineering Department to the Forests and Environment Department. The last reconstitution of the Board was notified vide Notification No. ENV./6/2008/307 Dated 20th November 2014. The Board consists of 17 members nominated by the State Government as per provisions laid down in Sub-Section (2) of Section 4 of the Water (Prevention and Control of Pollution) Act, 1974. Besides the Chairman and the Member Secretary, there are five official members representing various State Government Departments, five members representing Local Authorities, two Members representing the Companies or Corporations owned, managed or controlled by the State Government and three Non-official Members. The list of the present Members of the Board is given in Table 7.34.

Table 7.34: Current List of MSPCB Members (as of February 2019)

CURRENT LIST OF BOARD MEMBERS		
1.	Shri. C. P. Marak, IFS, Principal Chief Conservator of Forests (Territorial)	Chairman
2.	Shri. J. H. Nengnong, Senior Environmental Engineer, MSPCB	Member Secretary
OFFICIAL MEMBERS		
3.	Chief Conservator of Forests/Conservator of Forests nominated by the principal Chief Conservator of Forests & HoFF, Meghalaya	Member
4.	Chief Engineer Public Health Engineering, Meghalaya, *or* his nominee	Member
5.	The Director of Industries, Meghalaya, *or* his nominee	Member
6.	The Director of Health Services (Research, etc.), Meghalaya, *or* his nominee	Member
7.	The Director, Urban affairs, Meghalaya, *or* his nominee	Member
MEMBERS FROM LOCAL AUTHORITIES		
8.	The Chief Executive Member, Khasi Hills Autonomous District Council *or* his nominee	Member
9.	The Chief Executive Member, Jaintia Hills Autonomous District Council *or* his nominee	Member
10.	The Chief Executive Member, Garo Hills Autonomous District Council *or* his nominee	Member
11.	The Chairman Shillong Municipal Board *or* his nominee	Member
12.	The Chairman Tura Municipal Board *or* his nominee	Member
REPRESENTATIVES FROM CORPORATIONS		
13.	The Managing Director Meghalaya Industrial Development Corporation *or* his nominee	Member
14.	The Managing Director Meghalaya Mineral Development Corporation *or* his nominee	Member
NON-OFFICIAL MEMBER		
15.	Shri. Sanggra A. Sangma (M.A, B.Ed, M.Phil), Asst. Professor, Don Bosco College, Tura	Member
16.	Dr. (Mrs.) M.P.R Lyngdoh (MA, PhD) (Retd), Principal, Shillong College, Shillong	Member
17.	Presently Vacant	Member

Source: Study Team based on interview with Chairman of MSPCB

b. Meghalaya Biodiversity Board[182]

b.1 Basis Statutes

The Meghalaya Biodiversity Board is a Statutory Body established under Biological Diversity Act, 2002. As per the Act, Biological Diversity Rules, 2004 and the Meghalaya Biological Diversity Rules, 2010, the functions of the Board are 1. Advise the State Government, subject to any guidelines issued by the Central Government, on matters relating to the conservation of biodiversity, sustainable use of its components, and equitable sharing of the benefits arising out of the utilisation of biological resources; 2. Regulate by granting of approvals or otherwise requests for commercial utilization or bio-survey and bio-utilisation of any biological resource by Indians; 3. Perform such other functions as may be necessary to carry out the provisions of this Act or as may be prescribed by the State Government (as per Section 23 of Biodiversity Act, 2002).

b.2 Activities

i) Biodiversity Management Committee (BMC)

The Biodiversity Management Committees (BMCs) are statutory bodies that are formed by the 'local bodies' as per Section 41 of the Biological Diversity Act 2002, Rule 23 of the Meghalaya Biological Diversity Rules, 2010, and Biological Diversity Amendment Rules, 2015. In Meghalaya 94 BMCs have so far been constituted at the village level. Role of BMCs are as follows:

- Documentation of local biodiversity in the form of Peoples' Biodiversity Register (PBR)
- Protection of Traditional Knowledge recorded in PBR.
- Conservation and sustainable utilization of biological resources.
- Eco-restoration of the local biodiversity.
- Proper feedback to the SBB in the matter of IPR, Traditional Knowledge and local biodiversity issues, wherever feasible and essential feedback to be provided to the NBA.
- Management of Heritage Sites including Heritage Trees, Animals/Microorganisms etc. and sacred groves and sacred water bodies.
- Regulation of access to the biological resources and/or associated Traditional knowledge, for commercial and research purposes.
- Sharing of benefits arising out of commercial use of bio-resources.
- Conservation of traditional varieties/Breeds of economically important plants/animals.
- Biodiversity education and awareness building.
- Development of bio-cultural protocols.

ii) People’s Biodiversity Register (PBR)

One of the main functions of the Biodiversity Management Committees (BMCs) is to prepare People’s Biodiversity Register (PBR) in consultation with local people. The Register shall contain comprehensive information on the local biological resources, their medicinal or any other use or any other traditional knowledge associated with them. PBR should serve as a component of the knowledge base for conservation, sustainable use and equitable sharing of benefits of biodiversity and it should also be used in maintenance and prudent management of ecosystems such as forests, rivers, lakes, grasslands, and ponds. This will then enhance the public awareness of the significance of conservation, sustainable use, the equitable sharing of the benefits of biodiversity, and to catalyse grass roots action.

iii) Biodiversity Heritage Sites

Under Section 37 of Biological Diversity Act, 2002 (BDA) the State Government in

[182] Descriptions from Official Website of Meghalaya Biodiversity Board (http://megbiodiversity.nic.in/members; accessed in February 2019)

consultation with local bodies may notify in the official gazette, areas of biodiversity importance as Biodiversity Heritage Sites (BHS). Under sub section (2) of Section 37, the State Government in consultation with the Central Government may frame rules for the management and conservation of BHS. Under sub section (3) of Section 37, the State Governments shall frame schemes for compensating or rehabilitating any person or section of people economically affected by such notification. "Biodiversity Heritage Sites" (BHS) are well-defined areas that are unique, ecologically fragile ecosystems - terrestrial, coastal and inland waters and marine having rich biodiversity comprising of any one or more of the following components: richness of wild as well as domesticated species or intra-specific categories, high endemism, the presence of rare and threatened species, keystone species, species of evolutionary significance, wild ancestors of domestic/cultivated species or their varieties, past pre-eminence of biological components represented by fossil beds and having significant cultural, ethical or aesthetic values and which are important for the maintenance of cultural diversity, with or without a long history of human association with them.

Areas having any of the following characteristics may qualify for inclusion as BHS.

- Areas having any of the following characteristics may qualify for inclusion as BHS.
- Areas that contain a mosaic of natural, semi-natural, and manmade habitats, which together contain a significant diversity of life forms.
- Areas that contain significant domesticated biodiversity component and/or representative agro-ecosystems with ongoing agricultural practices that sustain this diversity.
- Areas that are significant from a biodiversity point of view and also are important cultural spaces such as sacred groves/trees and sites, or other large community conserved areas.
- Areas including very small ones that offer refuge or corridors for threatened and endemic fauna and flora, such as community conserved areas or urban greens and wetlands.
- Regulation of access to the biological resources and/or associated traditional knowledge, for commercial and research purposes
- Areas that provide habitats, aquatic or terrestrial, for seasonal migrant species for feeding and breeding.
- Areas that are maintained as preservation plots by the research wing of Forest Department.
- Medicinal Plant Conservation Areas.

State Biodiversity Boards (SBB) may invite suggestions (or consider those already coming from communities) for declarations of BHSs, through BMCs and other relevant community institutions, including gram sabhas, panchayats, urban wards, forest protection committees, and tribal councils. SBB may undertake widespread dissemination of information related to the proposed BHS among rural communities, NGOs, farmer/fishermen/adivasi associations, urban groups, research institutions, government agencies, and other organizations, regarding the provision of BHSs, through locally appropriate means. These could include local language newspapers, radio, holding meetings with the communities, letters to line departments, gram panchayats, local bodies, and other means.

As per the Biodiversity Act, areas rich/unique in biodiversity can be notified by the State Government as BHS. Based on the recommendation received from the *Dorbar* of Umkon Village, a forest patch of 16 ha area, under Umkon Village, Ri-Bhoi District has been proposed to be constituted as the first BHS in the state. The proposal has already been submitted to the Government of Meghalaya for further process towards declaration of the first BHS.

b.3 Board Members

As per Rule 9 of MBDR, 2010, the five ex-official members are posted.

- PCCF & HoFF, Forests & Environment Department
- Director, Agriculture Department
- Director, Veterinary & Animal Husbandry Department
- Director, Fisheries Department
- Director, Education Department

7.7.3. Environmental and Social Management System Framework (ESMSF)

The objective and structure of ESMSF are describe as below.

(1) Objective of ESMSF

The ESMSF is the primary reference document outlining how environmental and social considerations will be addressed in the project design and implementation.

ESMSF helps to establish a process for environmental and social safeguards which will permit the executing agency of the project to identify, assess and mitigate the environmental and social impacts of the proposed interventions. In the process, the framework also determines the institutional measures to be taken during the program implementation.

The objectives of the ESMSF are summarized as:

1) To provide a broad framework for the identification, management and monitoring of potential environmental and social risks arising under the project;
2) To enhance the project's positive environmental and social impacts and avoid or otherwise mitigate associated negative impacts;
3) To ensure that the rights and needs of forest dependents and their communities affected by or involved in the project, are respected and met in the design and implementation of project interventions; and
4) To ensure the protection of local ecosystems and environmental resources in the design and implementation of the project interventions.

(2) Structure of ESMSF

The ESMSF of the Project is structured as follows:

1) Summary of the Project: It briefly describes the project framework and sub-projects.
2) Environmental and Social Safeguard Policies of JICA: It briefly describes JICA's environmental and social safeguard policies and clarifies how the Project shall be categorized and what types of measures will be required.
3) Clarifying Definition and Selection of Safeguard Frameworks: It analyses and defines the key technical terms and select appropriate safeguard frameworks to be applicable for the Project.
4) Target Groups of ESMSF: It defines beneficiaries.
5) Existing Environmental and Social Management Systems: Outline of the legal and policy context for environmental and social safeguard in India as well as in the Tripura State.
6) Environmental and Social Risks and Mitigation Measures: An assessment of potential positive and negative environmental and social aspects associated with the Project, as well as measures for the mitigation of adverse risks in the project design and

implementation.

