FEASIBILITY STUDY
PROTECTION OF VULNERABLE CATCHMENT AREAS IN MEGHALAYA
(Umiew-EKH and Ganol-WGH)

Climate Change Adaptation Programme in Himalayas – Component III

सत्यमेव जयते

KFW
Bank aus Verantwortung

Meghalaya Basin
Development Authority

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ABBREVIATIONS AND ACRONYMS

%	Percentage
ADC	Autonomous District Council
ANR	Assisted Natural Regeneration
APD	Additional Project Director
APO	Annual Plan of Operations
BPL	Below Poverty Line
BSA	Benefit Sharing Agreements
BWRC	Block Water Resource Council
^{O}C	Degree Centigrade
CAAA	Controller of Aids Accounts and Audit
CAC	Catchment Advisory Committee
CAMPA	Compensatory Afforestation Fund Management and Planning Authority
CAP	Catchment Area Plan
CAT	Catchment Area Treatment
CBO	Community Based Organisation
CC	Climate Change
CCA	Climate Change Adaptation
CDD	Community Driven Development
CEM	Chief Executive Member
CLLMP	Community Led Land Scape Management Project
CMC	Catchment Management Committee
CMU	Catchment Management Unit
COM	Community Operational Manual – Same as POM
CPC	Criminal Panel Code
CSS	Centrally Sponsored Scheme
C&RD	Community and Rural Development Department, Govt. of Meghalaya
DBDU	District Basin Development Units
DFO	District / Division Forest Officer
DPD	Deputy Project Director
DWRC	District Water Resource Council
EDP	Enterprise Development Plan
EKH	East Khasi Hills
ESCP	Environment and Social Commitment Plan
ESMF	Environmental and Social Management Framework
FED/FD	Forest and Environment Department
FDRS	Fire Danger Rating System
FRI	Forest Research Institute at Dehradun
GHADC	Garo Hills Autonomous District Council
GIS	Geographic Information System
GIZ	Gesellschaft für Internationale Zusammenarbeit mbH,
GoM	Government of Meghalaya
GoI	Government of India
GRM	Grievance Redress Mechanism
GSWSP	Greater Shillong Water Supply Project
Ha	Hectare
IBDLP	Integrated Basin Development and Livelihood Programme
IGA	Income Generating Activities

INM	Integrated Nutrient Management
IPCC	Intergovernmental Panel on Climate Change
IVCS	Integrated Village Cooperative Society
JFMC	Joint Forest Management Committees
JWMC	Joint Watershed Management Committee
KfW	German Development Bank
KHADC	Khasi Hills Autonomous District Council
LMP	Labour Management Plan (part of ESMF)
m	Meters
MBDA	Meghalaya Basin Development Authority
MBMA	Meghalaya Basin Management Agency
MCM	Million Cubic Meters
MeghaLAMP	Meghalaya Livelihood and Access to Markets Project
MECL	Meghalaya Energy Corporation Limited
MGNREGS	Mahatma Gandhi National Rural Employment Generation Scheme
MIDH	Mission for Integrated Development of Horticulture
MIE	Meghalaya Institute of Entrepreneurship
MIG	Meghalaya Institute of Governance
MINR	Meghalaya Institute of Natural Resources
MIS	Management Information System
MLD	Million Litres per Day
Mm	Millimetres
MoDoNER	Ministry of Development of North Eastern Region
MoEFCC	Ministry of Environment Forest and Climate Change
MoRD	Ministry of Rural Development, Government of India
MPCAA	Meghalaya Protection of Catchment Area Act
MPT	Multi-Purpose Trees
MRV	Monitoring Reporting and Verification
MSRLS	Meghalaya State Rural Livelihood Society
MWP	Micro-Watershed Plan
M&E	Monitoring and Evaluation
NABARD	National Bank for Agriculture and Rural Development
NAP	National Afforestation Programme
NAPCC	National Action Plan on Climate Change
NDP	National Dairy Plan
NEHU	North Eastern Hill University
NGO	Non-governmental Organisation
NICRA	National Initiatives for Climate Resilient Agriculture
NREGA	National Rural Employment Guarantee Act
NRLM	National Rural Livelihood Mission
NRM	Natural Resource Management
NTFP	Non Timber Forest Products
O&M	Operations and Maintenance
PD/ CPD	Project Director / Chief Project Director
PDO	Project Development Objective
PES	Payment for Environmental Services
PHED	Public Health and Engineering Department
PIA	Project Implementing Agency
PISU	Project Implementing Support Unit

PLUM	Participatory Land Use Planning
PMC	Project Management Consultant
PMU	Project Management Unit
POM	Project Operations Manual (same as COM)
PRA	Participatory Rural Appraisal
PWD	Public Works Department
RCP	Representative Concentration Pathways
RFR	Recognition of Forest Rights
RKVY	Rastriya Krishi Vikas Yojana
Rs./INR	Indian Rupees
SALT	Sloping Agriculture Land Technology
SAPCC	State Action Plan on Climate Change of Meghalaya
SCB	Shillong Cantonment Board
SHG	Self Help Group
SGH	South Garo Hills District
SLUP	Sustainable Land Use Practices
SMB	Shillong Municipal Board
SMCPL	Suvigya Management Consultants Private Limited
SMP	Summary of Policy Makers
SMR	Small Multipurpose Reservoirs
SPEI	Standardized Precipitation and Evapotranspiration Index
SPI	Standardized Precipitation Index
SPMU	State Project Management Unit
Sq. m	Square Meters
STP	Sewage Treatment Plant
SUA	Shillong Urban Agglomerate
SWAT	Soil and Water Assessment Tool
S&WCD	Department of Soil and Water Conservation
ToC	Theory of Change
ToR	Terms of Reference
TNA	Training Need Assessment
TUA	Tura Urban Agglomerate
T&C	Training and Capacity
TWSS	Tura Water Supply Scheme
UPNRM	Umbrella Programme for Natural Resource Management
VC	Village Council
VEC	Village Employment Council
VFFCC	Village Forest Fire Protection / Control Committee
VWRC	Village Water Resource Council
VWSP	Village Water Security Plan
WKH	West Khasi Hills District
WMC	Watershed Management Committee
W/m2	Watts per meter square
WMP	Watershed Management Plan (same as MWP)
WMU	Watershed Management Unit
WRD	Water Resource Department
WUG	Water User Group
WUGIP	Water User Group Investment Plan

EXECUTIVE SUMMARY

Meghalaya is one of the hot spots for climate change vulnerability in India which faces environmental and economic threats to sustainability of its natural resource, food production, water availability, forest biodiversity and livelihoods. Climate changes and its variability in the temperature and rainfall regime may adversely affect the production and productive capacity of agriculture, fisheries, forests etc. The south-western monsoon from May to September bring torrential rains and flash floods in many parts of the State, especially in the low altitude areas bordering Assam and Bangladesh. These rains cause heavy environmental and economic loss to the State through soil erosion, silting of water bodies, loss of rural infrastructure besides destabilisation of riverbanks and riverine eco-system. Moreover, during dry seasons (winters) the State face acute shortage of water that adversely impacts livelihoods of the vulnerable and natural resources dependent communities. In order to address issues of water security and sustainable management of water resources the Government of Meghalaya enunciated its Water Policy in 2019. The policy emphasises on creation of Water Resources Councils at village, block, district and State levels for preparation and implementation of water security, micro-watershed and catchment plans. As a pioneering initiative in implementing this water policy, the Government of Meghalaya has formulated this project, with KfW assistance, for development of Umiew catchments in East Khasi Hills (EKH) district and Ganol catchment in West Garo Hills (WGH) district. These two catchments supply water to two of the most populated cities of Meghalaya viz., Shillong and Tura respectively. Besides Shillong and Tura cities the project will benefit 114 villages situated in 39 micro-watersheds in these two catchments.

Project outlay: The project will be implemented over a period of 7 years with total financial outlay of Euro 40 Million. The KfW will contribute Euro 32 Million (80% of the cost of the project) as loan to the Government of India which in turn will be passed on as grant cum loan in 90:10 ratio to the Government of Meghalaya for implementing four components of the project as mentioned below. KfW will also provide technical assistance grant of Euro 1 million.

S. No.	Component Name	Rs. Crore	Euro Million	%
1	Enhancement of forests and other ecosystems of catchment areas	185.642	22.10	55.25%
2	Livelihoods improvement of vulnerable communities in the catchment areas.	84.076	10.01	25.02%
3	Institutional development	6.287	0.75	1.87%
4	Project Management	59995	7.14	17.86%
	Total	**336.00**	**40.00**	100%

Approved cost norms and schedule of rates of the Government of Meghalaya and MBDA for financial year 2019-20 have been adopted for estimating cost of various sub-components of the project. Annual cost enhancement of 5% for project physical measures and salaries have been taken based on data provided by MBDA.

Summary of physical measures under Catchment Treatment Plan : Total 11483.93 ha. of land will be treated under the project with sustainable natural resource management techniques as per the plan given below.

1. Umiew Catchment

Particulars	Treatment type	Ha.
Comp 1		
Dense Forest with canopy density >40%	Assisted natural regeneration (ANR) gap filling planting (250 plants /ha.)	472.95
Open forests on lands with >30% slope and with <40% canopy density	Enrichment forestry planting with fencing and S&WC Measures (1100 plants/ha.)	2454.31
Rivers and tributaries	Riverbank protection with civil structure	
Riverbank (km)	Planting of bamboo and fast-growing sp. as community reserves (1600 plants / ha.)	883.00
Grasslands	Silvipasture: Fodder trees with grass seeding and S&WC measures (400 fodder trees/ha.)	1080.25
Sub Total of Component 1		4890.51
Comp 2		
Agricultural land	Modified SALT (on private lands horti-silvi-agri model)	1797.79
Culturable waste land/ scrub land with less than 30% slope	Block Horticulture plantation with soil and water conservation measures (400 plants /ha.)	85.23
Sub Total		1883.02
Total of Umiew Catchment		**6773.53**

2. Ganol catchment

Particulars	Treatment type	Ha.
Comp 1		
Dense Forest with canopy density >40%	Assisted natural regeneration (ANR) gap-filling planting (400 plants /ha.)	651.47
Open forests on lands with >30% slope and with <40% canopy density (non-shifting cultivation areas	Enrichment forestry planting with fencing and S&WC Measures (1100 plants/ha.)	1585.24
Rivers and tributaries	Riverbank protection with civil structure	
Riverbank (km)	Planting of bamboo and fast-growing sp. as community reserves on either side of the bank (1600 plants / ha.)	398
Grassland		998.4
Sub Total of Component 1		3633.11
Comp 2		
Culturable waste land/ scrub land with less than 30% slope	Block Horticulture plantation with soil and water conservation measures (400 plants / ha.)	443.19
Open forest areas prone to shifting cultivation mostly >30% slope (irrespective of slope)	Sloping Agriculture Land Technology (SALT)	634.10
Sub Total		1077.29
Total of Ganol Catchment		**4710.4**

Component-wise plan

The project will bring measurable and concrete contributions to the Climate Change Adaptation Programme of the State Government for ensuring water, food, income and livelihood security besides increasing forest cover and agricultural productivity. The project has 4 components. Investment for physical measures will be made under component 1 and 2. Component 3 will cover cost of soft interventions and Component 4 will cover project management cost.

Component 1: Enhancement of forests and other ecosystems of catchment areas

Investments under this component will be mainly done to conserve soil and enhance forest/ green cover on lands that are exposed and vulnerable. Forest areas on land >30% slope and <40% canopy cover will the focus. Riverine system will be stabilised through vegetative and civil works and dense plantations along the banks. Critical community infrastructure (road) to have access to remote areas will be provided in Ganol catchment. Silt and water quality will be regularly monitored to assess the impact of the project. Traditional sustainable NRM practices will be documented and promoted and communities will be provided training to build their capacities to meet objectives of the project.

Particulars	Rs. Lakh	%
Watershed panning	97.50	0.53%
Forestry – enhancing green cover	9957.91	53.64%
Soil and water conservation	3760.02	20.25%
Riverbank stabilisation	3047.44	16.42%
Forest fire management	99.99	0.54%
Water, silt and weather monitoring stations	350.00	1.89%
Critical community infrastructure	318.20	1.71%
Spring shed development (spring chambers etc)	383.26	2.06%
Training and capacity building	77.68	0.42%
Contingency	472.20	2.54%
Total (Component 1)	18564.20	100.00%

Component 2: Livelihoods improvement of vulnerable communities

This component emphasis on enhancing income and livelihoods of the communities through horticulture, agro-forestry, Sloping Agriculture Land Technology (SALT), biomass-based energy management and processing of aromatic and medicinal plants supported under aroma mission of the GoM. Water harvesting structure will be developed to ensure water security of the dependent villages. Convergence with various State and Centrally sponsored schemes. Investment under this component will be done mostly in lands with less than 30% slope, culturable wasteland, fallow lands, jhum lands and areas where economic activities having impact on catchment management are being done (e.g. sand mining). Regulatory provisions of Meghalaya Protection of Catchment Area Act (MPCAA-1990) will be strengthened by recognising criticality of the catchments for management of sand-mining and solid and liquid waste that gets discharged into the river systems

Particulars	Rs. Lakh	%
Community consultation and awareness generation for catchment protection	7.98	0.09%
Solid and liquid waste management	329.15	3.91%
Silt management	600	7.14%
Water harvesting structure (primary storage and distribution) for villages	644.9	7.67%
Support to aroma mission of GoM	1750	20.81%
Training on SALT	62.95	0.75%
Investment on Sloping Agriculture Land Technology	2751.45	32.73%
Horticulture development	1141.14	13.57%
Biomass based energy	1120	13.32%
Total under Component 2	8407.57	100.00%

through participatory community consultations on the catchment areas protection plans for Umiew and Ganol catchments. The concept of Payment of Environmental Services will be introduced for the first time in Meghalaya under the project where models of payment for environmental service provider from service seekers will be piloted and upscaled.

Component 3: Institutional Development

Under this component knowledge management and communication will include development of communication strategy, information and education material and development & maintenance of project website. Various trainings and capacity building activities for project stakeholders (traditional institutions, project staff, government department officials, project beneficiaries, local governance and administration personnel etc.) will be done under the project. It will also include project outreach involving collaboration with national and international agencies and organising/ participating in events related to sustainable NRM and climate resilient agriculture. Site specific environmental and social management plans (ESMPs) and Environmental and Social Code of Practices (ESCOPs) will be adopted to manage E&S risks using Environmental and Social Management Framework (ESMF) and Community Engagement and Planning Framework (CEPF) developed as part of the project in collaboration with different stakeholders.

Particulars	INR Lakh	%
Knowledge management and communications	165.89	26.39%
Training and capacity building	392.82	62.48%
Social and Environmental Risk Management	70	11.13%
Total of component 3	506.17	100.00%

Component 4: Project administration/ management

Particulars	INR Lakh	%
Staff remuneration	3179.24	52.99%
Equipment (Software and hardware)	279.1	4.65%
Project Monitoring, review and coordination	332.93	5.56%
Office and administrative expenses	528.25	8.80%
Project Management Consultancy (excluding KfW Grant contribution)	1680	28%
Total of component 4	5999.53	100.00%

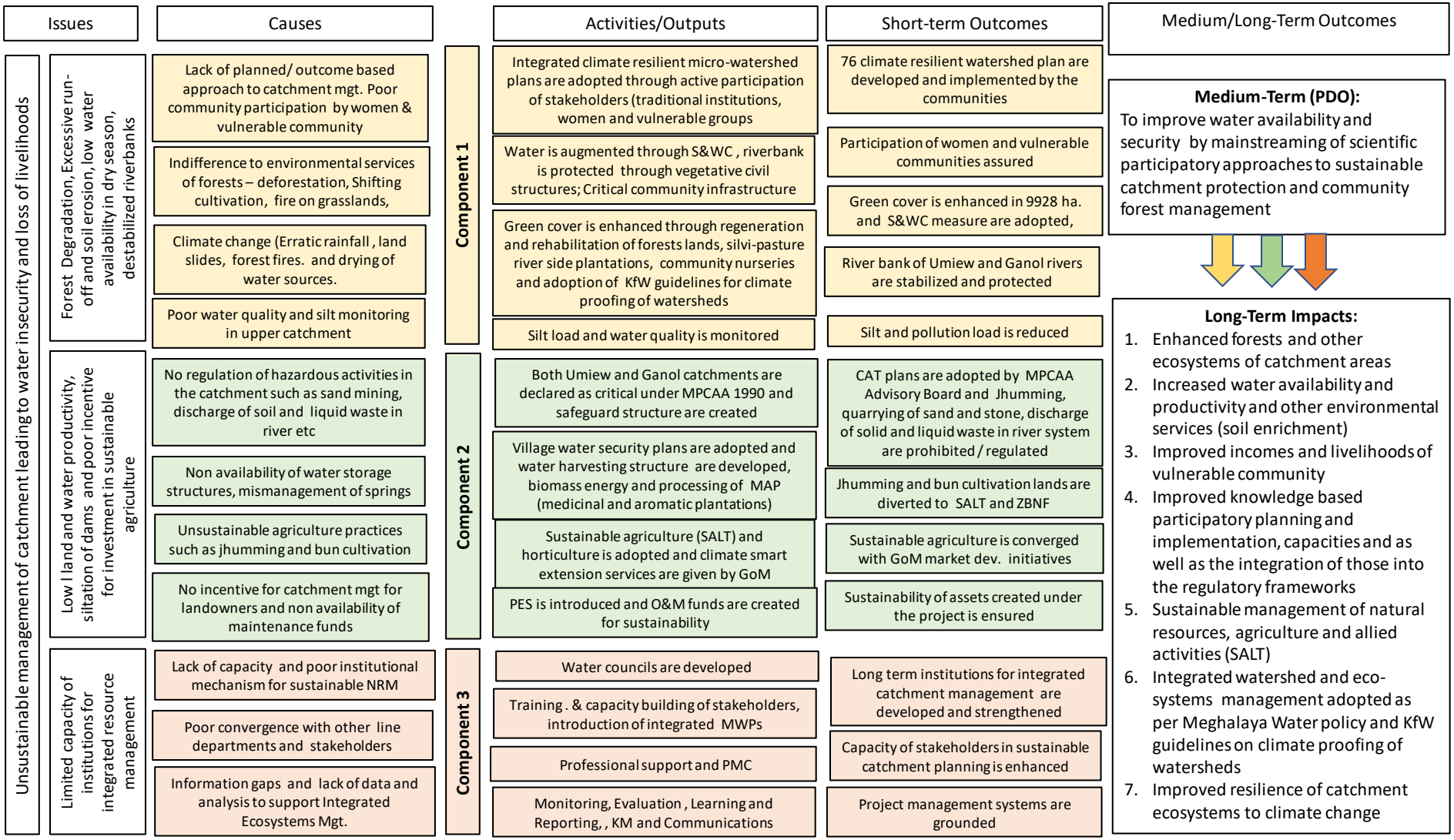


Figure 1 Results framework with theory of change

1. BACKGROUND

1.1. Introduction

KFW is financing Climate Change Adaptation Programme in Himalayas in India, which aims at the supporting sustainable, climate adapted, participative management of natural resources with an objective of ensuring

1. Measurable and concrete contributions to the target indicators of the Climate Change Adaptation Programme in the Himalaya viz.,
   - Reduced forest degradation (constant or even increased crown closure of woody vegetation on the project areas)
   - Increased income of the target group population
2. Promotion of forest restoration and adaptation to climate change in India

In line with above programme KfW (German Development Bank) will support the Government of Meghalaya in identification of a detailed project design in selected landscapes in Meghalaya for improved management and conservation of watersheds and biodiversity, while supporting forest dependent communities for their livelihoods. The Government of Meghalaya has identified two catchments viz., Umiew Catchment in East Khasi Hills (EKH) District and Ganol Catchment in West Garo Hills (WGH) district which supply water to the two most populated cities of Meghalaya i.e. Shillong and Tura respectively. This document is a feasibility study for investment in these two catchments.

1.2. Need for a project to protect vulnerable catchments in Meghalaya

The climate vulnerability analysis for Meghalaya was done by Mishra et al[1] under different Representative Concentration Pathways (RCPs)[2] for projections for near term (2016-2040), midterm (2041-2065) and long term (2066-2090). This study on climate change vulnerability have identified Meghalaya to be medium to highly vulnerable to variability in temperature and rainfall over short, medium and long durations. Summary of the past trends and future projects on climate change vulnerability is given in section 1.2.1 and 1.2.2 respectively. The rationale for having a project for investment in natural resources management as preventive Climate Change Adaptation (CCA) strategy is discussed in section 1.2.3.

1.2.1. Summary of past trend of climate change in Meghalaya

The summary of past trend of climate change as given in study done by Mishra et al is as under:

a) Trend in precipitation variability (1981-2012)

- The average annual rainfall in Meghalaya State is about 4100 mm for the period of 1981-2012. However, there is a very high spatial variability in rainfall in the region. For

[1] Dr. Vimal Mishra and Mr. Rahul Kumar in their study on" Identification of climate vulnerability hot-spots in Meghalaya"

[2] RCPs are climate pathways for approximate greenhouse gas concentration and anthropogenic heat, and which represents an equivalent earth system dynamic at certain radiative flux or forcing from the Sun in year 2100 relative to year 1750. There are four indicative pathways (RCP 2.6, RCP 4.5, RCP 6.0 and RCP 8.5), which represents mitigation scenarios with very low forcing (RCP 2.6), two stabilization scenarios (RCP 4.5 and RCP 6.0), and one scenario with very high greenhouse gas emissions (RCP 8.5). In simpler terms, RCP 8.5 represents climatic scenario of the Earth, equivalent to the condition when an added +8.5 W/m2 of radiative flux is provided by the Sun in the year 2100 in comparison to pre-industrial period or year 1750.
Each RCP provides spatially resolved data sets of land use change and sector-based emissions of air pollutants, and it specifies annual greenhouse gas concentrations and anthropogenic emissions up to 2100. RCPs are based on a combination of integrated assessment models, simple climate models, atmospheric chemistry and global carbon cycle models. While the RCPs span a wide range of total forcing value, they do not cover the full range of emissions in the literature, particularly for aerosols. (Source: https://skepticalscience.com/rcp.php; IPCC Climate Change Report 2013, Summary for Policymakers (SPM)).

instance, the southern WKH and EKH districts receives more than 8000 mm rainfall (*Cherapunji and Mawsynram receive highest rainfall in the world*) while the rest of the State receives an average value of 3200 mm in a year. The precipitation intensities also have very large spatial variability in the State.

- During 1981-2012, 72% of total precipitation, 2950 mm was received in the months of June-September. A consistent long-term average annual precipitation of 4085 mm was observed in the period 1981-2012.
- The average annual precipitation in the State shows an increasing trend (11.56 mm/yr) while the monsoon season precipitation shows steady values.
- Though the State on an average shows steady change in precipitation levels, the central districts (West Khasi Hills, South West Khasi Hills and East Khasi Hills show very high precipitation levels as well as higher rise in intensities that may cause flash floods and landslides.

Extreme precipitation[3] events - drought and wet periods (1981-2012)

- SPI (Standardized Precipitation Index) and SPEI (Standardized Precipitation and Evapotranspiration Index) show slightly different patterns in terms of frequency of wet and drought years. SPI values indicate that all parts of the State faced 3 - 5 extreme wet years and 3-6 extreme drought years with **EKH facing higher (5-6) drought years.**
- Based on SPEI, some districts viz., **WGH**, South-West Garo Hills, South Garo Hills, South West Khasi Hills and **EKH faced 3-4 extreme wet spells** while rest of the State faced 0-2 such periods. The frequency of extreme drought spells is rather uniform in the range of 1-3 spells. East Khasi Hills, East Jaintia Hills and Ri-Bhoi districts faced higher number (1-5) of extreme drought periods.
- Extreme precipitation events adversely affect productivity of natural resources and livelihoods related to agriculture and allied activities.

b) Trend in temperature variability (1981-2012)

- Central part of the State experienced lower temperatures as compared to rest of the region. The changes observed showed a positive trend in maximum, minimum and mean temperatures in most part of the State.
- The spatial average annual mean temperature shows a positive trend of 0.031 °C per year. This rising temperature poses a serious threat to the ecology of the State. With some recoveries or fluctuations in the period 1986-1994, rest of the observations period shows consistent positive increase in temperature. During the period of 1981-2012, a positive increment of 1 °C was observed.

Extreme temperature events - hot/cold days/nights & heatwaves (1981-2012)

- The mean frequencies for hot day, hot nights, cold days and cold nights were 6, 43.4, 6 and 2 events per year. Higher number of hot nights frequencies is a matter of concern for the State.
- Spatial variation of hot days shows moderate values (6-7) in the State with higher frequencies (8-10) in Ri-Bhoi, some parts of West Khasi Hills, East Khasi Hills and Jaintia Hills. While hot nights were of higher frequency (17-20) in the State relative to nearby regions, except for the north eastern parts, which faced higher number of hot nights. The changes in number of hot days shows nearly neutral change and a positive change in the number of hot nights in most part of the State.
- The variations and intensity of cold days and cold nights were uniform in the range of 4.55-4.6 and 4.6 events per year, respectively. Number of cold days shows nearly neutral changes in frequencies, with some regions of East Garo Hills, West Khasi Hills and

3 Extreme events are those that exceeds 95th percentile of occurrence.

Jaintia Hills facing mild positive changes (1-2). On the other hand, cold nights show nearly uniform decrease change in its frequency (-3 to -4) in the region.

- The State seems to be on the safe as far as events of heatwaves are concerned' as on an average the State experienced only 0 - 4 heatwaves only in the observation period.

1.2.2. Summary of future projections of climate change in Meghalaya

a) Projections for precipitation

- Different scenarios of near and mid-term projections indicate concentrated increment in precipitation intensity in the central part as compared to rest of the State
- Extreme precipitation frequency may rise in RCP 4.5, 6.0 and 8.5 scenarios in mid and long terms, and this change is prominent mostly in the southern and north-eastern regions of the State.

Projection for extreme precipitation events

- The projections suggest an overall increase in number of extreme wet monsoons.
- Extreme precipitation frequency may rise in all RCPs in mid and long terms, and this change is prominent mostly in the southern and north-eastern regions of the State in long term.
- Changes in frequency of droughts are expected to be negligible.

b) Projections for air temperature

- Maximum temperature has increasing tendency, with central plateau facing the lower amount of change.
- The extreme scenario (RCP 8.5) shows increase up to 3.8 °C while in mild scenario (RCP 4.5), the increment is limited to 2.65 °C in the long term.
- Mean temperature shows similar spatial variation as in maximum temperature. The increments in the extreme and mild scenario are limited to 3.7 and 2.2 °C respectively.
- Minimum temperature is also expected to rise and is limited to 3.5 and 2 °C in the extreme and mild scenarios for the long term.

Projection for extreme temperature events hot/cold days/nights & Heatwaves

- The increase in temperature may also result in the increase in extreme hot days and nights. The hot days in the extreme scenario (RCP 8.5) may rise by more than 100 days per year, while in the mild (RCP 4.5) scenario, the change may be above 50 days per year. Similarly, hot nights frequency is expected to increase by more than 80 days in the extreme scenario (RCP 8.5), while the increments in the mild scenario (RCP 4.5) may be expected to rise by 60 days per year in the long term.
- The increase in temperature may also result in the decrease in extreme cold days and nights. The cold days in the extreme scenario (RCP 8.5) may drop more than 60 days per year while in the mild (RCP 4.5), the change may be above 40 days per year. Similarly, cold nights frequency is expected to drop by more than 60 days in the extreme scenario (RCP 8.5), while the decrease in the mild scenario (RCP 4.5) may be expected to be 30 days per year in the long term.
- Heatwaves frequency is expected to rise by more than 20 spells per year in the extreme (RCP 8.5) scenario and up to 12 events per year in mild (RCP 4.5) scenario in long term.

1.2.3. Need for a project as preventive action for CCA in Meghalaya

The study by Mishra et.al have emphasised on need for conducting a careful impact and risk assessment of climate change projections on agriculture, water resources, and forests sectors. In assessing the adaptation gaps under various future projected climate scenarios (RCP 2.6, RCP

4.5, RCP 6, RCP 8.5) it was observed that these adaptation gap increase in future as temperature distributions shift to right in the near term (2016-2045), and longer term (2046-2075) for RCP 2.6 scenarios. These shifts are more pronounced under RCP 4.5, RCP 6.0 and RCP 8.5.

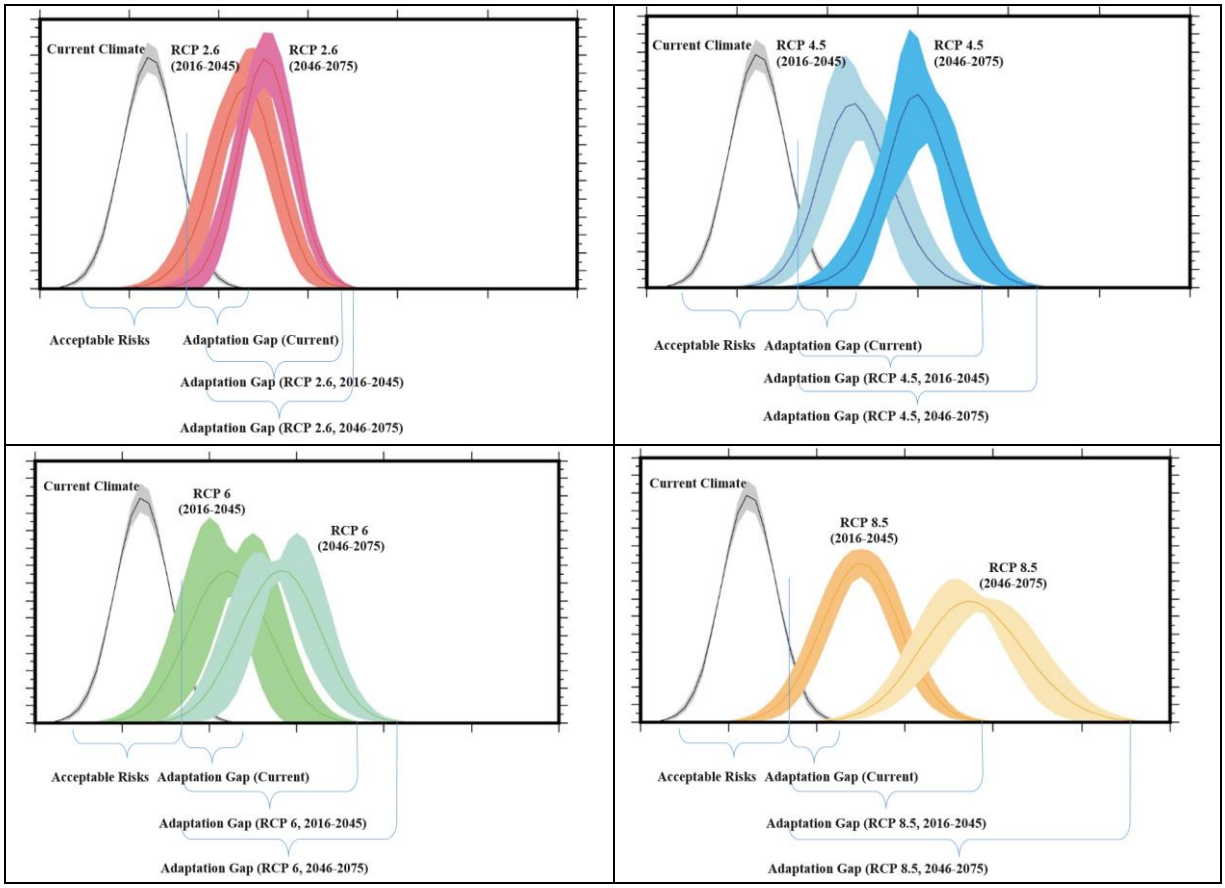


Figure 2 Adaptation gap under future project climate scenario

Under future climate change, it is evident that there is a right-ward shift in the distribution of risk. The shifts imply that new and additional financial investments will be required to cover risks. This spread may increase up to 2.5 times for RCP 2.6 and up to 4 times for RCP 8.5. This change in spread requires understanding the dynamic concept of acceptable risk and investing accordingly. Preventive adaptation to "expand" the range of acceptable risks would require much more investment as the risk profile is projected to shift to the right. This shift is crossing the right tails of present climate risk distributions under RCP 4.5, 6 and 8.5 during 2016-2045 itself. Almost no overlap remains during 2046-2075 risk profiles and the current risk profile.

This expansion of the adaptation gaps would require more financial resources to be committed for managing heat related mortality, morbidity, damage to eco-systems and space cooling. Most of the risks in future will remain under unacceptable domain, thus increasing the palliative costs much faster. This also implies that future would become much more uncertain and riskier, therefore increasing the chances of β errors much more. α errors may almost become negligible since whatever preventive measures would be taken, there would be hardly any chance of them going wasted.

It is concluded that it is better to take advance preventive measures to overcome harmful impact of climate change projects. Wait and watch approach may have lower preventive costs in the short term but may lead to higher palliative costs in future. This is because a higher proportion

of risk may get uncovered in future. The advance preventive actions require making reasonable investments now to avoid higher palliative costs in future when the larger proportion of risk is required to be covered.

The Government of Meghalaya (GoM) has taken cognisance of climate change and its impacts on sustainability of natural resource, food production, water availability, forest biodiversity and livelihoods of the people living in the State. During monsoon season the State faces high intensity torrential rains and flash floods, especially in the low altitude areas bordering Assam and Bangladesh, which cause heavy damage to the agriculture, fisheries, forestry and other forms of livelihoods. However, during winter entire State faces acute shortage of water. As a conscious strategy to overcome water related developmental challenges the GoM adopted its Meghalaya Water Policy 2019. In this context the GoM has approached KfW to design and support a project for protection of two of its most vulnerable river catchments viz., Umiew and Ganol catchments which are source of water to Shillong Urban Agglomerate (SUA) and Tura Urban Agglomerate (TUA) respectively. Therefore, this project is designed as a preventive investment to enhance resilient to climate change of the natural resource dependent communities in Umiew and Ganol catchments.

2. PPROJECT AREA

Shillong and Tura are the two largest towns of Meghalaya and are the growth centres for Khasi Hills Region and Garo Hills Region respectively. The GoM has selected Umiew catchment in EKH District and Ganol catchment in the WGH district for implement of this project. Umiew catchment supplies water to Shillong Urban Conglomerate through Greater Shillong Water Supply Project (GSWSP) and Ganol catchment supplies water to Tura Urban Agglomerate (TUA) through Tura (Ganol River) Water Supply Scheme (TWSS).

2.1. Project villages and watersheds

Umiew catchment consist of 13 micro-watersheds with 33 spring-sheds serving 106 villages out of which 76 villages will form part of the project as other villages have already been covered under Meghalaya Community Led Landscape Management Project financed by the World Bank. 5 blocks covered under the project are: Laitkron (33 villages), Mawkynrew (1 villages), Mawphland (11 villages), Mawryngkneng (10 villages), Mylliem (21 villages).

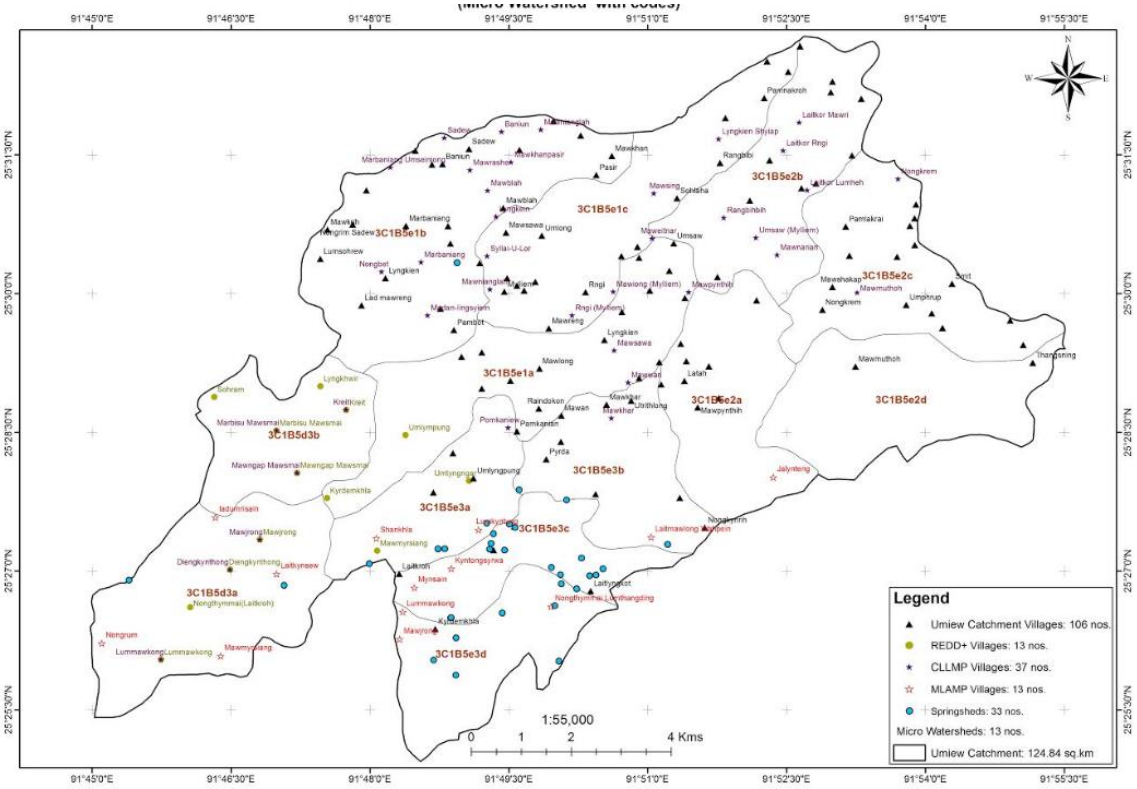


Figure 3 Umiew Catchment micro-watersheds

The greater Ganol catchment has 125 villages in 3 blocks viz., Betasing , Rongram and Selsells. Ganol catchment consist of 63 micro-watersheds. However, the project will treat 26 micro watershed covering 38 villages with 238 spring-sheds mostly in the upper catchment which supplies water to the Tura town.