7) Framework and Procedures/ Detail Procedures of ESMSF: It indicates the institutional framework and identifies procedures for management and mitigation of environmental and social risks of the project cycle. Social assessment to determine community needs and priorities, to obtain their views on the design and proposed implementation mechanisms of the Project is also covered here.

8) Capacity Development Requirements for ESMSF Implementation: The capacity development and training requirements for effective implementation of the ESMSF are identified.

7.7.4. Resettlement Plan Framework (RPF)

As the occasion arises, RPF will be developed and incorporated to the Draft Final Report. The draft structure of RPF is shown below.

1) Project objective and necessity of involuntary resettlement and land acquisition
2) Reason why resettlement plan cannot be prepared before loan approval
3) Preparation and approval process of resettlement plan
4) Estimated number of resettlement (including economic transfers that lose major livelihoods due to influence on owned land and structures)
5) Compensation and entitlements for affected assets/properties
6) Compensating procedure for loss assets based on reacquisition price
7) Means for livelihood rehabilitation which can improve or at least restore livelihood and living standard of eligibility of benefits
8) Grievance redress mechanism
9) The organizational framework for implementing resettlement, including identification of agencies responsible for delivery of resettlement measures and provision of services
10) Implementation schedule to initiate physical relocation after completion of compensation payment for asset losses
11) Costs and budget
12) Arrangements for monitoring of resettlement activities by the implementing agency supplemented by independent monitors
13) Strategy for consultation with and participation of resettlers and hosts in the design and implementation of the resettlement activities

However, the RPF will not be prepared because any voluntary/involuntary resettlement is planned in the proposed project.

7.7.5. Scheduled Tribe and Forest Dependents Plan Framework (STFDPF)

The objective and draft structure of STFDPF are shown below.

(1) Objective of STFDPF

The STFDPF is to be applied as an additional framework that works together with the ESMSF, the primary project safeguards document for the Project. In general, the STFDPF is specifically applied in situations where Scheduled Tribes (ST), Scheduled Castes (SC), Other Backward Classes, forest dwellers and other forest dependents are affected by the project activities and provides guidance for specific measures which may be required in addition to the provisions of the ESMSF.

(2) Structure of STFDPF

STFDPF is structured in an almost identical way to the ESMSF for easy usage by simply referring the ESMSF. The structure of STFDPF is described hereunder.

1) Definition of "Scheduled Tribes and Forest Dwellers" as "Indigenous People" and as Target of STFDPF
2) Safeguard Policies of JICA on ST and Forest Dependents
3) Legal and Policy Framework for ST and Forest Dependents
4) Environmental and Social Risks and Mitigation Measures
5) Framework and Procedures/Detail Procedures of STFDPF (Preparation of Scheduled Tribe and Forest Dependents Plan, Free, Prior and Informed Consultation, Social Assessment, Micro planning, Selection and Screening of Sub-project, Monitoring and Evaluation (M&E), and Grievance Procedures

ESMSF and STFDP, Environmental Checklist, ESMS Checklist, and Agreement on Environmental and Social Considerations between Planning Department (on behalf of MBDA) and JICA Study Team are attached in Annexure 6.

7.8. Gender Mainstreaming

7.8.1. Rationale and Methodology

Gender mainstreaming is one of the most critical strategies for achieving inclusive community forest management and overall poverty alleviation through the Project. This is mainly because women in rural Meghalaya take a main role in collecting NTFPs, specifically firewood and edible wild plants, as well as in farming food grains and cash crops and managing livestock to maintain their livelihoods. In spite of this, women there are often excluded from public meetings and the decision-making processes of existing traditional governing structures, such as *Dorbar Shnong*, *Raid*, and *Hima*. Thus, gender mainstreaming is essential for making it sure that these women be involved in the decision-making processes of the Project, their interests and needs based on their role be reflected in the planning of the Project's activities, and women get empowered through even taking leading roles in and having more access to resources and services through the Project. Women's empowerment should contribute to the achievement of the Project's purposes because they take important roles.

For gender mainstreaming, a gender perspective should be integrated into both the organizational structure of the Project and its contents in all the processes of planning, implementation, and monitoring & evaluation (M&E). In the tribal society of rural Meghalaya, gender division of labor/role is strictly determined and kept on a basis of social norms and tradition, and women's interests and needs are most probably different from men's. If the managers and other staff members involved in the Project ignore or overlook this point, the contents of the Project will tend to be designed and undertaken for the sake of men and the elderly who have dominated the decision-making power of existing traditional governing structures. To avoid this, a gender perspective should be fully integrated in the Project.

7.8.2. Gender Mainstreaming to the Organizational Structural of the Project

For gender mainstreaming, the Project should build systems which consist of gender responsive organizational structure and Project operation. First, in order to make the organizational structure of the Project gender responsive, it is highly recommended that a critical number of women should be involved as managerial officials, in addition to thematic experts and implementing staff members. This aims to avoid the Project's management/decision-making body being dominated by men only and instead to make it more diverse by involving a critical-mass number of women. Secondly, the

Project may establish a Gender Committee and appoint a gender focal point representing each of the Project's components. The committee of which members compose management officials and gender focal points is supposed to systematically monitor and check the processes and outcomes of the Project from a gender perspective and make it sure that the Project is operated in a socially-inclusive manner. If any serious constraints hinder local women's active participation in the Project, the committee members, together with implementing staff members, are supposed to identify and take effective measures to solve these problems. Such structural systems should be supported by gender responsive operational systems, which can mainstream a gender perspective in the Project.

One of crucial keys to making such a structural organization functional is to conduct gender analysis, based on which the contents of the Project are designed and the progress of the Project in promoting women's empowerment is monitored. For this, the Project should establish gender-disaggregated data collection and data storage system. Based on the data disaggregated by gender and other factors, the committee can assess the extent to which the Project achieves social inclusion in terms of the quantity and quality of women's participation in decision-making processes and activities and the distribution of the Project's benefits among diverse groups of local people. As a sort of knowledge management system, the Project may also establish a system by which the officials and staff members involved in the Project can share key lessons learnt from the activities of the Project and good practices in terms of promoting women's empowerment. To use such systems properly, the Project should train all the officials and staff members involved in the Project to be gender responsive and technically capable. Through the training, they are expected to recognize and well understand about the mechanism of context-specific gender-based division of labor/roles, different gender needs, and unequal gender relations. Based on these, the officials and staff members involved in the Project are supposed to make a plan, implement, and monitor and evaluate the Project.

Interventions which need to be taken for mainstreaming a gender perspective in the organizational structure of the Project is given in the following table while more details, including indicators, are described in Annexure 5:

Table 7.35: Interventions Necessary for Mainstreaming a Gender Perspective in the Organizational Structure of the Project

Categories	Interventions	Timing	Main Purposes
Organizational Structure	involvement of women managers as well as women experts	during the preparatory period	to make decision-making body diverse
	conducting gender analysis	at the beginning of the Project	to understand context-specific gender division of labor/role, gender needs, gender relations, etc., based on which the contents of the Project/activities are designed
	setting up of Gender Committee and appointment of gender focal points representing each of the components	at the early stage of the Project	to monitor the progress of the Project's promotion of women's empowerment and solve critical problems by identifying effective measures
	set up gender/other-factors-disaggregated data collection and data storage system set up knowledge bank on lessons learnt and good	at the early stage of the project and continuously through the Project	to analyze and visualize gender gaps in terms of participation in decision-making processes, activities, etc. and distribution of benefits from the Project to reflect the lessons learnt and

Categories	Interventions	Timing	Main Purposes
	practices in terms of promoting women's empowerment		good practices in the planning and implementation of activities in other target villages
	conducting gender training for those involved in the project	throughout the Project, specifically at the early stage	to make all those who are involved in the Project gender responsive and technically capable to operate the Project from a gender perspective

Source: developed by Study Team.

7.8.3. Gender Mainstreaming to the Project Operation

For mainstreaming a gender perspective in the Project, its rules and operational procedures also need to be gender responsive. To share the concept of gender mainstreaming among all the stakeholders, including the officials, staff members, and local people, the Project needs to develop operational guidelines in which a gender perspective is fully integrated. The main purpose and role of the guidelines is to regulate the rules and procedures by which the Project can prevent women and other marginalized groups of people from being excluded from decision-making processes and activities and from being utilized only as assistants to achieve the goals/interests of dominant groups in a community. Instead, the guidelines should lead the stakeholders, specifically the implementation staff members, to involving women and other marginalized groups of people as main actors, not passive beneficiaries, in the Project and fostering their agency or self-determination through the Project and activities, which is essential for achieving social inclusion.

There are several critical points which need to be stated in the guidelines and properly implemented in the Project. First, the Project should conduct a series of gender sensitization workshops at the village level throughout the Project, specifically during its early stage. Through the workshops, the Project aims to change the ideas and attitude of local women and men toward stereotyped gender division of labor/role and unequal gender relations. As a result of the workshops, women are expected to actively participate in decision-making processes and the Project's activities, not only income generation, but also micro-planning, mapping/GIS, and community forest management. On the other hand, men are expected to encourage women to assume even leading roles, instead of assisting roles, and also assist women in participating in various activities by taking up the household chores and child care which women exclusively take.

In order to make it sure that women be involved in the decision-making processes of the Project, the guidelines should regulate that a critical number of women should be involved as chairpersons, vice chairpersons, or other members in the executive committee at the village level. More importantly, the Project should make sure that women are not involved in the committee in name only, but that they play a leading and decision-making role. In order for women to be self-confident and speak up in public places, the guidelines also need to state that women will be provided with training on communication skills and leadership.