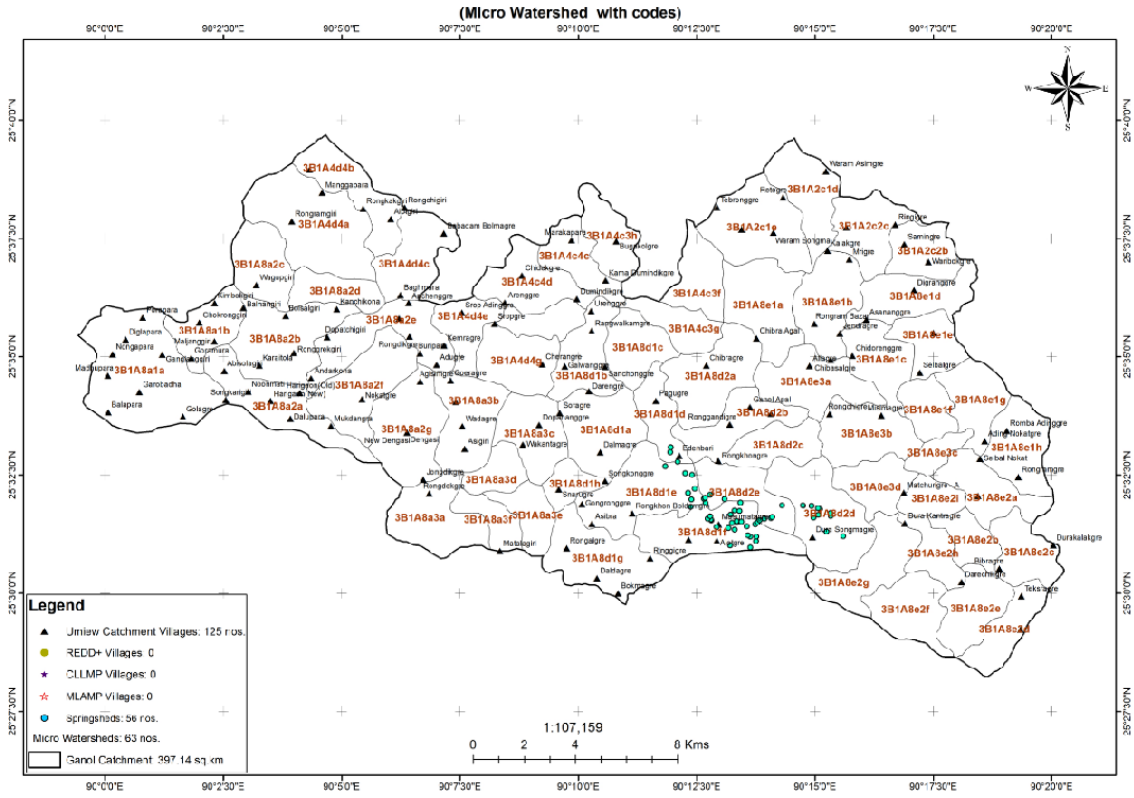


Figure 4 Ganol Catchment micro-watersheds

2.2. Land use pattern in the project area

Umiew catchment:

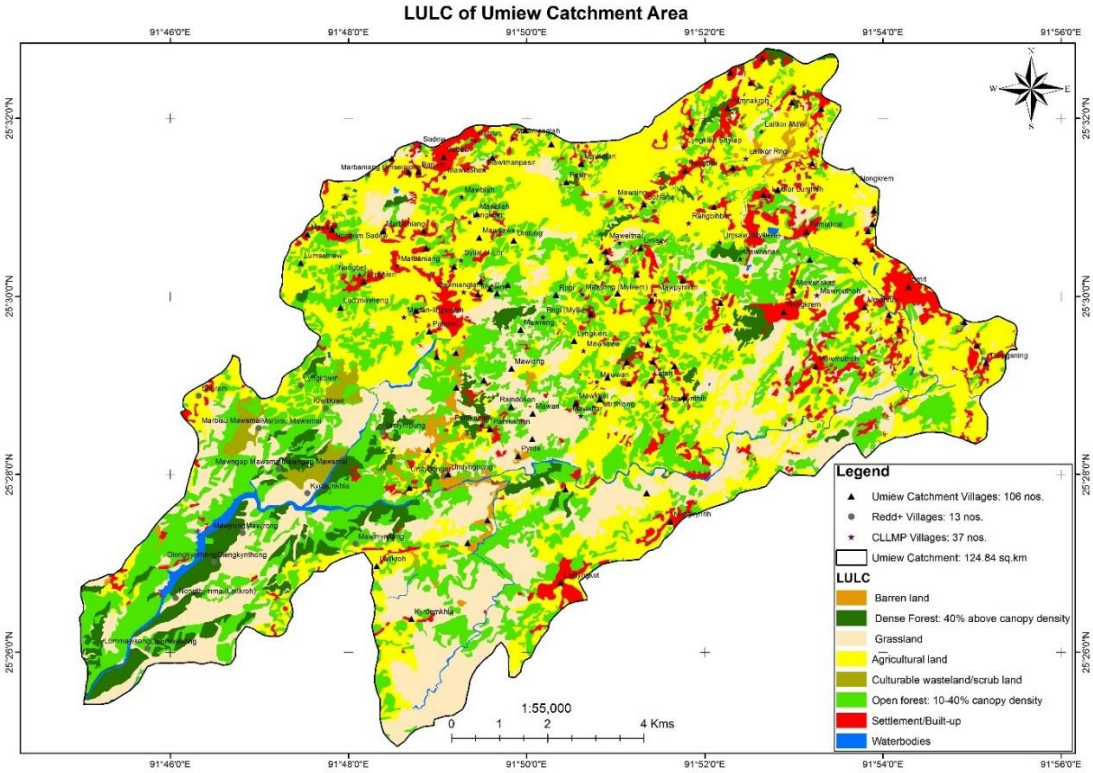


Figure 5 Land use of Umiew catchment

Table 1 Land use of Umiew catchment

Description	Area in Ha
Agricultural land	4494.47
Barren land	147.48
Culturable waste land/ scrub land	113.64
Dense Forest: 40% above canopy density	630.60
Grassland	2700.63
Open forests:- 10-40% canopy density	3272.41
Settlement/ Built up	953.80
Waterbodies	171.19
Grand Total	**12484.22**

Ganol catchment:

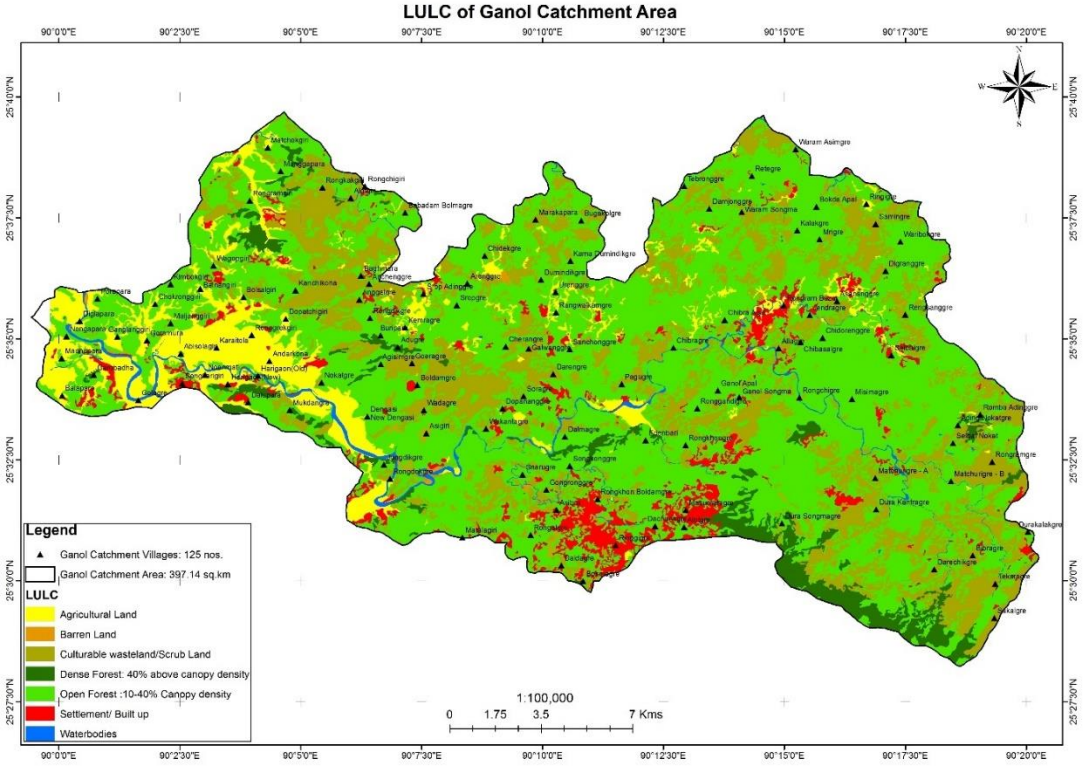


Figure 6 Land use of Ganol catchment

Table 2 Land use of Ganol catchment

Description	Area in Upper Ganol catchment sq.km
Agricultural Land	Negligible
Water bodies	398
Culturable wasteland / Scrub Land	886.38
Dense Forest: 40% above canopy density	1302.94
Grassland	2495.99
Open Forest :10-40% Canopy density	4529.25
Grand Total* excluding water bodies	**9214.56**

2.3. Socio-economic conditions in project districts

East Khasi Hills District: The Umiew catchment lies in EKH District. The district has 975 villages (923 are inhabited) and 13 towns with 163397 households and population of 825,922 persons of which 410749 are males and 415173 are females.

459441 people (228409 males 231032 females) live in rural areas and 366481 people (182340 males, 184141 females) live in urban areas. Urban population consist of 44.37% of the total population. The population density is 301 persons per sq. km. and the sex ratio is 1011.

The district has one Subdivision with 11 Blocks and eight Community and Rural Development (C&RD) Block. The Khasi, Jaintia, Bhoi & War collectively known as the *Hynniewtrep* predominantly inhabit the district.

The climate of the district falls under Hills and North Piedmont, Central Plateau, Southern Slopes and Valley agro-climatic zones. The total geographical area is 274784 ha. The cultivable waste land and fallow lands in the district are to the order of 4786 ha and 5998 ha respectively. About 90% of cultivable wasteland is rainfed respectively which can also be brought under cultivation/plantation by taking up suitable land development measures. The normal rainfall in the district is 8088 mm to 12000 mm. The major rivers in the district are *Umngot, Umkhenand and Umtrew* which are the major sources of irrigation.

Agriculture is the major economic activity of the district with 70 % of the population engaged in agriculture. Other predominant economic activities in the district are piggery, poultry and fish farming. As per 2011 Census, the level of rural and urban poverty in the district stands at 46.74% and 10% of the total rural and urban population respectively.

The net crop area and gross crop area of the district is 37852 and 48978 ha respectively with a cropping intensity of 46%. The number of cultivators in the district has gone up from 70,086 (2000 Census) to 73,210 (2011 Census). The fallow land has changed from 10755 ha. as per 2000 Census to 10784 Ha. as per 2011 Census. Cropping pattern reveals that more than 18% of the gross cropped area is under food grains and remaining under plantation and horticultural crops such as ginger, oranges, lemon, plums, pear, peach, banana, areca-nut and local indigenous fruits.

There are small industrial units of wood-based products like furniture making, sawmills, bamboo and cane works, bakery units, breweries, metal works, rice and flour mills, iron and steel fabrication, spice and candle making. New and emerging activities in the district under agriculture and allied sector are plantation of orange, bamboo and agar. Other activities such as handicrafts are also contributing to changes in the economy of the district

The banking network in the district as on 31 March 2019 comprises of 21 public commercial banks and 11 Private Sector Banks; one Rural Bank, one State Cooperative Bank and one State Cooperative Urban Bank. There are 194 branches in the district out of which 61 branches are in rural area and 29 branches are in semi urban area. The socio-economic profile of EKH is given in table 3.

West Garo Hills District: Ganol catchment is situated in WGH District which is one of the largest districts of Meghalaya located in the western part of the State and divided into 07 blocks. The district headquarters of West Garo Hills is Tura, which is the second largest town in the State after Shillong. The average rainfall in the district is 330 cms. The major rivers viz., Ganol, Jinjiram, Rongai, etc., are the major sources of irrigation in the district.

Agriculture is the major economic activity of the district with 70 % of the population engaged in agriculture. Other predominant economic activities in the district are horticulture plantation, rubber plantation and livestock activities. Paddy is the major food crop grown in the district while the important commercial crops are fruits and plantation (ginger, cashew nut, orange, pineapple, jackfruit, areca nut, black pepper etc.). Oilseeds, vegetables, jute, maize, pulses are also grown in the district. Gross cropped area and net sown area in the district is 93229 hectare and 74657 hectares respectively.

Absence of regulated markets, traditional way of cultivation, lack of food processing units, good transportation and restricted credit facilities are the factors affecting the rural economy adversely. Limited supply of improved breeds of cattle, high cost of concentrated feed, inadequate extension services are major constraints for development of Animal Husbandry activities despite presence of immense potential for this activity in the district. The socio-economic profile of WGH district is given in table 4.

Table 3 Socio economic profile of East Khasi Hills district

1. PHYSICAL AND ADMINSTRATIVE FEATURES

Total Geographical Area (sq.km)	2748
Number of sub-divisions	1
Number of blocks	11
No. of villages (inhabited)	923

2. SOIL AND CLIMATE

Agro climatic zone	Hills and North Piedmont,Central Plateau,Southern Slopes and Valley
Climate	Humid and moderately warm summer & severe winter.
Soil Type	Red Laterite & Lateritic type

3. LAND UTILISATION

Total area reported	274784
Forest land	106950
Area not available for cultivation	53654
Permanent pastures and grazing land	NA
Land under misc. tree cover	16874
Cultivable wasteland	40007
Current fallows	4786
Other fallows	5998
Net sown area	37852
Gross cropped area	48978
Area cultivated more than once	11126
Cropping intensity (GCA/NSA)	46%

4. RAINFALL AND GROUND WATER

Rainfall (mm)	Normal	Actual	2015	2016	2017
	8088		8126	9090.2	9233
	Variation from Normal		38	964	1145
Availability of ground water (ham)			NA	NA	NA

5. DISTRIBUTION OF LAND HOLDING

Classification of holding	Holding		Area	
	Nos	%	Ha.	%
Less than 1 ha.	16563	35	8816	15
1-2 ha.	13780	28	17911	25
More than 2 ha.	17896	37	50775	66
Total	48239	100	87502	100

6. WORKER PROFILE (IN '000)

Cultivators	76.76
of the above small and marginal farmers	37
Agricultural labourers	40.89
Workers engaged in House hold industries	2.96
Workers engaged in allied agro industries	NA
Other workers	206.16

7. DEMOGRAPHIC PROFILE (IN '000)

Category	Total	Male	Female	Rural	Urban
Population	825	410	415	459	366
Scheduled cast	5.6	2.9	2.7	NA	NA
Scheduled Tribe	661	320	341	NA	NA
Literate	578	287	290	NA	NA
BPL	50.99	NA	NA	NA	NA

8. HOUSEHOLDS (in '000)

Total households	163.39
Rural households	77
BPL households	51

11. HEALTH AND SANITATION (nos.)

Anganwadis	65	Dispensaries	5
Pry. Health Sub-Centre	63	Hospitals	10
Primary Health Centres	24	Hospitals beds	1666

10. VILLAGE INFRASTRUCTURE (Nos.)

Village electrified (2016-17)	868
Villages with agriculture poser supply	NA
Villages having Post Office/ Sub Post Office	136
Village with banking facilities	NA
Villages with primary schools	855
Village with Primary Health Centre/ Sub-Centre	29
Villages with potable water supply	811
Village connected with paved approach roads	NA

12. INFRASTRUCTURE AND SUPPORT FOR AGRICULTURE

Fertiliser/seed/ pesticide outlets	NA	Agri pump sets	NA
Total N/P/K consumption (MT)	2000	Energised pump	3
Certified Seed Supplied (MT)	NA	Agro service	NA
Pesticide consumed	NA	Soil testing centres (Nos.)	NA
Agriculture tractors	2	Plantation nurseries	NA
Power tillers (Nos.)	16	Farmer clubs (Nos.)	33
Threshers / Cutters (Nos.)	NA	Krishi Vigyan Kendras (Nos.)	1

13. IRRIGATION COVERAGE (HA.) (2016-17)

Total area available for irrigation (NIA+fallow)	NA
Irrigation Potential Created	6847
Net irrigated area	11816
Gross irrigated area	12180

14. INFRASTRUCTURE FOR STORAGE, TRANSPORT AND MARKETING

Rural/ urban mandi haat (Nos.)	24	Wholesale markets	10
Length of asphalt roads (km)	100.81	Godowns (Nos.)	5
Railway line (km)	NA	Godowns (capacity MT)	NA
Public transport vehicles (Nos.)	3721	Cold storage (Nos.)	1
Goods transport vehicles (Nos.)	360	Cold storage	1000

15. AGRO PROCESSING UNITS

Milk Chilling (Nos.)	10
Animal feed	NA

16. AREA, PRODUCTION AND YIELD OF MAJOR CROPS

Crop	2015-16		2016-17		Avg. Yield (kg/ha.)
	Area (ha.)	Prod. (MT)	Area (ha.)	Prod. (MT)	
Paddy	5834	12592	5870	14498	2470
Potato	11740	121787	8224	96303	
Trumeric	113	642	115	667	5800
Sweet potato	715	2992	723	3107	4297
Black pepper	182	154	183	158	863
Ginger	4990	4249	495	4343	8774
Pineapple	913	6995	925	7175	7757
Production of Jute and cotton are in bales (1 bale = 177.8kg)					

17 ANIMAL POPULATION

Cattle - cross bread	12807
Cattle - Indigenous	69410
Buffaloes	1756
Sheep - cross bread	364
Sheep - indigenous	7030
Goat	78334
Pig - crossbred	53818
Pig - Indigenous	79011
Poultry cross bread	64502
Poultry - Indigenous	477111

18. INFRASTRUCTURE FOR DEVELOPMENT AND ALLIED ACTIVITIES

Veterinary Hospital/	1	Animal markets	NA
Dispensaries	24	Milk collection	NA
Mobile dispensaries	2	Fish societies (nos.)	NA
Animal breeding farms (Nos.)	9	Fish seed farms	1
Vet Aid centres	12	Fish markets (nos.)	NA
Dairy Cooperative Societies	NA	Poultry hatcheries	1
Improved Fodder Farms (Nos.)	1	Slaughter houses	1

19. MILK, FISH, EGG PRODUCTION

Egg (lakh)	173.65
Milk (KL)	22.4
Fish (MT)	446.22

Table 4 Socio economic profile of West Garo Hills district

1. PHYSICAL AND ADMINSTRATIVE FEATURES	
Total Geographical Area (sq.km)	2861
Number of sub-divisions	2
Number of blocks	7
No. of villages (inhabited)	1158
3. LAND UTILISATION	
Total area reported	281100
Forest land	126164
Area not available for cultivation	15391
Permanent pastures and grazing land	NA
Land under misc. tree cover	18168
Cultivable wasteland	11346
Current fallows	8017
Other fallows	27345
Net sown area	74657
Gross cropped area	93229
Area cultivated more than once	18572
Cropping intensity (GCA/NSA)	125%
6. WORKER PROFILE (IN '000)	
Cultivators	73
of the above small and marginal farmers	16
Agricultural labourers	12
Workers engaged in House hold industries	3
Workers engaged in allied agro industries	NA
Other workers	51
8. HOUSEHOLDS (in '000)	
Total households	89
Rural households	77
BPL households	48
10. VILLAGE INFRASTRUCTURE (Nos.)	
Village electrified (2016-17)	1331
Villages with agriculture poser supply	6
Villages having Post Office/ Sub Post Office	63
Village with banking facilities	1102
Villages with primary schools	1118
Village with Primary Health Centre/ Sub-Centre	29+44
Villages with potable water supply	1314
Village connected with paved approach roads	425
13. IRRIGATION COVERAGE (HA.) (2016-17)	
Total area available for irrigation (NIA+fallow)	NA
Irrigation Potential Created	8318.2
Net irrigated area	3199
Source of irrigation	NA
15. AGRO PROCESSING UNITS	
Milk Chilling (1)	8000lpd
Animal feed	1
17 ANIMAL POPULATION (in '000)	
Cattle - cross bread	1.631
Cattle - Indigenous	239.28
Buffaloes	4.23
Sheep - cross bread	NA
Sheep - indigenous	9
Goat	106.52
Pig - crossbred	6.06
Pig - Indigenous	96.28
Poultry cross bread	27.945
Poultry - Indigenous	629.87
19. MILK, FISH, EGG PRODUCTION	
Egg (MT)	4179
Milk (KL)	174.05

2. SOIL AND CLIMATE	
Agro climatic zone	3 sobsones are i) Hills and Northern Slopes ii) Central Hyoerthermic Pleatue iii) Southern slopes and valley
Climate	Sub tropical in nature with warm humid summer and cool dry winters
Soil Type	Laterite and alluvial

4. RAINFALL AND GROUND WATER					
Rainfall (mm)	Normal	Actual	2016	2017	2018
	3500		2416.2	2156.4	1632.3
	Variation from Normal		-1083.8	-1343.6	-1867.7
Availability of ground water (ham)			NA	NA	NA

5. DISTRIBUTION OF LAND HOLDING				
Classification of holding	Holding		Area	
	Nos	%	Ha.	%
Less than 1 ha.	18283	38	10289	14
1-2 ha.	16132	33	20972	29
More than 2 ha.	13725	29	40952	57
Total	48140	100	72213	100

7. DEMOGRAPHIC PROFILE (IN '000)					
Category	Total	Male	Female	Rural	Urban
Population	470	237	233	396	74
Scheduled cast	7	4	3	4	3
Scheduled Tribe	336	167	168	282	53
Literate (%)	68	72	63	NA	NA
BPL	NA	NA	NA	NA	NA

11. HEALTH AND SANITATION			
Anganwadis	1059	Dispensaries	2
Community Health Centres	5	Hospitals	6
Primary Health Centres	10	Hospitals beds	310

12. INFRASTRUCTURE AND SUPPORT FOR AGRICULTURE			
Fertiliser/seed/ pesticide outlets (Nos)	NA	Agri pump sets (Nos.)	NA
Total N/P/K consumption (MT)	NA	Energised pump sets	NA
Certified Seed Supplied (MT)	NA	Agro service centres(Nos.)	NA
Pesticide consumed	NA	Soil testing centres (Nos.)	1
Agriculture tractors	NA	Plantation nurseries (Nos.)	5
Power tillers (Nos.)	NA	Farmer clubs (Nos.)	9
Threshers / Cutters (Nos.)	NA	Krishi Vigyan Kendras (Nos.)	1

14. INFRASTRUCTURE FOR STORAGE, TRANSPORT AND MARKETING			
Rural/ urban mandi haat (Nos.)	18	Wholesale markets	NA
Length of asphalt roads (km)	330	Godowns (Nos.)	1
Railway line (km)	NA	Godowns (capacity MT)	5000
Public transport vehicles (Nos.)	1041	Cold storage (Nos.)	NA
Goods transport vehicles (Nos.)	4326	Cold storage (capacity MT)	NA

16. AREA, PRODUCTION AND YIELD OF MAJOR CROPS					
Crop	2015-16		2016-17		Avg. Yield
	Area (ha.)	Prod. (MT)	Area	Prod. (MT)	(kg/ha.)
Paddy	30574	100106	30621	103531	3274
Maize	3144	7556	5130	12692	2403
Pulses	3588	4898	3611	1421	1365
Oilseeds	6778	7575	6810	8159	1118
cotton	3997	5995	4020	6512	255
Jute	4015	42830	4107	42830	1920
Ginger	NA	NA	NA	NA	NA
Production of Jute and cotton are in bales (1 bale = 177.8kg)					

18. INFRASTRUCTURE FOR DEVELOPMENT AND ALLIED ACTIVITIES			
Veterinary Hospital/ Dispensaries (Nos.)	1 (20)	Animal markets	NA
Disease diagnostic centres (Nos.)	1	Milk collection centres	5
Artificial Insemination Centres (Nos.)	24	Fish societies (nos.)	NA
Animal breeding farms (Nos.)	6	Fish seed farms	4
Animal Husbandry trg Centres(Nos.)	1	Fish markets (nos.)	4
Dairy Cooperative Societies (Nos.)	22	Poultry hatcheries (Nos.)	NA
Improved Fodder Farms (Nos.)	1	Slaughter houses (Nos.)	1

2.4. Description of water supply projects

2.4.1. Greater Shillong Water Supply Project (GSWSP)

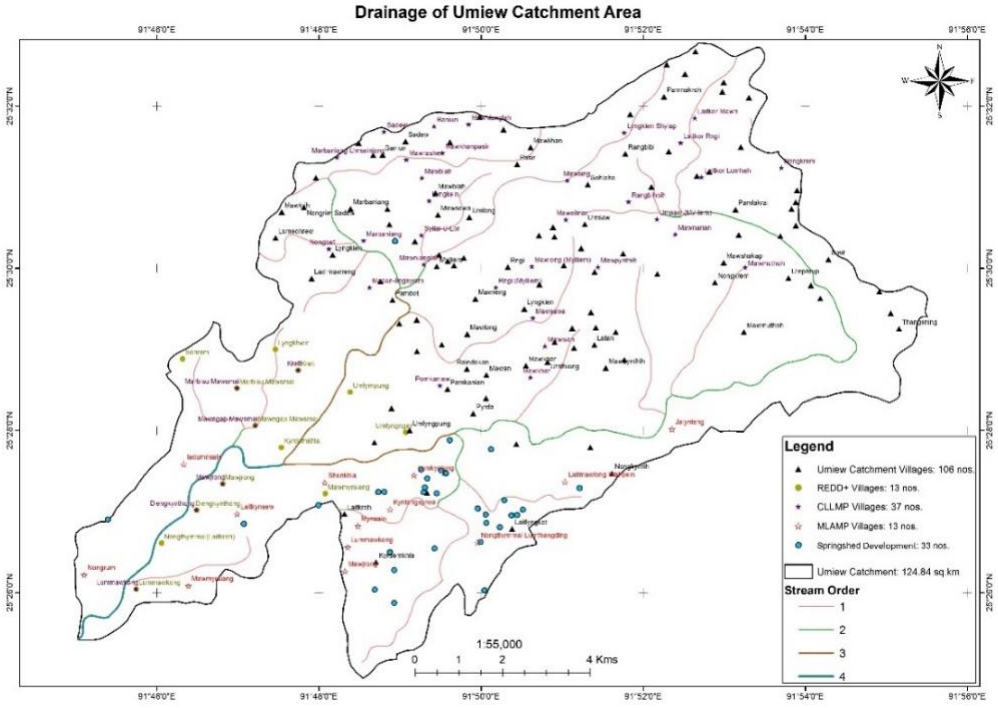


Figure 7 Drainage of Umiew catchment

Umiew Catchment: The river Umiew, the source of the GSWSP, originates at an altitude of 1849m in Shillong peak. The catchment is under governance of traditional institution of *Hima Shillong* consisting of *Mylliem State and Khyrim State since 1830.* The catchment boundary extends from longitudes 91°-46' to 91°-56' E and latitudes 25°-27' to 25°-32' N.

Umiwe river flows from *Umiew Pomlakrai*, towards *Nongkrem, Umphrup, Smit, Mtyngngar, Mawphlang, Shella (Umiam Bogra).* At *Umiew Pomlakrai* it is joined by *Rangbih bih* stream, then it flows to *Sharing Marai* area of *Nongkrem* and joined by a stream coming from *Ur maso U Joh* before it reached *Umphrup*. The river then flows to Smit and further down to *Mawmuthoh* where it enters *Nongkrem* again before reaching *Dkong* where Public Health Engineering Department (PHED) has constructed a reservoir for water supply scheme for neighbouring villages. The river is hardly used for irrigation.

The river initially flows in the easterly direction for about 10 km, then it flows towards the west up to its confluence with its major tributaries, the river *Umtyngar* and river *Umjyllieng*. The river flows towards the south below the confluence along the southern slope of the Khasi Hills.

GSWSP serves the Greater Shillong Planning Area covering 174 sq.km including 10.73 sq.km falling under the jurisdiction of Shillong Municipality. It comprises of 7 urban centres (Shillong Municipality Board (SMB), Shillong Cantonment Board (SCB), *Mawlai, Nongthymmai, Madanriting, Pynthorumkhrah and Nongmynsong* and 32 villages surrounding the Urban Centres.

The PHED supplies water in bulk to SMB and SCB who in turn distribute water to individual consumers. However, outside the jurisdiction of these two boards (SMB, SCB) the supply of water to individual consumers is made directly by the State PHED.

Phase I of GSWSP was commissioned in 1986 to supply water to SUA consisting of 4 urban centers viz., SMB, SCB, *Mawlai and Nongthymmai*. The GSWSP supplies water from river Umiew at *Mawphlang* about 30km away from Shillong by lifting the water from the run-off of the river in 2 stages and treating it at *Mawphlang* (capacity 34.05Million Liters per Day -MLD) and conveying the treated water by gravitational flow from *Mawphlang* towards different parts of Greater Shillong Area and zonal reservoirs of total storage capacity of about 6.81ML..

Phase II of the project comprises of

i) mass gravity concrete dam of about 130m wide and 50m high across the river *Umiew at Mawphlang* (storage capacity of 9.145MCM) constructed downstream of the existing intake structure built in Phase I
ii) additional water treatment plant of capacity 17.25MLD
iii) gravity feeder main (25km) for supply of water to zonal reservoirs of total storage capacity of 11.40Ml.

Total water supply to from Phase I and II to SUA from GSWSP is around 23.60 MLD as against the generated capacity of 51.30 MLD at source balance of which is unaccounted losses of about 58%.

Phase III: The population of Shillong which was 3.16 lakh in 2011 is expected to be 5.12 lakh by 2041 with daily water requirement of 79.49 MLD. Even with 15% unaccounted water loss the shortfall in water supply from Phase I and II to meet this future demand was expected to be 24 MLD by 2041. Therefore, Phase III was conceived in 2008 to augment water supply under Phase 1 and II and cover remaining 3 uncovered Urban Centres of Shillong. Objective of Phase III was also to reduce unaccounted water loss and create additional infrastructure at Mawphlang for generation and treatment of water to meet the future shortfall in water.

Phase IV of the GSWSP for supply of water to 5 New Urban Centres of SUA viz. *Mawpat, Umpling, Lawsohtun, Umlyngka & Nongkseh* is under consideration.

Figure 8 Mawphlang Dam - Greater Shillong Water Supply Project

2.4.2. Tura Water Supply Scheme (TWSS)

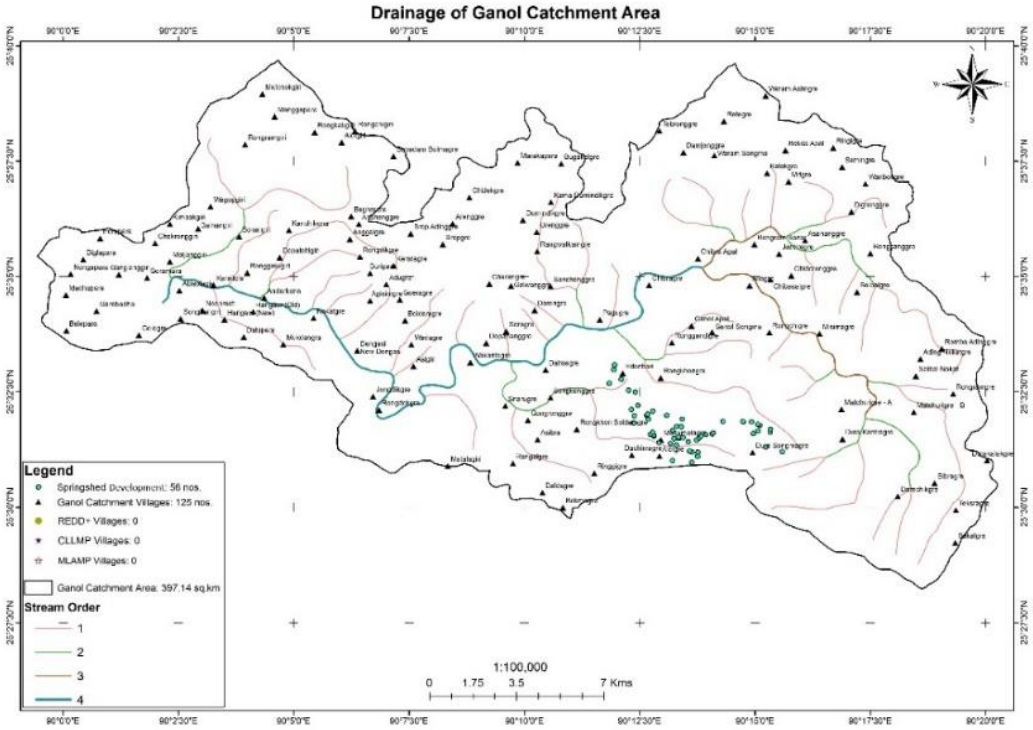


Figure 9 Drainage of Ganol catchment

Tura town is presently supplied water from two schemes namely (1) Tura Phase-I WSS (2) Tura Phase-II WSS.

Tura Phase-I is gravity feed scheme, completed in 1972, from *Rongkhon* River. Due to reduction in availability of water from *Rongkhon*, especially during dry periods, **Tura Phase-II WSS**, a pumping scheme from Ganol River, was taken up in the year 1980. This phase was commissioned in 1985. Both the schemes are currently functioning and they approx.3.1 MGD of water.

To cater to the drinking water needs of 37 new localities which have come up in and around New Tura, **Tura Phase-III WSS** has been undertaken.

Augmentation of Tura Phase-I & II WSS with supply of water from *Daribok* stream was sanctioned for funding of Rs. 50 Crore under 13th Finance Commission in 2011. The Scheme was intended to augment the water supply to Tura Town from Daribok Stream located in *Nokrek* Range near *Daribokgre* through construction of RCC-Weir and conveying the flow of raw water by gravity for a length of about 29.07 Km to the existing water treatment plant constructed earlier under the original scheme. The schemes was later opposed on the apprehension that construction of dam and tapping of water from *Daribok* Stream, which is the biggest tributary of *Simsang* River, will adversely affect the flow of *Simsang* River and it will affect the livelihoods of the villages along the *Simsang* river downstream upto Williamnagar. Therefore, the project was shifted to *Ganolsa* Stream, a Tributary of *Ganol* River.

A hydro-power plant is being constructed by Meghalaya Energy Corporation Limited (MECL) on river Ganol. This project will divert river water, through an intake structure, into a tunnel for hydro-power generation which will be finally released in a location beyond present water pumping station. MECL has agreed to supply 3.1 MGD (11.73 MLD) water to Tura against

its total demand of 25 MLD. The balance supply water is obtained from springs in nearby villages within Ganol catchment. These village meet their own demand before supply to water to Tura township. However, most of these springs are now drying up due to loss of forest cover in the region. There is acute scarcity of water in catchment villages are their village-heads are reluctant to release water for Tura town.

Figure 10 Hydro Power Project on Ganol catchment

Figure 11 Ganol Catchment at a glance

3. VULNERABILITY ANALYSIS OF PROJECT AREA

3.1. Climate change hazards in project area

3.1.1. Precipitation hazards in project area

In terms of hazards analysis based on precipitation done by Mishra et al, the central region containing EKH district and south-western region containing WGH district are projected to be more susceptible to rise in precipitation.

Number of surplus monsoon periods are also expected to rise in these regions. With these observations, fair chances of increase in flash floods and flooding in the downstream can be expected. Most part of Umiew (EKH) and Ganol (WGH) catchments are expected to experience high to extreme precipitation conditions resulting into soil-erosion, siltation, extremes risks of flood and land slide hazards. This would be much severe as the forest cover in these catchments are also declining.

An expected rise in precipitation may be a partial boon, in terms of availability of water, to rain-irrigated fields of Umiew catchment. However, increase in average temperature may result in decrease in productivity of traditional cropping systems.

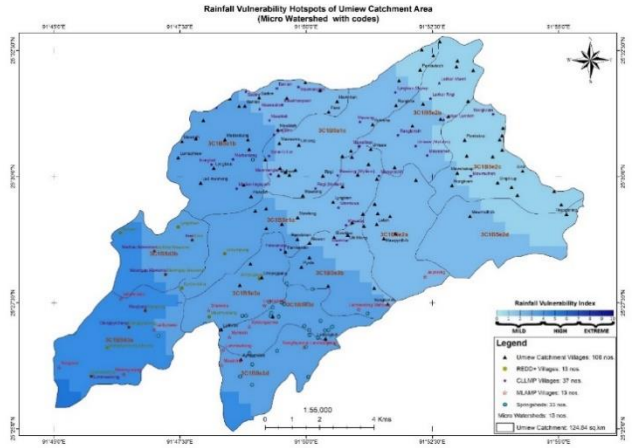


Figure 12 Rainfall vulnerability of Umiew catchment

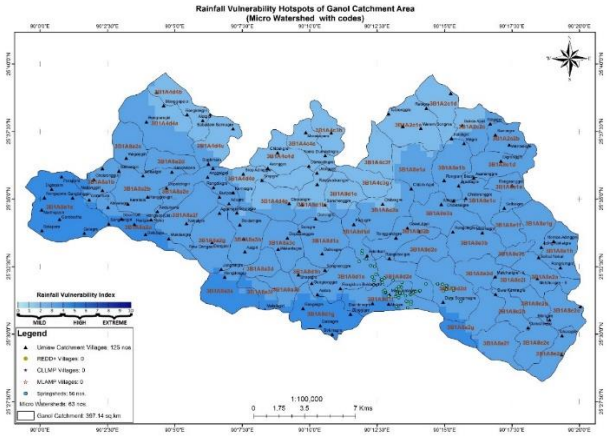


Figure 13 Rainfall vulnerability of Ganol catchment

3.1.2. Temperature hazards in project area

Both observations by local people and climate model done by Mishra et al show a significant increase in mean temperature and associated extreme temperature indices. The eastern part of the State, including East Jaintia Hills, West Jaintia Hills, **East Khasi Hills** and Ri Bhoi, is at high risk in terms of Temperature based hazards. **Garo Hills region may also face more effects of warming in the mild and severe scenarios** in the long term. This may not be as severe in part of Shillong plateau. (West Khasi Hills and South West Khasi Hills),

Temperature extremes has increased in the State during last 3 decades and is projected to increase significantly in future. Extreme temperature events (hot days, hot nights, and heat waves) can have far reaching implications on health of people and animals, bio-diversity, and agricultural production. Moreover, these events can have greater impacts availability of water in major cities (e.g. Shillong, Tura) that are centres for high population and economic growth.

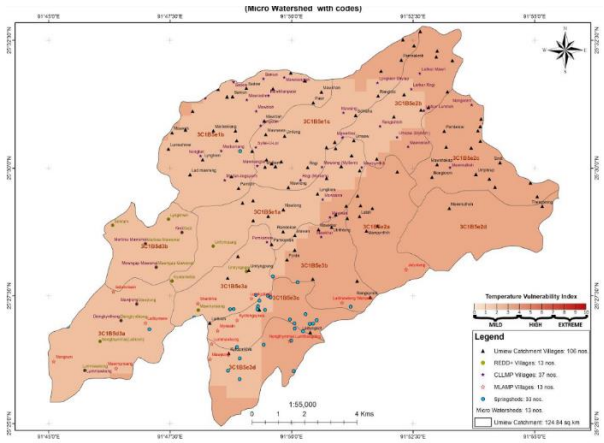


Figure 14 Temperature vulnerability of Umiew catchment

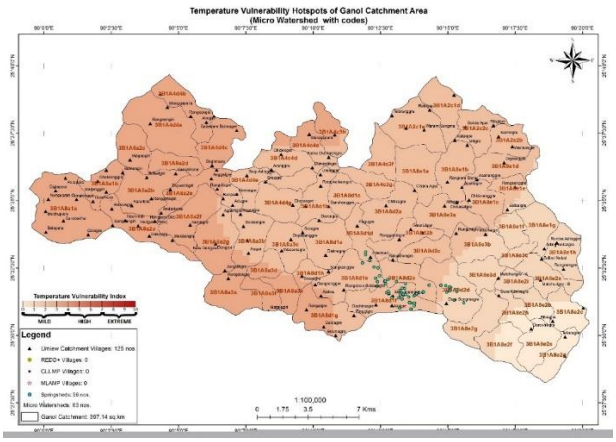


Figure 15 Temperature vulnerability of Ganol catchment

3.2. Impact of climate change in project area

3.2.1. Soil erosion

Umiew catchment: High intensity rainfall during monsoons result into heavy soil erosion in Umiew as it is now almost bereft of vegetative cover. The silt content in Umiew river water is abnormally high during rainy season when the river is frequently subjected to flash flood and high velocity flow due to high intensity rainfall in the catchment.

Particulars	Lean Period	High flood
Depth of flow	0.3 to 0.6m	1.5m to 1.8m
Velocity of flow	1m/sec to 1.5m/sec	3m/sec to 4m/sec
Discharge	1 to 2 cum per second	160 cum per second at Umiew Pomlakrai to 180 cum per second at Smit

Intense rainfall results into heavy erosion of the riverbank and agricultural lands. Much of the silt in the dam is contributed by its major tributaries viz., river **Umtyngngar and river Umjyllieng** on account of human activity through stone and sand quarrying and unsustainable agriculture practices. The high rate of siltation/sedimentation affects the productive life of the dam. The PHED has constructed few silt-retention barriers across the Umiew river and its tributaries to control the flow of silt from vulnerable areas of the catchment into the dam. These structures are already inundated with silt and fine clay.

Figure 16 Silt load on Stage 1 pumping station in GSWSP

It is important to protect the catchment of the river Umiew to ensure source-sustainability of water in GSWSP. As the event of extreme precipitation increases, it will increase the risk of **landslides in up-steam areas** and **siltation of water bodies** in down-stream areas thus affecting **aquatic ecosystem**. The situation may become worse with increase in the precipitation intensity as projected.

Figure 17 Flash floods washed away shoulders of silt trap (Umiew and Umtyngar rivers)

Ganol catchment: The soil erosion in the Ganol catchment is not as high as in Umiew catchment. However, loss of vegetative cover due to shifting cultivation and indiscriminate cutting of forests results into loos of soil nutrients, siltation of riverbed and poor recharge of riverine system. The sub-surface water flow is also substantially reduced in the last decade.

Figure 18 Jhum cultivation in Ganol catchment

3.2.2. Degradation of forests and green cover

The loss of natural forests in Umiew and Ganol catchments is a serious concern. The quality of the forests is also degrading at an unprecedented rate. The forest cover under dense forest category has decreased in recent times and only small patched of such forests remain. Since the catchments is predominantly mountainous, deforestation and the resultant loss of soil are leading to poor productivity of forests and increased siltation of rivers and streams. Open forests lands are deficient in nutrients and have poor regeneration carrying capacity.

Rise in temperature has various implications for forests and water resources. Due to significant increase in air temperature, **events of forest fires** have become more frequent especially in pine and bamboo forests. Unchecked shifting cultivation (Jhum), mainly in Ganol,

has resulted into increase in **forest blanks and scrubs** (**forest fragmentation**). This further causes land degradation and soil erosion.

With the change in climatic conditions native species get eliminated and various exotic invasive species encroach on the patches so created. Cumulative Forest Vulnerability Index as calculated by Prof N H Ravindranath et al. is over 3.5 (High disturbance index and high fragmentation index) in both West Garo Hills and East Khasi Hills

3.2.3. Water availability

Umiew catchment gets abundant water during rainy season making the river most dependable for supply of water. However, many of the tributaries and springs become dry during winters affecting livelihoods of the people in the catchment. Decrease in the forest cover and increasing wastelands in both the catchment have also resulted into low availability of underground/ sub-surface water mainly during winters. During winter although Umiew river has little surface flow of water the Ganol river gets is almost dry. Pictures below show lack of vegetative cover during winter due to shortage of water.

Figure 19 Degraded source of Umiew river

Figure 20 Degraded landscape at the Mawphlang dam

In **Ganol catchment** the condition of water security is still worse as the water is lifted from the riverbed for Tura township. Meghalaya Times (newspaper) reported on 31 March 2019 complete drying of Ganol river due to depletion of forest cover in its catchment including the lower reached of *Nokrek* Peak (*Akhonggre* area). During this period water was selling at Rs. 1000-2000 per tanker. *Jhumming* (Shifting cultivation), illegal timber trade and commercial plantation of rubber and betel nut are cause of loss of forest cover in Ganol catchment. Projected rise in temperature may cause further water scarcity will have a devastating impact on water resources specially in non-monsoon seasons.

Figure 21 Dried Ganol river that supplies water to Tura Town

Meghalaya Institute of Natural Resource (MINR) studies on impact of climate change

Soil and Water Assessment Tool (SWAT) models used to assess the impacts of current land use practices on water yield and preliminary agent based studies and hazard analysis done by MINR to assess climate change vulnerability have indicated:

- Increase in runoff as high as 50% in areas exposed due to loss of vegetation and decrease in ground water recharge even during monsoons
- Decrease in ground water recharge during winters and more frequent terminal draught with complete drying of over 50% of the springs
- Frequent occurrence of early season draught with late onset of monsoon or normal onset of monsoon followed by 15-20 days of dry spell;
- Fewer but highly intense rainy days with a long mid-season dry spell;
- High evapo-transpiration rate and water stress in forests and agricultural crops with increased dependence of springs;
- Lack of water supply to over 60% of the households and non-availability of drinking water due to poor quality of water in the springs. Pollution of water streams and springs from liquid and solid waste from villages
- Drying of small streams and springs and other water sources has adversely affected livelihood options such as animal husbandry, horticulture, agriculture fisheries etc.;
- Scarcity of feed, fodder and water for animals during draught with drying of springs;
- Problem in feeding and reproductive management of animals due to climate change;
- Difficulty in crop management (mainly vegetable) due to flash flood like situations during intense rains specially in Garo hills;
- Higher incidence of parasitic infections in animals;
- Draught-like situations affecting production of maize, pulses and oilseeds.
- Strong rains have increasingly caused soil erosion on farm land. This has increased the need for higher investments in chemical fertilizers and in-situ moisture conservation, construction of new rainwater harvesting ponds, reservoirs, check dams and water lifting from streams which are already drying out;

- Scarcity of drinking water. With the drying of natural streams women have to travel long distances to collect water for their families and cattle.;
- In the absence of enough quantity of grass in pasture lands has increased anthropogenic and biotic pressure on forests. Non availability of enough nutrition for cattle leads to malnutrition and vitamin deficiency related diseases in cattle;
- Forest fires have become more frequent due to climate change. Forest fires most certainly destroy the understory vegetation and, in many cases, standing full-size trees. They destroy food of wildlife and nesting sites with possible killings of birds, reptiles, or mammals trapped in the fire;
- Trees damaged from forest fires are more susceptible to bark beetle attacks, especially in adverse weather conditions. The destruction of vegetative cover leads to surface runoff and soil erosion especially in the steeper topography. Run off also carries suspended soil particles, dissolved inorganic nutrients, and other materials into adjacent streams and lakes adversely affecting water quality and destroying fish habitats.

Biodiversity: The project area is expected to experience rise in temperature which may cause gradual **loss of biological diversity**. **Habitat loss** coupled with forest / habitat fragmentation increases the risk of biodiversity loss. *Nokrek* National Park in Ganol catchment is habitat for several endemic and endangered / threatened plant species which becomes more vulnerable due to climatic and anthropogenic factors.

Agriculture: 70-80% of the population in these catchments depends on agriculture and natural resources for their livelihoods. Most of the agriculture in these catchments is rainfed. The crop's response of increase in temperature may vary from crop to crop. Mishra et al have observed that as a generalized trend, with the rise in temperature, crop growing days may increase which may result into reduced maturity period of crops. Early maturity may result into decreased grain filling period and ultimately may result into low yield / production of in different crop. Rise in temperature may also induce premature breaking of dormancy of insects and pests which may cause frequent insect and pests attacks on the standing crops. Net crop yield is expected to decline with increase in night temperature as it brings physiological changes leading to increased rate of respiration and decreased rate biomass accumulation. This may also impact pollination in certain crops like Maize. Rice also shows a similar temperature response as maize because of impact on pollen viability and production declines when day-time maximum temperature exceeds 33^0C and ceases when it exceeds 40^0C.

3.3. Non-climate change factors of resource degradation

3.3.1. Un-regulated sand and rock mining

Umiew catchment: As discussed earlier heavy soil erosion due to intensive agriculture on steep slopes, that too in the upper catchment of the drainage systems and deforestation are major concerns for GSWSP as the area is highly prone to land-slides that adds silt to the riverine system. More alarming concern is this catchment is unbridled and unscientific sand and rock mining activities. The threat from the silt discharge is so much so that 30% (15meter/ out of 50 meters depth) of the height of *Mawphlang* dam is already inundated with silt.

Un-regulated open-cast sand and stone mining is rampant in Umiew catchment. Most of the land under the catchment is privatised with community-heads having little control over unscientific and environmentally unsafe mining activities. There is a substantial demand for sand and rocks for construction activities in Shillong city. Because of its proximity to Shillong (demand centre) and excellent supply conditions such as i) good road connectivity, ii) availability of water from Umiew river for washing of soil for sand extraction, iii) availability

of excavation and land moving equipment for scrapping and digging of hills, iv) high sand and rock availability in the area etc. have made sand and rock mining a highly profitable business for greedy private land owners.

All these activities have resulted into heavy silt load in Umiew river threatening life of the Mawphlang dam, corrosion of the water supply systems, loss of riverine eco-systems and negatively affecting overall sustainability and quality of the water- supply to SUA and villages along the Umiew river.

Figure 22 Unregulated silt mining along main road in Umiew catchment

Figure 23 Silt filled silt trap in Umiew river in winters

Figure 24 Silt accumulation after the silt trap at the same location

Ganol catchment: Sand mining is also prevalent in Ganol catchment but it is done from the riverbed and since there is no dam on the river it is not much of a concern for the local administration.

3.3.2. Unsustainable agriculture practices

Umiew catchment: Umiew catchment area is one of the largest producer of potato, cabbage and other seasonal vegetables in the entire North East Region. The supplies are mostly made to Bada bazar in Shillong and markets in Guwahati and Shilchar in Assam. As the region faces high intensity rainfall people follow bun cultivations (gradient terrace farming) with tillage along the slope to avoid waterlogging. Although this form of agriculture avoids waterlogging it results into soil erosion and leaching of soil nutrients from the agricultural fields. High doses of farmyard manure and chemical fertilizers are used to retain productivity in the farm lands. Under this form of cultivation[4] the vegetation in a particular land is cleared (branches twigs,

[4] Courtesy Mr. Marcel Kharbani Sr AS&WCO

foliage, grasses and other debris) and stacked along the slope (8-12 inches height and 1meter width) before 5-6 months from the time of cultivation. Once this organic matter is dried it is covered with soil and burnt. This area is then planted. Burning of the organic matter is done to improve soil fertility. If needed, additional manure and fertilizer is added to the field in subsequent plantings (figure 25 and 26).

This form of cultivation is unsustainable as all nutrients and the top-soil are lost during rains. Burning also adversely affects the micro-organism in the soil

Figure 25 Bun cultivation and tillage along the slope in Umiew catchment

Figure 26 Stages in bun cultivation

Ganol catchment: Shifting Agriculture[5] / Jhum is a prominent traditional agricultural land use associated with the social framework of a large number of tribal communities in Garo hills. Such *jhums,* with 15-20-year jhum cycle and multiple cropping, used to be generally sustainable in the past. However, with increase in population and low availability of land, villagers are forced to reduce the fallow period (to even as little as two years), which is insufficient for natural regeneration. and has resulted in land degradation. *jhum* with reduced cycle is neither productive nor sustainable. Settled cultivation is practiced only in a small portion of the total cultivated land, mostly confined to the valleys. In view of the high labour cost and energy input involved in terrace making, and in absence of other viable alternatives to shifting cultivation, the large number of the population of the Garo hills continues to depend on shifting cultivation for their subsistence and livelihood. Frequent shifting from one land to the other for practicing jhum has adversely affected basic life support systems like availability of water and productivity of soil. It has also resulted onto decline in the area under natural forests, the fragmentation of habitats of wildlife, disappearance of native species, invasion by exotic weeds etc.. Due to shifting cultivation on steep slopes, down-stream siltation of water bodies is apparent in Ganol catchment. Here most of the jhum lands are highly infested with weeds and do not recover to forests because of heavy biotic pressure.

Figure 27 Jhumming and charcoal making

3.3.3. Solid and liquid wastes from habitations

As the Umiew river passes through densely populated areas (*Umiew Pomlakrai, Nongkrem, Umphrup, Smit, Mtyngngar, Mawphlang*) solid and liquid waste management along its bank has become a serious concern. The Umiew river and its tributaries gets garbage (domestic waste, municipal waste, food waste from hotels, polythene, waste from manufacturing units and even hazardous bio-medical waste) that affects the quality of water supply from GSWSP. Most the waste is contributed by Smit area. Similarly, in Ganol catchment solid waste from Rongram market is released in the river system.

3.3.4. Deforestation and loss of biodiversity

Illegal logging is also one main reasons for deforestation and degradation of forests areas. Deforestation is also being done because of other anthropogenic practices such as, shifting cultivation, man-made forest fires, encroachment, mining etc. These activities have led to fragmentation, habitat destruction, loss of biodiversity and irreversible changes in landscapes and natural habitats. Deforestation has also resulted into loss of soil cover and siltation of fish habitats, decrease in primary productivity of natural and agro-ecosystems.

3.3.5. Forest fires

Each year, 200-500 ha. of land is affected by forest fire in Meghalaya. Open forest areas and scrub lands, that constitute 33.6% of the forest area of the State, are highly vulnerable to fires.

[5] It involves cutting and burning of forests area before its cultivation and shifting to other locations once the cultivated land becomes infertile. The area is left to regenerate with natural vegetation before it is burnt again for cultivation. Jhum cycle is the number of years before which the vegetation on the land is again burnt and area is cultivated.

Amongst forest types, high incidences of fire are observed in deciduous tropical forests that occur up to an elevation of 1200m, sub-tropical forests that occur at 1500 m elevation on the southern slopes of Khasi Hills. Degraded grasslands mostly in EKH and WGH districts, are also vulnerable to fire. Forest areas that are least affected by fire are protected forests[6], green blocks[7] and reserve forest areas[8]. Un-classed forests are most affected by forest fires. These are mostly private forests on hill slopes over which local self-government has some control and used for jhum cultivation. Communities and traditional institutions have been managing forests in Meghalaya around their religious, cultural and economic activities. However, with breaking up and weakening of traditional institutions forest management is a real challenge. Various types of forests and their propensity to fire are described below:

Table 5 Forest Ownership and Vulnerability to Fire Hazards

Type of forest use / ownership	Fire incidence
Sacred grooves	No fire
Community reserves	Low to medium
Village supply forest and restricted forests	Moderate to high
Law raid (forest belonging to group of villages)	High
Private forests (mainly for charcoal making)	High and localised
Champe forests and bamboo reserves (used for shifting cultivation)	Very high but localised
Clan forests	Low

3.3.6. Impaired springs

Most of the villages in Khasi and Garo hills depend on springs as main source of water for household and irrigation purposes. According to the estimates, the State has over 60,000 springs. According to MINR over 54% of the springs have either dried or water discharge from them has significantly reduced (<50%). Impaired springs have caused widespread water stress in the rural landscape, adversely affecting agriculture, livestock and other allied livelihood activities of the people and causing hardship and drudgery. Despite heavy rainfall, many areas are water-stressed due to increase in demand-supply gap leading to a surge in the use of ground water. Further, ground water data shows that the depletion rate between pre and post monsoon period is about 40 to 80% depending on the landscape. Changing land use, deforestation, quarrying, mining and climate change are perceived to be the main causes for deterioration of springs and ground water regime.

3.3.7. Compliance to laws and regulation

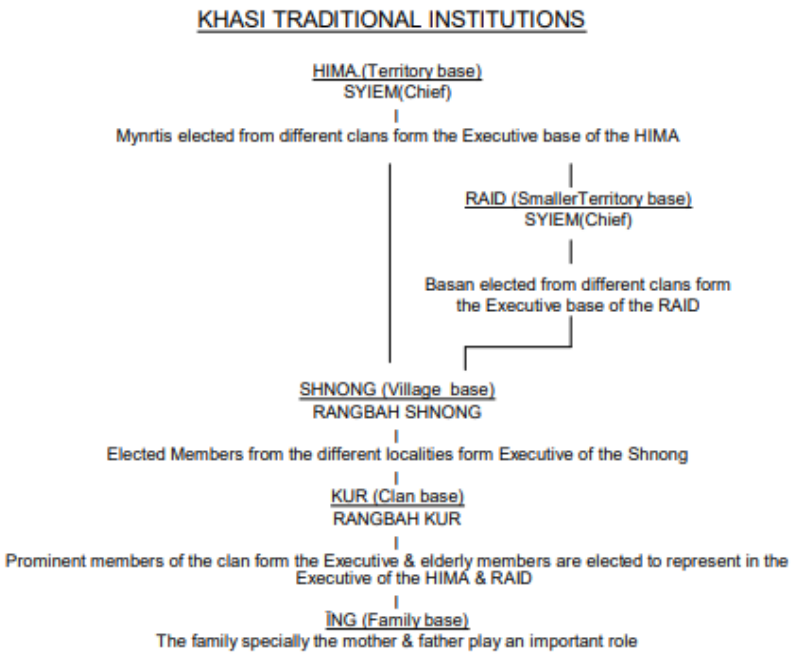
Because of the typical forest ownership structure multiple forest laws apply to the State of Meghalaya. This complicates the management and decision making and results in no-action against defaulters particularly on the matters that relate to catchment area protection (The Meghalaya Protection of Catchment Area Act, 1990). Many of the laws are old and outdated and needs revision keeping in mind the developmental needs of the State and changes socio-economic conditions. Recently the Government of Meghalaya has promulgated Meghalaya Water Policy 2019 which brings hope in management of catchment areas.

6 forests declared protected by the District Council for the growth of trees for the benefit of local inhabitants.
7 These forests belong to an individual family or clan or joint clans and grow on Raid lands and are protected for aesthetic beauty and water supply of the urban areas.
8 forests declared so by the executive committees of the District Councils. In these forests human settlement and felling of trees or cutting of branches are prohibited

3.3.8. Weakening of traditional institutions

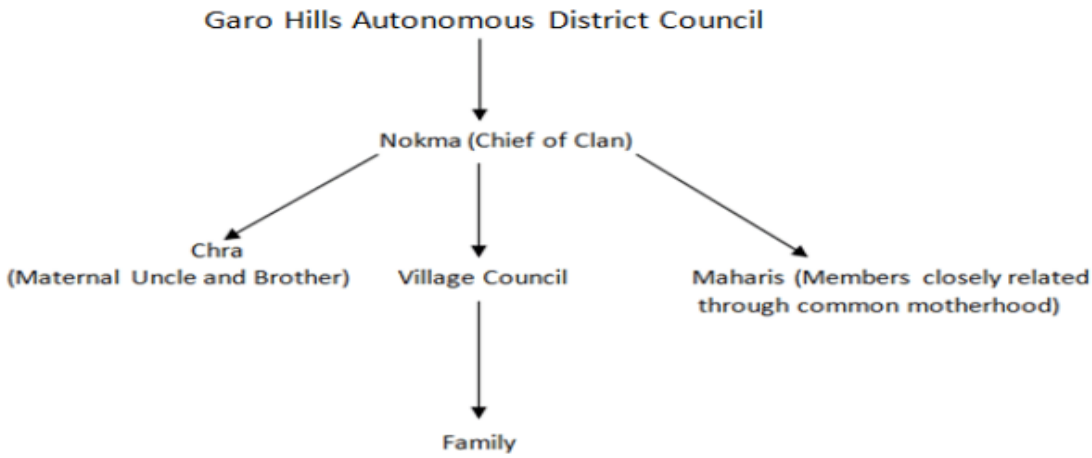
Traditional institutions (figure 28 and 29) and Autonomous District Councils (ADCs) own around 88% of the forest in Meghalaya. Strength of these institutions usually determines the strength of the management system. However, traditional institutions are slowly losing their control and governance on natural resources particularly forests. Sometimes local elites have often usurped and reallocated traditionally held community and tribal rights – rarely recorded in any official statute book – with predictable consequences in terms of local tensions and conflict resulting in unplanned clearing of forests, with no planning or effort towards maintaining forests.

Source of revenue for the traditional institutions are also limited so they are unable to make any investment in forests that they manage. In absence of sustainable livelihood management planning the forests are getting over exploited with reduced carrying capacity. Consequently, with loss of livelihood opportunities, the people, particularly the youth, are losing interest in managing their natural resources.



Community Forest Type	Management Responsibility
Sacred Forests	Lyngdoh, Rangbah Shnong, Rangbah Kur
Village Forests	Rangbah Shnong
Raid Forest	Syiem Raid
Clan Forest	Rangbah Kur
Syiemship Forest	Syiem
Private Forests	Private owner

Figure 28 Khasi Hills - traditional institutions and forest management



Forests in Garo Hills are owned by Nokma who is head of the village council.

Figure 29 Garo Hills- traditional institutions and forest management

4. PROJECT DESIGN

4.1. Proposed Developmental Objective

To improve water availability and security by mainstreaming scientific participatory approaches to sustainable catchment protection and community forest management.

The project will achieve above mentioned objective by:

1. Enhanced forests and other ecosystems of catchment areas
2. Livelihoods improvement of vulnerable communities in the catchment areas.
3. Improved knowledge based participatory planning and implementation, capacities and as well as the integration of those into the regulatory frameworks to achieve 1 and 2 above.
4. Adopting best project management practices

4.2. Expected project activities as per the Terms of Reference (ToR)

The expected project outcomes as envisaged in the ToR for the feasibility study are:

- Institutionalization of participatory processes for community-led planning and management
- Participatory and sustainable catchment areas development, protection and management
- Sustainable Community forest management, integrated in the FD working plans and strategies
- Soil and Water Conservation measures including spring-shed development
- Surface and Sub Surface Water Harvesting Measures
- MBDA (PEA) and S&WC Department (PIA) Partners (NGOs and CBOs) to collaborate with traditional institutions/Villages/CBOs etc. to identify sites for forest landscape restoration planting trees in catchment areas and management.
- Incentivization on the surviving plants at the end of every year up to 4 years from the date of planting and to be linked to Payment for Ecosystem Services.

4.3. Summary of stakeholder consultation

Causes of natural resource degradation were discussed with the Stakeholder through regional workshops (Annex 6.1 and 6.2) and community consultation during field visits. Action plan as envisaged during the consultation is summarised below:

Project Development Objective (PDO): To improve water availability and security by mainstreaming scientific participatory approaches to sustainable catchment protection and community forest management.			
Comp	Cause of vulnerability	Components / project objectives (as per ToR)	Proposed interventions

1	• Lack of planned/ outcome-based approach to catchment mgt. Poor community participation by women & vulnerable community
	• Climate change: frequent torrential rains and flash floods, heavy rainstorm resulting into soil erosion, land slides
	  • Siltation of river basin and Umiew dam
	  • Destabilisation of riverbank and loss of riverine eco-systems
	• Indifference to environmental services of forests (mainly supply of water and soil protection) – deforestation, shifting cultivation, fire on grasslands, destabilization of river banks
	• Poor water quality and silt monitoring in upper catchment
	• Impaired springs due to deforestation, quarrying, mining, climate change and unplanned development resulting into water
		COMPONENT 1: Enhancement of forests and other ecosystems of catchment areas	• **Micro-watershed development approach is adopted** through active consultation of women and vulnerable community for increased sustainability of sources of water in catchments under consideration.
			• **Climate resilient micro-watershed plans are developed** for 39 micro-watershed plans (26 for Ganol and 13 for Umiew). Land, water and forest resources are managed as per site specific management plans
			• **Green cover is enhanced** through development of community nurseries and undertaking forestry plantations for rehabilitation and regeneration of degraded forest areas, forest fire prevention
			• **Stabilisation of riverbanks** with river-side plantation and civil structures (embankment etc.)
			• **Water is augmented** through
			  • Soil and water conservation measures
			  • Management of springs
			• Provision for **rural infrastructure** such as list mile connectivity (roads etc.)
			• **Monitoring of water quality** vis-à-vis silt content and weather conditions

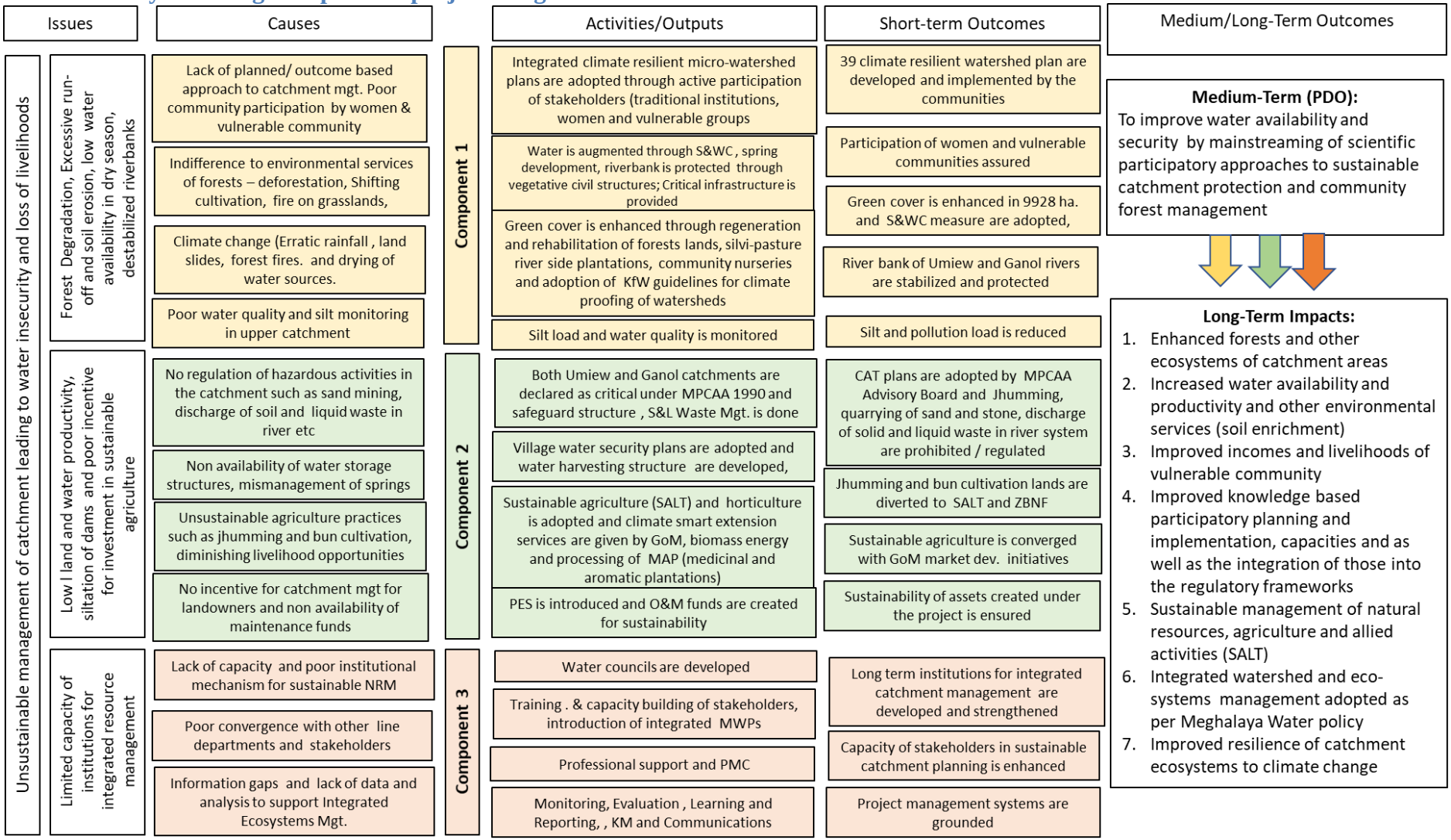
	stress, hardship and drudgery for vulnerable communities		

2	• Poor productivity of catchment
	  • Climate change and extreme events result into poor land and water productivity due to soil erosion, floods and water scarcity
	• Non regulation of hazardous activities in the catchment such as sand mining, discharge of soil and liquid waste in river etc. resulting in siltation and contamination of water bodies; soil toxicity; damage to hydrological cycles
	• Unsustainable agriculture and land-use systems including shifting cultivation with short rotation cycle (Ganol) and Bun cultivation along the slopes (Umiew)
	• Non availability of water storage structures for dry seasons
	• Heavy dependence on fuelwood and firewood leading to forest destruction
	• No incentive for sustainable catchment mgt for land-owners and non-availability of maintenance funds
		COMPONENT 2: Livelihoods improvement of vulnerable communities in the catchment areas.	• **Sustainable farming is adopted** for development of culturable wasteland and agriculture fallow lands
			  • Horticulture with soil and water conservation
			  • Introduction of climate resilient integrated farming systems (SALT – Sloping Agriculture Land Technology)
			  • Management of shifting cultivation areas
			• **Water availability enhanced** for livelihood activities by constructing primary surface and sub-surface harvesting of water and development of springs
			• **Sand/ stone mining is regulated,** and slurry is filtered before its discharge in river and alternative livelihoods are promoted. Discharge of solid and liquid water is minimised/ avoided.
			• **Livelihood and income security**: Potential NRM and horti-agriculture-based activities area promoted. Biomass based energy enterprises are promoted. Meghalaya Aroma Mission is supported for processing and marketing for value realisation by farmers
			• **Ensure sustainability of investments**
			  • Operations and Maintenance (O&M) funds for sustainability of NRM assets is established
			  • Incentivization of climate resilient package of practices through payment for environmental services is piloted.

3	• Poor understanding of science of climate change and its impact by stakeholders besides need for community collaboration • Loss of traditional institutions • Poor women participation in decision making - drudgery and social conflicts on rights and privileges	**COMPONENT 3- Institutional development**: Improved knowledge based participatory planning and implementation,	• **Intuitional development for project implementation**: Water Resource Councils are supported at State, District, block and Village levels to implement the project and meet the objectives of Meghalaya Water Policy). This will ensure institutionalization of participatory processes for community-led planning and management and participatory collaboration between MBDA, S&WC Department and other partners to

	• lack of understanding of causes of degradation of natural resources amongst youth and new leadership • No mechanism to capture traditional knowledge and its optimal dissemination	capacities and as well as the integration of those into the regulatory frameworks to achieve 1 and 2 above	implement the policy and sustainable catchment treatment action plan. • **Capacity of the traditional institution**, particularly women and vulnerable section of the society, to plan, negotiate and implement watershed management is built through • Training and capacity building • Knowledge Management and communications • Monitoring, Evaluation, Learning and Reporting • Environmental and Social Safeguards and Grievance Redress Mechanism (GRM) • Project Management Consultancy • Community Operations Manual • Technical guidelines for sustainable NRM and climate resilient watershed management
4.	• Need for a robust institutional structure for efficient delivery of project objectives • Government institutions are working in isolation resulting into sub-optimal level for natural resource management	**COMPONENT 4 Project Management**: Best project management practices adopted and internalised	• Project management structure is established • Financial and Procurement Management systems is established. • Learning from the management practices adopted under the project are reflected in various developmental policies and practices of other projects

4.4. Theory of Change adopted for project design



5. SUB-PROJECT PLANNING AND FINANCE

Government of Meghalaya enunciated its new Water policy (2019) which will be institutionalised and implemented in a planned through this KfW financed project. The water policy lays emphasis on need for bottom-up planning and organising communities into water resources councils at village, block, district and State levels.

The detailed project implementation structure at State, catchment, watershed, village levels is given in 6.4.2. The basic unit for planning for KfW financed project will be Micro-Watershed Plan (MWP) developed by Watershed Management Committee which will incorporate Village Water Security Plans developed by respective village water resource councils or designated bodies of village governance such as Village Employment Council (VEC), Village Council (VC), traditional institutions or any other village body implementing village development plans of GoM.

MWPs will be developed as a comprehensive community driven plans for augmenting water through NRM activities under component 1 and livelihood promoting activities under component 2. All MWPs for each catchment will be aggregated to form respective Catchment Area Plan (CAP) for Umiew and Ganol catchments. Hierarchy of grass-root planning is given below.