Interventions which need to be taken into account for gender mainstreaming to the Project operation are as follows while more details, including indicators, are described in Annexure 5:

Table 7.36: Necessary Interventions to Mainstream Gender in the Operation of the Project

Category	Interventions	Timing	Main Purposes
Project Operation	involvement of women in decision-making processes and women's taking up leading roles	at the early stage of the project and throughout the Project	to let women's ideas/needs heard by other villagers and reflect their ideas/needs in the plans of the Project activities to give women more opportunities to represent villagers, make decisions, contribute as main actors to community forest management and livelihood improvement, etc.
	dissemination of information on the project among all villagers	in the very beginning of the project and throughout the Project	not to exclude anyone from the Project and let all villagers to know about the Project and the possible benefits they might get from the Project, based on which they can make a choice on if they participate in the Project
	conducting gender sensitization workshops	at the early stage of the project and throughout the Project	to change the ideas and attitude of women and men toward stereotyped gender division of labor/role and unequal gender relations, to encourage women to actively participate in decision-making processes and take up leading roles, and to convince men to understand the importance of women's taking up new roles through the Project and assist women doing household chores and child-care so that women can participate in the Project's activities
	provision of training on communication skills and leadership for women	at the early stage of the project and throughout the project	to let women speak up in the public places with self-confidence
	involvement of women and men in all activities of the Project: micro-planning, mapping/GIS activities, community forest management, micro-credit activities, income generation activities, etc.	at the early stage of the Project and throughout the Project	not to exclude women and men from the processes of realizing community forest management and livelihood improvement through the Project and to let both women and men have opportunities for decision making, receiving materials/resources, taking training, improving skills and incomes, making network, etc.

Source: developed by Study Team

7.9. Project Cost Estimate

7.9.1. Conditions and Assumptions

(1) Preconditions for Cost Estimate

The Project cost shall be estimated based on the following preconditions:

1) Preconditions for Project cost estimate as of June 2019 provided by JICA

- The project period is ten (10) years, and the unit costs were estimated based on the constant price of June 2019 in Indian Rupees.
- The following exchange rates were applied:

  INR 1 = JPY 1.58
  USD 1 = Rs 69.8
  USD 1 = JPY 110

- The average inflation rate (the average WPI and CPI in 2009 to 2018) was estimated as 5.50%, and the average exchange fluctuation rate was 1.97% in the same years. As a result, the price escalation rate for the local currency portion was estimated as 3.53% (= 5.50% - 1.97%).
- Similarly, the price escalation rate for the foreign currency portion was estimated as 1.72%.
- A 5% physical contingency was applied.

2) GST (Goods and Services Tax)

- GST (Goods and Services Tax) shall be calculated as CGST (Central GST) x 2 since GST is combined with CGST and SGST (State GST) for intra-state business. CGST shall be referred to using the schedule of CGST rates on goods[183] and the schedule of CGST rates on services[184]. However, the schedule of SGST is not available.
- IGST (Integrated GST) shall be calculated as CGST x 2 following the same practice above for inter-state business.

(2) Price Adjustment

A value of a unit cost in a past base year shall be adjusted to the value for 2019 with the following price indices:

The unit cost referred from a past base year shall be multiplied by the price index in the table below to adjust for 2019 price. The price indices were calculated based on the average inflation rate (the average WPI and CPI between 2010 and 2018) as mentioned above. The price indices to adjust for 2019 price from 2010 are shown in the table below.

[183] Updated schedule of CGST rates on goods, as on 15.11.2017, Central Board of Excise and Customs (CBEC), the Department of Revenue, the Ministry of Finance, Government of India
[184] Schedule of CGST rates on services, discussed on 19 May 2017 during the 14th GST Council meeting, CBEC

Table 7.37: Price Indices to Adjust for 2019 Price

Base Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Price Index	**1.87**	**1.67**	**1.53**	**1.40**	**1.26**	**1.19**	**1.12**	**1.07**	**1.05**	**1.00**

Source: compiled by Study Team based on the preconditions provided by JICA

7.9.2. Project Cost

(1) Summary of Cost Estimate

Close to the public

Table 7.38: Summary of Project Cost

Close to the public

(2) Project Component (Base Cost)

Close to the public

(3) Price Escalation

Close to the public

(4) Physical Contingency

Close to the public

(5) Consulting Services

Close to the public

(6) Taxes and Duties

Close to the public

(7) Annual Fund Requirement

Close to the public

Table 7.39: Annual Fund Requirement

Close to the public

(8) Currency Component

Close to the public

Table 7.40: Currency Components of Project Cost

Close to the public

(9) Financial Plan

Close to the public

Table 7.41: Summary of Financial Plan by Components

Close to the public

7.10. Project Evaluation

7.10.1. Economic Analysis

(1) Basic Assumptions for Cost-Benefit Analysis

The cost-benefit analysis was conducted under the following basic conditions and assumptions.

- The economic life of the project is assumed to be 50 years since this type of forest management project takes a longer time to deliver returns than ordinary infrastructure development projects.
- The project costs in the project period are estimated based on June 2019 constant prices in Indian rupees.
- For the estimation of the economic project cost, each item of the financial cost is divided into a foreign currency portion and local currency portion. The local currency portion is converted into economic value by applying a standard conversion factor of 0.9 which is generally used in many projects in India Special Assistance for Project Formation (SAPROF) for Tripura Forest Environment Improvement and Poverty

Alleviation Project (TFIPAP) applied 0.9, West Bengal Integrated Forestry Development and Biodiversity Conservation Project applied 0.9, and "Manual on Economic Evaluation of Highway Projects in India" by Indian Roads Congress (2009) mentioned that as an approximation in many projects taken up in India, a factor of 0.80 - 0.90 has been used to convert financial costs of road works to economic costs.)

- The price contingencies, taxes and other kinds of transfer payments are excluded from the estimated financial costs to estimate the economic costs.
- For the calculation of the net present value, a discount rate of 12% is applied.
- Exchange Rates: INR 1 = JPY 1.58; USD 1 = JPY 110; USD 1 = INR 69.8 as of June 2019.

Major Activities of the Project are not supposed to collect any charges from beneficiaries except ecotourism activity. For the ecotourism, the Ecotourism Development Organization would be established and operate the ecotourism facilities. Thus, only economic analysis is carried out and financial analysis is not done in this report.

(2) Economic Cost of the Project

1) Capital Cost

The economic cost of the project was estimated based on the conditions mentioned above. The financial cost and estimated economic cost are summarized in Table 7.42.

Table 7.42: Financial and Economic Cost by Component and Item

(million INR)

Item	Financial Cost	Economical Cost
Component 1. Sustainable Forest Management	3,427	3,084
Component 2. Community Development/Livelihood Improvement	786	707
Component 3. Institutional Strengthening	1,137	1,023
Base Cost Total	**5,351**	**4,816**
Price Escalation	1,129	0
Physical Contingency	324	292
Consulting Services	367	330
Land Acquisition	0	0
Meghalaya Government	1,486	1,337
Taxes & Duties	0	0
Price Escalation	290	0
Physical Contingency	89	80
Interest during construction	243	0
Front End Fee	9	0
Grand Total	**9,288**	**6,855**

Source: compiled by Study Team based on JICA Cost Estimate Kit

In addition to the capital costs stated above, O&M cost and replacement cost were estimated for the economic analysis with following assumptions.

2) Operation and Maintenance Cost

It was assumed that the major portion of the O&M cost would emerge after the completion of each component, while most maintenance costs will be covered by the project during the project period.

Major portion of the O&M cost would be generated from construction works such as building, facilities and structures. O&M costs for the project were estimated at 1% of the construction and activites costs based on the SAPROF for TFIPAP applied 1% of the capital cost.

3) Replacement Cost

The replacement costs were estimated to recur every 20 and 30 years for the nursery and plantation. The replacement cost is applied as the same amount of the cost for the nursery and plantation.

(3) Benefit Evaluation

Several economic benefits would be derived from the implementation of the project. Some of these are direct benefits, while others are indirect. Among other things, the following items are regarded as the major economic benefits derived from the project, which can be either estimated in or converted into monetary terms showing in Table 7.43.

Table 7.43: Major Activities for Benefit Evaluation

Items	Beneficial Activities
Forestry Production	Production from AR, ANR, ANR Mix (NTFP, Fuel wood and pine)
Prevention of Soil Erosion	Prevention of soil erosion by increase of vegetative cover
Water Use	Aquaculture in the check dams and conservation pond, and water usage for living by the check dams, conservation pond and water tank
Income Generation Activities	Imcome generation by production of piggery, mushroom and weiving.
CO_2 Reduction	Increment of CO_2 stock between without and with the Project by Forestry Production

Source: developed by Study Team

The methodology of the benefit evaluation for each item is shown below.

1) Forestry Production

Several species will be planted in the project. For the benefit evaluation purpose, major species for each activity were selected. Major species and size of area for the AR, ANR and AR Mix are summarized in Table 7.44. Each species will be planted from 3rd to 8th project years.

Table 7.44: Major Species and Area to Be Planted

Components	Main Species	Area (ha)
1.2.3 ANR	Sal	1,600
1.2.4 ANR	Fuel wood	7,700
1.2.5 AR	Pine	5,500
1.2.6 ANR Mix	NTFP (Emblica officinalis)	1,250
	Pine	1,600
	Fuel wood	1,600
1.2.7 AR	Pine Mix	3,100
1.2.8 ANR	Jack Fruit	150
	Total	22,500

Source: developed by Study Team

For each component (species), the value/benefit was estimated with a set of assumptions. The assumptions for the value calculation for each component (species) are shown below.

It should be noted that from each component above, 50% of the value was deducted as the costs for maintenance, harvesting, marketing and other miscellaneous expenses, resulting in 50% of the value as the net profit of plantation. This cost is equivalent to the average cost for cypress and ceder, 46% and 77% respectively based on the Annual Reports on Forest and Forestry by Forest Agency, Japan.

ANR (Sal)

It is assumed that *Sal* would become valuable from 30 years after establishment in Table 7.45.

Table 7.45: Assumptions for Value Calculation (Sal)

Year	Production (m3/ha)	Unit Price (INR/m3)	Value (INR/ha)	Area (ha)	Total Value (INR)
33 - 38	36.55	2,500	91,375	267	24,397,125

Source: Production rate and Unit Price; Perspective plan for development of forestry sector 2002-03 to 2011-12 (2001) Tripura Forest Department (TFD)

ANR (Fuel Wood)

It is assumed that fuel wood would become valuable from 5 years after plantation (8th project year) in Table 7.46.