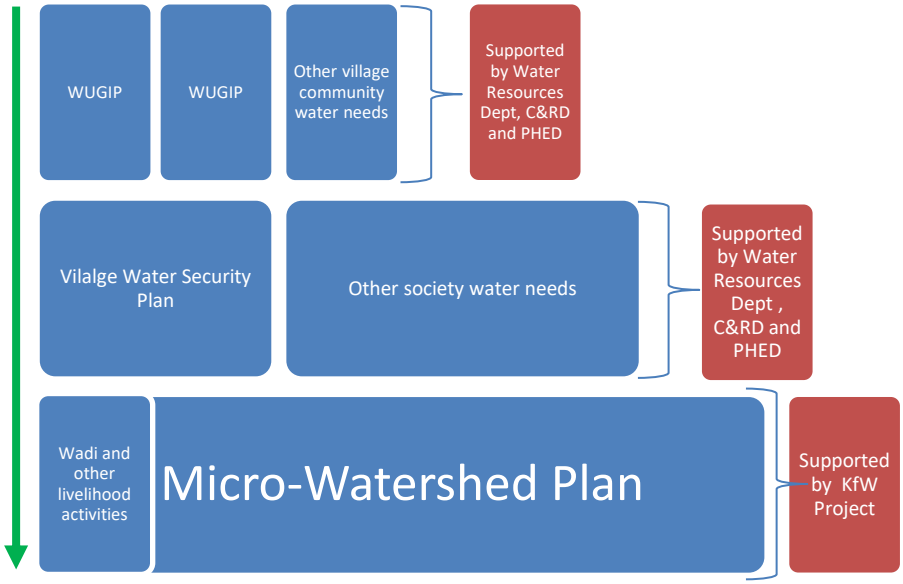


Figure 30 Hierarchy of grass-root planning

5.1. Micro-Watershed Plan (MWP)

Micro-watershed plan will be developed by respective WMC in consultation villages councils and line departments (S&WC Department, Forest Department, Horticulture Department and Agriculture Department) after considering water and other requirements for integrated climate

resilient watershed management. The MWP will be approved by CMC (Catchment Management Committee) of the Project and endorsed by the BWRC once established. The

Steps in preparation of and implementation of MWP

A. Preparation for the Planning

1. A draft Community-Led Project Operations Manual will be prepared as a dynamic document and will revised continuously based on the decisions taken during planning and implementation processes discussed below.
2. Project website is developed and all findings, observations, reports, agreements etc. are disclosed during planning and implementation of MWPs.
3. Community facilitators are identified and trained on various aspects of watershed management, community mobilisation, monitoring and evaluation and reporting etc.
4. Workshop on results framework is conducted and various staff of the project and line department personnel are trained on various aspects of project planning and implementation.
5. Funds are allocated and resources and equipment for Watershed Management Planning are procured.

B. Watershed Management Planning

6. The project staff meets the Village Chiefs for preliminary introduction of the project. A date is fixed for transact walk through the villages and meeting with various stakeholders (village council).
7. Transact walk with villagers is organised to understand the landscape, living systems, hydrological information, socio-ecological settings, governance and ownership structure. A shared understanding and rapport with the community is established.
8. In various rounds of meeting with community mapping (digitised) and qualitative assessment of community stakeholders is conducted with respect to:
   - People who are likely to be impacted adversely by the project.
   - Most vulnerable groups in the community and specific constraints faced by them that limit their participation (i.e. literacy, health/physical abilities, lack of childcare for women, gender dynamics, economic status)
   - Community members who are regularly excluded in community process
   - Identification of stakeholders who are likely to support or oppose for the project and reasons thereof.
   - Identification of stakeholders who can assist in the early scoping of risk and impacts.
   - Identification of relevant cultural and social values, power dynamics, land / forest resource ownership structure etc.
9. Meetings are organised with the village councils (each Watershed Management Unit (WMU) may have 2-3 villages) on the pre-decided date where all stakeholders, particularly the vulnerable communities are present. Project and its purpose, relevant sub-components are explained in the villages selected under the project. The rational for conservation and protection, potential benefits and potential impacts (including social and environmental impacts) are explained. Alternatives and mitigation measures about problems faced by the community are discussed.

10. A written Free Prior and Informed Consent of the Community is sought for collaboration under the project. The consent will be signed by heads of traditional institutions.
11. A meeting is organised for the entire WMU where all households of the Village Councils (general assembly) are invited and findings/ agreements with each village are explained and differences, if any, are sorted out.
    a. Watershed Management Committee is established within Watershed Management Unit (WMU) as per the guidelines in the project operations manual considering traditional governance mechanisms (e.g. representation by clans), inclusivity, equity and democratic principles. WMU consists of all villagers within a micro-watershed.
    b. Concept and the purpose of Sustainable Land Use Planning (SLUP) to the community
12. Roles and responsibilities of each WMU officer bearers are explained and training is provided on management of WMU.
13. Detailed Participatory Rural Appraisal (PRA) (resource and social mapping, transact walk, gender analysis, analysis of resource flows, wealth ranking, matrix ranking of livelihood preferences, seasonal calendars, charting of daily activities, Venn Diagrams for institutional mapping, and the preparation of a historical timeline of the community) is conducted with active participation of people for deeper understanding of the village setting and its land use practices; for analysing potential livelihood opportunities and conservation priorities. A problem tree analysis is undertaken to identify causes, impacts and solutions to the social and environmental issues faced by the communities. Finally, a vision and mission building exercise will outline how the community wants to develop over the coming 20 years and indicate the key steps to reach this goal.
14. Grievance redress mechanism (GRM) is established taking into account various concerns of project management observed during PRA. GRM made know to the public.
15. Identify key livelihood of the people and critical resources on which these livelihoods depend. Critical resources may include natural capital, physical capital, financial capital, human capital and social capital.
16. Identify climate related hazards (extreme events and their impacts) and risk of them happening again. Hazard calendar for most frequent hazards can be prepared along with priority ranking of hazards from livelihood perspective of the community in general and disadvantages sections of the society in particular.
17. Assess impacts of hazards on resources
18. Assess vulnerability and resilience of critical sectors (livelihoods) and social -groups.
19. Assess coping and adaptation strategies and implementation mechanism
20. Identify partnership instructions (traditional institutions, NGOs, CBOs etc.)
21. Detailed Participatory Land Use Planning (PLUP) with mapping of land use and resources) is conducted and land tenure are recorded. Potential opportunities, constraints (availability of labour etc.), benefits and benefits sharing mechanism, and risks involved, roles and responsibilities of various stakeholders etc. that result from land-use decisions are discussed.
22. PLUP identifies investments (soil and water conservation measures, Drainage Line Treatment, forestry, horticulture activities etc.)
23. PLUP maps are digitised and shared with the community representatives

24. Digital PLUPs is rechecked and confirmed by the community in village council meetings.
25. Technical survey of the land is undertaken by engineers and technical designs and cost estimates for investments are prepared.
26. MWPs are prepared covering all aspects discussed above and procurement plan is for Micro-Watershed is prepared (establishment of nurseries and supply of seedlings, supply of labour etc.)
27. Agreement is signed on voluntary land use for the project by the landowners with associated roles, responsibilities and benefit sharing mechanism.
28. Supervision and management cost of WMC is estimated and incorporated in the WMP
29. MWP is approved by Catchment Management Committee (CMC) and endorsed by BWRC
30. Various formats for fund management, procurement, implementation, monitoring and reporting as given in the Project Operations Manual (POM) are explained to people responsible for the same.
31. Important trainings of target population are imparted in the project (please refer component 3) mainly on environmental and social safeguards.

C. Consolidation of MWPs

32. Catchment Area Plan is prepared by CMU
    a. MWPs are aggregated into Catchment Area Plan (CAP)
    b. All investment that go beyond a WMP are incorporated into the CAP
    c. Supervision and management cost of CMU is added.
    d. CAP is approved by CMC
33. Catchment Management Committee (CMC) will enter into a performance agreement with the WMC, village councils/ village designated bodies/ traditional institutions and landowners where fund flow, implementation arrangements and responsibilities, sustainable management of assets and infrastructure created under the project, management of O&M fund and Payment of Environmental Services etc. are elaborated.
34. Responsibilities of various line departments is identified, and respective staff is dedicated by them as per the requirements of CAP.
35. The CMP and MWP are divided into annual action plans and procurement plans

D. Implementation

36. Funds are released for procurement of goods and implementation of works.
37. Works as per plan and design are undertaken (component 1 &2) and recorded.
38. Handholding support is provided by the line departments.
39. Sub-component wise progress is monitored, reviewed and reported.
40. Activity completion and fund utilisations reports are prepared and submitted to SPMU and KfW regularly as the POM guidelines.

5.2. Catchment Area Plan (CAP)

CAP will be developed by respective CMU. CAP will be assemblage of all MWPs with addition of CMU supervision and management costs. CAP will be approved by respective CMC of the project and the Catchment Area Advisory Board as per provision of Meghalaya Catchment Area Act, 1990 (discussed in section 6.2.1). CAP will also cover investment requirement for activities that go beyond any watershed (watershed plus) such as regulating

silt and sand mining, river bank stabilization etc.. A preliminary assessment of the cost requirement of Ganol and Umiew catchments has been done as part of this feasibility report (chapter 7).

MWPs and CAPs will indicate their financial requirement under different components. The WMC in consultation with respective Village Council / traditional instruction will ensure that their respective plan does not include any disputed land and consent of all landowners whose land comes under treatment have been taken.

5.3. Livelihood/ Enterprise Development Plan

The project will support training of farmers under non-agricultural component (forestry, horticulture) under Sloping Agriculture Land Technology (SALT) and processing and marketing of aromatic plants grown under Aroma Mission of the Government of Meghalaya in the selected watersheds. If required, NABARD may be involved to promote its Wadi models (Tribal Development Fund) for promotion of livelihood and enterprise development in convergence with various state and centrally sponsored schemes.

5.4. Financing of Sub-Plans

WMU, headed by WMC, will be the ground level community-based project executing agency. The fund will be disbursed to WMC for implementation of MWPs.

CMU headed by CMC will be supported for investment which cut across MWPs such as supervision and monitoring of the catchment area plans. Wherever required, line departments will be paid for services rendered by them through CMUs. All investments within a village will be implemented by VWRC/ designated village bodies under supervision of WMC. Detailed fund flow arrangement is discussed in section 6.4.6.

Effective and inclusive engagement of the stakeholder communities (project affected or likely to be affected communities) will be ensured at all levels of project planning, implementation and monitoring. It is important to note that many lands are owned by private owners, clan-heads and traditional institutions where members of the community have varying nature and degree of usage rights. CMUs (headed by CMCs), WMCs and designated village bodies will be able to make investment on private lands on behalf of the communities after-having negotiated usage rights of the communities over such investments. Financial arrangement between the project, communities and sub-project proponents will be guided by a formal agreement duly accepted by relevant traditional institution.

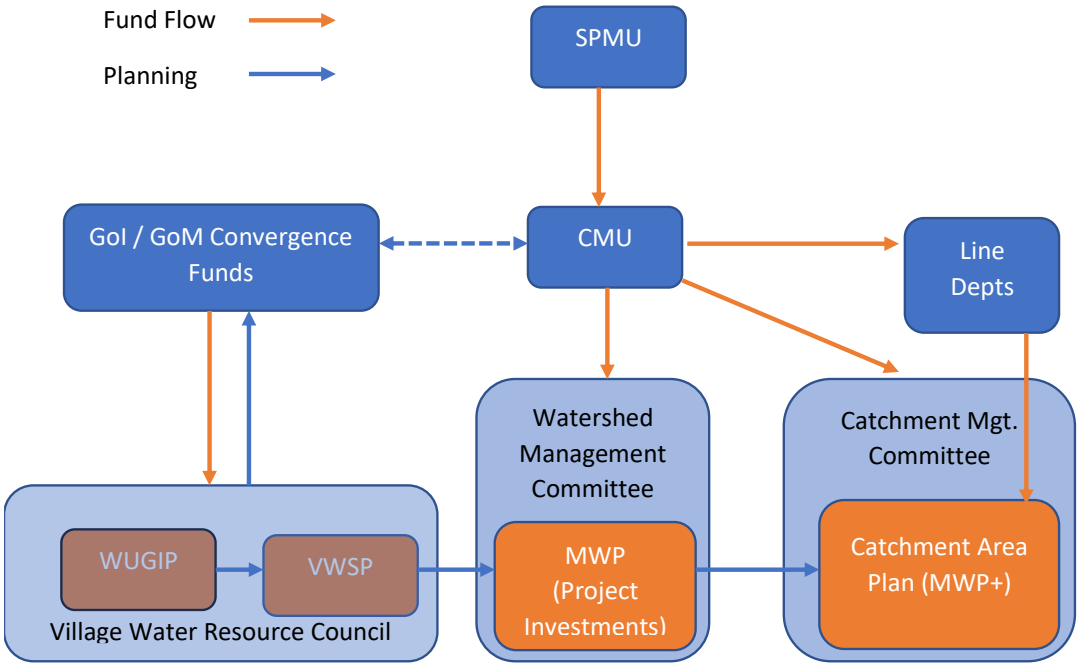


Figure 31 Planning and fund flow system

6. PROJECT COMPONENTS

As discussed under Theory of Change (ToC) , investment for physical measures will be made under component 1 and 2. Component 3 will cover cost of soft interventions and Component 4 will cover project management cost.

Component 1 covers investment for watershed development through enhancing green cover through forestry plantation and nursery management primarily for stabilisation of the river catchment besides meeting Non-Timber Forest Produce (NTFP) and energy (firewood) needs of the community. It also covers soil and water conservation measures for augmenting supply of water, drainage line treatment, spring development, creation for critical community infrastructure necessary for management of catchment etc. Investments under this component will be mainly done in exposed and vulnerable forest areas / other community lands with more than 30% slope and less than 40% canopy cover and wherever there is less economic activity.

Component 2 emphasis on management of livelihood related solid and liquid wastes (garbage) and pollutants (silt); enhancing income and livelihoods of the community through horticulture, agro-forestry, sustainable agriculture (SALT), bioenergy generation; enhancing water supply through water harvesting structure. Land based investment under this component will be done in lands with less than 30% slope, culturable wasteland, fallow lands or lands where economic activities are being done or are possible.

Catchment area development will be anchored in the Soil and Water Conservation Department of the Government of Meghalaya who would help at each stage of project implementation.

6.1. Component 1: Enhancement of forests and other ecosystems of catchment areas

This component is related to planning and implementation of climate resilient and eco-systems-based watershed development activities for

- improving availability of water by identifying natural sources of water and enhancing their ecological and hydrological processes in targeted micro-watersheds. Sustainable watershed management will not only reduce run-off of rainwater and soil erosion but also improve sub-surface recharge to increase and prolong post-monsoon availability of water.
- development, conservation and management of natural resources for improving the landscape productivity of the river basin. Improving the forest and other vegetation cover, and other soil and water conservation measures in the hills will stabilize the watersheds and thus bring greater sustainability in catchments.

Various activities under this component are:

1. **Develop climate resilient micro-watershed plans**
    - Watershed development planning (39 micro watershed plans)
    - Development of green cover (mainly on exposed landscapes with over 30% slope and less than 40% crown cover**)** through forestry and energy plantations for rehabilitation and regeneration of degraded forest areas (block plantations, enrichment plantations)
    - Water augmentation through soil and water conservation and vegetative treatment of drainage line
    - Fire management in fire vulnerable areas

2. Protection of riverbank (drainage line treatment) through civil structure (Water Resources Department)
3. Development of community reserves up to 500 meters distance on either side of the rivers and 200 meters on either side of rivulets as community reserves with no mining allowed and undertaking planting with high density bamboo plantations
4. Development of critical community infrastructure for last mile connectivity
5. Development of springs in micro-watersheds
6. Setting up water quality monitoring systems along various location along the river
7. Promoting NRM innovations and technical consultancies

6.1.1. Climate resilient micro-watershed and resource planning

This sub-component deals with participatory vulnerability assessment and climate resilient adaptation planning in watersheds. Active participation of the stakeholders particularly the vulnerable community is essential for developing and implementing a climate resilient watershed development project. The planning exercise involves use of various PRA tools to conduct community consultation in order to understand their concerns and priorities before preparing investment plans. The planning done for watershed management will be reinforced with planning tools for resilience to climate change. Community consultation for climate vulnerability analysis at micro-watershed level and sustainable land-use planning involves (figure 32):

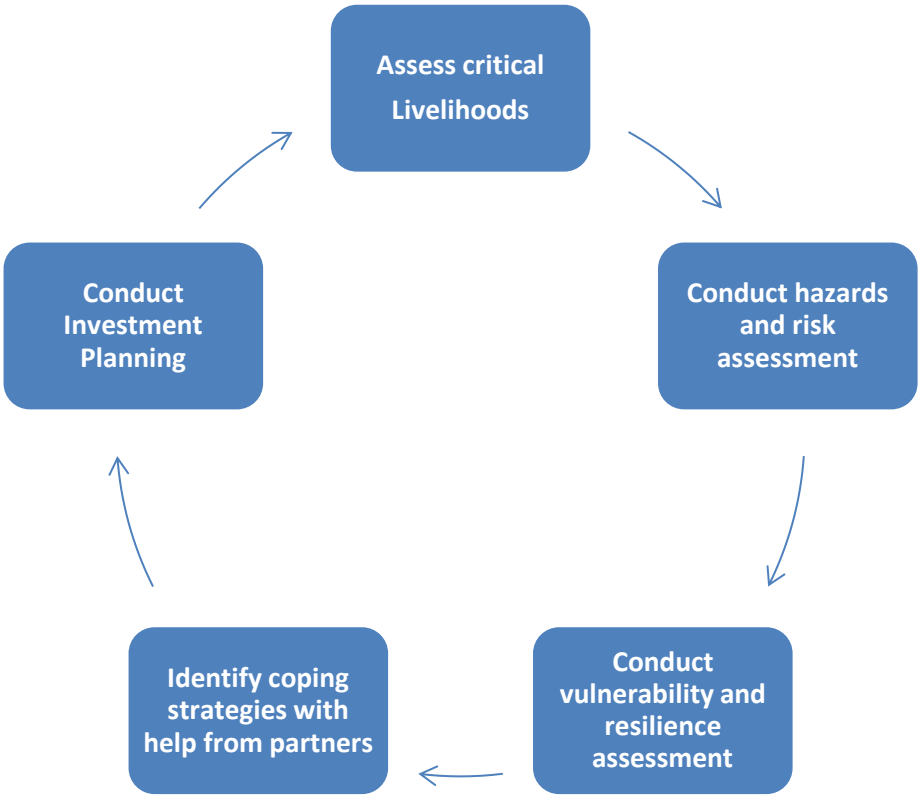


Figure 32 Planning framework

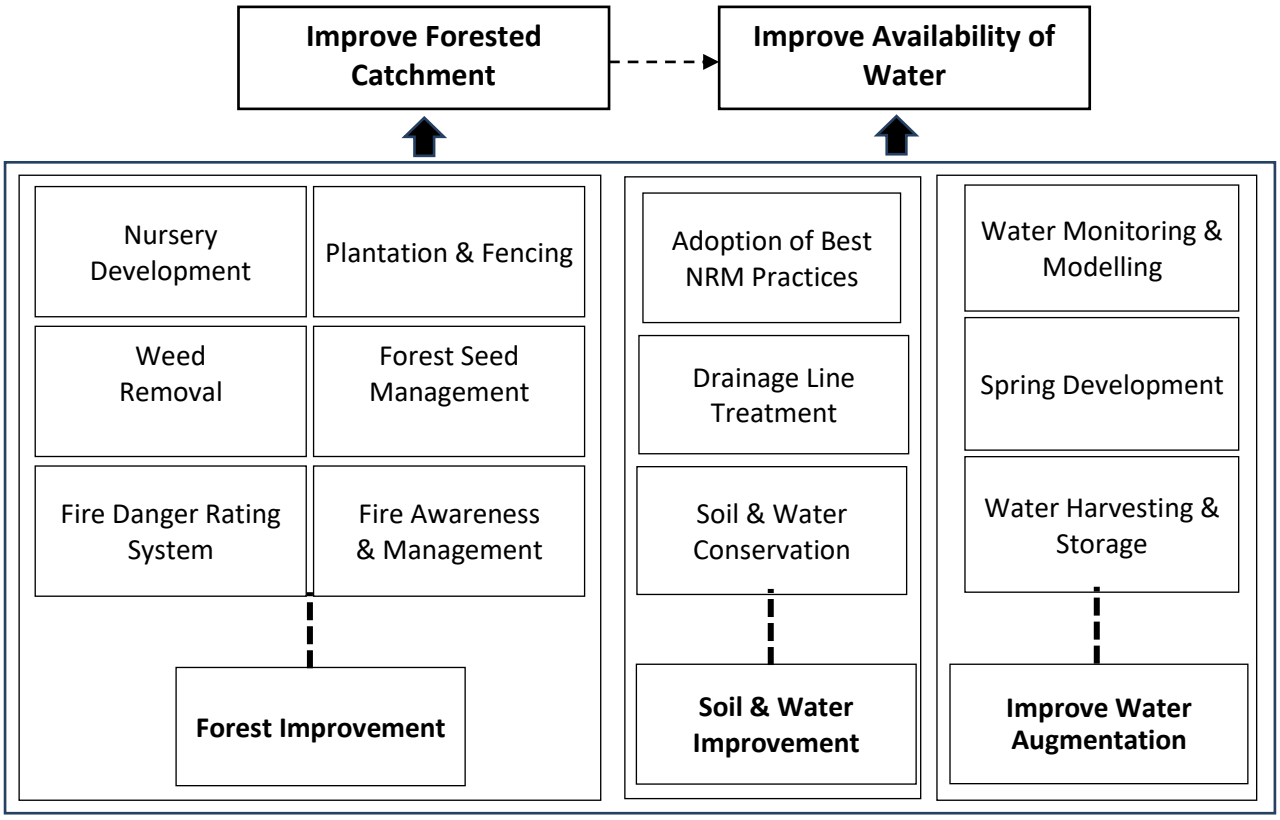


Figure 33 Climate resilient resource management planning

6.1.2. Development of green cover

6.1.2.1.Forestry plantations

This sub-component involves planting of site-specific forestry plantation of indigenous species in dense forest areas; open forest areas; and un-utilised non-forest areas with exposed landscapes having more than 30% slopes. Objective of this sub-component is to increase green cover for improving water regime, stabilising slopes and drainage lines, linking of fragmented forests and improving biodiversity in the catchment. Therefore, for selection of sites for afforestation preference will be given to:

- exposed slopes which are highly vulnerable to soil
- linking of fragmented forests
- development of wildlife corridors
- reinforcement of drainage lines

The species will be selected based on need assessment of the community and agro-ecological suitability. In order to ensure good survival rate of the plantations it is proposed to plant tall and sturdy seedling on higher slopes which are vulnerable to heavier soil erosion. Small and root trainer plants can be planted in other areas. In a sense, project will follow various models of tree plantations to improve the canopy cover of the forests and thus help in maintaining the soil and water regime in planted areas. Wherever possible grasses will also be planted as second tier of vegetation for soil stabilisation and moisture conservation

Block plantation will be done in open (crown density less than 40%) and degraded forests. In such areas proposed density of 800-1100 plants per hectare will be carried out, with 4 years of maintenance. However, it is important to consider that < 40% canopy forest often have small patches of grasslands (i.e. grass dominated patches) which are source of fodder for cattle. While planning and demarcating the area for planation, such small grass-dominated patches on which the rural cattle depend for fodder will excluded from the plantation activity. In such areas, grass planting can be taken up.

Enrichment planting with 200-300 plants per ha. (average 250 plants/ha) with 4 years of maintenance will be done in lands having crown density more than 40% and/or with abundance of root stock. Natural regeneration of root stock will be facilitated through fencing and gap-filling.

Soil and water conservation and grass seeding: Grasses are the best biodefence against soil erosion. Being the lowest layer of natural vegetation cover, grasses bind the soil more effectively than any other plants. While the tree plantations take few years to establish, grass grows quickly and protect the soil immediately. Moreover, the grasses are also good source of fodder for livestock and thus contribute in meeting the community needs. So, the project will undertake soil and water conservation measures (discussed later in 6.1.3) with seeding of nutritive grasses in open forest areas and culturable wastelands.

6.1.2.2.Development of community nurseries

Timely and adequate availability of planting stock is necessary for the success of the project. The project will promote community nurseries for supply of seedlings for plantation activities under the project. MBDA and S&WC Department have developed models of community nurseries across the State. The horticulture department and the forest department will: supply quality genetic material to these nurseries; provide training and guidance to entrepreneurs and community nursery mangers; develop and demonstrate scientific standards etc. Board leaved species that cannot be grown in community nurseries will be grown in Forest Department's nurseries.

Nurseries will be centrally located with appropriate site-quality (soil depth and quality, elevation, drainage, slope, aspect) and away from locations prone to natural hazards such as landslides, wind storms etc.. Each nursery will need an adequate source of water – irrigation facility; good (all weather) road connectivity; easy availability of labour on long term basis (which can be trained). Community needs will be taken into consideration for selection of species specially for supply / production of fruits, NTFPs, firewood, medicinal and aromatic plants, forest-based fruits and nuts, resins, timber etc. provided it is technically viable to raise those species in community nurseries.

Planting stock would be raised in polybags / containers/ root trainers, unless the species being raised is not amenable to such a practice. Efforts would continue to be to restrict the use of non-biodegradable materials in nurseries and to find more environmentally friendly alternatives. Procurement of labour and material will be done locally. Provisions of environmental and social framework will be used to safeguard interest of communities especially regarding labour standards. Enough measures will be undertaken to ensure robust growth and quality (resilience) of the seedling with fixing of criteria for appropriate age, collar diameter and height. Appropriate light growing porous and fibrous medium will be used to economize on transportations cost and improve production.

Staff of nursery will be trained on seed management; sowing and plating techniques; weed and pest management; maintenance and handling of equipment; record keeping; vegetative propagations techniques. A nursery manual with systems and procedures on modern techniques of nursery management including technical management, financial management, procurement, community participation, human development etc. will be developed as part of the Operations Manual of the Project. Production of vermicompost at village level will be a source of additional revenue for the villages. Women's Self-Help Groups (SHGs)/ Integrated Village Cooperative Societies (IVCS) will be engaged in production of vermi-compost and the project will give them training and initial support by way of supplying earthworms and then assuring buy back at agreed to rates.

6.1.3. Soil and water conservation measures

Objectives of this sub-component is to enhance soil productivity, improve moisture regime, augment availability of water for longer period particularly in the storage structures (earthen embankments, water storage ponds, percolation tanks, anicuts etc.) created under component 2. This shall also bolster agricultural productivity in addition to reducing hardships and drudgery of people especially of the women folk. Soil and water conservation measures (vegetative check dams, contour trenches / bunds /ditches) will be undertaken primarily in and around plantation areas.

Community consultation shall be held to identify the S&WC requirement of the area and proposed sites for their construction. Further, members of the community would be adequately trained to monitor the process of construction of such structures and to maintain project asset afterwards. The WMC shall be sensitized to create a O&M fund to cater to the maintenance needs of the created assets. Technical assistance for S&WC measures shall be provided by S&WC department.

6.1.3.1. Planning for soil and water conservation measures

Following aspects will be considered for planning of soil and water conservation measures:

- Before taking up of such activity, a water security plan shall be prepared for the village clearly specifying the water conservation structures which can be taken up in the village as per the available topography and precipitation.
- It shall be ensured that the Soil and Water /Moisture Conservation (S&WC) structures are solely meant to reduce the speed of flow of runoff to encourage percolation of water in the ground and to promote conservation of soil.
- The S&WC structure should not restrict the flow of water to the major reservoir of the area, if any.
- Priority should be placed on treating the village commons and community land.
- Water User Groups formed as per the Water policy of the Government of Meghalaya should be actively involved in planning, implementation, usage and maintenance of the assets created.

- Suitable indicators of efficacy of the S&WC works should be identified and regularly monitored to ensure achievement of objective.
- The efforts of other line departments and ongoing/proposed schemes of S&WC in the village/areas should be considered to create synergy.
- For technical aspects of S&WC structure, services of experts for line departments should be sought.
- No structure having the core wall/ restricting wall of greater than 1.5 metre height shall be built under the project in the way of the drainage.
- Planting / sowing of seeds of suitable species of trees/shrub shall be attempted alongside the structure to utilize availability of moisture.

Contour Trenches: In general, contour trenches worked effectively where the slope of the ridge lies between 10-30%. However, in the areas with higher slopes, the same will be made with some minor design change. For example, in the slope 10-30% the distance between two line of trench will be 20 meters, while in the higher slopes, the same will reduced to 15 meters. Size of each staggered trench will be 0.5 m wide and 0.5 m deep with 4 m length. Between two staggered trenches, the gap will be around 4 meters, depending upon the site. The distance between two successive rows and between two trenches in one row will be adjusted and depends on the volume and velocity of runoff they are expected to handle, which in turn depend on i) quantum of rainfall: the greater the rainfall, the lesser the distance ii) permeability of the soil: the more permeable the soil, the greater the distance iii) vegetative cover: the lesser the vegetative cover, the lesser the distance Dug up soil will be stacked along the downhill side of the trench making a berm of 20-30 cm width on which seeds/ seedling of grasses, herbs or perennial shrubs will be sown/ planted. In the project, contour trenching will be taken up in plantation areas in micro-watersheds. In addition to this, contour trenches can also be made where although plantations are not required but trenches can help improve soil-moisture condition and in turn improve the forest structure.

6.1.3.2. Contour trenching

Contour trenches[9] are a simple, low-cost method of checking the velocity of runoff in the ridge area of any watershed. For effective results, the continuous contour trenches are alternatively designed as 'staggered trench'. The objective of the staggered contour trenching is to trap as much surface run-off as possible and thus checking soil erosion. This will ultimately lead to moisture retention in the soil which will consequently help in better growth of adjacent plants.

6.1.3.3. Drainage-line treatment with vegetative protection

The objective of drainage line treatment is to reduce the erosive velocity of surface run off by flattening the steep gradient of the gullies (drainage lines) in order to prevent cutting of banks of drainage lines. This treatment involves construction of a series of barriers (commonly known as check dams) from top to bottom which transform the longitudinal gradient into a series of steps with low risers and long flat treads. The drainage line treatment under the Project will broadly cover (i) vegetative protection (discussed below) and (ii) the civil structure-based protection (discussed in section 6.1.4)

Vegetative protection involves protection of the bank through high density plantation and creating vegetative barrier in the drainage line.

[9] A contour trench is a trench dug along a contour line A contour line is an imaginary line that joins together points of the same elevation.

High density tree plantation will be done to protect the land on both sides of drainage line. Traditionally, forests areas, when declared as community reserves, are regulated by the traditional institutions who can permit or prohibit certain actives in the area to ensure conservation of community reserves. It is suggested that the 500 meters of land on either side of the river (Umiew/Ganol) and their major tributaries and 200 meters of land on either side of minor tributaries/rivulets are declared as community reserves where mining of sand and stone is disallowed and the area is planted with high density bamboo plantations or other fast growing species (1600 plats/ha.). This will serve as natural screen for garbage from habitations and will reduce soil erosion along the riverbanks. Bamboo are extensively grown and used in both the catchments.

Figure 34 Bamboo on farm boundaries in Umiew catchment

Vegetative Check Barriers: These types of check dams are provided in small and medium gullies having side slope less than 45 degree. Wooden poles of local species (preferably capable of sprouting) are driven into ground in a single or double row across the gully (drainage line) and brushwood is packed on the upstream face of the check barriers.

6.1.4. Drainage line treatment with civil structures

The Water Resource Department (WRD) has prepared a proposal for protection of river bank in Umiew catchment. Similarly, they have made preliminary estimate of river-bank protection works for Ganol river and its tributaries. They will construct civil structure along the rivers such as boulder filled wire crate gabion retaining walls in vulnerable areas, bank revetment and stone masonry retaining wall etc. At the upper reaches of gullies (drainage lines) having width 2-3 metres, where surface run-off is high and cannot be adequately controlled by vegetation alone, dry stone check barriers, cement concrete check barriers, crate wire check barriers will be used for retention of debris in gullies (drainage lines) receiving relatively large quantities of runoff. All these structures will also be reinforced with vegetative measures.

Figure 35 Stone retaining wall with plantations along the riverbank

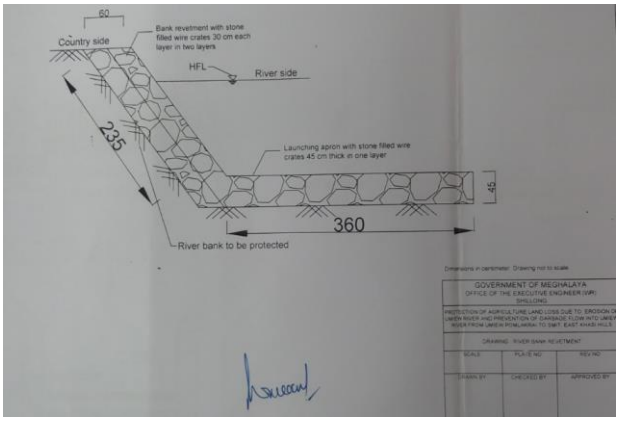


Figure 36 Bank revetment

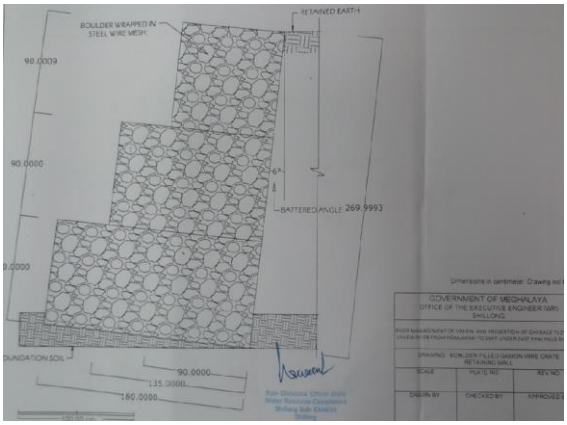


Figure 37 Boulder filled wire gabion crate retaining wall

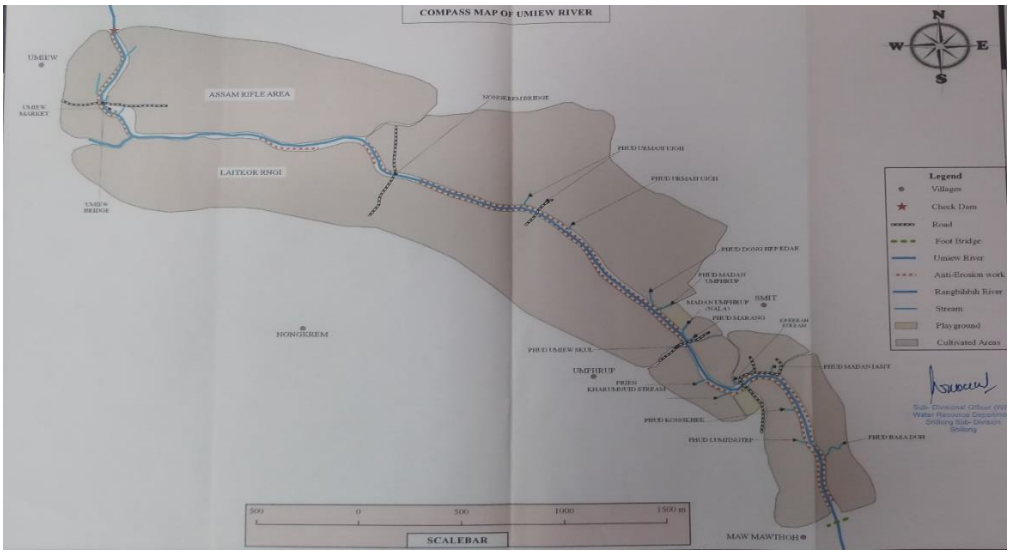


Figure 38 Anti erosion works planned along river Umiew

6.1.5. Fire management in fire vulnerable forest areas

Another key area where community cooperation is needed is the prevention of forest fires. Forest fires adversely affect the regeneration capacity of young forests stands and result in early dying of older stands. It not only destroys forest ecosystems but also affect the supply of NTFPs thus decreasing livelihood resources of forest-dependent communities.

Some of the important considerations in forest fires as per the study conducted by N S Rathore[10] are:

- Forest ownership structure plays a critical role in ability of any owner to prevent, control and manage forest fire. Forests under the individual ownership, without enough resources, incentive, ability to protect forests or any social pressure to manage their forest, are most vulnerable to fires. Fire incidence are observed mostly on individually owned forests in Meghalaya.