Table 7.46: Assumptions for Value Calculation (Fuel Wood)

Year	Production (m3/ha)	Unit Price (INR/m3)	Value (INR/ha)	Area (ha)	Total Value (INR)
8<	150	250	37,500	1,283	48,112,500

Source: Production rate and Unit Price; Perspective plan for development of forestry sector 2002-03 to 2011-12 (2001) TFD.

AR (Pine)

It is assumed that pine would become valuable from 20 years after establishment shown in Table 7.47.

Table 7.47: Assumptions for Value Calculation (Pine)

Year	Production (m3/ha)	Unit Price (INR/m3)	Value (INR/ha)	Area (ha)	Total Value (INR)
23 - 28	23	2,000	46,000	917	42,182,000
43 - 48	23	2,000	46,000	917	42,182,000

Source: Production rate and Unit Price; Perspective plan for development of forestry sector 2002-03 to 2011-12 (2001) TFD.

ANR Mix

It is assumed that emblica officinalis and fuel wood would become valuable from 5 years after plantation (8th project year), while pine would become valuable from 20 years after establishment shown in Table 7.48 (emblica officinalis).

Table 7.48: Assumptions for Value Calculation (NTFP: *Emblica officinalis*)

Year	No of Tree (nos/ha)	Production (kg/tree)	Unit Price (INR/kg)	Value (INR/ha)	Area (ha)	Total Value (INR)
8	200	20	60.0	240,000	200	52,800,000
9	200	20	60.0	240,000	400	105,600,000
10	200	20	60.0	240,000	600	158,400,000
11	200	20	60.0	240,000	800	211,200,000
12	200	20	60.0	240,000	1,000	264,000,000
13	200	20	60.0	240,000	1,250	330,000,000
14<	200	20	60.0	240,000	1,250	330,000,000

Source: Production rate and Unit Price; National Afforestation Program and SAPROF for TFIPAP.

ANR (Jack Fruit)

It is assumed that *jack fruit* would become valuable from 5 years after plantation (8th project year)

in Table 7.49.

Table 7.49: Assumptions for Value Calculation (Jack Fruit)

Year	No of Tree (nos/ha)	Production (kg/tree)	Unit Price (INR/kg)	Value (INR/ha)	Area (ha)	Total Value (INR)
8	200	150	100	3,000,000	25	82,500,000
9	200	150	100	3,000,000	50	165,000,000
10	200	150	100	3,000,000	75	247,500,000
11	200	150	100	3,000,000	100	330,000,000
12	200	150	100	3,000,000	125	412,500,000
13	200	150	100	3,000,000	150	495,000,000
14<	200	150	100	3,000,000	150	495,000,000

Source: developed by Study Team

2) Prevention of Soil Erosion

The forest covering the surface of the earth with trees and other plants would mitigate the rainfall impact on the surface soil so that surface erosion would be alleviated. Also, the root system of the vegetation would bind the soil. If there is no vegetation on the earth, the surface soil is run off and deposited on the river bed. As a result, excavation of the river bed would be required. So, the value of soil erosion prevention by the vegetative cover was calculated as surrogated cost being represented by the excavation of the river bed.

Since no adequate data is available on soil erosion and erosion mitigation by vegetation in Meghalaya, 4.2 mm/ha/year[185] for plantation was used for the estimation as the effect of reduction of soil erosion with regards to the Project. For the ANR site, 2.1 mm/year of the reduction rate was applied since vegetation would be already existed more than the plantation and AR site and the reduction effect by the ANR would be smaller.

Total effect by soil conservation activities was calculated multiplying unit effect and area to be covered by the activities as shown in Table 7.50.

Table 7.50: Value Calculation for Prevention of Soil Erosion

Activities	Area (ha)	Reduction Rate (mm/year)	Volume (m^3)	Excavation Unit Cost (INR/m^3)	Total Value (INR)
ANR (Sal)	1,600	2.1	33,600	189.4	6,363,840
ANR (Fuel wood)	7,700	2.1	161,170	189.4	30,625,980
AR (Pine)	5,500	4.2	231,000	189.4	43,751,400
ANR Mix	4,450	4.2	186,900	189.4	35,398,860
AR (Pine mix)	3,100	4.2	130,200	189.4	24,659,880
ANR (Jack fruit)	150	2.1	3,150	189.4	596,610

Source: Unit cost is estimated based on INR 113.4/m3 of Tripura Schedule Rate (2011) and multiplied by 1.67 for the price index referred to Table 7.37.

3) Water Use

For the estimation of economic benefit from water use by the activites for soil and water conservation, the following assumptions were made.

[185] Nelly C antolin and Vincente P. Varacion: "Effect of Alley Cropping on Some Hydrologic Data and Soil Properties of Upland Farms in Bacnotan, La Union", 1993.

Aquaculture

A number of check dams and conservation ponds would be constructed under the project. The check dams and conservation ponds would be used for fish culture under the JFMC. 1.0 ha of water body can produce 3,000 kg of fish per year at the price of INR 186.4/kg. The utilization rate of check dams for the fish culture is assumed as 50%.

30% of the total value was assumed to be deducted as the necessary expense such as purchase of the seedlings, harvesting, marketing and other miscellaneous. Value calculation for aquaculture in check dams and conservation ponds are shown in Table 7.51 and Table 7.52, respectively.

Table 7.51: Value Calculation for Aquaculture in Check Dam

Year	Check dam (ha)	Utilization Rate for Aquaculture	Production Rate (kg/ha)	Fish Production (kg)	Unit Price of Fish (INR/kg)	Value (INR)	Net Profit (INR)
4	48	50%	3,000	72,000	186.4	13,420,800	9,394,560
5	184	50%	3,000	276,000	186.4	51,446,400	36,012,480
6	320	50%	3,000	480,000	186.4	89,472,000	62,630,400
7	456	50%	3,000	684,000	186.4	127,497,600	89,248,320
8	592	50%	3,000	888,000	186.4	165,523,200	115,866,240
9	680	50%	3,000	1,020,000	186.4	190,128,000	133,089,600
10<	680	50%	3,000	1,020,000	186.4	190,128,000	133,089,600

Source: Production rate and Unit Price; SAPROF for TFIPAP.

Table 7.52: Value Calculation for Aquaculture in Conservation Pond

Year	Check dam (ha)	Utilization Rate for Aquaculture	Production Rate (kg/ha)	Fish Production (kg)	Unit Price of Fish (INR/kg)	Value (INR)	Net Profit (INR)
4	68	50%	3,000	102,000	186.4	19,012,00	13,308,900
5	204	50%	3,000	306,000	186.4	57,038,400	39,926,880
6	340	50%	3,000	510,000	186.4	95,064,000	66,544,800
7	476	50%	3,000	714,000	186.4	133,089,600	93,162,720
8	612	50%	3,000	918,000	186.4	171,115,200	119,780,640
9	680	50%	3,000	1,020,000	186.4	190,128,000	133,089,600
10<	680	50%	3,000	1,020,000	186.4	190,128,000	133,089,600

Source: Production rate and Unit Price; SAPROF for TFIPAP.

Living Water

With the aid of the check dams and conservation ponds, people living around the check dams and ponds would be able to use the water in dry season. The benefit of the water usage was assumed as the cost of water in public service (3.2 INR/m^3: 350 INR/year average for public water payment devided by 109.5 m^3/year/family usage). The value calculation for living water in check dam and conservation pond are shown in Table 7.53 and Table 7.54, respectively.

Table 7.53: Value Calculation for Living Water in Check Dam

Year	Check dam (m^3)	Utilization Rate for Water	Effective Water Volume (m^3)	Water Use Volume (m^3/year)	Unit Price (INR/ m^3)	Value (INR)
4	80,000	50%	40,000	80,000	3.2	256,000
5	1,546,667	50%	773,333	1,546,667	3.2	4,949,333
6	3,013,333	50%	1,506,667	3,013,333	3.2	9,642,667
7	4,480,000	50%	2,240,000	4,480,000	3.2	14,336,000
8	5,946,667	50%	2,973,333	5,946,667	3.2	19,029,333
9	7,333,333	50%	3,666,667	7,333,333	3.2	23,466,667

Year	Check dam (m^3)	Utilization Rate for Water	Effective Water Volume (m^3)	Water Use Volume (m^3/year)	Unit Price (INR/ m^3)	Value (INR)
10<	7,333,333	50%	3666,667	7,333,333	3.2	23,466,667

Source: developed by Study Team

Table 7.54: Value Calculation for Living Water in Conservation Pond

Year	Check dam (m^3)	Utilization Rate for Water	Effective Water Volume (m^3)	Water Use Volume (m^3/year)	Unit Price (INR/ m^3)	Value (INR)
4	693,333	50%	346,667	693,333	3.2	2,218,667
5	2,080,000	50%	1,040,000	2,080,000	3.2	6,656,000
6	3,466,667	50%	1,733,333	3,466,667	3.2	11,093,333
7	4,853,333	50%	2,426,667	4,853,333	3.2	15,530,667
8	6,240,000	50%	3,120,000	6,240,000	3.2	19,968,000
9	6,933,333	50%	3,466,667	6,933,333	3.2	22,186,667
10<	6,933,333	50%	3,466,667	6,933,333	3.2	22,186,667

Source: developed by Study Team

With the RCC tanks/spring tapped chambers for fifteen families and water tanks for four families, people living around the tanks and chambers would be able to use the water all year round. The benefit of the water usage was assumed as the cost of water in public service. The result for RCC tanks/chambers and water tanks are shown in Table 7.55 and Table 7.56, respectively.

Table 7.55: Value Calculation for Living Water in RCC Tank/Chamber

Year	Tank /Chamber (m^3)	No. of Families (No.)	WaterUse (m^3/year)	Unit Price (INR/ m^3)	Value (INR)
4	210	3,150	344,925	3.2	1,103,760
5	420	6,300	689,850	3.2	2,207,520
6	625	9,375	1,026,563	3.2	3,285,000
7	830	12,450	1,363,275	3.2	4,362,480
8	1,040	15,600	1,708,200	3.2	5,466,240
9	1,250	18,750	2,053,125	3.2	6,570,000
10<	1,250	18,750	2,053,125	3.2	6,570,000

Source: developed by Study Team

Table 7.56: Value Calculation for Living Water in Water Tank

Year	Water Tank (m^3)	No. of Families (No.)	WaterUse (m^3/year)	Unit Price (INR/ m^3)	Value (INR)
4	210	840	91,980	3.2	294,340
5	420	1,680	183,960	3.2	588,670
6	625	2,500	273,750	3.2	876,000
7	830	3,320	363,540	3.2	1,163,330
8	1,040	4,160	455,520	3.2	1,457,660
9	1,250	5,000	547,500	3.2	1,752,000
10<	1,250	5,000	547,500	3.2	1,752,000

Source: developed by Study Team

4) Income Generation Activities (IGAs)

For the estimation of economic benefit of Income Generation Activities (IGAs), the following assumptions were made.

Piggery

For the estimation purpose, it was assumed that 300 SHGs would be adopted in the IGA activities for the piggery. SHGs would purchase a 3-month-old piglet and they would sell them within a year. Selling price of the pig were estimated based on the actual situation stated in the interviews during study, say selling price of a pig is INR 15,000.

30% of the total value was deducted as the necessary expense such as purchasing of a little pig (INR 3,000, stated in the interviews during study), feeding, marketing and other miscellaneous showing in Table 7.57.

Table 7.57: Value Calculation for Piggery

Year	Progress	No. of SGH	Sold Pig (No.)	Selling Price (INR)	Revenue (INR)	Net Profit (INR)
3	20%	60	0	15,000	0	0
4	40%	120	1,800	15,000	27,000,000	18,900,000
5	60%	180	3,600	15,000	54,000,000	37,800,000
6	80%	240	5,400	15,000	81,000,000	56,700,000
7	100%	300	7,200	15,000	108,000,000	75,600,000
8	100%	300	9,000	15,000	135,000,000	94,500,000
9<	100%	300	9,000	15,000	135,000,000	94,500,000

Source: developed by Study Team

Mushroom

For the estimation purpose, it was assumed that 150 SHGs would be adopted in the IGA for the mushroom production. SHGs would harvest mushroom 3 times a year. Selling price per hurvest was estimated based on the actual situation stated in the interviews during study, which is INR 8,500. 50% of the total value was deducted as the necessary expense such as purchasing fungus, nursery woods, transport, marketing and other miscellaneous.

Table 7.58: Value Calculation for Mushroom

Year	Progress	No. of SGH	No. of Families	Selling Price(INR)	Annual Sales (INR/year)	Revenue (INR)	Net Profit (INR)
3	20%	30	0	8,500	25,500	0	0
4	40%	60	1,350	8,500	25,500	34,450,000	17,215,500
5	60%	90	2,700	8,500	25,500	68,850,000	34,425,000
6	80%	120	4,050	8,500	25,500	103,275,000	51,637,500
7	100%	150	5,400	8,500	25,500	137,700,000	68,850,000
8	100%	150	6,750	8,500	25,500	172,125,000	86,062,500
9<	100%	150	6,750	8,500	25,500	172,125,000	86,062,500

Source: developed by Study Team

Weaving

For the estimation purpose, it was assumed that 50 SHGs would be adopted in the IGA for weaving. SHGs would produce epron, cloths, bed sheets, etc. by weaving monthly. Selling price per monthly weaving was estimated based on the actual situation stated in the interviews during study, which is INR 20,000 on average. 20% of the total value was deducted as the necessary expense such as purchasing close, threads, transport, marketing and other miscellaneous.

Table 7.59: Value Calculation for Weaving

Year	Progress	No. of SGH	No. of Families	Selling Price(INR)	Annual Sales (INR/year)	Revenue (INR)	Net Profit (INR)
3	20%	10	0	20,000	240,000	0	0
4	40%	20	150	20,000	240,000	36,000,000	28,800,000
5	60%	30	300	20,000	240,000	72,000,000	57,600,000
6	80%	40	450	20,000	240,000	108,000,000	86,400,000
7	100%	50	600	20,000	240,000	144,000,000	115,200,000
8	100%	50	750	20,000	240,000	180,000,000	144,000,000
9<	100%	50	750	20,000	240,000	180,000,000	144,000,000

Source: developed by Study Team

5) CO_2 Reduction

The reduction of CO_2 emission was calculated and described in Chapter 7.10.2.

Based on the CO_2 reduction estimation result, economic value of the CO_2 reduction is estimated. For valuing reduction of CO_2 emission in monetary term, Euro CO_2 Emission Allowance at the date of December 2018 (9.68 EUR) was used. Value calculation for CO_2 reduction was estimated and shown in Table 7.60.

Table 7.60: Value Calculation for CO_2 Reduction

Year	Planted Area (ha)	Occupancy (%)	Reduction (tCO2/year)	Unit Price (INR/tCO2)	Value (INR/year)
3	0	0.0%	92,724	769.5	0[
4	1,500	6.7%	92,724	769.5	4,756,741
5	3,000	13.3%	92,724	769.5	9,513,482
6	4,500	20.0%	92,724	769.5	14,270,224
7	6,000	26.7%	92,724	769.5	19,026,965
8	7,500	33.3%	92,724	769.5	23,783,706
9	9,000	40.0%	92,724	769.5	28,540,447
10	10,500	46.7%	92,724	769.5	33,297,188
11	12,000	53.3%	92,724	769.5	38,053,930
12	13,500	60.0%	92,724	769.5	42,810,671
13	15,000	66.7%	92,724	769.5	47,567,412
14	16,500	73.3%	92,724	769.5	52,324,153
15	18,000	80.0%	92,724	769.5	57,080,894
16	19,500	86.7%	92,724	769.5	61,837,636
17	21,000	93.3%	92,724	769.5	66,594,377
18	22,500	100.0%	92,724	769.5	71,351,118
19<	22,500	100.0%	92,724	769.5	71,351,118

Source: developed by Study Team

(4) Cost Benefit Analysis

1) Cost Benefit Analysis Results

The economic internal rate of return (EIRR), net present value (NPV), and cost-benefit ratio (B/C) of the Project were calculated to assess the economic viability of the project based on the projected economic cash flow is shown in Table 7.61. The EIRR is 15.5%, which is higher than the discount ratio of 12%, and the NPV and B/C are 1,350.4 million INR and 1.27, so that the project is economically viable.

2) Sensitivity Analysis

A sensitivity analysis was carried out to examine the viability of the project under the enforceable change of the benefit and cost levels. The result of the calculation indicates that the project is still viable even with 10% increase of cost or 10% decrees of benefit, however in case 20% increase of cost and 10% decrease of benefit is not viable shown in Table 7.61.

Table 7.61: Sensitivity Analysis of EIRR

Change of Cost	Change of Benefit		
	+10%	0%	-10%
0%	17.1%	15.5%	13.9%
+10%	15.5%	14.0%	12.6%
+20%	14.2%	12.8%	11.4%

Source: developed by Study Team

Table 7.62: Result of the Cost-benefit Analysis

(million INR)