[10] Forest Fire Management in Meghalaya: Community Perception Survey Report by N S Rathore, 2017

- Forest owned by multiple villages are neglected due to "tragedy of commons" unless there is a mechanism to bring them together on a common platform for common good. Formation of Village Fire Control Committees (VFCC) is a good example of how the Forest Department, with almost no ownership of forest resources, can still play a positive role in bringing communities together to protect community owned forests.
- Religious values associated with forests (sacred grooves) are the most important driver for the communities to protect their forests followed by need of forests as a water resource.
- Strong and enforceable rules of forest management framed by the communities (clan forests in Khasi Hills and Community Reserves in Garo Hills) are an important factor in success of fire management. Awareness generation amongst traditional institutions and traditional leaders is more important than general awareness amongst forest dependent communities.
- Forest Department of the Government of Meghalaya has adapted and contextualised its strategies to deal with various communities in different regions. In Garo hills they have provided incentives to communities to designate their "village forests" as "community reserves" while in Khasi hills they are actively involved with the communities, through awareness generation programmes, for introduction of mixed broad leaf species which are more fire resistant as compared to pines.
- Community leadership from different self-governance systems (Himas in Mawphlang) can also be brought together under common agenda / project (REDD+) provided there is a strong binding institutional arrangement.
- Fire management is more about fire prevention through social interventions rather than control of fires through technical means.
- It is important to equip fire control agencies / institutions with tools and equipment to control fire. Although satellite information on forest fires is fed to the Forest Department on real time basis, they, with limited human and capital resource, can hardly do anything to control fires unless communities come forward to help in whatever limited manner they can.
- Communities are the most effective tool of fire management as Meghalaya, as compared to other State where forests are owned by Government.
- Fire resistant broad leaf tree species need to be introduced in the forests that are vulnerable to forest fires. Green barrier is as effective a tool of fire management as fire lines and controlled burning.
- A sizable population practices *Jhum cultivation* and *bun*[11] *cultivation*. Here, small fires, if not managed properly, result into large uncontrolled fires in nearby forest areas. Additionally, charcoal making, and unattended burning of waste increase the risk of a fire breakout in forest areas. But the biggest cause is intentional and accidental burning of forests by man.
- Forest Department has identified and mapped fire prone areas in the State and the area where fire has occurred consecutively for last five years. They conduct awareness programmes and engage fire watchers during fire season (winters) besides undertaking fire protection works such as creation of fire lines, controlled burning, display of posters and imposition of section 144 CPC by district magistrate and encouraging village communities to take up preventive measures.
- It is reported that Forest and Environment Department (FED) personnel are ill-equipped to identify and fight fires in terms of their mobility and firefighting equipment. There lot

[11] Dry organic matter is spread over the field, covered with a thin layer of soil and burnt to improve soil fertility.

of scope for coordination between the FED and Various District Councils to plan and manage forest fires.

The project will support various activities that will help effective control and management of fires in the project villages. These activities will broadly target toward preventing the fire and its spread, incentivizing the fire management system at village level and capacity building through awareness and education programs. Thus, following activities will be undertaken under project:

i. Fire management activities to reduce the risk of spread of fire by:

- removing the potential fuels from the forest floor, like removal of pine needles
- fire line management
- deployment of fire watchers at micro-watershed in peak fire seasons
- ensure better coordination and networking of field team by providing tele-communication allowances to the watchers
- maintenance of forest ponds / waterbodies so that to increase water storage which will be used in controlling the fire in extreme cases.

ii. Community Incentives

After the plantation work, those villages which will successfully tackle dry season fire incidences in and around their area, will be awarded with a "no-fire monetary bonus". The mechanism and criteria to identify the villages, bonus amount, etc will be detailed out in Community Operation Manual (COM).

iii. Mass awareness and education program

Forest fires have the potential to cause losses of property and resources. Fire prevention and management education to different stakeholders is important for the project area. Some of the proposed activities in the project will include:

- Distribute fire safety videos to communities.
- Media (social as well as print and electronic) campaigns
- Printed materials, including general information handouts, bulletins and brochures on fire management will be distributed in Panchayats, schools, and other community places.
- Sign boards in strategically important location
- Conduct fire management training programs for different stakeholders
- Organize street plays and rallies on fire prevention and control themes

The Government of Meghalaya is setting up a fire danger rating system (FDRS), in collaboration with Forest Research Institute (FRI) Dehradun, as an early warning system to give warning well in advance about enabling conditions that could trigger fire events. Factors influencing fire danger may include weather, forest floor condition, soil moisture and topography. The FDRS quantifies different aspects of fire behaviour, for example, how fast fires are likely to spread, how intensely they may burn under current conditions, and how difficult they may be to control. The project will collaborate with Meghalaya Forest Department to introduce FDRS in Ganol and Umiew catchments.

6.1.6. Water quality monitoring systems

The project, by improving the micro-watershed areas, will ultimately help in generating water benefits in 114 (no.) village in two catchments and dependent townships. It is important, therefore, to understand these water benefits in a rigorous way in order to provide essential inputs to policy and decision makers. To achieve this, project will undertake two major initiatives:

- Water quality monitoring in project streams
- Hydrological modelling the effectiveness of different project interventions in watershed areas

a. **Water quality monitoring:** Project will establish monitoring stations in ten locations of the project area (5 in each catchment). These locations will be used to monitor water quality, silt content, chemical and pathogen content vis-à-vis weather conditions. For the monitoring purpose adequate number of project personnel will be trained in recording the data, periodically.

b. **Hydrological Modelling:** Project will study the changes in land use and land cover in watershed areas and various S&WC works like drainage line treatment, check dams, contour trenches etc, undertaken in the project. It will also fit-in rainfall, topographic, soil and geological data and information in the model. The real-time data from ten monitoring stations will also be used to study the correlation of investments with improvement in water regime in the catchments. The main purpose of developing this model is to understand the key effects of different interventions on water flow in streams and drainage systems in different seasons. This will also be helpful to the state while designing future watershed interventions.

Because both monitoring and modelling are highly technical and scientific works, project will identify and engage a competent organization of national repute to design and implement these aspects. The organization will also train the project team to collect and analyse data from monitoring stations in order to draw scientific conclusions.

6.1.7. Development of critical community infrastructure

In order to manage forests, communities will need critical infrastructure such as pathways, ropeways and roads for last mile connectivity. These infrastructure requirements will be financed under the project to respective Public Works Departments (PWD) in EKH and WGH districts. The PWD of WGH has already given preliminary estimate of constructing a road from Durakalakgre junction to Sakalgre via Baladinggre for Rs. 3.182 crore.

6.1.8. Spring source development

According to MINR, 78% of total number of villages in Meghalaya depend on springs as main source of water for household and irrigation purposes. According to the estimates, the State has over 60,000 springs. MINR has estimated that 54% of the springs have either dried or water discharge from them has significantly reduced. Therefore, there is an urgent need to rehabilitate the depleting these natural sources of water i.e. the springs. Under this activity, civil structure (spring chambers) of existing springs sources will be developed or renovated for effective use of spring waters for various domestic, livestock and even to some extent the agriculture uses. In addition, it will be essential to protect and enrich approx. 0.5 ha of area on the upstream side of the natural source with vegetative cover (trees and grasses) as discussed in sections above. The planting model will be site specific. The selection of any spring will be

made such that it caters to maximum number of people, has potential for higher water yield and is accessible to the community.

6.1.9. Promoting innovative NRM models

During community consultation some alternatives for people engaged in sand mining ware suggested such as construction bricks, use of silt for soil improvement in the fields etc. Besides, natural resource management practice is integral aspect of ethnic communities. While, often these practices are relevant to the specific sets of enabling environment, it is important to understand the basic principles on which these practices work; their potential of replication or scaling-up in other regions of similar agro-climatic situations with distinct community and governance set-ups. Of these practices only few qualifies to term as best practice.

Project aims to adopt some of these opportunities and best practices for the benefits of the communities. The project will identify and document these practices based on need and applicability in the project area, some of those practices will be executed. The project will also converge with Innovation Fund created by the Government of Meghalaya under CLLMP to test and promote some innovative ideas of grassroot origin on different aspects of natural resources.

6.2. Component 2: Livelihoods improvement of vulnerable communities

As discussed earlier, Umiew catchment (EKH) faces issues related to bun-cultivation, deforestation, sand mining, discharge of waste into river system and siltation of Mawaphlang dam while people in Ganol catchment (WGH) are concerned about loss of income and productivity related to shifting cultivation, drying of steams and springs and pollution of streams. All these factors impact livelihoods of the people living in these catchments.

The upper part of Umiew Catchment supports agriculture and allied activities and lower catchment support degraded forest. The situation in Ganol is completely reverse as the upper catchment supports (degraded) forests and lower part supports agriculture and allied activities. Villages in both the catchments face water shortage in winters (dry season). This is primarily due high intensity rainfall in short period with communities having no capacity to store water when traditional sources of water are drying up. Other factors of low productivity and low income are absence of water budgeting, limited adoption of evidence- based climate resilient technologies for conserving water, limited access to knowledge, finance and markets especially for women producers.

This component deals with improving livelihood of the poor and vulnerable communities which are dependent on natural resources and agriculture for their sustenance though

- Community consultation on Meghalaya Protection of Catchment Areas Act (MPCAA) 1990 for declaration of both catchments as critical under the Act.
- Regulating discharge of sewage water and garbage into the river
- Development of village water security plans
- Promoting sustainable agriculture
    - Adoption of Sloping Agriculture Land Technology (SALT)
    - Management of shifting cultivation
    - Promotion of climate smart extension services for efficient utilisation of water
- Improving livelihood activities such as horticulture, generation and optimisation of bio-mass based energy, processing and marketing of products of medicinal and aromatic plants promoted under Meghalaya Aroma mission etc.
- Introduction of Payment of Environmental Services (PES) for incentivising sustainable practices
- Establish systems for O&M funds with provision of matching grant for sustainability of assets created from project funds or convergence funds

6.2.1. Community consultation under MPCAA 1990

Many environmentally unstainable economic activities (e.g. sand mining) are rampant in Meghalaya in general and Umiew and Ganol catchment in particular, because of poor understanding and implementation of appropriate regulations with respect to protection of catchment. One such regulation MPCAA-1990. Regulatory provision of this Act can only be imposed after any catchment is declared as "*Critical Catchments under the Act*" if it supplies water to habitations and preservation of that catchment is so vital for the life and health of the community.

The project will make efforts to get both Umiew and Ganol catchments declared as *Critical Catchments* since they supply water to habitations (SUA and TUA) and preservation of these catchments is so vital for the life and health of the community. Community consultation with the stakeholder will be held and Catchment Area Regulatory Board will be activated to review

the progress made in implementation of the decision taken with respect to catchment area development plans. Procedure for implementation of the catchment area development plan will be as under:

- Catchment area development plan is prepared by the Catchment Management Committee in consultation with the stakeholders. It will be sum of all micro-watershed development activities and additional activities that go beyond any watershed in a particular catchment.
- The plan is discussed with the community and landowners. Negotiations are held with the landowners and their consent is taken in writing so that the terms and conditions of implementation of the plan are binding on signatory parties.
- The catchment area investment plan (Catchment Management Plan) will have to be approved by the Meghalaya Catchment Area Advisory Board constituted under the Act. The Board is empowered to recommend appropriate methods for management of catchment areas vis-à-vis the activities customarily practiced in such areas. They will also approve the basis, term and conditions of the agreement to be made with the landowners, after negotiations with them, and decision on any payment (to be made by the GoM) if called for, for the tress and other cultivation but not for the land.
- Based on the recommendation of the Board and the consent received from the landowners, the Government of Meghalaya will declare the area to be a critical catchment area through a notification. This notification will empower the Government to take such measures as it deems necessary for protection of the catchment including regulating therein by the communities (CMC, WMC):
    - The felling of trees, destruction or clearance of groves, bushes or any vegetation cover;
    - *Jhumming* or cultivation or use of any insecticides or pesticides
    - Quarrying of sand or stone;
    - Excavation of earth
    - Carrying of any activity which in the opinion is likely to damage the springs, streams rivulets or water sources in the area

6.2.2. Regulating discharge of sewage water and garbage in rivers

The PHED department can set up quality parameters for discharge of any used-water from habitations into the river system. All the habitations specially the market owners (smith market in Umiew and Rongram in Ganol catchment) and settlements (e.g. camp of Assam Rifles in Umiew catchment) must be asked to set up sewage treatment plants (STPs) and ensure that un-treated liquid or solid waste is not discharged into the river system. These STPs can be put by the concerned agencies under the project with technical assistance from PHED. Water monitoring stations will be installed under the project to monitor quality of the water released into the river. Water Resources Department will set up garbage screen along the river system under the project for control of discharge from Smit in Umiew Catchment and Rongram Market in Ganol catchment.

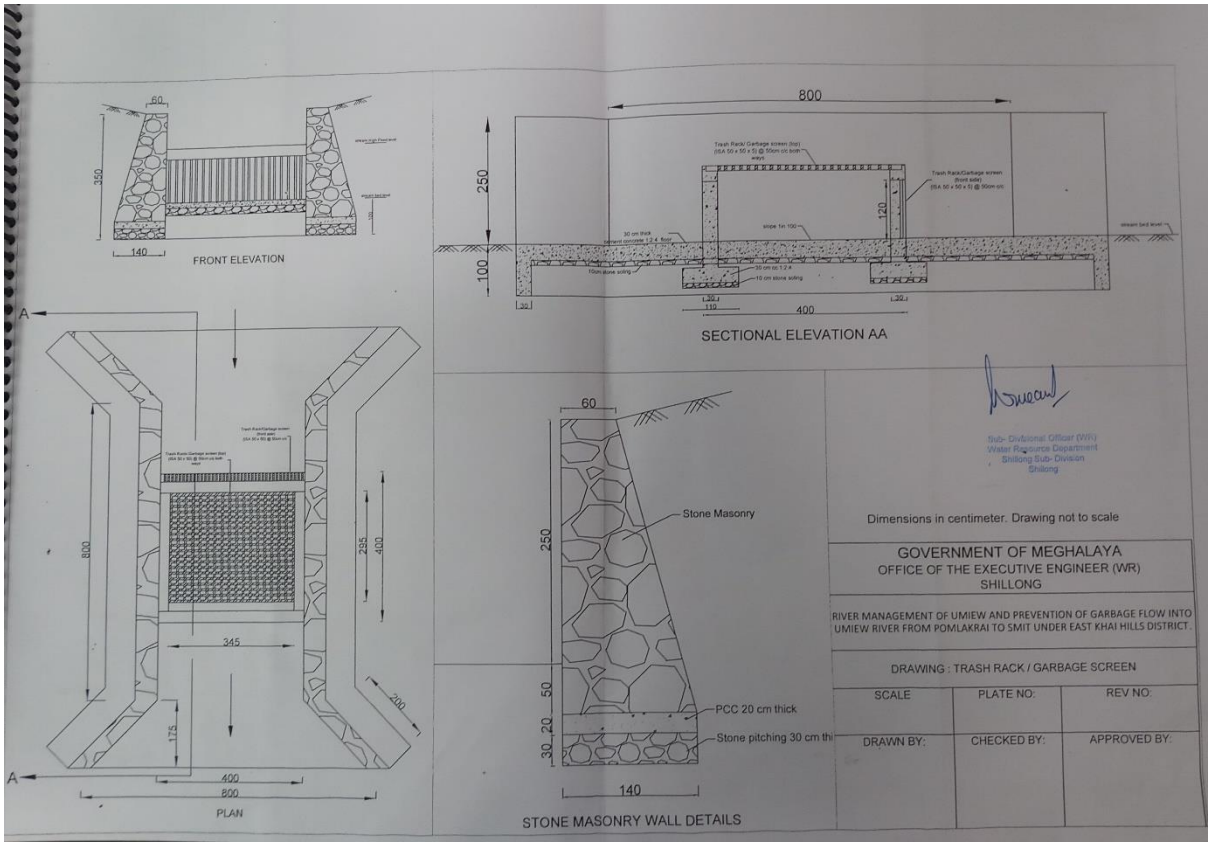


Figure 39 Prevention of garbage flow in Umiew river through garbage screen (design by WRD)

6.2.3. Regulating sand and stone mining activity

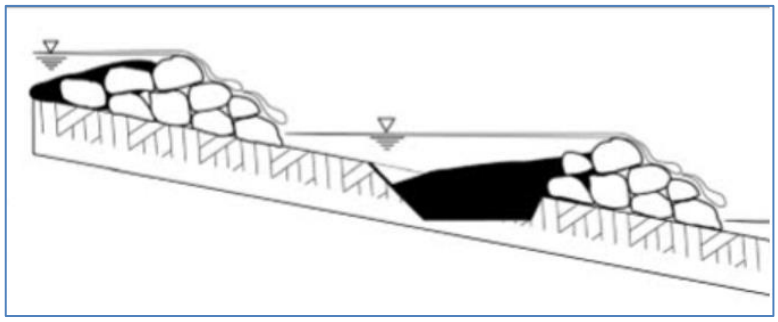


Figure 41 Multiple silt traps along the slope on the periphery of mining area

It is proposed under component 1 to set up community forest reserves, wherever possible, for 500m on either side of main rivers (Umiew and Ganol) and 200m on either side of rivulets (tributaries). The communities, particularly the traditional institutions and Water Resource Committees/ Catchment Management Committees are expected to minimize mining within community reserves. The project, on critical sites will provide partial assistance in construction of silt barrier / sediment trap/ check dams for collection of silt (after the sand is washed) and undertake multi-layer filtration of slurry before water it is disposed-off into the river systems. Communities will ensure that silt from these barriers is regularly removed by the mining

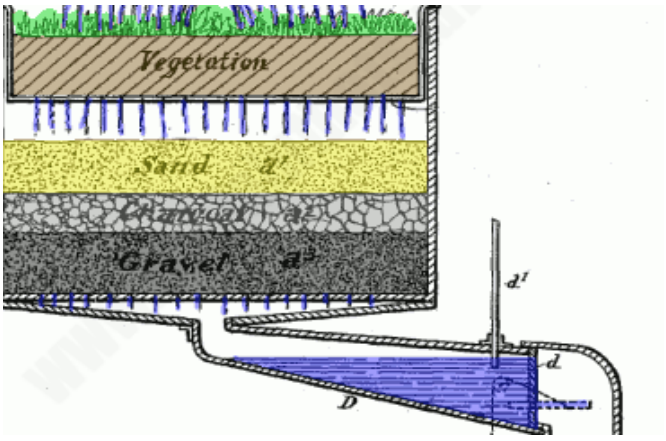


Figure 40 Water filtration before releasing in river system

enterprises and is disposed in an appropriately manner such that it does not enter the river system.

6.2.4. Water augmentation through water harvesting structures

MWPs will consider crop-water-budgets in consultation with the Department of Water Resources, Department of Soil and Water Conservation and Department of Agriculture. Water usage will be accordingly prioritised. The project will improve the water availability to local people by adopting following broad approaches:

- Mapping and identification of critical water sources based on their seasonality and dependence of the community;
- Creating water harvesting and storage systems (construction of new ponds and renovation of old ponds, check dams, sub-surface dykes/ sump wells);
- Improving water-use efficiency (under convergence – to be financed by the GoM)

Depending upon local geo-physical and climatic conditions, suitable water-harvesting and storage systems will be created in each village. While the detailed planning of water harvesting, storage and distribution infrastructures for each village will part of micro-watershed development plans, at broader level, following set of interventions will be adopted:

(i) **Construction of new ponds and renovation of old ponds:** The objective of constructing/ renovation of water ponds is to harvest the surface run off for making the harvested water available for agriculture, the wildlife, cattle and general-purpose use by the communities. In addition, these ponds will improve the water regime of the area. These will be constructed by excavating earth and forming embankments with stone lining to harvest rainwater. An approach path with stone pitching is provided in these ponds for the animals (cattle and wildlife). The size of these ponds will depend upon the catchment area and the space available.

(ii) **Check dams:** These are small gravity check dams (having height not more than 6 m) and are generally constructed in the areas down below near to the agricultural fields to store rainwater for the primary purpose of irrigation. Depending upon the site conditions and the local availability of construction material, these can be constructed in stone masonry, cement concrete or earth.

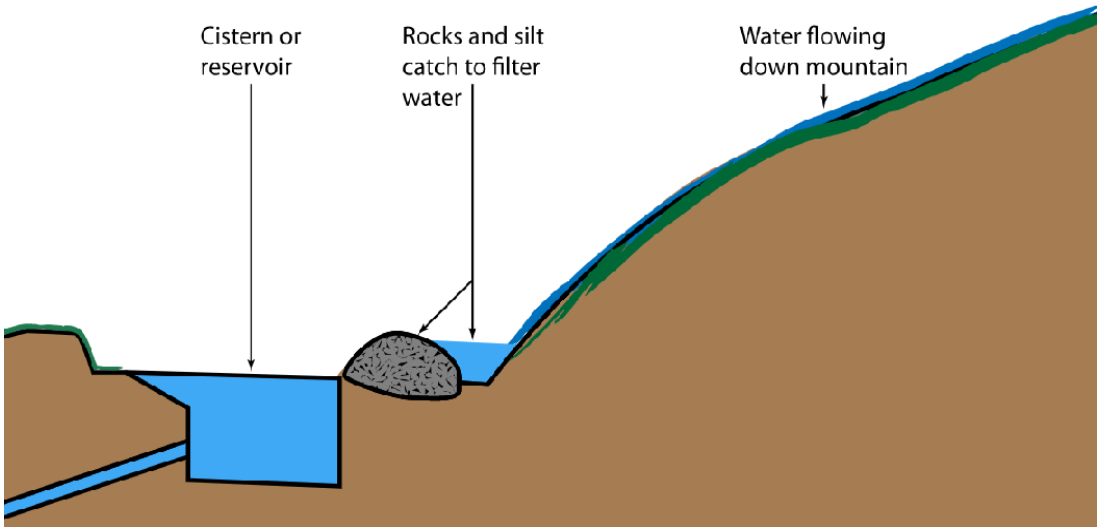


Figure 42 Check dam for irrigation and silt collection

(iii) **Sub-surface dykes/ sump well:** The objective of these intake structures is to harvest sub-surface flow for the purpose of making it available for irrigation. These are constructed at locations where river-beds are generally sandy and an impervious layer lies at a small depth. Harvesting of sub surface flow is done by construction of a head wall across the stream/ drainage line/ nallah up to the impervious layer of the bed and a water collection chamber with filters and wing walls. Selection of type of structures to be constructed will depend upon the site conditions. These are generally constructed in perforated stone masonry surrounded by filters.

6.2.5. Supporting activities by the GoM under convergence

While the project intervention will enhance availability of water through investments in component 1 and 2 the Government of Meghalaya will finance following activities from various state and centrally sponsored schemes for ensuring efficient utilisation of water.

Primary water distribution (pipes and pumps): This activity comprises of distribution of water from the primary water harvesting structure (financed under the project) to a secondary water storage structure in villages through installation of pumps and pipelines.

Secondary water storage (tanks), water distribution to field (pipes and canals) and enhanced water use efficiency (e.g. sprinklers): As a next step, GoM will finance secondary water storage and distribution infrastructure to cater to arable areas. This will cover new community tanks, renovation of old community tanks, roof rainwater harvesting tank, irrigation channels etc. Creation of secondary storage structure of water near culturable lands will ensure irrigation at required time in a crop cycle. Further sprinklers, drip irrigation systems and climate resilient technologies under convergence with GoM and Central Government schemes will be made available.

6.2.6. Sustainable agriculture

This sub-component is meant for agricultural land (bun cultivation), shifting cultivation lands and culturable wastelands with less than 30% slopes which are lying idle and get exposed to torrential rains. Bun cultivation with tilling along the slopes in Umiew Catchment and short cycle Shifting cultivation within Ganol catchments are two of the most unsustainable agriculture practices. It is proposed to address concerns related to these practices by Sloping Agriculture Land Technology, management of shifting cultivation, agro-horticulture and provision of climate smart extension services.

6.2.6.1. Sloping Land Agriculture Technology (SALT)

SALT[12] is low cost technique of upland farming which is used for overcoming concerns of land degradation and soil erosion besides increasing yield and food security. It combines reforestation, terracing, multiple cropping and cover cropping along the contours. Field crops (cereals, legumes, potato, melon, pine apple, castor beans), permanent crops (coffee, citrus and smaller fruit frees) and nitrogen fixing trees are grown in alternate 3-5m rows along the contours. Steps involved in SALT are

12 http://www.agrowingculture.org/a-review-of-sloped-agricultural-land-technology-salt/
https://www.slideshare.net/santoshpathak817/sloping-agriculture-land-technology

- Draw contour lines spaced 4-6 meter on steep slopes and 7-10 m in gradual slopes such that land between each contour line forms a strip.
- Plant 2-3 hedge rows (0.5m apart) of nitrogen fixing trees (e.g. *Leucaena leucocephela, Gliricidia, Acacia etc.*) in every third strip along the contour. Natural terraces can be formed by stacking of stones, twigs etc between nitrogen fixing trees which will ultimately develop into natural terraces.
- (figure 43)
- Plant permanent crops (banana, citrus after spot clearing and ring weeding) next to the rows of nitrogen fixing trees. Short permanent crops are planted on top of the hills while tall permanent crops are planted on the bottom of the hill to avoid shading for other crops.
- Short-term crops can be planted in the strips next to the strip of permanent crops once the nitrogen fixing plants are grown up. This can be done by ploughing the strip along the contour lines.
- Do pruning of nitrogen fixing trees periodically and use leaves and twigs as organic fertilizer for crops.
- Practice crop rotation. Plant grains (corn, upland rice, sorghum etc.), tubers (cassava etc.) and other crops (pineapple, beans) on strips where legumes were earlier planted and vice versa.
- Variation in the vegetation can be done to meet varied objectives such as supply of fodder, timber, fuelwood etc.

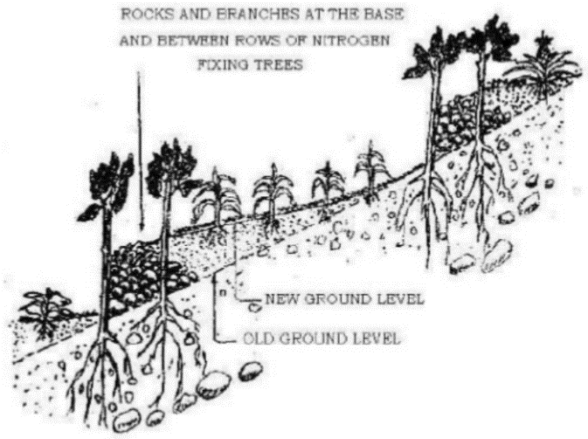


Figure 43 Formation of natural terraces

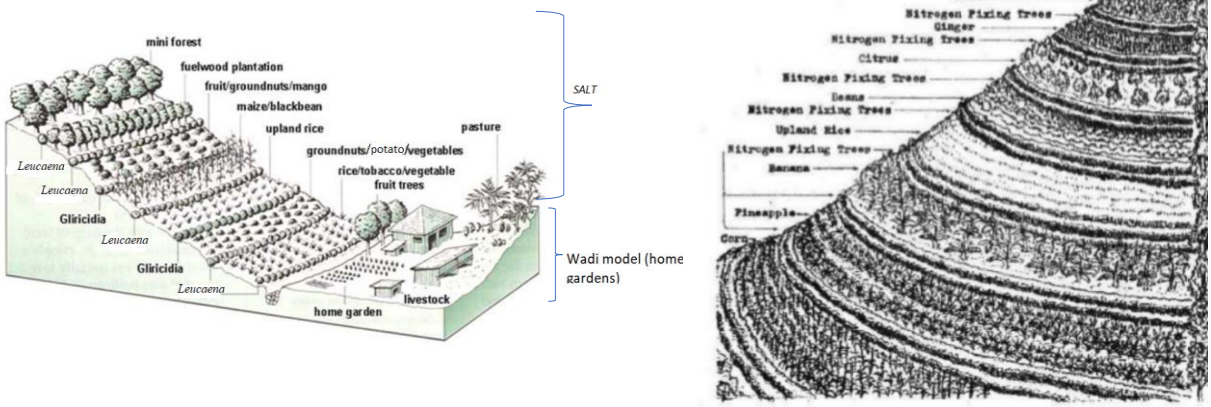


Figure 44 Sloping Agriculture Land Technology (SALT)

Plantation of permanent crops (horticulture and forestry) with nitrogen fixing trees will be financed under the project. Farming on the strips for agricultural activities will be done and financed by the farmers themselves.

6.2.6.2. Management of shifting cultivation areas

The whole approach of managing shifting cultivation areas should be to build upon traditional wisdom, technology, knowledge base through modern scientific inputs, value systems with

which the people could identify and therefore participate effectively in the developmental process. Initially, in some shifting cultivators may not adopt SALT techniques fully. Here communities can be pursued to pick and choose parts of SALT, as appropriate to them, for management of shifting cultivation areas keeping in mind following issues:

a. Shifting cultivation areas can be promoted to be special community conserved areas where traditional and sustainable practices can grow and prosper simultaneously for the wellbeing of the community members.
b. Both Umiew and Ganol catchment have very high percentage (90-95%) of tribal population. Tribal populations are still very dependent on forests for food and nutritional security. So special focus must be placed on forests-based foods and resources.
c. Transfer of knowledge from one tribe to another can be considered as one of the pathways. For example, exchange of seeds of indigenous rice varieties can help people overcome vagaries of climate change. There is a great potential for marketing jhum rice as an organic product, both in India and abroad, but it will require high skills and consistent effort in marketing.
d. Strengthen agroforestry component of the shifting agriculture system using locally acceptable species such as the Nepalese alder (*alnus nepalensis*), improvement of valley agriculture and home gardens (wadi). Nitrogen economy of jhum can be improved by introduction of nitrogen-fixing legumes and non-legumes.
e. Provide alternative employment opportunities such as animal husbandry, handicrafts through cottage industries; processing of minor forest produce, honey collection, fisheries etc.. These activities should be promoted through convergence.
f. Regeneration of fallow after *jhumming* can be expedited by introducing fast-growing native shrubs and trees.
g. Redevelop village ecosystems through the introduction of appropriate technology to relieve drudgery and improve energy efficiency (cooking stoves, agricultural implements, biogas generation, small hydroelectric projects, etc.) under convergence.
h. Strengthen conservation measures based upon the traditional knowledge and value system with which the tribal communities can identify, e.g. the revival of the sacred grove concept based on cultural tradition, which enabled each village to have a protected forest. Only a few are now left.

6.2.7. Horticulture development

Agro-climatic condition of Meghalaya are most suited for horticulture. The project will promote horticulture activity with soil and water conservation measures on culturable wastelands and fallow lands. These activities will aim at providing livelihood activities to the people engaged in shifting cultivation and sand mining.

In order to consolidate benefits of project investment the Agriculture Department and Water Resources Department of the Government of Meghalaya will undertake investments for adoption scientific package of practices and build capacity of various stakeholders for efficient use of water. The cost of development of training modules and training of farmers on following aspects can be financed by the project.

- Soil resilience: build soil carbon, control soil loss due to erosion and enhance water holding capacity of soils, in-situ moisture conservation; agriculture residue management, Integrated Nutrient Management (INM) and periodic soil testing;

- Rainwater harvesting, storage and recycling: farm ponds, restoration of old rainwater harvesting structures in dryland/rainfed areas, percolation ponds for recharging ground water;
- Water saving technologies: sprinklers, direct sowing of rice etc.;
- Climate adapted cultivars**:** improved, early duration drought, heat and flood tolerant varieties;
- Improved cropping systems: village level seed production and linking farmers decision-making to weather based agro-advisories and contingency planning;
- Improved feed and feeding methods for livestock: Use of community lands for fodder production during droughts/floods, improved fodder/feed storage methods, feed supplements, micronutrient use to enhance adaptation to heat stress, preventive vaccination, improved shelters for reducing heat/cold stress in livestock, management of fish ponds/tanks during water scarcity and excess water

6.2.8. Project sustainability

It is important to ensure that project activities and maintenance of assets created under the project are carried out beyond the project period and the funds are made available for the same. It is proposed to establish a system of i) Payment for Environment Services (PES) for providing incentives for stakeholder engagement and ii) Operations and Maintenance Funds (O&M Fund) to cater to institutional and operational needs beyond the project period. iii) Strengthening various level of water resources councils; building strong linkages them; and gradually handing over the project management to these councils during exit stage.

6.2.8.1. Payment for Environmental Services

The project envisages maintenance of private and community land under tree cover and adoption of climate resilient agriculture to augment and maintain sustainable supply of water for Shillong and Tura cities. The project will pilot a system of payment of environmental services (PES) wherein part of the water-tariff collected from ultimate users (in cities) of water will be paid to the resources owners / communities through CMC as compensation for land-owners in upper catchment who divert their land for ensuring sustainability of water supply to these cities. Modalities of development and operations of PES will be discussed in the COM after detailed community consultation by the GoM as it requires political decision with respect to water-tariff rules and regulations.

6.2.8.2. Operations and maintenance fund

Operation and maintenance fund will be created at the level of CMU (headed by CMC) with designated bank account. All the assets created under the project will be maintained by concerned WMCs or designated village institutions (e.g. VECs) from O&M fund allocated by CMC on the basis O&M plan submitted by WMC and approved by CMC. This fund will get contribution in the following manner:

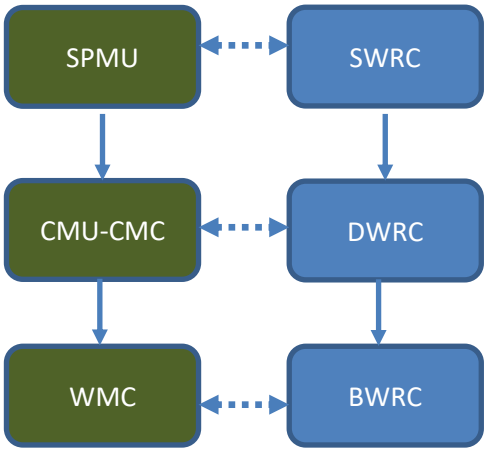
a) All individuals or water user groups using water from the primary water harvesting and storage structure will jointly deposit 10% of the cost infrastructure financed by the

project as their one-time contribution to the O&M fund. Willingness of the community to contribute to the O&M fund will be pre-requisite for making such investments.

b) Individuals and groups using water from project structure (asset) will make monthly contribution towards the O&M fund such that at inflation adjusted replacement cost of the asset is collected within life of the asset.
c) Traditional institutions and landowners who get revenue from farm level investments made by the project will make annual recurring contribution towards O&M fund equal to 5-10% of the inflation adjusted cost of investment (depending on the asset).
d) The project agencies will also use convergence funds from GoI or GoM developmental programs to top up the O&M fund.
e) Maintenance cost of any investment made under the project (requiring maintenance in subsequent years and also budgeted as part of the project cost such as for plantations 1st year planting with 4-year maintenance), will be deposited in the maintenance fund. These costs will be deemed as utilised in the year of initial investment itself for the purpose of seeking reimbursement from KfW.
f) Each WMC will prepare O&M plan for consideration and approval of CMC and release of funds.
g) The cost of operations of WMC (excluding cost of meeting WMC and village meetings) and community facilitators) will be met from the O&M fund. Maximum 5% of the annual collection of O&M fund will be used for operational expenses of WMC. This provision is to ensure that contribution to O&M funds are actively pursed by WMCs.
h) O&M fund management will be discussed in detail in the COM.

6.2.8.3. Linkages with water resource councils

The project will support establishment cost of 2 CMCs and 39 WMCs which will be linked to respective DWRCs and BWRC created as per the provision of the Meghalaya Water Policy. Since the CMC and WMC are project specific institutions, representatives of DWRC and BWRC will be appointed in the management committees at watershed and catchment level. State Project Management Unit would work closely with the State Water Resource Council.



38 community facilitators will be appointed and placed with CMUs such that they serve 3 villages each to conduct and facilitate operations related to the project. The community facilitators will mobilize communities, help in development of village water security plans and Micro-Watershed Plans, undertake hydrological monitoring, maintain accounts of investments in micro-watersheds etc. These facilitators will work closely with the BWRCs and will be employed by them after the project period.

The management of the Project will be gradually handed over to the Water Resource Councils at in the last 2 years of the project (exit stage).

6.3. Component 3: Institutional development

Institutional development will be accomplished under the project through:

a. **Linkages to water resource councils**: The project will initiate and support the process of building and strengthening self-reliant, self-managed and sustainable CMC and WMC as organic link to DWRC, BWRCs respectively for the project as per the provision of the State Water Policy, 2019.
b. **Knowledge management and communication**: The project will a develop mechanisms for the project which will constantly evolve in servicing the needs of the rural communities through the knowledge management, printing and publication, learning, monitoring, evaluation and reporting.
c. **Training and capacity building (T&C)** : The project will support T&C activities to build capacity of stakeholders to effectively manage their land resources with ecosystems approach in a participatory, transparent, and demand-driven manner. This will also nurture and develop competent staff, resource persons, and agencies with required skill and capability to identify and respond to the project specific needs of the local communities.
d. **Project Management Consultancies**: To support the project with various consultancies requirements

6.3.1. Knowledge management and communications

This subcomponent is to help implement a strategy that identifies specific audiences and develops targeted messages/ education material to increase general awareness about the project on topics such as approach, processes, expected results, performance, progress etc. This information will be constantly communicated to all the stakeholders appropriately through appropriate medium so that they are able take informed decisions. It envisages serving multiple stakeholders – the target community, community water user groups, CMC, WMC, people's representatives, line departments, local organizations etc. Development and maintenance of project website with documents, case studies, success stories and annual reports for larger outreach will also be taken up as part of knowledge management and communications.

6.3.2. Training and capacity building

Specifically, the objectives of the capacity building activities are:

- To enhance the knowledge base and skills and influence the attitudes of all stakeholders at different levels of the project implementation, so that they can work as efficient teams and perform in coordinated manner.
- To build the capacity of project staff for implementation of various project activities involving participatory approaches.