Year		Cost					Benefit						B-C
		Capital (Loan)	Capital (Borrower)	O&M	Replace	Total	Forest Production	Prevention of Soil Erosion	Water Use	Income Generation Activity	CO2 Reduction	Total	
1	2019	59.7	78.0			137.7	0.0	0.0	0.0	0.0	0.0	0.0	-137.7
2	2020	399.5	174.2			573.7	0.0	0.0	0.0	0.0	0.0	0.0	-573.7
3	2021	732.3	176.2			908.5	0.0	0.0	0.0	0.0	0.0	0.0	-908.5
4	2022	732.4	187.7			920.1	0.0	19.1	49.3	64.9	4.8	138.0	-782.1
5	2023	769.3	199.6			968.9	0.0	38.1	166.3	129.8	9.5	343.7	-625.1
6	2024	771.1	211.9			983.0	0.0	58.4	283.2	194.7	14.3	550.6	-432.4
7	2025	803.4	224.7			1,028.0	0.0	78.6	400.2	259.7	19.0	757.5	-270.5
8	2026	809.9	237.8			1,047.8	96.7	118.4	517.2	324.6	23.8	1,080.6	32.9
9	2027	817.3	251.5			1,068.8	164.4	141.4	586.3	324.6	28.5	1,245.2	176.4
10	2028	841.2	265.6			1,106.9	232.0	141.4	586.3	324.6	33.3	1,317.6	210.7
11	2029	434.6	110.4			545.0	299.7	141.4	586.3	324.6	38.1	1,390.0	845.0
12	2030			92.9	0.0	92.9	367.3	141.4	586.3	324.6	42.8	1,462.4	1,369.5
13	2031			92.9	0.0	92.9	441.6	141.4	586.3	324.6	47.6	1,541.4	1,448.5
14	2032			92.9	0.0	92.9	441.6	141.4	586.3	324.6	52.3	1,546.2	1,453.3
15	2033			92.9	0.0	92.9	441.6	141.4	586.3	324.6	57.1	1,550.9	1,458.1
16	2034			92.9	0.0	92.9	441.6	141.4	586.3	324.6	61.8	1,555.7	1,462.8
17	2035			92.9	0.0	92.9	441.6	141.4	586.3	324.6	66.6	1,560.4	1,467.6
18	2036			92.9	0.0	92.9	441.6	141.4	586.3	324.6	71.4	1,565.2	1,472.3
19	2037			92.9	0.0	92.9	441.6	141.4	586.3	324.6	71.4	1,565.2	1,472.3
20	2038			92.9	0.0	92.9	441.6	141.4	586.3	324.6	71.4	1,565.2	1,472.3
21	2039			92.9	0.0	92.9	441.6	141.4	586.3	324.6	71.4	1,565.2	1,472.3
22	2040			92.9	0.0	92.9	441.6	141.4	586.3	324.6	71.4	1,565.2	1,472.3
23	2041			92.9	196.9	289.7	480.7	141.4	586.3	324.6	71.4	1,604.3	1,314.6
24	2042			92.9	196.9	289.7	480.7	141.4	586.3	324.6	71.4	1,604.3	1,314.6
25	2043			92.9	196.9	289.7	480.7	141.4	586.3	324.6	71.4	1,604.3	1,314.6
26	2044			92.9	196.9	289.7	480.7	141.4	586.3	324.6	71.4	1,604.3	1,314.6
27	2045			92.9	196.9	289.7	480.7	141.4	586.3	324.6	71.4	1,604.3	1,314.6
28	2046			92.9	196.9	289.7	480.7	141.4	586.3	324.6	71.4	1,604.3	1,314.6
29	2047			92.9	0.0	92.9	441.6	141.4	586.3	324.6	71.4	1,565.2	1,472.3
30	2048			92.9	0.0	92.9	441.6	141.4	586.3	324.6	71.4	1,565.2	1,472.3
31	2049			92.9	0.0	92.9	441.6	141.4	586.3	324.6	71.4	1,565.2	1,472.3
32	2050			92.9	0.0	92.9	441.6	141.4	586.3	324.6	71.4	1,565.2	1,472.3
33	2051			92.9	30.9	123.8	453.8	141.4	586.3	324.6	71.4	1,577.4	1,453.6
34	2052			92.9	30.9	123.8	453.8	141.4	586.3	324.6	71.4	1,577.4	1,453.6
35	2053			92.9	30.9	123.8	453.8	141.4	586.3	324.6	71.4	1,577.4	1,453.6
36	2054			92.9	30.9	123.8	453.8	141.4	586.3	324.6	71.4	1,577.4	1,453.6
37	2055			92.9	30.9	123.8	453.8	141.4	586.3	324.6	71.4	1,577.4	1,453.6
38	2056			92.9	30.9	123.8	453.8	141.4	586.3	324.6	71.4	1,577.4	1,453.6
39	2057			92.9	0.0	92.9	441.6	141.4	586.3	324.6	71.4	1,565.2	1,472.3
40	2058			92.9	0.0	92.9	441.6	141.4	586.3	324.6	71.4	1,565.2	1,472.3
41	2059			92.9	0.0	92.9	441.6	141.4	586.3	324.6	71.4	1,565.2	1,472.3
42	2060			92.9	0.0	92.9	441.6	141.4	586.3	324.6	71.4	1,565.2	1,472.3
43	2061			92.9	196.9	289.7	480.7	141.4	586.3	324.6	71.4	1,604.3	1,314.6
44	2062			92.9	196.9	289.7	480.7	141.4	586.3	324.6	71.4	1,604.3	1,314.6
45	2063			92.9	196.9	289.7	480.7	141.4	586.3	324.6	71.4	1,604.3	1,314.6
46	2064			92.9	196.9	289.7	480.7	141.4	586.3	324.6	71.4	1,604.3	1,314.6
47	2065			92.9	196.9	289.7	480.7	141.4	586.3	324.6	71.4	1,604.3	1,314.6
48	2066			92.9	196.9	289.7	480.7	141.4	586.3	324.6	71.4	1,604.3	1,314.6
49	2067			92.9	0.0	92.9	441.6	141.4	586.3	324.6	71.4	1,565.2	1,472.3
50	2068			92.9	0.0	92.9	441.6	141.4	586.3	324.6	71.4	1,565.2	1,472.3
		7,170.7	2,117.7	3,622.5	2,547.8	15,458.7	18,481.8	6,251.2	26,042.3	14,605.3	2,854.0	68,234.6	

		EIRR=	15.5%
Discount Rate=	12%	NPV=	1,350.4
		B/C=	1.27

Source: developed by Study Team

7.10.2. Reduction of CO_2 Emission

Forest management activities in Component 1, including afforestation and forest protection, will contribute to reduction of CO_2 emission through increase in carbon stock and prevent carbon loss from forests by growing trees and maintain existing forests.
The following parts explain the procedure of the estimation of amount of CO_2 emission reduction.

(1) Methodology

To estimate the forest carbon stock through the project, JICA Climate Finance Impact Tool for Mitigation Draft Ver.2.0 (March 2014) and its section of "Afforestation" and "Forest Protection" was used. The amount of CO_2 sequestration was estimated at the point of 30 years after planting trees and starting protecting forests.

1) CO_2 Sequestration in the Project

The amount of CO_2 sequestration in the Project was estimated as follow:

$$ER_y = ER_{AR,y} + ER_{REDD,y}$$

Where,
ER_{ARy} : CO_2 sequestration by afforestation in the Project in year 30 (t-CO_2)
$ER_{REDD,y}$: Reduction of CO_2 emission by forest protection in the Project in year 30 (t-CO_2)

2) CO_2 Sequestration in Afforestation

As described in 7.5.1, there are two types of afforestation measures in the Project, namely ANR and AR with different tree density of 200 trees/ha and 1100 trees/ha, respectively. Afforestation through ANR is planed to be implemented in C1.2.3, C1.2.4, C1.2.6, C1.2.7 and C1.2.8, and AR in C1.2.5.

The amount of CO_2 sequestration in afforestation in the Project was estimated by the following equation.

$$ER_{AR,y} = C_{PJ,\ y} - C_{BL,\ y}$$

Where,
$C_{PJ,\ y}$: CO_2 sequestration with the Project in year 30 (t-CO_2)
$C_{BL,\ y}$: CO_2 sequestration without the Project in year 30; Baseline (t-CO_2) = 0

3) CO_2 Emission Reduction in Forest Protection

Forest protection is also carried out in the afforestation site of C1.2.3, C1.2.4, C1.2.6, C1.2.7 and C1.2.8.

Reduction of CO_2 emission in forest protection in the Project was estimated by the following equation.

$$ER_{REDD,y} = C_{BL,\ y} - C_{PJ,\ y}$$

Where,
$\Delta C_{BL,\ y}$: CO_2 emission without the Project in year 30; Baseline (t-CO_2)
$\Delta C_{PJ,\ y}$: CO_2 emission with the Project in year 30 (t-CO_2)

Base line of CO_2 emission without the Project in forest protection was obtained from the past trend of forest area change driven by deforestation and forest degradation between 2007 and 2017 in the state. In deforestation, it loses 100% of existing carbon stock in forest. In forest degradation, it was assumed to lose 30% of carbon stock in forest under the transition of forest status from MDF to OF in this estimation. The total forest area change by both deforestation and forest degradation from 2007 to 2017 was converted to reduced carbon stock, giving the carbon reduction rate 0.37% from forests annually.

4) Calculation for amount of CO_2 in the Project area

The amount of CO_2 in each activity area was produced in the following calculation.

$$C = C_s \times SD \times A \times 44/12$$

Where,
C : CO_2 stock in the Project site (t-CO_2)
C_s : Carbon stock per tree (t-C/tree)
SD : Tree stand density (trees/ha)
A : Area (ha)

$$C_s = (AGB + BGB) \times C_c = AGB \times (1 + R) \times C_c$$

Where,
AGB : Above ground biomass (t-dm/tree)
BGB : Below ground biomass (t-dm/tree)
R : Root/Shoot Ratio
C_c : Carbon content (%)

$$ABG = V \times WD$$

Where,
V : Tree volume of above ground (m^3/tree) gained by the volume equation (a.5)
WD : Wood density (t-dm/m^3)

5) Tree species, volume equations and variables used in the estimation

Tree species used in this estimation were selected with consideration of climate of the state (Tropical Moist and Dry Deciduous) and availability of tree volume equations developed by FSI[186]. *Pinus roxburghii* was selected for activity C1.2.3 as timber resource.
Tables below list the tree species, volume equations and variables used in the estimation.

Table 7.63: Activities and Tree Species for the CO_2 Sequestration Estimation

Activity No.	Contents of activity	Total area(ha)	Tree Species used for calculation
1.2.3	Restoration of timber resources (ANR)	1,600	*Pinus roxburghii*
1.2.4	Restoration of natural vegetation (ANR)	7,700	*Albizia* spp. *Castanopsis* spp. *Gmelina arborea* *Schima wallichii* *Shorea robusta*
1.2.5	Afforestation on barren land (AR)	5,500	
1.2.6	Restoration of shifting cultivation area (ANR)	4,450	
1.2.7	Restoration of degraded lands due to quarrying (ANR)	3,100	
1.2.8	Improvement of corridors (ANR)	150	

Source: developed by Study Team

Table 7.64: Specie-wise Equations

Tree Species	Equations
Pinus roxburghii	$\sqrt{V} = 0.05131 + 3.9859D - 1.0245\sqrt{D}$
Albizia spp.	$\sqrt{V} = -0.07109 + 2.99732D - 0.26953D^2$
Castanopsis spp.	$\sqrt{V} = 0.05331 - 0.87098D + 6.52533D^2 + 1.74231D^3$
Gmelina arborea	$V = 0.25058 - 3.55124D + 16.4172D^2 - 8.32129D^3$
Schima wallichii	$V = 0.27609 - 3.68443D + 15.86687D^3$
Shorea robusta	$V = 0.16019 - 2.81861D + 16.19328D^2$

Note: V: Tree Volume (m^3/tree), including all above ground volume; D: Diameter at breast height (m)
Source: State Forest Report 2017. Annexure.

[186] State of Forest Report 2017. Annexure.

Table 7.65: Variables Used for Estimation

Tree Species	DBH (cm)	WD (t-dm /m^3)	R[*13]	C (%)	SD (trees/ha)
Pinus roxburghii	15.7[*1]	0.55[*7]	0.24	0.54[*14]	ANR: 200 AR: 1100 Natural forest: 1204[*20]
Albizia spp.	15.6[*2]	0.66[*8]	0.24	0.45[*15]	
Castanopsis spp.	28.6[*3]	0.67[*9]	0.24	0.43[*16]	
Gmelina arborea	25.9[*4]	0.53[*10]	0.24	0.45[*17]	
Schima wallichii	25.9[*5]	0.75[*11]	0.24	0.43[*18]	
Shorea robusta	19.0[*6]	0.81[*12]	0.24	0.48[*19]	

Note: DBH: diameter at breast height; WD: wood density; R: root/shoot ratio; C: carbon content, SD: stand density
Source: see "Data Sources"

(2) Result of CO_2 emissiton reduction in the Project

The estimation gave the result that the Project will contribute to total 2,781,720 t-CO_2 sequestration and emission reduction in 30 years (Table 7.66).

Table 7.66: CO_2 Sequestration and Emission Reduction in the Project

Activity No	Area (ha)	Project activity	CO_2 sequestration/reduction for 30 years (t-CO_2)	Average annual CO_2 sequestration/reduction (t-CO_2/y)
C1.2.3	1,600	Afforestation Forest Protection	25,320 10,980	844 366
C1.2.4	7,700	Afforestation Forest Protection	239,220 267,030	7,974 8,901
C1.2.5	5,500	Afforestation	939,570	31,319
C1.2.6	4,450	Afforestation	760,200	25,340
C1.2.7	3,100	Afforestation	529,560	17,652
C1.2.8	150	Afforestation Forest Protection	4,650 5,190	155 173
Total	**22,500**		**2,781,720**	**92,724**

Source: developed by Study Team

(3) Data Sources

Variables in Table 7.65 were obtained from the following literature:

*1: ENVIS. Chir Pine (*Pinus roxburghii*). http://www.frienvis.nic.in/WriteReadData/UserFiles /file/pdfs/Chir_Pine.pdf, (accessed 2019-06-01).

*2,3,4,5: https://shodhganga.inflibnet.ac.in/bitstream/10603/98554/7/th-1808_ch6.pdf, (accessed 2019-06-01).

*2,7: P.S.Thakur and H. Kaur. Variation in photosynthesis, transpiration, water use efficienc y, light transmission and leaf area index in multipurpose agroforestry tree speies. *India n J Plant Physiol.* 2001. 6(3), pp. 249-253.

*3,5: Lalfakawma, U.K., Sahoo, S.Roy, K. Vanlalhriatpuia, P.C. Vanalalhluna. Community c omposition and tree population structure in undistributed and distributed semi-evergreen forest stands pf North-East India. 2009. *Applied Ecology and Environmental Research*. 7, pp. 303-318.

*4: A.Balasubramanian. Developing yield table for few fast growing tree species grown in f arm settings. *Project Completion Report*. https://www.forests.tn.gov.in/app/webroot/img/Yi eld%20table%20for%20few%20tree%20species%20grown%20in%20farm%20settings.pdf, (a ccessed 2019-06-01)

*6: Baral, S., Prasad, Gaire, N. P., Aryal, S., Pandey, M., Rayamajhi, S. and Vacik, H. Gr owth Ring Measurements of Shorea robusta Reveal Responses to Climatic Variation. *F orest*. 2019. 10(6), p. 466, https://doi.org/10.3390/f10060466

*8,12: Rani, A., Singh, J. Singh, T.P. An experimental characterization of physical propertie s of timber woods. *Mater Sci Nanotechnol*. 2017. 1(2), pp.41-45.

*9,11: Pitamber, S., Dipul, K., Dhanapati, D. Assessment of the fuel wood of India: A cas e study based on fuel characteristics of some indigenous species of Arunachal Pradesh. *Energy Sources Part A Recovery Utilization and Environmental Effects*. 2013. 38(7), p p. 891-897. doi: 10.1080/15567036.2013.834399.

*10: Verma, P., Bijalwan, A., Shankhwar, A. K., Dobriyal, M.J.R., Jacob, V., Rathaude, S. K. Scaling up an Indigenous Tree (Gmelina arborea) Based Agroforestry Systems in I ndia. *International Journal of Science and Qualitative Analysis*. 2017. 3(6), pp. 73-77. doi: 10.11648/j.fem.20170306.11

*13: IPCC. Good Practice Guidance for Land Use, Land-Use Change and Forestry.TABLE 3A.1.8. 2003.

*14: Kaur, R.; Kaur, S. Growth, Biomass, Carbon Sequestration and soil nutrient dynamics under pine-forest in North-Eat Himalayas. *International Journal of Advanced Research.* 2016. 4(6), pp. 738-746. doi: 10.21474/IJAR01

*15,17: Hauchhum, R. Aboveground biomass and carbon stock assessment in forest stands of Gmelina arborea Roxb. in Mizoram, North-East India. *Journal of Tropical Forestry and Environment*. 2017. 7(2), pp. 31-38.

*16,18: Bishnu, S. Carbon Sequestration in Schima-Castanopsis Forests. *The Greenary, A Jo urnal of Environment and Biodiversity*. 2009. 7, pp. 34-40.

*19: Das, B., Sarkar, P. K., Kumari, N., Dey, P., Singh, A. K., Bhatt, B. P., Biophysical p erformance of different multipurpose trees species in Jharkhand, India. *Current Science*. 2019. 116(1), p.82-88.

*20: Upadhaya, K., Pandey, H.N., Law, P.S.; Tripathi, R.S. Tree diversity in sacred groves of the Jaintia hills in Meghalaya, northeast India. *Biodiversity and Conservation.* 2003. 12, pp. 583–597.

7.11. Risk Management

During the implementation of the Project, there will be several risks that would hamper progress and achievement of the Project. The risks include multiple aspects such as capacity, governance, finance and crime. It is necessary to analyse potential risks and prepare countermeasures against them in prior to the implementation of the Project. In this regards, the risk analysis was conducted during the Study by using a format provided by JICA. Detail results of the risk analysis was shown in Annexure 11.

In conclusion, it is assessed that an overall risk for the Project was low. However, since various departments and organizations are involved in the project implementation at multiple levels, close coordination and efficient management are required. Poor management may result in delay and/or failure of the Project and cause financial problems in fund flow and complicity of fraud. Moreover, because this is the first Japan ODA loan project in the forestry sector for Meghalaya State, sufficient support and capacity building need to be provided to EA and other concerned governmental agencies especially at the initial stage of the Project period.

7.12. Security Management

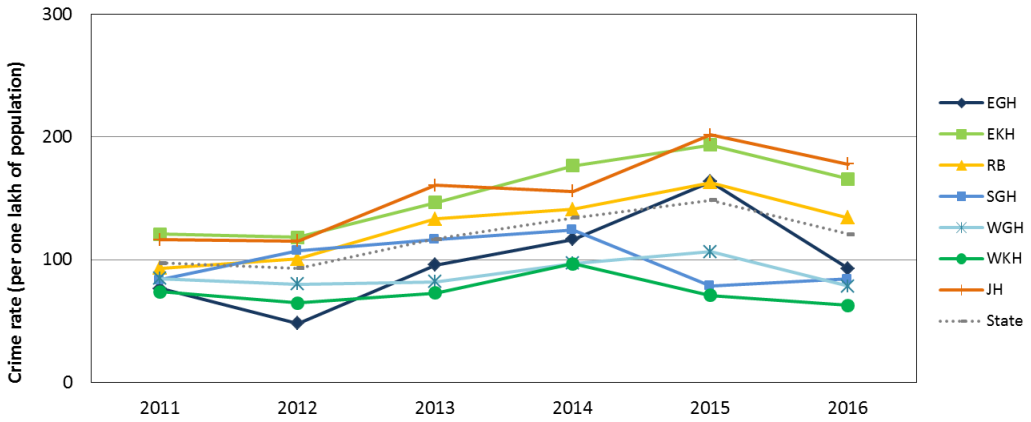
7.12.1. Overview of Crime Situation in Meghalaya State

(1) Crime Rate in India and states

Meghalaya State has a lower crime rate compared with the entire India and other states. In Meghalaya state, there were a total of 3582 crimes in 2016, with the crime rate of 120.7 per one lakh of population, including both crimes stipulated in the Indian Penal Code (IPC) and Special & Local Laws (SLL). In the entire India, there were a total of 4,831,515 crimes with the crime rate of 379.3 per one lakh of population in 2016[187]. In terms of IPC crime, Meghalaya had 3,366 crimes (113.5) in 2016, while the entire India had 2,975,711 crimes (233.6) in 2016. In other UTs and states, Delhi UT had the highest crime rate (974.9) under IPC crimes, followed by Kerala State (727.6) and Madhya Pradesh State (217.1) in 2016. In all India, Meghalaya is ranked in the 29th state in crime rate out of 36 states and UTs. From the status above, it can be said that Meghalaya State is not a seriously dangerous state.

(2) District-wise Crime Rate in Meghalaya State

The Figure below depicts District-wise crime rate within Meghalaya State. The District-wise crime rate shows a slight increase between 2012 and 2015, but all fell in 2016 (Figure 7.25). There were slight differences of the crime rate among the Districts. Districts which have relatively high crime rate compared with the state average are Jaintia Hills District which was divided into West Jaintia Hills and East Jaintia Hills after 2012, and East Khasi Hills District, and these Districts had almost double rate than the minimum rate in West Khasi Hills District, which was divided into West Khasi Hills and South West Khasi Hills after 2012. Although the two Districts had higher rate than the state average, the rate is still below than the national average (233.6).



Note: Although Districts were divided into eleven Districts in 2012, the figure presents the data in the original seven Districts to show the trend from the past.
Source: Meghalaya Police, Crime Statistics

Figure 7.25: District-wise Crime Rate

(3) Threats in the Northeast India and Meghalaya State

Possible threats in Meghalaya State would be presence of insurgency groups. North Eastern India is characterized as having a great variety of ethnicities, cultures, religions, and languages, and such conditions could easily create an unstable situation as to safety. The region is comprised of eight

[187] Crime in India Statistics 2016

states and has a high concentration of tribal groups, making up 30% of the total population[188]. Instability as regards safety could easily occur in Northeast India due to the fears of local people of migrants from bordering countries, namely Bangladesh, Bhutan, Myanmar, and China, a lack of economic opportunities, and weak governance, which makes people feel alienated and left behind. In addition, there is easy access to arms from the international border areas[189]. Although Meghalaya State is said to have relatively fewer number of insurgencies compared with neighboring states, the state is being increasingly used as a corridor and regrouping zone by rebels from all over Northeast. There are two major insurgent groups in Meghalaya State.