Broadly tools used for training and capacity building will be sensitization programmes, induction programmes, training on thematic areas, skill building programmes, field visits and exposure visits to other similar programmes/ projects.

Capacity Building Needs: Although project will undertake a separate training need assessment (TNA) for various stakeholders, a tentative list of capacity building needs of the various staff and project partners may include analysis of Log-frame, project orientation, investment planning, need based training on COM, project monitoring and reporting, environment and social safeguards, procurement and financial planning etc. The project will use existing training infrastructure of MBDA and district administrations.

Exposure Visits: In addition to above, key staffs and stakeholders will be sent to outside project area as exposure visits to other projects in the State, national and international exposure visits.

Seminar & conference participation and organization: The objective of seminars and events is to share and learn from others experiences on innovative, science-based knowledge, tools and approaches to improvement in ecosystem planning and implementations, promotion of climate smart agriculture, climate change and hydrology based on identified needs of the State, communities and farmers. The project will, therefore, promote cross-learning opportunities for the larger benefits of the project.

Community awards and recognition: In order to bring healthy competition amongst the implementing agencies, mainly the WMCs and traditional institutions, every year project will reward best performing entities. Project will make a jury / committee to shortlist and identify the entities for rewards. State level awards to 3 best WMCs and VWRCs/traditional institutions will be given.

6.3.3. Project Management Consultancies

MBDA / S&WC Department does not have any experience in implementing KfW projects. Though MBMA, a sister concern of MBDA, is implementing MeghaLAMP and CLLMP projects this project requires multiple skill sets specific to the project. Because of its association with projects implemented by MBMA, the MBDA has developed expertise in financial management, procurement, knowledge management, communication, monitoring and evaluation, community mobilisation and institutional development (Khasi and Garo communities) and administration but it lacks expertise on technical matters related to the project. Support from partnering institutions (line departments) on technical matters is envisaged but it being an intensive project, enough supervision and handholding support through Project Management Consultants will be required.

Almost all the land resources are owned by communities in Meghalaya, therefore, according to the Government of Meghalaya, it is important for consultants who have long experience of planning and implementing NRM projects in Meghalaya and have good knowledge of socio-economic and cultural context to deal with communities in Meghalaya.

The consultants will

- Review and endorse Annual Action Plans and Environmental and Social Risk Management documents, progress reports etc. of the project before they are submitted to KfW.
- Prepare technical and financial norms for project investments (forestry, horticulture, nursery management civil structures etc.)
- Provide support to SPMU in technical and managerial aspects of project implementation
- Assist SPMU in preparing documents for institution building, microplanning, environmental and social safeguards, and implementation of activities in the field
- Assist SPMU in reviewing, formulating and preparing various guidelines and manuals (project operations manual, procurement plan, financial manual etc.) required for the project
- Provide support to SPMU in liaising with KfW, particularly on procurement and disbursement related matters and procedures
- Assist SPMU in annual planning and report preparation in the initial years of the project

- Assist SPMU in developing training programme and its schedule
- Assist SPMU in development and implementation of ESMF
- Assist SPMU in monitoring of the project progress, as well as developing efficient and effective system of collecting data on physical and financial progress
- Assist SPMU in planning and organizing relevant national/international trainings/ exposure visits for project personnel
- Prepare annual reports of the project.

The Project Management Consultant team shall consist of one International Team Leader, and one National Teal Leader and other short-term experts. All long term and short term experts must have in-depth experience of working in Meghalaya.

Long Term Experts

- **International Team Leader**: The international team leader will be an expert in Natural Resources Management, Forestry and Environmental and Social Safeguards and will bring in international best practices in project management.
- **Deputy Team Leader (national)**: The National Team Leader should be an expert on watershed management and landscape development using SALT, agro-horticulture, soil and water conservation measures. This expert will provide support on planning and implementation of landscape activities including soil and water conservation measure, horticulture, community nurseries, protection of eco-sensitive zones, management of shifting cultivation areas
- **Full time office administrator and office manager**: A full time project administrator and office manager will be appointed to coordinate mobilization of the experts and undertake office management related tasks.

Short Term Experts

- Civil engineer with expertise in deigning of community level water-harvesting structures, drainage line treatment structures, waste management, silt barriers, soil and water conservation physical measures etc. This expert will complement S&WC Department and Water Resource Department's technical staff on all matters related to civil engineering structures in catchment area development.
- Expert on climate change adaptation: The expert will support development of climate resilient planning of livelihood activities of the target population in the catchment areas.
- Expert on monitoring and evaluation
- Expert on financial management and procurement
- Expert on social and environmental safeguards (to support Team Leader in preparation of ESMPs and ESCOPs)
- Other need-based experts such as knowledge management and communication, agribusiness, back-stopping team as per requirement

A. International Team Leader

- S(he) will have international experience and be versed in all relevant aspects of KfW programme design.
- Postgraduate university degree in a relevant field (economics, developmental economics, rural or agriculture economics, landscape management, natural resource management, forestry, agribusiness; environmental engineering);
- 10 years of wide-ranging experience in relevant field (design, evaluation, implementation) in various Externally Aided Projects (FC Projects)

- Experience in development of environmental and social safeguards documents and management of E&S risks (3 Projects)
- Specific knowledge of German Financial Cooperation (management procedures, reporting, etc.), 10 years in KfW programmes
- Experience in management and financial administration of financial cooperation programmes, 10 years of long-term assignment in FC programmes
- Experience in programme planning and design for Feasibility Studies/ supervision missions or other studies of similar complexity; 10 assignment of which 5 in NER / Meghalaya
- International work experience outside of home country (six months) and work experience in NER
- Long-term association with firms; permanent staff member of the Consultant or at least 3 years association
- Proficiency in English is mandatory.

B. National Team Leader

- Post graduate degree in soil and water management, natural resource management, agriculture, land development.
- Relevant and proven professional work experience in core area of expertise. 20 years of professional experience
- Experience in the North East Region. 5 consulting assignment in Natural Resource Management, watershed development, landscape management, livelihood promotion etc
- Long-term association with firms; permanent staff member of the Consultant or at least 3 years association
- Proficiency in English is mandatory.

Other experts

The other experts will be assessed using the qualifications as shown below:

- Postgraduate university degree in a field relevant to the position
- Relevant and proven professional work experience in core area of expertise (10 years)
- Experience in programme planning, design and implementation of projects of similar complexity;
- Long-term association with the firms: permanent staff member of the Consultant or at least 2 years association.
- Proficiency in English is mandatory.

One person may cover one or more fields of expertise. Knowledge of English language is a prerequisite for all experts.

6.4. Component 4: Project management

6.4.1. Project implementation arrangement

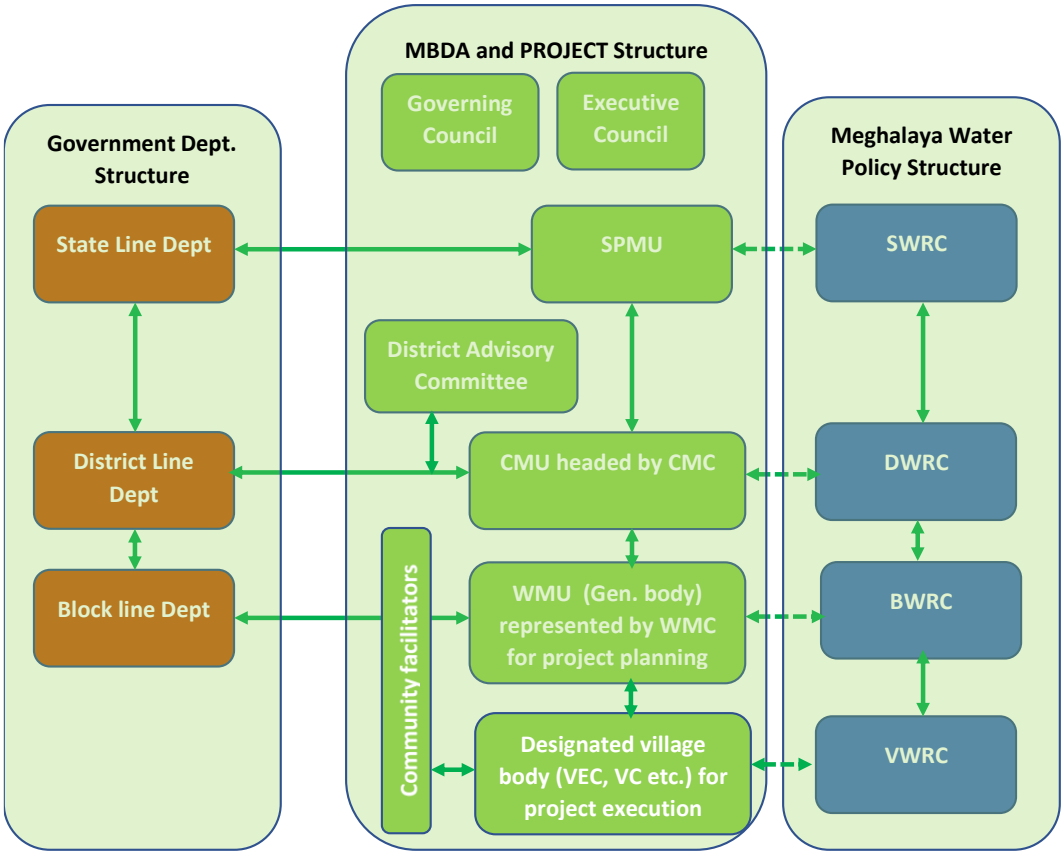


Figure 45 Project Implementation Structure

Project Executing Agency: Meghalaya Basin Development Authority, a society registered under Meghalaya Societies Registration Act 1983 will be the project executing agency (PEA) and Soil and Water Conservation Department will be the main Project Implementing Agency (PIA) where the project will be anchored. The State Project Management Unit (SPMU) for implementing the KfW Project will be located at MBDA/S&WC Department as a separate unit. MBDA will project all project management support while S&WCD will implement the project.

The Meghalaya Institute of Natural Resources (MINR), Meghalaya Institute of Governance (MIG) and Meghalaya institute of Entrepreneurship (MIE), three functional arms of MBDA will function as resource agencies to contribute in their respective area of operations viz., Natural Resource Management, Governance and Entrepreneurship respectively.

PEA will collaborate with various line departments for project implementation. The departments besides S&WC Department that have a key role are FED, WRD, PHED, Agriculture Department and the Autonomous District Councils (ADC). MBDA and the implementing agencies will work closely with Water Resource Councils at Village, Block and

District levels the custodians of land resources (traditional intuitions, ADCs, FED, private owners) to develop and implement sub-component activities.

6.4.2. Project implementation structure

6.4.2.1. State project implementation structure

State Project Management Unit
State Project Management Unit (SPMU) will be established in Shillong as a separate unit and housed within the premises of MBDA/S&WC Department for overall management, supervision and implementing the project at the State level.

The Unit will be headed by a Chief Project Director (CPD) who will be Senior Officer of the S&WC Department. S(he) will be supported by a full time Additional Project Directors (APD). APD will also be a senior officer of Soil and Water Conservation Department.

The SPMU will have several professional experts to cater to various aspects of project operations at field level viz.,

- Chief Financial Officer
- Legal expert- traditional laws & practices
- Monitoring and evaluation
- Legal expert on traditional laws and practices
- Knowledge management and communications
- Finance and procurement
- Human resource development
- General administration and logistics
- Support staff

The professional staff will be either hired from the market of will be taken on deputation from various departments. The SPMU functional departments will have Senior Managers, Managers or an Assistant Managers besides Programme Associates, Multi-Tasking Assistants as shown in the table below.

CPD and APD will be responsible for overall management and administration of the project. They will ensure physical and financial achievement of the project consistent with State laws, regulation and the terms of agreement of KfW with the Project Executing Agency / Nodal Department. They will coordinate with various agencies (FED, S&WC Department ADC and resource agencies e.g. MINRM, MIG, MIE, Bio-Diversity Board, NEHU etc.). The SPMU will also coordinate with State Water Resource Council as and when the latter is created.

Functions of SPMU

- Prepare overall project Annual Plan of Operations (APOs)
- Ensure implementation of APOs with respect to all the components (1to 4) of the project.
- Guide, supervise and monitor operations of CMUs and WMUs.
- Ensure timely and adequate availability of technical and financial support for CMUs and WMU through PMCs and line departments.
- Develop COM and active involvement of stakeholders in project planning, implementation and evaluation.

- Develop and implement a knowledge management and communication strategy for achieving the objectives of the project.
- Prepare and submit periodic MIS reports to the GoM and KfW
- Arrange training and capacity building programmes for stakeholders
- Ensure convergence of the project with other developmental programs of the State
- Maintain all records for physical and financial transaction of the project.

Staffing of SPMU

State Project Management Unit (SPMU)	Govt. Staff			Hired From the Market							
	CPD	APD	DPD/GM	CFO	Sr. Mgr	Mgr.	AM	Prog Ast.	MTA	Driver	Maint.
Project Management											
O/o Project Director - Full time on deputation to project	1	1						1		1	
CFO				1							
Monitoring and Evaluation					1	1		1	1	1	
Legal Expert- Traditional laws & practices					1	1					
KM and communications					1	1		1			
Finance and Administration (Support Division)			1						1	1	
Finance					1	1		1			
Procurement					1		1	1			
Human resource development					1		1	1			
General Administration					1		1	1			
Support Staff											4
Sub Total	1	1	1	1	7	4	3	7	2	3	4
Total excluding Govt. Staff											31

Table 6: Staffing of SPMU

6.4.2.2. Catchment project implementation structure

At the catchment level the CMU (Catchment Management Unit) will be established. A graphical representation of CMU level implementation structure is shown below.

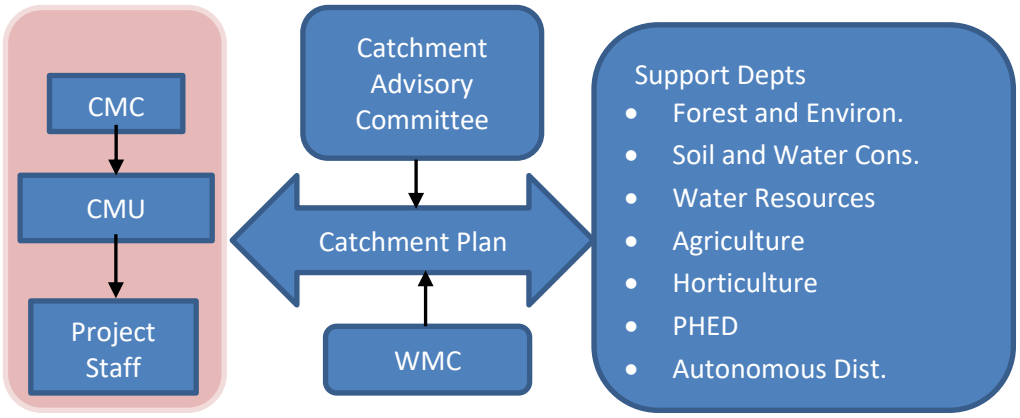


Figure 46: Catchment level implementation structure

The CMU will be headed by a senior level district officer of the S&WC Department. The CMU will work directly under the operational supervision of SPMU and CMC. The DC will appoint a Catchment Advisory Committee (CAC) with experts from various fields to provide technical inputs and recommendations on all matters related to catchment area plans. While CMC will be the stakeholder committee CAC will be the committee of select technical experts.

The CMC will take all decision with regard to CAP on the recommendations (optional) of the CAC. The CMU will be responsible for executing CAP.

Catchment Management Committee (CMC)
The District Commissioner (DC) will constitute a CMC of all the stakeholder consisting of representative of:

- Watershed Management Committees
- Line Departments (S&WC, FED, PHED, Agriculture and Horticulture, WRD, C&RD etc.)
- Autonomous District Councils and their line departments
- Traditional institutions and major landowners
- Representative of DWRC

The District Commissioner (DC) will function as ex-officio representative of District Water Resource Council (DWRC) in the CMC till the time DWRC is established and made fictional. The CMC will be chaired by the Deputy Commissioner. He will ensure coordination with various stakeholders and line departments and convergence with various State and Centrally Sponsored Schemes. The CMC will undertake following functions

- Approve APO for the catchment prepared by the CMU
- Ensure that APO considers technical recommendations of the CAC
- Ensure convergence with other developmental programs.
- Supervise and monitor performance of CMU

Catchment Management Unit (CMU)
Project implementation at catchment level will be spearheaded a Catchment Project Manager (CPM) who will be a senior district level head of the S&WC department. The CMU will work closely with the DWRC and line departments to implement the catchment management plan.

The CMU will have professional experts related to Forest Management and SALT, Agro-horticulture, S&WC and civil engineering, Finance and Administration, M&E, GIS and ICT, Social and Environmental Safeguards and support staff. These experts will be either hired from the market or personnel on deputation from the Government departments. CMU will also have community facilitators to support WMU in preparation and execution of watershed plans.

The CMU will undertake following functions:

- Act on the behalf of SPMU at catchment level
- Prepare APOs for the catchment for its approval by CMC and SPMU
- Ensure implementation of APOs within the catchment with respect to all the components (1to 4) of the project.
- Coordinate with district line department for inputs, convergence and technical advice.
- Guide supervise and monitor operations WMUs.
- Ensure timely and adequate availability of technical and financial support for WMU line departments.
- Ensure that ESMF/ CEPF is implemented through community consultation, grievance redress mechanism
- Prepare and submit periodic MIS reports to SPMU
- Organise training and capacity building programmes for stakeholders

- Maintain all records for physical and financial transaction at the catchment level.

Catchment Advisory Committee

The DC will constitute a CAC which will function as a technical working group of experts for providing guidance to the CMU on various aspects of project implementation. This body may have people government departments besides traditional knowledge holders, academia, entrepreneurs and other relevant practitioners. The CAC will meet periodically to guide project implementation and conduct independent review of CAP.

Staffing of the CMU

Catchment Management Unit	Govt. Staff			Hired from the Market							
Government Staff	DC		DPD/AGM	Sr. Mgr.	Mgr.	AM	Prog As	MTA	Driver	Maint.	VF
O/o District Project Director (DC)	1							1			
Catchment Project Manager - Full time by deputation on project			1					1			
Professional Staff											
Forest Management and SALT					1	1					
Agro-horticulture					1	1					
Soil and water conservation and civil engineer					1	1	1				
Finance and administration						1	1				
Monitoring and Evaluation					1	1					
GIS and ICT					1	1					
Social and Environmental safeguards					1	1					
Village facilitators											19
Support staff									2	2	
Sub Total	1	0	1	0	6	7	2	2	2	2	19
All catchments (2)	2	0	2	**0**	**12**	**14**	**4**	**4**	**4**	**4**	**38**
Total excluding Govt. Staff											80

Table 7: Staffing of CMUs

6.4.2.3. Watershed project implementation structure

Watershed Management Unit (WMU)

WMU will consist of all the households of a micro-watershed. There are 39 micro-wateshed in the project. They will meet every month to discuss progress made under MWP. It is the general body that will also conduct a six-monthly social audit the physical and financial progress under the project. This body will decide priorities for and approve the AOP for the watershed. Day-today functions of the watershed management will be looked after by a committee elected by WMU known as Watershed Management Committee.

Watershed Management Committee (WMC)

Watershed Management Committee (WMC) will be constituted for each micro-watershed.

This committee will have elected representative of the WMU and will executive the MWP as per the decision taken by the WMU. Based on the traditional institutional structure of the society higher level community custodians of land such as Hima/ syiem/ Nokma can also be inducted in the committee. At least 2 members from each village will be elected every year to the committee such that 50% of the members are women. The committee will have President, Secretary, Treasurer appointed annual on rotation basis from different villages. Member Secretary of the WMC will be a Government Official nominated by DC/MBDA.

The Block Water Resource Council (BWRC), formed under Meghalaya Water Policy, will be represented in each WMCs. Block Development Officer will function as ex-officio representative of BWRC in the WMC till the time BWRC is established and made functional.

The WMC will have a bank account and will be supported by CMU through Community Facilitators. The WMC will plan and allocate funds for the project activities which will executed by respective village designated bodies.

6.4.2.4. Village implementation structure

The lowest level of project planning will be WMU represented by WMC. The project activities will however be executed by designated village level bodies such as VEC, VC, VWRC or any other body designated to work on behalf of the village. The community facilitators will work closely with designated bodies / traditional institutions. Slight variation among Khasi Hills and Garo Hills areas will exist as each of these 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. Wherever appropriate the VEC may be involved to ensure convergence with various Government schemes.

Community facilitators of CMU: The community facilitators will motivate, 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 CMU and report the progress of activities conducted at all levels (villages to CMU). These individuals should be youth from the target villages. Minimum educational qualification of matriculate is required. Community facilitators shall assist in preparation of VWSP, MWP, organizing meeting, record keeping, and implementation of activities at village level.

6.4.2.5. Supporting agencies/organizations

Soil and Water Conservation Department (S&WCD): S&WCD is the major stakeholder to the project implementation as the project will be anchored within S&WCD with MBDA functioning as PEA to provide all administrative and project management support to the department. In relation to the volume of work implemented by SWCD, deputation of officer(s) from the department to SPMU and CMU needs to be considered.

Forest and Environment Department (FED): It being a catchment area development project FED will play a crucial role in project implementation at the SPMU and CMU level. They will be key resource for development of community nurseries, supply of seedlings and guiding on the technical matters related to forestry development in two catchments.

Autonomous District Councils (ADCs): Similarly, as a link between the project and community, ADCs will also have important role to play. 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.

Water Resource Department (WRD): This department is responsible for supply of water to communities for agriculture and allied activities. They will assist in planning, development and maintenance of primary and secondary water storage and distribution assets.

Public Health Engineering Department (PHED): Primary responsibility of the PHED will be to institutionalise Payment of Environmental Services to ensure sustainability of assets created under the project.

Agriculture and Horticulture Department: These departments will support climate resilient agriculture and introduction of SALT practices in the catchments.

For all the stakeholders where the project fund will be channelized from SPMU/CMU to respective office, they will be responsible in keeping records of and reporting the fund utilization to the SPMU/CMU on regular basis. Fund flow is discussed in subsequent section.

NGO and other agencies: Non-governmental organization (NGO)/ Community based organisations may be utilized, particularly in mobilization and sensitization of the communities and in preparation of various plans (water security plan, micro-watershed plan or catchment treatment plan) and monitoring of implementation of project components. Their involvement will be essential in facilitating participation of women in the project's community level organization. Cost of involvement of NGOs can be met from respective head (planning, M&E etc.)

6.4.3. Project governance

Governing Council: MBDA has a governing council vested with powers and functions of decision-making. The composition of Governing Council is as follows:

Table 8: Governing Council of MBDA

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 (KfW project)	Member (new)
12	KfW representative	Observer

Roles and responsibilities of the Governing Council: The main responsibility of the Governing Council is to review and monitor the physical and financial project progress against the annual plans. It will review the functioning of the SPMU regularly and any coordination required with other stakeholders at State level will be facilitated for smooth implementation of the project. The key roles and responsibilities of the GC will be as follows:

- Approve the Operation Manual including Financial Rules and Accounting Procedures prepared for SPMU
- Approve APO and annual budget of the project
- Monitor physical and financial progress of the project regularly
- Advise/resolve issues and problems related to fund flow from the Government of Meghalaya to the project, if any
- Facilitate convergence and coordination of project with other government departments and institutions
- Appoint an auditor to audit accounts of project
- Approve policies and guidelines on gender mainstreaming

Frequency and representation: The Governing Council 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. In case the members are not available on the day of the meeting, they may nominate senior rank officers in the department as their representatives to attend the meetings with authorization for decision making. Also, based on the agenda of the meetings, representative from non-member departments/institutions can be invited to the meeting as special invitee, if their presence is relevant to the agenda.

Quorum and agenda circulation: A minimum of 2/3rd members will form the quorum for the Governing Council meetings. Agenda of the meeting and proposals will be circulated by the Member-Secretary well in advance to all members, at least seven days ahead of the meeting date. The proceedings of the meetings will be circulated to all the members/ attendees within reasonable timeframe, after the meeting is concluded.

Executive Committee

While the Governing Council's responsibility is to look after overall management of MBDA, day to day operation of the project will be entrusted to Executive Committee created specifically for the project. The Executive Committee will ensure efficient management of the project such as quick decision making, trouble shooting, close supervision etc.

Composition for the Executive Committee 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 9: Executive committee of the project

Sl. No.	Rank of Officers and Department	Membership
1	Commissioners Planning or S&WC	Chairperson
2	Chief Project Director	Member Secretary
3	Additional Project Director	Member
4	Senior Officer of SPMU	Members
5	Director, SWCD	Member
6	Director, WRD	Member
7	Director, PHED	Member
8	ACCF, FED	Member
9	Director Agriculture	Member
10	Representative, SWRC when constituted	Member
11	Representative District WRC (GH)	Member

12	Representative District WRC (KH)	Member
13	Representative, KHADC	Member
14	Representative, GHADC	Member

Roles and responsibilities of the Executive Committee: Following will be the key roles and responsibilities of the Executive Committee:

- Oversee implementation of the project as per Operation Manual including Financial Rules and Accounting Procedures
- Ensure compliance with policies and guidelines on catchment management, E&S safeguards etc
- Decide and approve proposals on procurement of Goods & Services as required under the project
- Closely monitor the physical and financial progress of the project by organizing regular meetings with field level offices and suggest next plan of actions;
- Propose Annual Plan of Operations for approval of the Governing Council
- Approve contractual posts, remuneration, and allowances etc.
- Prepare modifications and/or changes in components/subcomponents of the project with justification, when required, and submit to Governing Council for onward submission to Nodal Department (Finance, GoM) and KFW and approval

Frequency and representation: The committee will be exclusively for the project and should meet at least once in six months. 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.

Quorum and agenda circulation: As far as possible efforts will be made that meetings are organized when all 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.

6.4.4. Monitoring and evaluation

Monitoring and Evaluation (M&E) will be conducted to validate physical, financial and institutional progress. This will also ensure efficiency and accountability in project management and use of resources by defining the roles and responsibilities of stakeholders, delineating procedures for identification of M&E indicators and describing processes for integration of findings with project implementation. Following activities will be undertaken as part of the project.

a) **Silt, water quality and weather Monitoring:** Project will install automatic silt, water quality and weather monitoring station at various location in both the catchments. The data will be periodically captured and fed into an analytical system to assess the impact of project activities on the riverine system.
b) **Use of technology for regular monitoring:** MBDA has acquired drones for monitoring of field activities. These drones will be used assess physical progress of various plantation and civil works. GIS based images and images of various stages of progress will be

captured through GPS enabled camera/ mobile phones for advisory, review, analysis, feedback mechanism.

c) **Mid-term evaluation:** The mid-term evaluation is intended to provide an independent evaluation of project interventions in 3rd years of project implementation. The main objective of the mid-term evaluation is to consolidate project outputs/outcomes and ensure sustainability. It will make recommendation for any mid-term corrections of the project.

d) **End of the Project Evaluation:** An end of the project evaluation is proposed to be conducted to assess the physical and financial achievements of the project and asses its impacts *vis-a-vis* the baseline and desired goals set forth for the project.

e) **Review by Governing Council and Executive Committee:** The Governing Council will meet every six months to review the progress of the project and take any policy initiatives whenever required. The Executive Committee will review the progress on monthly basis.

f) **Self-monitoring by community institutions:** WMC will meet every month to evaluate their progress through a community-based contextual, evolutionary/adaptive M&E system for the Project. They will also conduct social audit once in a year. A simplified mobile based technology feedback system can be used at community level to capture and feed data into the Management Information System of the PMU.

g) **Monitoring support by line departments:** The participating implementing agencies shall be directly responsible for first-level monitoring (so called self-check). The underlying monitoring system shall cover all aspects of project implementation as per the project design.

h) **Verification by CAC:** While the team of technical experts will review the project process, it proposed to have independent verification by CAC to get an unbiased verification of project activities (inputs and outputs) from the field on an annual basis through systematic stock taking and verification of assets created under the project. They will also verify the implementation of the recommendations made by the district advisory committees with respect to quality and quantity of technical components of project implementation. The results and analyses derived from systematic assessment and verification are expected to facilitate improvements of processes and ensures strict adherence to laid-down guidelines.

i) **Monitoring visit by SPMU and CMU and desk monitoring:** Officials of SPMU and CMU will visit the project area regularly and record their observation for project implementation. It is proposed that the project also adopts multiple monitoring/reporting mechanisms such as budget head wise Statements of Expenditure (with financial progress), Monthly Progress Reports (with physical progress) and Quarterly Progress Reports (with both financial and physical progress) from lowest level. An automated centralised Management Information System connected to field units will developed to avoid time consuming paper-based Management Information System (MIS).

j) **Annual review workshop:** The project will conduct annual review workshop annually. This will be combined with the review by the Governing Council. It will be attended by KFW representatives.

6.4.5. Reporting

SPMU shall report to KFW semi-annually on the progress of the project (progress report), including on the fulfilment of implementation agreements and on all developments of important and general conditions. The content and form of report shall be determined by the KFW and agreed with MBDA. In addition, MBDA shall report on all circumstances that might jeopardize the achievement of the overall objective, the Project purpose and the result.

Annual report: An annual report will be prepared to highlight the progress made under the project in all aspects of project implementation. This will consolidate finding at all levels of M&E i.e. Village level to the Governing Council level.

6.4.6. Standard financial management and fund flow

Project life: The project life is 5 years, starting from fiscal 2020-21 (Sept 2020) expected to be completed by fiscal 2025-26 (September 2025).

Physical and price contingencies: As all project interventions are on a project mode, no specific physical contingencies have been applied. Price contingencies will be applied on various items and activities once the same is finalized. Cost escalation rate of 5% is applied salaries, goods and services and for labour and material

Exchange rates: The initial exchange rate for the analysis has been set at 78 Indian Rupees (INR) to one Euro, the rate prevailing at the time of plan preparation (February 2020).

Project Cost and Loan Component

The entire cost of the Project is estimated a 40 Million Euro excluding 1 Million grant support for accompanying measures (Project Management Consultancy). Out of which 32 Million Euros the loan for the Project (hereinafter referred to as the "the Loan") to GoI who in turn will pass it on to the GoM as grant cum loan in 90:10 ration. The cost estimation is subject to the decision of Government of Germany and Government of India.

A ceiling ratio of the coverage of KfW loan over total project costs is 80% for the Special Category States, as per the policy of GOI and that there is no such ceiling ratio for any particular component under the KFW eligible financial portion

Terms and Conditions of the Loan: Terms and conditions of the loan will be decided by Government of India.

Eligible Portion and Non Eligible Portion : Eligible Portion includes catchment treatment measures, procurement of the equipment, goods, consultancy and non-consulting services, project management, training and capacity building, community level activities under component 1, 2, 3 and 4. Non eligible Portion, which should be borne by MBDA, includes the followings;

a. Purchase of land and other real property
b. Compensation
c. Good and Services Taxes and other taxes
d. Other indirect items

Counterpart Funding: Department of Finance of the State will arrange counterpart fund for Non-Eligible Portion as stated above. Department of Finance of the State will mobilize additional financial resources when KFW's contribution reaches the maximum loan amount.

Disbursement Procedure: The KFW project will follow Reimbursement Procedure

Designated Account: Government of Meghalaya will maintain a Designated Account for the Project. The GoI is responsible for foreign exchange risks and repayment of the principal and interest on the loan to KFW.

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 Euro loan

portion but also for State share. At SPMU and its field offices, exclusive bank accounts for the project will be opened.

SPMU will make request for budgetary provision to the State government based on the APO prepared by SPMU. The GoM will provide 100% funding (Central and State share) for the Project in the yearly State budget at the beginning of each financial year based on the budget estimates (APO) provided by SPMU. The budget utilization will be monitored by finance department of GoM and any additional demand for the budget during the financial year will be met through a provision by way of supplementary demand in the month of September. GoM will opened a separate budget head for the project in the State budget and a budget provision will be made.

Annual Plan of Operation (APO): SPMU will prepare APO for each financial year starting from first year, and get it approved by the Governing Council 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 acquaint field functionaries on how to draft APO at CMU and WMU.

Fund flow: Fund flow will have two channels:

a) fund for procurement and operations at respective departments/institutions, the fund will be transferred to from SPMU to CMU to these departments/institutions
b) the fund for activities implemented by designated village units will be transferred from SPMU to CMU, and then to CMU to the WMC.

Most of the activities related to soil and water conservation, forestry, watershed and spring-shed development will be implemented by respective village institutions. Only higher-level civil works related primary water storage and distribution and drainage line treatment will be done by respective line departments in consultation with WMU and CMU. The rules for timelines for release of funds and submission of utilisation certificates will be detailed in the operations manual. Fund requirement of CMU, WMC for approved activities (e.g. planning of MWP, CAP, supervision and monitoring, meetings cost) other than field operations will be met by SPMU by direct transfer to these institutions.

Fund Flow (GoM to SPMU): SPMU will receive sanction order from GoM after the annual budget is approved by GoM to draw funds from the budget into the project bank account. The payments will be made by SPMU for the following key project activities: (i) Release of grant funds to WMC as per terms and conditions stipulated in the Performance Agreement between SPMU and participating WMC; (ii) release of funds to various line departments for their agreed activities for the project as per terms and conditions stipulated in the Performance Agreement between SPMU and participating institutions / line departments and (ii) Goods, Consulting, Non-Consulting, Training and program management costs of the project. The interest earned by SPMU shall be managed as per norms of GoM.

Fund Flow and financial monitoring for community led activities: The CMU and participating WMC will open a separate bank account to receive funds under the project. APO will be prepared by WMC with the support of community facilitators which will be approved by a CMC headed by the Deputy Commissioner of the District. WMC, CMU and SPMU will also prepare their supplementary budgets for managing, supporting and supervising the Project which will be approved by the immediate higher level. The funds will be transferred from SPMU bank account into the bank account of CMU which in turn will transfer the funds to participating WMCs. The withdrawal of funds will be made by WMCs for the activities specified in the Performance agreement. The WMC will make labour payment in the bank account of person employed. There would be a proper segregation of duties on the financial management functions relating to procurement, payment and accounting among the elected members of WMC. WMC will maintain cash book/register and supporting documents for the payment made from the bank account. Such financial records will be kept for subsequent audit and verification. WMC will submit utilization certificate within one month from end of each half year ending September 30 and March 31 to CMU which will be endorsed by Deputy Commissioner and subsequently be forwarded to SPMU. The monitoring on end use of funds and compliance with the terms and conditions of the Performance Agreement will continue to be undertaken by SPMU with the support of CMU on an ongoing basis. A community implementation manual will be developed which will govern the operating procedures on use and monitoring of grant funds.

Compliance to General Finance Rules: Government departments in Meghalaya follow Meghalaya Financial Rules. To comply with the prevailing rules, an experienced finance officer will be posted to SPMU, preferably a civil servant within the State on full-time basis as Finance Officer. The Finance Officer shall be a key officer in facilitating preparation and submission of Statement of Expenditures (SOEs) to KFW 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 KFW for getting clearance on reimbursement claims in timely manner.

Administrative and Financial Manuals: MBDA has its Administrative and Financial Rules. Since the project will be spearheaded under the aegis of MBDA, the same rules will be applicable to SPMU. The rules should be reviewed, and amendments should be made in the context of the Project, if required.

Accounting Procedures: SPMU and CMUs will have exclusive bank account for the project. A bank account should be opened for WMC 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 DC office / SPMU should be one of signatories for the bank account. Accounting procedure will be unified based on double accounting system at SPMU and all its field offices.

Funds for the project will be released from SPMU to respective departments/institutions as well as to CMU on regular basis, based on APO. The fund from SPMU to CMU and then to Line Departments will be transferred to the respective Director of the department. CMU will release fund to WMCs.

The funds from the State government to SPMU, as well as its field offices, Line Departments and WMC are provided as grant-in-aid. None of the fund reserved for the project must be used

or diverted for purpose other than the project. WMCs can further disburse fund to their constituents (WUGs/ land owners/Village Councils) as grant/loan for ensuring people's participation and flow of benefits from project investment to the community concerned.

Utilization certificates and Statement of Expenditures (SOE) will be submitted from community level institution to CMU / Line Departments depending on the nature of work. The same will be submitted from CMU to SPMU on the regular basis. Preparation and submission of utilization certificates and SOE will be made on regular basis.

External audits: Transparency, particularly related to utilization of project fund, is important. The statutory audit of MBDA as per the India Companies Act is presently conducted by an external audit firm appointed by the Comptroller and Auditor General of India (CAG).

All levels of implementation bodies in the proposed project must have annual statutory financial audit conducted each year. 20% of the books of accounts ofWMC will be audited each year. Qualified chartered accountant firm (audit entity) will 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. To obtain fiduciary assurance for this project, entity audit will also cover project transactions and a separate schedule reporting financial activity of the project will be provided along with entity audit report and financial statements. The entity audit report will be shared with the KFW within nine months from the end of each fiscal year.