- Garo National Liberation Army (GNLA)

The Garo National Liberation Army (GNLA) is a home-grown insurgent force formed in 2009. The aim of GNLA is to create a separate 'Garoland' in the western parts of the state, especially in coal rich areas. GNLA has modern weapons and is conducting several violent activities, such as killing, kidnapping, and extortion in the Garo Hills District. GNLA has links with other militant groups, such as the United Liberation Front of Asom[190].

- Hynniewtrep National Liberation Council (HNLC)

HNLC is a militant organization claiming itself to be a representative of the Khasi and Jaintia people. Its aim is to free Meghalaya from the Garos and the non-tribal groups that dominate the state. HNLC's activities are restricted to the Khasi Hills; several attacks have taken place in the state capital of Shillong[191].

These two rebels were active in the past years but inactive now, according to the local police responding the questionnaire in the survey mentioned in a later section.

Another potential risk in Meghalaya State is to have majority of Christians in the population. About 85 % of population is tribal people and most are Christians, while Hindus comprise about 10%, Muslims 2%, and other groups the remaining 2%. The Meghalaya High Court, however, issued a statement that restricts Muslim citizenship in the state[192], which could trigger instability and protests by those people affected.

7.12.2. Security Management Survey

A survey was conducted to understand the actual local security situations in the state by collecting information through both interviews and questionnaires. The interviews were given with the Superintendent of Police (SP) in two districts, West Jaintia Hills and West Garo Hills Districts, and with one security guard from Shillong. In the other nine districts, questionnaires were sent to the MBDA District Project Managers (DPMs), and the DPMs forwarded them to their local SP as needed.

Answers to the questionnaire indicated that there were serious dangers that could negatively impact on the Project implementation in the state. In Shillong and the East Kashi Hills area, no threats from HNLC and GNLA have been reported for the last 20 years. Besides these rebels, no other major crimes have been reported during the last 20 years. However, migrants protested in Shillong against the government in 2014 for permission to work in the state. This type of protest may happen again

[188] Subir Bhaumik. (2007). Insurgencies in India's Northeast: Conflict, Co-option & Changes

[189] Vision IAS. Insurgency in North East.: http://visionias.in/beta/sites/all/themes/momentum/files/interview_issues_2016/Insurgency_in_NE.pdf

[190] Sushil Kumar Sharma. (2016). Garo National Liberation Army: An Emerging Threat in Meghalaya.

[191] centre for development and peace studies (CDPS). (2018). Overview: Insurgency & Peace Efforts in Meghal aya.: http://cdpsindia.org/meghalaya_insurgency.asp

[192] THE WEEK. (2018). India becoming Islamic state would spell doomsday: Meghalaya HC judge.: https://www.theweek.in/news/india/2018/12/13/india-islamic-doomsday-meghalaya-hc.html

in the future and the Project members may be affected.

In West Jaintia Hills, HNLC was active until 2010, but no incidents have been reported since 2010. The situation in East Jaintia Hills is similar. One incident was reported in East Jaintia Hills in which police were beaten when they tried to capture illegal coal miners, but this incident will not strongly influence the implementation of the Project activities.

Caution will be needed in the Garo Hills area. According to SP in West Garo Hills District, GNLA was active in the entire Garo Hills area from 2010 to 2018 and they targeted everybody, including government officers and citizens. In February 2018, the leader of GNLA was killed by police; since then, the Garo Hills area has become stable. Since February 2018, no incidents involving GNLA have been reported.

Similar information was reported from South Garo Hills. In South Garo Hills, special forces are still deployed to ensure security. Therefore, although no threat has been observed there since February 2018, caution should be still taken and the security situation should be monitored, particularly in the Garo Hills area.

Other than HNLC and GNLA, a conflict was reported between different tribes, namely in South Garo Hills between Garo and Rabha tribes in 2010. The situation has been settled and is under control now by the district police. Regarding inter-tribe conflicts, no incident has been reported in the last decade.

The questionnaire also asked about the presence of especially dangerous areas. No respondent mentioned any such areas, except for the coal mining area of Nongalbriba in South Garo Hills, which likely attracts petty criminals. However, the district police have been deployed to check criminal activity and ensure security, and no incidents have been reported recently.

Thus, there will be no limitations on the places in which the Project will be conducted. Nevertheless, caution will be needed in mining areas and areas with different neighboring tribes.

Overall, it is concluded that there will be no serious security risk in the state to implementing the Project, but security measures as described in the following section are needed.

7.12.3. Measures against Insecurities

Although the state does not have serious security risks at present, measures to avoid and mitigate risks should be taken. In the following parts, measures to ensure safety in the field, residences, and trips to the field are explained.

General and Before Journey

The following measure will be required in general and before journey

i. Collect and analyze information on rebels such as GNLA, HNLC and others, as well as on political situations, through local newspapers and television programs to avoid any conflicts and danger
ii. Contact the concerned institutions regarding security, and ask for guidance before visiting the Project site
iii. Appoint reliable security guards who are equipped with arms and have had official training facilitated by the government, especially for visits to Garo Hills
iv. Plan routes to the Project site that Project members know ahead departure and arrival
v. Plan an alternative route in case of necessity
vi. Report travel details, including persons who travel, routes, time of departure and arrival,

transportation, assigned drivers, contact information of Project members, and submit these to the security department

vii. Hire or appoint reliable drivers who have had training for security as well as first aid
viii. Develop an emergency evacuation plan and security management procedure and nominate persons for security and safety management with clear roles and responsibility
ix. Undergo security management and awareness training on arrival in India or the state
x. Avoid any criticism of the government, political parties, religious or indigenous groups

During Journey

i. Work and move in day-time before getting dark
ii. Ensure all vehicles display the emergency numbers of the police, fire station, ambulance etc.
iii. Use a system or apps that can track the location of persons in the field
iv. Report arrival to security personnel in charge, and if no report is received by the expected arrival time, security personnel thereafter alerts a manager at a higher level
v. Avoid mining sites and areas neighboring different tribes unless it necessary, since GNLA is likely to often appear at coal mining sites and conflicts might happen.

Safety Practices in emergency

i. In case of an attack by insurgent groups, move away from the place immediately
ii. When an insurgent event happens outside a hotel or place of residence, close the drapes, stay away from the windows, and turn off the lights
iii. In confronting extortion, give all valuables and do not resist or attempt to pursue the rebel

7.13. Possibility of Introduction of Japanese Technologies

The northeastern region of India, including Meghalaya State, is identified as one of the prioritized areas of "Act East Policy" of the Government of India and "Free and Open Indo-Pacific Strategy" of the Government of Japan. Following these policies, it is expected to improve the relationship between the two governments and generate tangible outputs through their collaboration. In this regard, this section examines possibilities to introduce Japanese domestic technologies in forestry sector projects, particularly for GIS and MIS and Timber and Bamboo Processing.

Forest Planning and Monitoring by using GIS/MIS Technologies

Japan has experiences with the use of advanced geospatial technologies in overseas countries. In this section, three major Japanese technologies are discussed. They include (1) the development of forest information management systems based on data acquired using geospatial data such as satellite imagery and aerial photos, (2) combination use of timely and free data for efficient monitoring, and (3) data management using cloud services. In the context of this section, "Japanese domestic technology" refers to not individual element technologies, but a combination of individual elements technologies appropriate to achieve project objectives.

First, forest information management systems have a good potential to be developed in Meghalaya State. These systems were developed to enable the local governments for efficiently and effectively conducing forest management in some overseas countries under JICA projects. For example, the tablet-based data collection technology was developed and incorporated in an official forest monitoring system, namely Forest Resource Monitoring System. The tablet-based data collection method provides multiple functions including digital base maps for easy field navigation, GPS for area measurement, digital camera for site conditions recording, and digital field notes for direct data input on site. The collected data are directly transferred to the central database and can be managed under Forest Management Information System, going through the approval process at district,

provincial, and national level. In the context of Meghalaya State, this kind of technology will be useful for preparing working schemes by the ADCs and making forest management plans by communities as well as monitoring the implementation of those plans in the Project.

Second, at present, needs for timely data analysis and free geospatial information has rapidly increased, and to date, many satellite imagery and thematic maps generated from the satellite imagery have become available for free of charge. To achieve sustainable monitoring activities in terms of time and cost in the future, it can be also proposed to additionally utilize freely available deforestation datasets (e.g. JJ-FAST and Hansen data) to detect forest cover changes in a timely manner.

Finally, it is also important to manage a wide range of data and information about forestry in a systematic and efficient manner. The timely data for identifying possible monitoring sites are shared within relevant organizations. These data can be shared through cloud service. By the combination use of local server, which is for confidential data and information, and cloud services, which can be used for a large volume of data and less sensitive information, the speed and efficiency of data sharing can be improved while securing the data confidentiality.

Timber and Bamboo Processing Technologies

Through the preparatory study, it was revealed that majority of communities do not have intention to produce timber for commercial purposes. Rather, they would like to conserve their forests for conserving water resources and biodiversity. Some private forest owners harvest timber from their forests and sell it to local saw mills. According to the observation by the Study Team, a sawing machine used in a local saw mill was primitive, and the volume of timber producing in the state was small. Under these circumstances, it is not adequate to introduce Japanese advanced technologies by using modern machines on timber harvesting or timber processing.

Bamboo is one of the important NTFPs in the state, and it is used for craft making. Although traditional bamboo crafts in Meghalaya State are marvelous, there is still potential to develop bamboo craft further in terms of design, items, and durability. For example, treatment of bamboo is necessary before making furniture because furniture made from bamboo will be damaged by insects. Japan also has traditional as well as modernized techniques of bamboo craft. However, it may be better to introduce bamboo processing technologies not from Japan but from Tripura State in which Bamboo and Cane Development Institute (BCDI) is located. BCDI has sophisticated and modernized technologies including bamboo treatment and provides training on bamboo craft making. Natural and social conditions in Tripura is much more similar to those in Meghalaya than those in Japan, thus, bamboo related technologies transferred from Tripura may be more suitable for Meghalaya.