Internal audit: MBDA will hire full time audit officer in SPMU, at its own cost, to carry out concurrent internal audit of the Project. The internal audit will focus mainly on (i) quality of maintenance of financial records at WMCs; (ii) payment, financial reporting and procurement functions at WMCs; and, (iii) disbursement and reconciliation functions at SPMU and CMU for the community led activities. The selection of WMCs for audit will be carried in such a manner that all units are covered for internal audit during the lifetime of the project. The audit reports along with the corrective actions taken by the project to address control weaknesses will be shared with the KFW.

Responsibility of PMUs: Under the administration of Project Director, a State level Project Management Unit (SPMU) and Catchment level Project Management Unit (CMU) will be established. The SPMU will have the overall responsibility of maintaining the financial management system of the project and ensuring that these functions are carried out in accordance with the project's legal agreements. These activities will include (a) adequate annual budgetary provision and effective utilization; (b) sufficient and timely flow of funds for project activities, including for community-led program; (c) maintenance of adequate and competent financial management staff; (d) appropriate accounting of project expenditures; (e) oversight on project funds spent by WMCs and line departments as per Performance Agreement; (f) control over assets created under the project; (g) preparation and timely submission of interim financial reports; and (h) timely submission of audit reports and project financial statements to KFW. The following arrangements will govern the Project's financial management.

Finance staff and training: The finance wing of SPMU for the project is be headed by CFO-finance and supported by accounting professionals specifically recruited for the Project. Requisite finance staff will be hired at SPMU and CMU to manage accounting and financial reporting functions of the Project. Provision for staff costs have been made in the Project budget. Enough training will be provided to the finance staff on financial management, KFW disbursement policies and procedures and use of client connection website.

Financial reporting: The reporting framework for the Project will consist of an Interim Financial Report (IFR). It will provide information on the sources and uses of funds according to disbursement categories and project components (component 1, 2, 3 and 4). The IFR will be prepared by MBDA from its underlying accounting records, ledger accounts and expenditure statements generated from the accounting system. The IFR will be submitted by SPMU to KFW through Controller of Aid, Accounts and Audit (CAAA) within 45 days from the end of each calendar semester. To maintain cash flow of the project, SPMU is allowed to submit out of turn IFRs as and when substantial expenditures are incurred under the project. The IFR will form the basis of disbursement from KFW to GoI and GoM.

Public disclosure: Annual audit reports and project financial statements will be disclosed by MBDA on its official website.

6.4.7. Standard procurement management

General Procurement Objectives and Procedures

The objectives of procurement under the Project are to procure the material/goods/services/works of the specified quality, at the most competitive prices achieving value for money, in a fair, just and transparent manner; ensuring transparency, fair and equitable treatment of bidders and consultants, promoting competition and enhancing efficiency and economy in the procurement process; and ensuring highest standards of transparency, accountability and probity in the public procurement process and enhancing public confidence in public procurement. Specific procurement objectives will be:

- To achieve the Project objectives together with Value for Money [VfM], Transparency and Integrity
- Ensuring timely and efficient availability of material/goods/works/non-consulting services and consultants, and training, in line with the Procurement Plan [or the updated Procurement Plan] within budget and on time, and in compliance with the Procurement Regulation of the KfW
- Effective contract management
- Effective and efficient handling of procurement-related complaints
- Disclosure of procurement information

KFW Procurement Guideline: Procurement of goods and services to be financed out of proceeds of KfW Loans should be implemented in accordance with "Guidelines for the Procurement of Consulting Services, Works, Plant, Goods and Non- Consulting Services in Financial Cooperation with Partner Countries" (Jan 2019). The PMUs may make use of the state procurement rules, but KFW's guidelines shall overrule whenever such procurement rules are in conflict.

Project will ensure highest standard of ethics during the procurement and execution of the project and measures against corrupt and fraudulent practices. The Project will also ensure that bidders/contractors/consultants to include their bids and contract documents a letter of acknowledgement of compliance with the guidelines to declare that the contractor/consultant is eligible in accordance with the concerned guidelines.

Procurement Responsibility: The project envisages both centralized and decentralized procurement which will primarily be carried out at 3 levels, namely, the State [SPMU] level, District [CMU] level and Community [WMC] level; and will cover procurement of goods, need based consultancy services for studies and technical services, non-consulting services and minor civil works to be implemented in a demand-driven manner by the communities. Village level supply of material and labour as per APO will be procured by the WMC in line with their approved plans and following community procurement procedures as outlined in the Community Operations Manual [COM] applicable to the project.

SPMU and CMUs will have enough staff to oversee procurement operations. They will be responsible for day-to-day procurement functions [procurement planning and monitoring, coordination with decentralized procuring entities at various levels and with technical cells, reporting and coordinating with KFW, responsible for implementation of procurement risk mitigation plan, procurement capacity building under the Project, etc.]. The Deputy Director [Administration] will be responsible for providing guidance and direction to the Procurement Staff and ensuring that all procurement under the project is carried out as per agreed procedures applicable to the project.

Procurement Capacity: The staff in SPMU identified to handle procurement under the project will receive training in procurement procedures on KFW financed projects. SPMU, with KFW support as needed, will ensure that all staff handling procurement at all levels are adequately trained in KFW procurement procedures. Contract management training will also be provided by SPMU with KFW support, upon project implementation.

Procurement plan and guidelines: Procurement plan and guidelines of the project will be prepared. It is intended to guide all entities involved in procurement and community institutions to understand the procedures to be followed for procurement under the Project. In addition, a separate and simplified procurement chapter of the Community Operations Manual would also be prepared for effective and efficient procurement at the community level, in line with the principles of community procurement. Value thresholds for community will be mentioned in the Procurement Guidelines.

Community Operations Manual: The Procurement Section of the Community Operations Manual prepared by SPMU and updated from time to time will describe the roles and responsibilities, and procurement arrangements under the Project, and serve as a guide and tool for procurement functionaries for procurement implementation and contract management under the Project.

E-procurement using portal hosted by NIC: Use of e-Procurement using the NIC Portal will be appropriately introduced in line with GO FEG.25/2014 dated February 7, 2014 issued by the Finance Department of the Government of Meghalaya, to bring in greater transparency in the procurement process, as and when the project and field staff receives training and become comfortable with the system.

Procurement complaint handling mechanism: A procurement complaint handling mechanism to address any procurement related complaints received by the project, will be developed and implemented by the SPMU to the satisfaction of KFW. Upon receipt of complaints, immediate action would be initiated to acknowledge the complaint and to redress it within a reasonable timeframe. All complaints will be addressed at levels higher than the level at which the procurement process was undertaken, or the decision was taken. Any complaint received will also be forwarded to KFW for information, and the KFW would be kept informed after the complaint is redressed.

Procurement Limits, Thresholds and Review Arrangements: The project is to be implemented by SPMU, CMU and WMCs. The procurement thresholds and review arrangements will as per GoM guidelines as detailed in the procurement guidelines. All major procurement which is not covered under shopping [RFQ] method will be centralized at SPMU level and follow the prior and post review arrangements.

All contracts which are not covered under prior review by the KFW will be subject to post review during implementation support missions and/or special post review missions, including missions by consultants hired by the KFW/SPMU.

Review arrangements by MBDA: SPMU will establish internal prior review thresholds that will be reflected in the Procurement Guidelines for the Project and the Procurement chapter of the Community Operations Manual prepared by SPMU. Additionally, the terms of reference for internal auditors [Individual Consultants] hired by the SPMU for conducting the financial audit will include adequate requirement to cover review of compliance of agreed procurement procedures during project implementation.

Record keeping: All records pertaining to award of tenders/selection of consultants, including tender notification/advertisement, register pertaining to sale and receipt of bids, bid/proposal opening minutes, bid/technical and financial evaluation reports and all correspondence pertaining to bid evaluation, communication sent to/with KFW in the process, bid securities, and approval of invitation/evaluation of bids/proposals would be maintained and kept for post review by the Project.

Disclosure of Procurement Plan: The Procurement Plan and it's updates, as approved by the KFW will be disclosed on the MBDA website (as per guidelines, if required), the project website and shared with District and sub-district level agencies. Other documents that will be shared will include: specific Procurement Notice for procurement of goods, non-consulting services and works for open competitive procurement , Request for Expressions of Interest for selection/hiring of consulting services, list of contracts awarded, shortlist of consultants, contract award details of all procurement of goods and works using international/ national open competitive procurement, contract award details of all consultancy services and list of contracts/purchase orders placed following Direct Selection or CQS procedures. In addition, MBDA will also publish on its website any information required under the provisions of "*suomotu*" disclosure as specified by India's Right to Information Act.

Ex-Post Procurement Audit: Once the loan for the Project is approved by KFW, an ex-post procurement audit shall be carried out during/after the implementation stage by Comptroller and Auditor General of India in order to ensure the fairness and competitiveness of procurement procedure, in case where KFW considers it necessary.

Working areas to be included in the "Site": SPMU shall be responsible to designate and acquire working areas necessary for sound and safe implementation of the Project (i.e. construction yard, borrow pit, disposal yard, etc.). Such working areas shall be considered as a part of the Site as defined in the applicable construction contract and clearly be so indicated in the bidding documents together with all relevant Site Data.

Repackaging: Repackaging will be avoided to the extent possible since it will cause a delay in the implementation of the Project.

Minimum Age of the Construction Workers: SPMU shall observe eighteen (18) years old as minimum age for the acceptance of construction workers in reference to the Child Labour (Prohibition & Regulations) Act, 1986 and Rules 1950.

Safety of the Project: KFW's financial assistance to support development efforts of SPMU will be lasted through the completion of the Project, and maintaining the safety of workers and the general public by thorough implementation of safety measures and immediate action in the case of accident is essential requirement for achieving this goal. Therefore, Project will pay high attention to the safety measures during construction period.

SPMU will notify KFW immediately (within 24 hours at the latest) in case any fatal or important accident, involving serious injuries or damages, occurs during the implementation of the Project.

To assure the safety during the construction work of the Project, SPMU shall take the following actions;

(1) Bidding documents for procurement of works and those for procurement of supply and installation of plant require that:
   i) The safety requirements shall be in accordance with the laws and regulations in the country of the Borrower, relevant international standards (including guidelines of international organization), if any, and also in consideration of "the Guidance for the Management of Safety for Construction Works," and shall be clearly stipulated in the specification of the bidding documents;
   ii) Bidders shall furnish a safety plan establishing basic policy on the general safety management and operation for the entire works at site in accordance with the safety requirements stipulated in the bidding documents. Such a safety plan shall be updated after signing a contract as appropriate;
   iii) The personnel for key positions to be proposed by bidders shall include an accident prevention officer;
   iv) Contractor shall submit method statements of safety to SPMU and the consultants at the construction stage.

(2) The following tasks shall be duly carried out by SPMU in bidding and supervising constructions:
   i) When preparing or reviewing bidding documents for procurement of works and those for procurement of supply and installation of plant, SPMU shall make sure that the requirements stipulated in (1) above will fully be met;
   ii) During the bid evaluation, SPMU shall review the safety plans submitted by the bidders from the point of view of securing the safety during the construction;

iii)During the supervision of the construction work, SPMU shall;

- confirm the safety plan is duly updated and implemented by the contractor;
- confirm method statements for each type of work are prepared taking account of safety and duly implemented by the contractor;
- confirm any other safety requirements specified in the contract are respected by the contractor; and
- in case of necessity, instruct the contractor to make good.

Security of the Project: SPMU shall, at its own responsibility and expense (including the proceeds of the Loan, if necessary), take necessary measures to ensure and maintain the security of the Project area and the persons related to the implementation of the Project, in cooperation with relevant authorities during the Project period. Such security measures shall reasonably reflect views and needs of the Consultant/the Contractor engaging in the implementation of the Project.

SPMU will ensure that the Project area is fully controlled and secured by law enforcing authorities, and there is no security concern in the area at present. In addition, GOM and its law enforcing authorities are committed to take necessary measures to a maximum extent to maintain the security in the Project area.

7. PROJECT COSTING

7.1. Assumptions

Blocks	8
Districts	2
Villages Umiew	76
Villages Ganol	38
Micro watershed Umiew	13
Micro watershed Ganol	26
Springs Umiew	33
Springs Ganol	238
Contingency provision in Compo 1	2.61%
Annual cost escalation	5%
1 Euro= INR	84.00

7.2. Project implementation schedule

Year	Year	1	2	3	4	5	6	7
Investment schedule for land development activities		Inception	25%	25%	25%	25%	Consolidation and maintenance	

7.3. Activity-wise cost and technical norms

7.3.1. Micro-watershed planning

Rs. 250000 have been proposed as cost of preparation of each micro-watershed plan.

7.3.2. Catchment treatment plan

Umiew Catchment					
Description	Ha.	% of Geog Area	Treatment %	Treatment area (Ha.)	Treatment type
Component 1					
Dense Forest with canopy density >40%	630.60	5.47%	75.00%	472.95	Assisted natural regeneration (ANR) gap filling planting (250-400 plants /ha.)
Open forests on lands with >30% slope and with <40% canopy density	3272.41	28.38%	75.00%	2454.31	Enrichment forestry planting with fencing and S&WC Measures (1100 plants/ha.)
Rivers and tributaries	171.19	1.48%			River bank protection with civil structure
River bank (km)			8.83	883.00	Planting of bamboo and fast-growing sp. as community reserves (1600
Grasslands	2700.63	23.42%	40.00%	1080.25	Silvi – pasture: Fodder trees with grass seeding and S&WC measures (400 fodder trees/ha.)
Sub total	6774.83			4890.51	
Component 2					
Agricultural land	4494.47	38.98%	40%	1797.79	Modified SALT (on private lands = horti+silvi-agri models)
Barren land	147.48	1.28%	0%	0.00	Nothing
Culturable waste land/ scrub land with less than 30% slope	113.64	0.99%	75%	85.23	Block Horticulture plantation with soil and water conservation measures
Sub Total	4755.59			1883.02	
Total Umiew Catchment	**11530.42**	100.00%		**6773.53**	

Ganol catchment					
Description	Ha.	% of Geog Area	Treatment %	Treatment (Ha)	Treatment type
Component 1					
Dense Forest with canopy density >40%	1302.94	14.14%	50%	651.47	Assisted natural regeneration (ANR) gap-filling planting (250-400 plants /ha.)
Open forests on lands with >30% slope and with <40%	4529.25	49.15%	35%	1585.24	Enrichment forestry planting with fencing and S&WC Measures (1100
Open forest areas prone to shifting cultivation mostly			14%	634.10	Sloping Agriculture Land Technology (SALT)
River bank (km)			3.98	398.00	Planting of bamboo and fast-growing sp. as community reserves on either side of the bank (1600 plants / ha.)
Grasslands	2495.99	27.09%	40%	998.40	Silvi – pasture: Fodder trees with grass seeding and S&WC measures (400 fodder trees/ha.)
Sub total	8328.18	63.29%		4267.20	
Component 2					
Culturable waste land/ scrub land with less than 30% slope	886.38	9.62%	50%	443.19	Block Horticulture plantation with soil and water conservation measures
Sub total	886.38	9.62%		443.19	
Total Ganol Catchment	9214.56			4710.39	
GRAND Total	17542.74			**11483.92**	

7.3.3. Forestry operations (planting, maintenance and seedling)

Current cost norms of the Department of Forest and Environment, Government of Meghalaya, as per schedules of rates adopted in Jan 2019, have been taken for project estimates. The cost norms as prescribed by FED are average costs irrespective of density of plantation, land category, forest type, agro-ecological region, intensity of inputs etc. The generic cost norms as prescribed by FED are:

Year	1	2	3	4	5	INR
Plantations in Reserve/ Protected forests / Natural Forests- Cost per Ha.						
Direct Sowing/ ha.	33000	14400	14400	4200	6000	72000
Planting cost/ ha.	36000	14400	14400	4200	6000	75000
Plantation outside reserved and protected forests (other forests) - Cost per ha.						
Direct sowing with barbed wire fencing	55200	20700	17400	10500	13200	117000
Direct sowing with peripheral bunding	51000	20700	17400	10500	13200	112800
Planting with barbed wire fencing	58200	20700	17400	10500	13200	120000
Planting with peripheral bunding	54000	20700	17400	10500	13200	115800
Planting without bunding	36000	20700	17400	10500	13200	97800
Cost per seedling (poly-pot)	9.18	0.73				9.91

These costs have been taken to estimate project budget. However, actual cost of forestry operations will be based on site-specific micro-watershed plans.
It is assumed that all plantations will be done through raising of seedling in poly-pots or root-trainers through sowing or root-shoot cuttings. Direct sowing in the field will not be adopted till the seed collection methodology is standardized and testing laboratories are established in the State.

The estimation of the area available for different categories of forests (open forest, medium density forests, high density forests, cultivable wastelands, shifting cultivation land, fallow lands etc.) in selected catchment is based on discussion with various stakeholders and field visits.

It is assumed that anthropogenic pressure and intervention on open forests, fallow lands, cultivable wastelands and shifting cultivation areas is much intense for meeting immediate economic needs of the people. Therefore, these areas will be planted with species that are of economic importance such as fuel-wood, fodder, timber, fruits and NTFPs. Gap filling on high-density forests will be done with species of natural forests keeping in mind biodiversity, ecological significance and other eco-system services. Mainly broadleaved species suitable to agro-ecological conditions will be planted in these areas.

Planting density for various categories of forestry/horticulture activities is given below. Provision for casualty replacement of seedling in the 2nd and 3rd year of each plantation has been made.

Type of forests	Plants/ha.	Cost of treatment type
Open forests	1100	Planting with peripheral bunding as in other forests

Medium Density forests	800	Planting as in RF/PF
High density forests	250	Planting as in RF/PF
Horticulture plantations on cultivable wasteland	700	Planting with fencing as in other forests
River bank plantation - high density	1600	Planting without bunding as in other forests
Silvi-pasture in grasslands lands	400	Planting without bunding as in other forests

7.3.4. Soil and water conservation measures

S&WC measure will be undertaken in different categories of forests land and culturable wastelands. S&WCD has proposed cost of Rs. 50000 per ha. as the cost norm. For the purpose of investment site-specific actual costs of soil and water conservation measure will be calculated for each micro-watershed plan with the help of Soil and Water Conservation Department.

7.3.5. Community Nurseries

Communities will be encouraged to raise nurseries for meeting planting requirement of the project. Each nursery raising family will be granted Rs. 125000 as for development of a nursery space. It is expected that each nursery will raise 25000 seedlings per year which will be procured by the project at pre-determined rate.

7.3.6. Sloping agriculture land technology

SALT will be adopted mainly in the shifting cultivation areas in Ganol catchment. The project will finance only forestry and horticulture activities, but the cost of agriculture activities will be financed by the farmer.

Sloping Agriculture Land Technology	Land %	Cost per ha(average)	Rs/ ha.
Forestry on periphery (planting + seedling)	10%	123000	12300
Nitrogen fixing trees (e.g. Alder)	30%	120000	36000
Horticulture (average)	30%	190870	57261
Agriculture	30%	Farmer contribution	
Total			105561

7.3.7. Development of civil structures

Water Resources Department will prepare detailed designs and cost estimates for various water-harvesting structure and river-bank stabilization civil structure. For the purpose of budgeting MBDA has made an estimate ofRs. 250000 per village as cost of water-harvesting structures. The WRD- Shillong and WRD Tura have given estimate of river protection civil measure as Rs. 11.47 crores and Rs. 19 crores respectively. Actual cost of investment will be based on detailed sub-project plans to be submitted by them and approved by respective district advisory bodies. The PWD-Tura has given a proposal for construction of road as last mile connectivity for Rs. 318.2 lakh.

7.3.8. Salaries of professional staff

Salaries of the Government employees, who will work fulltime or part-time in the project, have not been considered as part of the project cost. Remuneration of the professionals/ support staff to be hired from the markets has been taken as per current norms of MBDA.

It is assumed that recruitment of the staff will be undertaken before the launch of the Project. An increment of 5% compounded annually has been considered as cost escalation. Any saving from delayed recruitment will be used towards higher annual increment, incentivizing the staff for better performance or recruitment of new staff which has not been envisaged at this stage.

Monthly Salaries + allowances+ PF contribution	Basic	HRA	Mobile	Govt Contri.	Total
General Manager	125000	8000	1200	16875	151075
AGM	75000	8000	1200	10125	94325
CFO/ Auditor	100000	8000	1200	13500	122700
Sr. Manager	52000	5000	1000.00	7020	65020
Manager	43000	5000	1000.00	5805	54805
Asst Manager	31000	5000	1000.00	4185	41185
Programme Associates	23000	3000	700	3105	29805
MTA	15000	3000	700	2025	20725
Village facilitators	12000				12000
Drivers	15000	3000	700	2025	20725
Maintenance Staff	15000	3000	700	2025	20725

7.3.9. Training and capacity building cost

Rates (Rs.) per Trainee

Rates	Rs./ Unit
Break fast	100
Lunch/ Dinner	350
Snacks and tea (2 times)	150
Travel (Local)	250
Writing material	200
Faculty support per trainee per day	300
Hotel (lodging and boarding)	1000

Rates (Rs.) per trainee for different training days

Particulars	Days of training programme				
	1	2	3	4	5
Breakfast	0	100	200	300	400
Lunch	350	700	1050	1400	1750
Dinner	0	350	700	1050	1400
Snacks	150	300	450	600	750
Travel	250	250	250	250	250
Writing material	200	200	200	200	200
Stay	0	1000	2000	3000	4000
Faculty (fees, lodging and boarding)	300	600	900	1200	1500
Sub Total	1250	3500	5750	8000	10250

7.4. Project Costing

7.4.1. Year wise and component wise financial plan of the project

Cost estimate of the project in Euro Million								
Component	**Yr. 1**	**Yr. 2**	**Yr. 3**	**Yr. 4**	**Yr. 5**	**Yr.6**	**Yr.7**	**Total**
1	**3.00**	**6.07**	**4.20**	**4.40**	**4.35**	**0.06**	**0.02**	**22.10**
KfW	2.40	4.86	3.36	3.52	3.48	**0.04**	**0.02**	**17.68**
GoM	0.60	1.21	0.84	0.88	0.87	**0.01**	**0.00**	**4.42**
2	**0.71**	**2.77**	**2.48**	**1.70**	**1.75**	**0.30**	**0.30**	**10.01**
KfW	0.57	2.22	1.98	1.36	1.40	**0.24**	**0.24**	**8.01**
GoM	0.14	0.55	0.50	0.34	0.35	**0.06**	**0.06**	**2.00**
3	**0.22**	**0.10**	**0.08**	**0.14**	**0.07**	**0.07**	**0.07**	**0.75**
KfW	0.18	0.08	0.06	0.11	0.05	**0.05**	**0.06**	**0.60**
GoM	0.04	0.02	0.02	0.03	0.01	**0.01**	**0.01**	**0.15**
4	**1.24**	**0.89**	**0.92**	**0.98**	**0.98**	**1.02**	**1.12**	**7.14**
KfW	1.00	0.71	0.73	0.79	0.79	**0.81**	**0.89**	**5.71**
GoM	0.25	0.18	0.18	0.20	0.20	**0.20**	**0.22**	**1.43**
Total	**5.18**	**9.83**	**7.68**	**7.22**	**7.15**	**1.44**	**1.51**	**40.00**
KfW	**4.14**	**7.87**	**6.14**	**5.77**	**5.72**	**1.15**	**1.21**	**32.00**
GoM	**1.04**	**1.97**	**1.54**	**1.44**	**1.43**	**0.29**	**0.30**	**8.00**

Table 10 Year wise component wise KfW and GoM share

10 lakh = 1 Million

Component wise year wise financial plan of the project (INR lakh)

COMP	Years																					Total		
	1			2			3			4			5			6			7					
	KfW	GoM	Total	KfW	GoM	Total	KfW	GoM	Total	KfW	GoM	Total	KfW	GoM	Total	KfW	GoM	Total	KfW	GoM	Total	KfW	GoM	Total
COMP1	2015.49	503.87	2519.36	4080.41	1020.10	5100.51	2824.75	706.19	3530.94	2955.30	738.83	3694.13	2924.92	731.23	3656.16	36.97	9.24	46.22	13.51	3.38	16.89	14851.36	3712.84	**18564.20**
Umiew	816.76	204.19	1020.95	2115.94	528.98	2644.92	1721.34	430.33	2151.67	1800.28	450.07	2250.35	1775.02	443.76	2218.78	23.27	5.82	29.09	8.21	2.05	10.26	8260.81	2065.20	10326.02
Ganol	1198.73	299.68	1498.41	1964.47	491.12	2455.59	1103.42	275.85	1379.27	1155.02	288.76	1443.78	1149.90	287.48	1437.38	13.70	3.43	17.13	5.30	1.33	6.63	6590.55	1647.64	8238.18
COMP2	475.91	118.98	594.89	1863.38	465.85	2329.23	1666.11	416.53	2082.63	1142.97	285.74	1428.71	1175.87	293.97	1469.83	200.91	50.23	251.14	200.91	50.23	251.14	6726.05	1681.51	**8407.57**
Umiew	431.71	107.93	539.64	1372.29	343.07	1715.36	1157.27	289.32	1446.59	711.50	177.88	889.38	729.58	182.39	911.97	160.61	40.15	200.76	160.61	40.15	200.76	4723.57	1180.89	5904.46
Ganol	44.20	11.05	55.25	491.10	122.77	613.87	508.84	127.21	636.04	431.46	107.87	539.33	446.29	111.57	557.86	40.30	10.08	50.38	40.30	10.08	50.38	2002.49	500.62	2503.11
COMP3	150.52	37.63	188.15	69.69	17.42	87.11	52.64	13.16	65.80	91.22	22.80	114.02	44.53	11.13	55.67	46.15	11.54	57.69	48.22	12.06	60.28	502.97	125.74	**628.71**
COMP4	835.92	208.98	1044.90	594.78	148.70	743.48	615.34	153.84	769.18	660.93	165.23	826.16	659.59	164.90	824.49	683.39	170.85	854.23	749.67	187.42	937.09	4799.62	1199.91	**5999.53**
Total	3477.83	869.46	4347.29	6608.27	1652.07	8260.33	5158.84	1289.71	6448.55	4850.41	1212.60	6063.01	4804.91	1201.23	6006.14	967.42	241.86	1209.28	1012.32	253.08	1265.40	**26880.00**	6720.00	**33600.00**

Component wise year wise financial plan of the project (Euro Million)

COMP	Years																					Total			%
	1			2			3			4			5			6			7						
	KfW	GoM	Total	KfW	GoM	Total	KfW	GoM	Total	KfW	GoM	Total	KfW	GoM	Total	KfW	GoM	Total	KfW	GoM	Total	KfW	GoM	Total	
COMP1	2.40	0.60	3.00	4.86	1.21	6.07	3.36	0.84	4.20	3.52	0.88	4.40	3.48	0.87	4.35	0.04	0.01	0.06	0.02	0.00	0.02	17.68	4.42	22.10	55.25%
Umiew	0.97	0.24	1.22	2.52	0.63	3.15	2.05	0.51	2.56	2.14	0.54	2.68	2.11	0.53	2.64	0.03	0.01	0.03	0.01	0.00	0.01	9.83	2.46	12.29	
Ganol	1.43	0.36	1.78	2.34	0.58	2.92	1.31	0.33	1.64	1.38	0.34	1.72	1.37	0.34	1.71	0.02	0.00	0.02	0.01	0.00	0.01	7.85	1.96	9.81	
COMP2	0.57	0.14	0.71	2.22	0.55	2.77	1.98	0.50	2.48	1.36	0.34	1.70	1.40	0.35	1.75	0.24	0.06	0.30	0.24	0.06	0.30	8.01	2.00	10.01	25.02%
Umiew	0.51	0.13	0.64	1.63	0.41	2.04	1.38	0.34	1.72	0.85	0.21	1.06	0.87	0.22	1.09	0.19	0.05	0.24	0.19	0.05	0.24	5.62	1.41	7.03	
Ganol	0.05	0.01	0.07	0.58	0.15	0.73	0.61	0.15	0.76	0.51	0.13	0.64	0.53	0.13	0.66	0.05	0.01	0.06	0.05	0.01	0.06	2.38	0.60	2.98	
COMP3	0.18	0.04	0.22	0.08	0.02	0.10	0.06	0.02	0.08	0.11	0.03	0.14	0.05	0.01	0.07	0.05	0.01	0.07	0.06	0.01	0.07	0.60	0.15	0.75	1.87%
COMP4	1.00	0.25	1.24	0.71	0.18	0.89	0.73	0.18	0.92	0.79	0.20	0.98	0.79	0.20	0.98	0.81	0.20	1.02	0.89	0.22	1.12	5.71	1.43	7.14	17.86%
Total	4.14	1.04	5.18	7.87	1.97	9.83	6.14	1.54	7.68	5.77	1.44	7.22	5.72	1.43	7.15	1.15	0.29	1.44	1.21	0.30	1.51	**32.00**	**8.00**	**40.0000**	100.00%
Technical Assistance (Grant)																						1.00	0.00	1.00	
Grand Total																						**33.00**	**8.00**	**41.0000**	

7.4.2. Component 1 costing

	Component 1 Cost Estimates								
S.No.	Particulars	Years							Rs. Lakh
		1	2	3	4	5	6	7	
1	Watershed panning (MWP)	97.50	0.00	0.00	0.00	0.00	0.00	0.00	97.50
i	Umiew	32.50	0.00	0.00	0.00	0.00	0.00	0.00	32.50
ii	Ganol	65.00	0.00	0.00	0.00	0.00	0.00	0.00	65.00
2.1	Forestry Plantation & maintenance and seedling cost	178.54	2267.11	2405.83	2526.12	2435.42	29.37	0.00	9842.38
i	Umiew	115.52	1479.96	1570.22	1648.73	1590.75	18.83	0.00	6424.02
ii	Ganol	63.01	787.14	835.61	877.39	844.66	10.54	0.00	3418.36
2.2	Community Nurseries	90.00	13.13	12.40	0.00	0.00	0.00	0.00	115.53
i	Umiew	58.75	7.88	8.27	0.00	0.00	0.00	0.00	74.89
ii	Ganol	31.25	5.25	4.13	0.00	0.00	0.00	0.00	40.63
3	S&WC measures in open forest areas, grasslands and culturable wastelands	0.00	872.37	915.99	961.79	1009.88	0.00	0.00	3760.02
i	Umiew	0.00	475.10	498.85	523.80	549.99	0.00	0.00	2047.73
ii	Ganol	0.00	397.27	417.13	437.99	459.89	0.00	0.00	1712.29
4	Drainage line treatment with civil structures (river bank stabilisation)	1523.72	1523.72	0.00	0.00	0.00	0.00	0.00	3047.44
i	Umiew (WRD proposal)	573.72	573.72						1147.44
ii	Ganol (WRD Proposal)	950.00	950.00						1900.00
5	Forest fire management	12.28	12.89	13.54	14.22	14.93	15.67	16.46	99.99
i	Umiew	7.46	7.83	8.23	8.64	9.07	9.52	10.00	60.75
ii	Ganol	4.82	5.06	5.31	5.58	5.86	6.15	6.46	39.24
6	Water, silt and weather monitoring stations	350.00	0.00	0.00	0.00	0.00	0.00	0.00	350.00
i	Umiew (5 stations)	175.00							175.00
ii	Ganol (5 Stations)	175.00							175.00
7	Critical community infrastructure	159.10	159.10	0.00	0.00	0.00	0.00	0.00	318.20
i	Umiew								0.00
ii	Ganol (Connectivity road from Durakalakgre Junction to Sakalgre via Baladinggre)	159.10	159.10						318.20
8	Springshed development (spring chambers etc)	0.00	88.92	93.37	98.04	102.94	0.00	0.00	383.26
	Umiew	0.00	10.83	11.37	11.94	12.53	0.00	0.00	46.67
	Ganol	0.00	78.09	82.00	86.10	90.40	0.00	0.00	336.59
9	Training and capacity building	44.14	33.54	0.00	0.00	0.00	0.00	0.00	77.68
	Umiew	32.03	22.33	0.00	0.00	0.00	0.00	0.00	54.36
	Ganol	12.11	11.21	0.00	0.00	0.00	0.00	0.00	23.32
10	Contingency	64.08	129.74	89.81	93.96	93.00	1.18	0.43	472.20
	Umiew	25.97	67.28	54.73	57.24	56.44	0.74	0.26	262.65
	Ganol	38.11	62.46	35.08	36.72	36.56	0.44	0.17	209.55
Total (Component 1)		**2519.36**	**5100.51**	**3530.94**	**3694.13**	**3656.16**	**46.22**	**16.89**	**18564.20**
i	**Umiew**	**1020.95**	**2644.92**	**2151.67**	**2250.35**	**2218.78**	**29.09**	**10.26**	10326.02
ii	**Ganol**	**1498.41**	**2455.59**	**1379.27**	**1443.78**	**1437.38**	**17.13**	**6.63**	8238.18

Table 11 Component 1: year-wise activity-wise cost estimates

1.1 Micro Watershed Planning											
S.No	Particulars	Rs./ Unit	No.	Year							Lakh
				1	2	3	4	5	6	7	Total
1	Micro watershed dev Plans Preparation			97.50							97.50
i	Umiew	250000	13	32.50							32.50
ii	Ganol	250000	26	65.00							65.00

Table 12 Cost of micro-watershed planning

1.2.1 Cost of forestry plantation, maintenance and seedlings									
S.No.	Catchment / Year	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr.6	Yr. 7	Total
i	Umiew	115.52	1479.96	1570.22	1648.73	1590.75	18.83	0.00	6424.02
ii	Ganol	63.01	787.14	835.61	877.39	844.66	10.54	0.00	3418.36
Total		**178.54**	**2267.11**	**2405.83**	**2526.12**	**2435.42**	**29.37**	**0.00**	9842.38

Table 13 Cost of forestry plantations, maintenance and seedlings

Forestry Plantation Area (Ha.)									
S.No.	Particulars	Ha	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr.6	Yr. 7
Umiew Catchment									
i	Dense Forest: 40% above canopy density	472.95	0.00	118.24	118.24	118.24	118.24	0.00	0.00
ii	Open forest:- 10-40% canopy density	2454.31	0.00	613.58	613.58	613.58	613.58	0.00	0.00
iii	Silvipasture on grasslands	1080.25	0.00	270.06	270.06	270.06	270.06	0.00	0.00
iv	River bank plantations	883.00	0.00	220.75	220.75	220.75	220.75	0.00	0.00
Sub Total		**4890.51**	**0.00**	**1222.63**	**1222.63**	**1222.63**	**1222.63**	**0.00**	**0.00**
Ganol Catchment									
i	Dense Forest: 40% above canopy density	651.47	0.00	162.87	162.87	162.87	162.87	0.00	0.00
ii	Open forest:- 10-40% canopy density	1585.24	0.00	396.31	396.31	396.31	396.31	0.00	0.00
iii	River bank plantations	398.00	0.00	99.50	99.50	99.50	99.50	0.00	0.00
Sub Total		**2634.71**	**0.00**	**658.68**	**658.68**	**658.68**	**658.68**	**0.00**	**0.00**
Total for both catchments		**7525.22**	**0.00**	**1881.30**	**1881.30**	**1881.30**	**1881.30**	**0.00**	**0.00**

Table 14 Estimated area under forestry plantations (ha.)

Cost of forestry plantation (Rs. Lakh)										
S.No.	Particulars	Type/ Year	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr.6	Yr. 7	Total
	Umiew Catchment									
i	Dense Forest: 40% above canopy density	Planting	0.00	44.69	46.93	49.27	51.74	0.00	0.00	192.64
		Maintenance	0.00	48.42	50.84	53.38	56.05	0.00	0.00	208.69
ii	Open forest:- 10-40% canopy density	Planting	0.00	347.90	365.29	383.56	402.74	0.00	0.00	1499.49
		Maintenance	0.00	398.15	418.06	438.96	460.91	0.00	0.00	1716.08
iii	Silvipasture on grasslands	Planting	0.00	102.08	107.19	112.55	118.17	0.00	0.00	439.99
		Maintenance	0.00	175.24	184.01	193.21	202.87	0.00	0.00	755.32
iv	River bank plantations	Planting	0.00	83.44	87.62	92.00	96.60	0.00	0.00	359.65
		Maintenance	0.00	143.24	150.41	157.93	165.82	0.00	0.00	617.40
Sub Total		Planting	0.00	578.12	607.03	637.38	669.25	0.00	0.00	2491.77
		Maintenance	0.00	765.06	803.31	843.48	885.65	0.00	0.00	3297.49
Total (umiew)			**0.00**	**1343.18**	**1410.34**	**1480.85**	**1554.89**	**0.00**	**0.00**	5789.26
Ganol Catchment										
i	Dense Forest: 40% above canopy density	Planting	0.00	61.56	64.64	67.87	71.27	0.00	0.00	265.35
		Maintenance	0.00	66.69	70.03	73.53	77.21	0.00	0.00	287.46
ii	Open forest:- 10-40% canopy density	Planting	0.00	224.71	235.94	247.74	260.13	0.00	0.00	968.52
		Maintenance	0.00	257.17	270.02	283.52	297.70	0.00	0.00	1108.41
iii	River bank plantations	Planting	0.00	37.61	39.49	41.47	43.54	0.00	0.00	162.11
		Maintenance	0.00	64.57	67.79	71.18	74.74	0.00	0.00	278.29
Sub Total		Planting	0.00	323.88	340.08	357.08	374.93	0.00	0.00	1395.97
		Maintenance	0.00	388.42	407.85	428.24	449.65	0.00	0.00	1674.16
Total (Ganol)			**0.00**	**712.31**	**747.92**	**785.32**	**824.58**	**0.00**	**0.00**	3070.13
Grand Total (Umiew and Ganol)			**0.00**	**2055.48**	**2158.26**	**2266.17**	**2379.48**	**0.00**	**0.00**	8859.39

Table 15 Cost of forestry plantations in both catchments

Number of seedling required for forestry operations ('000)

S.No.	Particulars	Phase	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr.6	Yr. 7	Total
Umiew Catchment										
i	Dense Forest: 40% above canopy density	Planting	29.56	29.56	29.56	29.56	0.00	0.00	0.00	118.24
		Replacement		1.48	2.96	2.96	2.96	1.48	0.00	11.82
ii	Open forest:- 10-40% canopy density	Planting	674.94	674.94	674.94	674.94	0.00	0.00	0.00	2699.74
		Replacement		101.24	202.48	202.48	202.48	101.24	0.00	809.92
iii	Silvipasture on grasslands	Planting	108.03	108.03	108.03	108.03	0.00	0.00	0.00	432.10
		Maintenance		10.80	21.61	21.61	21.61	10.80	0.00	86.42
iv	River bank plantations	Planting	353.20	353.20	353.20	353.20	0.00	0.00	0.00	1412.80
		Replacement		35.32	70.64	70.64	70.64	35.32	0.00	282.56
Sub Total		Planting	1165.72	1165.72	1165.72	1165.72	0.00	0.00	0.00	4662.88
		Replacement	0.00	148.84	297.68	297.68	297.68	148.84	0.00	1190.73
Total Umiew catchment			**1165.72**	**1314.56**	**1463.40**	**1463.40**	**297.68**	**148.84**	**0.00**	5853.60
Ganol										
i	Dense Forest: 40% above canopy density	Planting	40.72	40.72	40.72	40.72	0.00	0.00	0.00	162.87
		Replacement		2.04	4.07	4.07	4.07	2.04	0.00	16.29
ii	Open forest:- 10-40% canopy density	Planting	435.94	435.94	435.94	435.94	0.00	0.00	0.00	1743.76
		Replacement		65.39	130.78	130.78	130.78	65.39	0.00	523.13
iii	River bank plantations	Planting	159.20	159.20	159.20	159.20	0.00	0.00	0.00	636.80
		Replacement		15.92	31.84	31.84	31.84	15.92	0.00	127.36
Sub Total		Planting	635.86	635.86	635.86	635.86	0.00	0.00	0.00	2543.43
		Replacement	0.00	83.35	166.69	166.69	166.69	83.35	0.00	666.78
Total Ganol catchment			**635.86**	**719.20**	**802.55**	**802.55**	**166.69**	**83.35**	**0.00**	3210.20
Grand Total both catchment			**1801.58**	**2033.76**	**2265.95**	**2265.95**	**464.38**	**232.19**	**0.00**	9063.81

Table 16 Number of seedlings required for forestry plantations

Seedling cost (Rs. Lakh)

S.No.	Catchment / Year	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr.6	Yr. 7	Total
i	Umiew	115.52	136.79	159.89	167.88	35.86	18.83	0.00	634.76
ii	Ganol	63.01	74.84	87.68	92.07	20.08	10.54	0.00	348.23
Total seedling cost		**178.54**	**211.62**	**247.57**	**259.95**	**55.94**	**29.37**	**0.00**	982.99

Table 17 Cost of seedlings for both catchments

1.2.2. Investment in Nursaries (Rs. Lakh)

S.No.	Catchment / Year	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr.6	Yr. 7	Total
i	Umiew	58.75	7.88	8.27	0.00	0.00	0.00	0.00	74.89
ii	Ganol	31.25	5.25	4.13	0.00	0.00	0.00	0.00	40.63
Total nursery cost		**90.00**	**13.13**	**12.40**	**0.00**	**0.00**	**0.00**	**0.00**	115.53

Number of nursery units required

S.No.	Catchment / Year	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr.6	Yr. 7	Total
i	Umiew	47	53	59	59	12	6	0	59
ii	Ganol	25	29	32	32	7	3	0	32
Total		**72**	**82**	**91**	**91**	**19**	**9**	**0**	**91**

I NU = 25000 seedling production capacity per year

Table 18 Number and cost of nurseries required for both catchments

	1.10 Training and capacity building										
S.No.	**Particulars**	Rs./ Unit	No.	Year							Lakh
				1	2	3	4	5	6	7	Total
1	5 Day Training on preparation of MWP		119	12.20	0.00	0.00	0.00	0.00			12.20
i	Umiew (Vill facilitators 25, BWRC rep 3, DWRC 1, Villagers 76	10250	105	10.76							10.76
ii	Ganol (Vill facilitators 3, BWRC 3, DWRC1, Villagers 7)	10250	14	1.44							1.44
2	3 Day Forestry Management		570	16.39	17.21	0.00	0.00	0.00			33.59
i	Umiew 5 from each village	5750	380	10.93	11.47						22.40
ii	Ganol - 5 from each village	5750	190	5.46	5.74						11.20
3	2 Day community nursary		91	1.59	1.67	0.00	0.00	0.00			3.26
i	Umiew	3500	59	1.03	1.08						2.12
ii	Ganol	3500	32	0.56	0.59						1.15
4	2 Day soil and water conservation		570	9.98	10.47	0.00	0.00	0.00			20.45
i	Umiew 5 from each village	3500	380	6.65	6.98						13.63
ii	Ganol - 5 from each village	3500	190	3.33	3.49						6.82
5	2 Day fire management		114	2.00	2.09	0.00	0.00	0.00			4.09
i	Umiew	3500	76	1.33	1.40						2.73
ii	Ganol	3500	38	0.67	0.70						1.36
6	2 Day water, weather and silt monitoring		114	2.00	2.09	0.00	0.00	0.00			4.09
i	Umiew	3500	76	1.33	1.40						2.73
ii	Ganol	3500	38	0.67	0.70						1.36
Total				**44.14**	**33.54**	**0.00**	**0.00**	**0.00**			**77.68**
i	Umiew			32.03	22.33	0.00	0.00	0.00	0.00	0.00	54.36
ii	Ganol			12.11	11.21	0.00	0.00	0.00	0.00	0.00	23.32

Table 19 Training and capacity building cost under component 1

7.4.3. Component 2 costing

	Component 2 Cost estimates								
S.No.	**Particulars**	Years							Rs. Lakh
		1	2	3	4	5	6	7	
2.1	Community consultation and awareness generation	1.14	1.14	1.14	1.14	1.14	1.14	1.14	7.98
	Umiew	0.76	0.76	0.76	0.76	0.76	0.76	0.76	5.32
	Ganol	0.38	0.38	0.38	0.38	0.38	0.38	0.38	2.66
2.2.1	Solid and liquid waste Management for Umiew and Ganol (4 in each catchment)	29.14	0.00	0.00	0.00	0.00	0.00	0.00	29.14
	Umiew	29.14							29.14
	Ganol Cost included in river protection proposal by WRD								0.00
2.2.2	Upgradation of STPs/ Garbage Treatment Units	0.00	150.00	150.00	0.00	0.00	0.00	0.00	300.00
	Umiew (smit / Assam Rifles)		100.00	100.00					200.00
	Ganol		50.00	50.00					100.00
2.3	Silt bariers along sand minning units and multi-layer water filtering systems	300.00	300.00	0.00	0.00	0.00	0.00	0.00	600.00
	Umiew	300.00	300.00						600.00
	Ganol								0.00
2.4	Water harvesting structure (Primary storage and Distribution) for villages	0.00	149.63	157.11	164.96	173.21	0.00	0.00	644.90
	Umiew	0.00	99.75	104.74	109.97	115.47	0.00	0.00	429.93
	Ganol	0.00	49.88	52.37	54.99	57.74	0.00	0.00	214.97
2.5	Training on SALT (5 Day training for 5 farmers each village divided over 4 years)	14.61	15.34	16.10	16.91	0.00	0.00	0.00	62.95
	Umiew	9.74	10.22	10.74	11.27				41.97
	Ganol	4.87	5.11	5.37	5.64				20.98
2.6	SALT	0.00	638.37	670.29	703.80	738.99	0.00	0.00	2751.45
	Umiew	0.00	471.92	495.52	520.29	546.31	0.00	0.00	2034.03
	Ganol	0.00	166.45	174.77	183.51	192.69	0.00	0.00	717.42
2.7	Horticulture	0.00	264.76	278.00	291.90	306.49	0.00	0.00	1141.14
	Umiew	0	42.70496	44.84021	47.08222	49.43633	0	0	184.06
	Ganol	0	222.0531	233.1558	244.8136	257.0543	0	0	957.08
2.8	Biomass based energy management (briqquets making and improved stoves)	0.00	560.00	560.00	0.00	0.00	0.00	0.00	1120.00
	Umiew		490	490					980.00
	Ganol		70	70					140.00
2.9	Medicinal and aromatic pantations (preocessing and marketing)	250.00	250.00	250.00	250.00	250.00	250.00	250.00	1750.00
	Umiew	200	200	200	200	200	200	200	1400.00
	Ganol	50	50	50	50	50	50	50	350.00
Total under Component 2		**594.89**	**2329.23**	**2082.63**	**1428.71**	**1469.83**	**251.14**	**251.14**	**8407.57**
	Umiew	539.64	1715.36	1446.59	889.38	911.97	200.76	200.76	5904.46
	Ganol	55.25	613.87	636.04	539.33	557.86	50.38	50.38	2503.11

Table 20 Component 2: Year-wise activity wise cost estimates

7.4.4. Component 3 costing

	Component 3 Cost estimates								
S.No	**Particulars**	Years							Rs.Lakh
		1	2	3	4	5	6	7	
3.1	Support to WMC through village facilitators	Cost included in component 4.1							
3.2	Knowledge management and communications	17.00	18.60	22.64	24.02	25.67	27.69	30.28	165.89
3.3	Training and capacity building	161.15	58.51	33.16	80.00	20.00	20.00	20.00	392.82
3.4	Social and Environmetal Framework	10.00	10.00	10.00	10.00	10.00	10.00	10.00	70.00
Total of component 3		**188.15**	**87.11**	**65.80**	**114.02**	**55.67**	**57.69**	**60.28**	628.71

Table 21 Component 3: Year-wise activity-wise cost estimates

	3.2. Knowledge management and communications						Rs. Lakh		
S.No	Particulars	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr.6	Yr.7	total
1	Project web-site dev and maint.	5.00	1.00	1.05	1.10	1.16	1.22	1.28	11.80
2	Printing and publication		2.00	2.10	2.21	2.32	2.43	2.55	13.60
3	Video and radio		3.00	3.15	3.31	3.47	3.65	3.83	20.41
4	Case studies			3.00	3.15	3.31	3.47	3.65	16.58
5	Translation of documents in local languages	2.00	2.10	2.32	2.68	3.26	4.16	5.57	22.08
6	Thematic studies	5.00	5.25	5.51	5.79	6.08	6.38	6.70	40.71
7	Water campaign - mass awareness	5.00	5.25	5.51	5.79	6.08	6.38	6.70	40.71
Sub Total KM and Communications		**17.00**	**18.60**	**22.64**	**24.02**	**25.67**	**27.69**	**30.28**	165.89

Table 22 Knowledge management cost

	3.3. Training and capacity building			Rs. Lakh							
S.No	Types of Training	Target (persons)	Days per trg.	Years 1	2	3	4	5	6	7	Total
1	Project Launch - Stakeholder Workshop										
i	Analysis of Log frame, Project orientation for Project and Line Department taff	100	1.00	1.25							1.25
ii	Catchment level Project orientation	250	1.00	1.56	1.64						3.20
	Sub total			**2.81**	**1.64**	**0.00**	**0.00**	**0.00**			4.45
2	**Village facilitators**										
i	Project Orientation and Refresher Training	38	1.00	0.48	0.50						0.97
ii	Use of water, silt and weather monitoring stations	38	2.00	1.33							1.33
iii	WMC formation, documentation and record keeping	38	2.00	1.33	1.40						2.73
iv	Need based training	38	2.00	1.33	1.33	1.33					3.99
v	E&S Safeguards	38	2.00	1.33		1.33					2.66
vi	Project monitoring and reporting including GPS usage and need based training	38	2.00	0.67	0.70						1.36
Sub total				**6.46**	**3.92**	**2.66**	**0.00**	**0.00**	**0.00**	**0.00**	13.04
3	**Traditional Institutions / Forest**										
i	Project orientation	300	1.00	1.88	1.97						3.84
ii	Support and Governance	300	1.00	1.88	1.97						3.84
iii	Self monitoring and evaluation - social audit and need based training	300	1.00	1.88	1.97						3.84
iv	E&S Safeguards	300	1.00	1.88	1.97						3.84
v	Need based training	300	2.00	10.50	10.50	10.50					31.50
vi	Knowing and recording Impact of climate change on rural livelihood and adaptation strategies	300	2.00	5.25	5.51						10.76
Sub total				**23.25**	**23.89**	**10.50**	**0.00**	**0.00**	**0.00**	**0.00**	57.64
4	**Exposure visits**										
i	Exposure visits to other project in State	300	3.00	8.63	9.06						17.68
ii	Exposure visits to other states	300	LS	100.00							100.00
iii	International exposure visits	30	LS				60.00				60.00
iv	Sub total			**108.63**	**9.06**	**0.00**	**60.00**	**0.00**	**0.00**	**0.00**	177.68
5	Seminars particiaption		LS	**5.00**	**5.00**	**5.00**	**5.00**	**5.00**	**5.00**	**5.00**	35.00
6	Community awards and recognition		LS	**15.00**	**15.00**	**15.00**	**15.00**	**15.00**	**15.00**	**15.00**	105.00
Total				**161.15**	**58.51**	**33.16**	**80.00**	**20.00**	**20.00**	**20.00**	392.82

Table 23 Training and capacity building cost under component 3

7.4.5. Component 4 costing

Component 4 Cost estimates									Rs. Lakh
S.No.	Particulars / Years	1	2	3	4	5	6	7	Total
4.1	Professional staff remuneration	390.47	410.00	430.50	452.02	474.62	498.35	523.27	3179.24
4.2	Equipment (Software and hardware)	279.10	0.00	0.00	0.00	0.00	0.00	0.00	279.10
4.3	Monitoring, review and coordination	57.90	28.43	29.86	61.35	32.92	34.56	87.92	332.93
4.4	Incremental adminstative expenses	64.88	68.12	71.53	75.11	78.86	82.81	86.95	528.25
4.5	PMC (Excluding Million 1 Euro KfW grant)	252.54	236.93	237.29	237.68	238.09	238.51	238.96	1680.00
	Total	**1044.90**	**743.48**	**769.18**	**826.16**	**824.49**	**854.23**	**937.09**	**5999.53**

Table 24 Component 4: Year-wise activity-wise cost estimates

4.1. Professional support to the Project

SPMU - Salary estimates Rs. Lakh

Level of Staff	Units	Rate/ M	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr. 6	Yr. 7	Total
CFO	1	122700	14.72	15.46	16.23	17.04	17.90	18.79	19.73	119.88
Sr. Manager	7	65020	54.62	57.35	60.22	63.23	66.39	69.71	73.19	444.69
Manager	4	54805	26.31	27.62	29.00	30.45	31.98	33.57	35.25	214.19
Asst Manager	3	41185	14.83	15.57	16.35	17.16	18.02	18.92	19.87	120.72
Programme Associates	7	29805	25.04	26.29	27.60	28.98	30.43	31.95	33.55	203.84
MTA	2	20725	4.97	5.22	5.48	5.76	6.05	6.35	6.67	40.50
Drivers	3	20725	7.46	7.83	8.23	8.64	9.07	9.52	10.00	60.75
Maintenance Staff	4	20725	9.95	10.45	10.97	11.52	12.09	12.70	13.33	81.00
Total	**31**		**157.89**	**165.79**	**174.08**	**182.78**	**191.92**	**201.52**	**211.59**	**1285.57**

CMU - Salary estimates Rs. Lakh

Level of Staff	Units	Rate/Mo	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr. 6	Yr. 7	Total
Sr. Manager	0	122700	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Manager	6	54805	39.46	41.43	43.50	45.68	47.96	50.36	52.88	321.28
Asst Manager	7	41185	34.60	36.33	38.14	40.05	42.05	44.15	46.36	281.68
Programme Associates	2	29805	7.15	7.51	7.89	8.28	8.69	9.13	9.59	58.24
MTA	2	20725	4.97	5.22	5.48	5.76	6.05	6.35	6.67	40.50
Drivers	2	20725	4.97	5.22	5.48	5.76	6.05	6.35	6.67	40.50
Maintenance Staff	2	20725	4.97	5.22	5.48	5.76	6.05	6.35	6.67	40.50
Catchment Sub-Total	21		**96.13**	**100.94**	**105.98**	**111.28**	**116.85**	**122.69**	**128.82**	782.69
Community facilitators	28	12000	40.32	42.34	44.45	46.68	49.01	51.46	54.03	328.29
Total for 2 districts	**70**		**232.5804**	**244.21**	**256.42**	**269.24**	**282.7**	**296.838**	**311.68**	**1893.672**

Rs. Lakh

Year	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr. 6	Yr. 7	Total
Total Salary cost	**390.47**	**410.00**	**430.50**	**452.02**	**474.62**	**498.35**	**523.27**	**3179.24**

Table 25 Cost estimate of salary of professional staff

4.2. Estimate of equipment requirement

Particulars	U. Cost	Numbers				INR
	lakh	SPMU	CMU	BWRC (VF)	Total	Lakh
Seating -work station	0.4	29	82	28	139	55.60
Computers with MS Office	0.29	20	26		46	13.34
Lab-tops with MS Office	0.45			28	28	12.60
Projector	0.55	1	2		3	1.65
LED Display TV	1.498	1	2		3	4.49
Photocopier	1.5	1	2		3	4.50
Printers	0.21	6	2	8	16	3.36
Camera	0.32	2	2		4	1.28
Almirah	0.15	10	6	8	24	3.60
Heaters	0.04	20	6	16	42	1.68
Vehicles	15	3	4		7	105.00
Two wheelers (comunity faciltators)	1	0		28	28	28.00
Power backup	2	1	1		2	4.00
Office renovation	20	1	1		2	40.00
Total						**279.10**

Table 26 Cost estimate of equipment requirement

4.3. **Monitoring review learning and coordination**

S.No.	Particulars	Units	No. / Yr.	Rate (lakh)	Years 1	2	3	4	5	6	7	Total Rs.
1	**Consultancies**											
i	Baseline study	1		30	30.00							30.00
ii	Mid term evaluation	1		30	`			30.00				30.00
iii	End term evaluation	1		30							30.00	30.00
iv	Project Completion Report			25							25.00	25.00
	Sub-total of consultancies				**30.00**	**0.00**	**0.00**	**30.00**	**0.00**	**0.00**	**55.00**	115.00
2	**Operating Cost**											
i	Six Monthly meeting of Executive Committee	1	**2**	0.02	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.32
ii	Project annual planning and review workshop	1	1	3	3.00	3.15	3.31	3.47	3.65	3.83	3.65	24.05
iii	Third party audit of field operations	1	1	5.00	5.00	5.25	5.51	5.79	6.08	6.38	6.08	40.09
iv	Quarterly Meetings of district advisory committees	2	4	0.5	4.00	4.20	4.41	4.63	4.86	5.11	4.86	32.07
v	Social audit at village level	114	1	0.05	5.70	5.99	6.28	6.60	6.93	7.27	6.93	45.70
vi	Six monthly meeting of CMC	1	**2**	0.50	1.00	1.05	1.10	1.16	1.22	1.28	1.22	8.02
vii	Village monthly meetings	114	12	0.005	6.84	7.18	7.54	7.92	8.31	8.73	8.31	54.84
viii	WMC six montly meeting	39	2	0.011	0.82	0.86	0.91	0.95	1.00	1.05	1.00	6.59
	Sub-total of operating costs				**26.40**	**26.86**	**28.20**	**29.61**	**31.09**	**32.65**	**31.09**	205.91
3	**Non consulting services**											
i	Annual Report Preparation and Printing	1	1	1.5	1.50	1.58	1.65	1.74	1.82	1.91	1.82	12.03
	Sub-total of non-consulting services				**1.50**	**1.58**	**1.65**	**1.74**	**1.82**	**1.91**	**1.82**	12.03
	Total				**57.90**	**28.43**	**29.86**	**61.35**	**32.92**	**34.56**	**87.92**	332.93

Table 27 Cost estimate of project monitoring, review and coordination

ADMINISTRATIVE EXPENSES

4.4. Administrative Expenses

S.No.	Cost Centre		Nos.	1	2	3	4	5	6	7	Total
1	SPMU		1	32.60	34.23	35.94	37.74	39.63	41.61	43.69	265.43
2	CMU		2	32.28	33.89	35.59	37.37	39.24	41.20	43.26	262.82
	Sub Total			64.88	68.12	71.53	75.11	78.86	82.81	86.95	528.25

4.4.1. State Project Management Unit

Recurring cost		Unit	No. of Units	Rate/Unit	Years 1	2	3	4	5	6	7	Total
1	Rent of building	Month	12	50000	6.00	6.30	6.62	6.95	7.29	7.66	8.04	48.85
2	Electricity	Month	12	30000	3.60	3.78	3.97	4.17	4.38	4.59	4.82	29.31
3	Stationery	Month	12	10000	1.20	1.26	1.32	1.39	1.46	1.53	1.61	9.77
4	Postage	Month	12	5000	0.60	0.63	0.66	0.69	0.73	0.77	0.80	4.89
6	Building maintenance	Month	12	10000	1.20	1.26	1.32	1.39	1.46	1.53	1.61	9.77
7	Printing and publication	Annual	1	200000	2.00	2.10	2.21	2.32	2.43	2.55	2.68	16.28
8	Misc.	Month	12	5000	0.60	0.63	0.66	0.69	0.73	0.77	0.80	4.89
9	Fuel/ Taxi Hire	Month	12	45000	5.40	5.67	5.95	6.25	6.56	6.89	7.24	43.97
10	Travel (TA and DA)	Month	12	100000	12.00	12.60	13.23	13.89	14.59	15.32	16.08	97.70
Total recurring cost					32.60	34.23	35.94	37.74	39.63	41.61	43.69	265.43

4.4.2.]CMU

Recurring cost		Unit	No. of Units	Rate/Unit	Years 1	2	3	4	5	6	7	Total
1	Rent (office)	Month	12	25000	3.00	3.15	3.31	3.47	3.65	3.83	4.02	24.43
2	Electricity	Month	12	10000	1.20	1.26	1.32	1.39	1.46	1.53	1.61	9.77
3	Stationery	Month	12	2000	0.24	0.25	0.26	0.28	0.29	0.31	0.32	1.95
4	Postage	Month	12	1000	0.12	0.13	0.13	0.14	0.15	0.15	0.16	0.98
6	Building maintenance	Month	12	4500	0.54	0.57	0.60	0.63	0.66	0.69	0.72	4.40
7	Misc.	Month	12	2000	0.24	0.25	0.26	0.28	0.29	0.31	0.32	1.95
8	Fuel/ Taxi Hire/ Fuel for CFs	Month	12	60000	7.20	7.56	7.94	8.33	8.75	9.19	9.65	58.62
9	Travel (TA and DA)	Month	12	30000	3.60	3.78	3.97	4.17	4.38	4.59	4.82	29.31
Total recurring cost					16.14	16.95	17.79	18.68	19.62	20.60	21.63	131.41

Table 28 Cost estimates of administrative expenses

8. FINANCIAL AND ECONOMIC ANALYSIS

1. The project supports catchment management through integrated micro-watershed management with Euro 22 million and livelihood development activities Euro 10 million out of the total project cost of Euro 40 Million. The proposed activities will help maintain or restore ecosystem services of the watershed. The components introduce ehhancing green cover through forestry, measures for soil and water conservation, drainage line treatment, spring development, and critical community infrastructure in order to increase water availability to improve productivity and production of catchment and provide employment opportunities, which is critical during current COVID-19 crisis to secure rural livelihoods. 39 micro watersheds will be targeted.

2. Financial analysis has been done with the assumptions of discounting rate of 12% whereas the for economic analysis the economic growth rate is assumed to be 6%, wholesale price inflation for food and related activities is 7.5% and inflation of around 5%.

3. For financial analysis a cost-benefit analysis was developed to assess the impact of a range of potential catchment interventions over 20 years. The analysis is conducted for the land use pattern in selected catchments. Benefits and cost for each activity are based on expert estimates in the catchment and their comparison with the yield data published by the Agriculture and Horticulture Departments of the Government of Meghalaya. The net present value of total cost and benefits, at a discount rate of 12 percent are INR2350 Million and INR3518 Million, respectively. The resulting NPV is INR 1168 Million with an IRR of 19 percent and cost-benefit ratio of 1.49. The sensitivity analysis give following results

FIRR		cost increase			
		5%	10%	15%	20%
Benefit decrease	5%	17.43%	16.53%	15.70%	14.92%
	10%	16.39%	15.52%	14.71%	13.96%
	15%	15.33%	14.49%	13.71%	12.98%
	20%	14.24%	13.43%	12.67%	11.97%

EIRR		cost increase			
		5%	10%	15%	20%
Benefit decrease	5%	29.34%	28.32%	27.37%	26.48%
	10%	28.15%	27.16%	26.24%	25.38%
	15%	26.94%	25.98%	25.09%	24.26%
	20%	25.70%	24.77%	23.91%	23.11%

4. For economic analysis the all transfer payments (taxes) were removed from the cost and price of products were adjusted against WPI and discounted at economic growth rate of 6%. The EIRR is 32%. The sensitivity analysis on the economic parameters is as under:

5. Besides quantifiable benefits, a range of social and environmental benefits could be demonstrated, which cannot easily be quantified in monetary terms and captured as income increases. Given the status of land degradation in selected catchments, it is expected that the value of ecosystem services provided by rangelands and forests, which will protect the population and businesses from natural disasters and climate-related threats is immense. Enhanced vegetation cover, as promoted by the proposed project, will decrease vulnerability to climate and related natural disasters, losses of property and life, and improve functioning of watersheds. Improved agronomic practices reduce environmental pollution, horticulture development and agro-forestry increase resilience to market shocks and disruptions in the supply chain due to diversified income pathways. Further, the project provides increased employment opportunities due to soil and water conservation measure, drainage line treatment and other construction works in watershed; increased empowerment through participation of women and the poor in local decision making.

ANNEX 1: RECENT DEVELOPMENT PROGRAMMES IN MEGHALAYA

1. Megha-LAMP - Meghalaya Livelihoods and Access to Markets Project

Megha-LAMP is a key state wide initiative, which focuses on developing markets and value chains for sustainable livelihoods, and ensures that those livelihoods are adapted to Meghalaya's geographical context. It is being implemented as part of the Integrated Basin Development and Livelihood Programme (IBDLP), and is assisted by the International Fund for Agricultural Development (IFAD) in 18 blocks. Megha-LAMP has three thrust areas.

- To support Enterprise Facilitation Centres to promote a range of rural farm and non-farm investments.
- To support clusters for the development of specific products for markets within and outside the state, along with supportive investment in natural resource management, rural finance, and market access infrastructure. A cluster-based approach is expected to create volumes and economies of scale needed to access to markets.
- Generation and dissemination of knowledge to support rural production and enterprise regarding the state's natural resource base, production technologies, supporting services and markets.

2. Community Led Landscape Management Project

CLLMP is assisted by the World Bank covering critical landscapes of 400 villages across the State. It aims at strengthening communities and traditional institution to manage their natural resources such as soil, springs and other water sources, forest and biodiversity, agriculture and horticulture through landscape approach. This project is designed to strengthen community participation in planning and implementation of landscape based activities; improved project management skills and building knowledge and capacity etc.

The project has three components viz.,

1. Strengthening Knowledge and Capacity for Sustainable NRM
    - Promotion of traditional knowledge, grass-root innovations and communication
    - Strengthen communities through training and capacity building
    - Promotion of landscape management principles through Catalytic Funds
    - Research and development
    - Monitoring, learning and reporting
2. Planning and Implementation of Community Natural Resource Management Plans
3. Project Governance and Management.

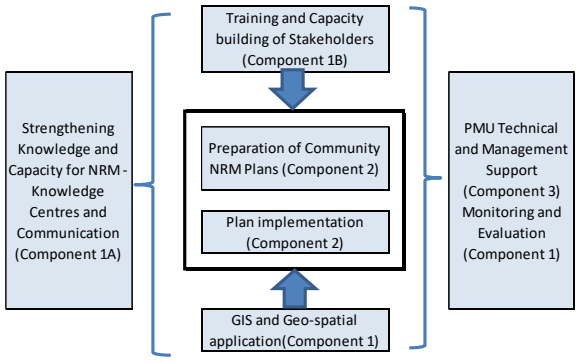


Figure 47 CLLMP at a glance

3. Meghalaya Integrated Basin Development and Livelihood Promotion Programme

The Integrated Basin Development and Livelihood Promotion (IBDLP) Programme was launched by the Government of Meghalaya as its flagship programme in 2012 in order to create a state-wide institutional ecosystem for ecologically sustainable and economically inclusive development in Meghalaya. The Programme aims to put Meghalaya on a higher growth trajectory and improve the quality of life and wellbeing of all its citizens. It seeks to redefine the relationship between the citizen and state and to bring about a paradigm shift in the way development is viewed and administered by moving from the current supply driven beneficiary model of development to a demand driven partnership model of development.

It is a strongly citizen-centric programme that emphasizes entrepreneurship and intellectual development of the people of Meghalaya as the pathway to its vision for sustainable development: individuals' entrepreneurial capacity to start successful enterprises, communities' leadership capacity to take action on ecological and economic issues that are critical to them, citizens' capacity to identify their own development aspirations and make these aspirations a reality.

The IBDLP programme is not prescriptive in nature and leaves space for the choices regarding planning and implementation of demand side initiatives by the citizens and entrepreneurs. Rather, IBDLP focuses on building a systematic, inclusive framework within which sustainable, inclusive, people-centred development can occur.

The key features of the IBDLP framework are:

1. Strengthen state wide institutions for good governance that respond to the needs and demands of the people, and that enable collaboration between citizens and the government;
2. Facilitate convergence across government departments so that cross-cutting sectors can be addressed and public service delivery becomes effective and responsive to on-ground realities;
3. Reconceptualise citizens as active "***partners***" and not as passive "***beneficiaries***", thus catalysing people's aspirations and creating in them the spirit of enterprise;
4. Ensure that the twin goals of natural resource management and livelihoods are simultaneously integrated into every initiative to enable holistic sustainable development;
5. Catalyze, support and invest in the entire sustainable development value chain – from skills and resources for community partners, to market infrastructure of regional markets, to state level institutions for policy and technical knowledge;
6. Promote livelihoods through enterprise and entrepreneurship rather than through direct subsidies and grants;
7. Promote natural resource management not through top-down policies and programmes, but through community-led initiatives for sustainable use of natural resources;
8. The core thrust of the programme is on creating an ecosystem for inclusive growth and sustainable development and not on direct benefits transfer to individuals and households to ensure systemic reforms rather than short term solutions
9. Thus the programme ensures universal access to institutional services under its interventions rather than use a targeted approach that may lead to exclusion or marginalisation;
10. Where targeted investment of resources is required, investment is based on fair and transparent policies and not on arbitrary selection of individuals, interventions or regions.

One of the biggest ways in which IBDLP carries out its mission of departmental convergence of programmes and policies toward sustainable development, is through cross-sector "Missions"; mission mode projects that involve extensive collaboration between government departments and the institutions of IBDLP. These Missions are sector-specific, and involve integrated activities with specified, precise targets to be achieved within specified deadlines.

Thus far, 9 Missions have been launched viz., apiculture. Aquaculture, forestry, horticulture, livestock, rural energy, sericulture, tourism and water.

4. The North Eastern Region Community Resource Management Project (NERCORMP)

It is a rural development project working in three states of Northeast India including Meghalaya with the overall objective to improve the livelihoods of vulnerable groups in a sustainable manner through improved management of their resource base in a way that contributes to protecting and restoring the environment.

5. National Rural Livelihood Mission (NRLM)

The NRLM under Meghalaya State Rural Livelihood Society (**MSRLS**) aims "To reduce poverty by enabling the poor households to access gainful self-employment and skilled wage employment opportunities, resulting in appreciable improvement in their livelihoods on a sustainable basis, through building strong grassroots institutions of the poor." The NRLM/Aajeevika project period is from 2012-13 to 2017-18 and covers all the 11 districts of the state.

6. The Khasi Hills Community REDD+ Project Restoring and Conserving Meghalaya's Hills Forests through Community Action[13]

The project is located in the Khasi Hills covering 27,139 hectares of forest in 62 villages and deploys strategies for both forest protection (Reducing Emissions from Deforestation and Forest Degradation, "REDD") and restoration (Assisted Natural Regeneration, or "ANR"). The project also provides detailed and long-term plans for improving the livelihoods of 4,400 households, 80 to 90% of which live below the poverty line. The project provides proven strategies and funding for addressing the area's root causes of deforestation. To reduce the number and severity of forest fires, fire lines have been established, maintained, and monitored during the fire season. To reduce fuel wood collection, fast-growing plantations are being established near villages and will eventually meet up to 40% of fuel wood demand. The project is supported by WE Forest and has received support throughthe sale of Carbon offset certificates issued by the Plan Vivo foundation.

7. Integrated Watershed Management Programme (IWMP)[14]

The Soil & Water Conservation Department, Meghalaya had been implementing watershed development programme. The main objectives of the IWMP are to preserve and conserve the ecology, restore and develop degraded natural resources by arresting soil loss, improving soil health, soil-moisture regime augmentation, promote water harvesting, recharging ground water, enhancing crop production and promoting livelihood and enhancing gainful employment opportunities.

8. Climate Change adaptation in the North Eastern Region15

The programme has been commissioned by German Federal Ministry for Economic Cooperation and Development (BMZ) in close cooperation with the Ministry of Development of North Eastern Region (MoDoNER) along with the partner states Meghalaya, Nagaland and Sikkim to jointly develop strategies, policies and instruments on climate change adaptation. The objective is to strengthen the most vulnerable communities in rural areas of the region and to enhance adaptive capacities and livelihoods of people and enable them to encounter the impacts of climate variability and change.

[13] www.mdpi.com/1999-4907/**6**/12/4382/pdf
[14] http://megsoil.gov.in/iwmp/iwmp.htm
[15] https://www.giz.de/en/worldwide/16041.html

9. Livelihoods Improvement Project in the Himalayas[16]

The objective of the project is to help vulnerable groups in the rugged highlands of the Himalayas improve their livelihoods and develop broader alternatives for income-generating activities. The area of operations includes the most remote and underdeveloped districts in the states of Meghalaya and Uttarakhand. It is expected that poor people in an estimated 1,730 villages in those areas will benefit directly from expanded livelihood opportunities, increased income and greater economic security.

The project provides access to financial services such as credit, savings and insurance, to develop livelihoods and strengthen local institutions. It assists poor rural people in managing new technologies and establishing sustainable cultivation systems, and in organizing business development services that enable them to market products on a larger scale. The total project costs were estimated at US$84.29 million. Of this 47.4 per cent was to be financed through an IFAD loan of US$39.92 million, 11.3 per cent (US$9.49 million) from beneficiaries, 13.6 per cent (US$11.44 million) from State governments, and 27.8 per cent (US$23.44 million) from formal financial institutions.

10. Biomonitoring of Important Rivers in Meghalaya[17]

The project "Bio-monitoring of Important Rivers in Meghalaya" is a time bound project sanctioned by the Central Pollution Control Board, Delhi. Under this project, the Meghalaya State Pollution Control Board periodically monitors the water quality in all major rivers of the state. The objectives of this project are: i)to obtain information about the state of ecological environment of the water bodies; ii)to assess the physico-chemical and bacteriological characteristics; iii) to generate base line data on the aspects of the bio-monitoring; iv)to plan control strategies for restoration of the pristine water quality of the water bodies.

11. Cherrapunjee Ecological Project- Restoration of Degraded Lands under Sohra Plateau[18]

The Cherrapunjee Ecological Project for Restoration of Degraded Lands under Sohra Plateau was implemented by the Department of Soil and Water Conservation. The objective of the project is to enhance Soil moisture/ water regime, ameliorate under scarcity during drier months, revitalizes water sources, eco- restoration and identify critical areas for immediate restoration of degraded soil.

12. Watershed Development Project in Shifting Cultivation Areas (WDPSCA)[19]

The main objective of the project is to protect hill slopes of Jhum areas through soil and water conservation measures on a watershed basis, encourage and assist Jhum families to develop Jhum land for productive uses with improved cultivation and suitable package of practices leading to settled cultivation, improved socio-economic status of Jhum families through household/land-based activities and mitigate ill effects of shifting cultivation by introducing appropriate land use as per land capacity and improved technologies. This project is being implemented by the Department of Soil and Water Conservation.

[16] https://www.ifad.org/evaluation/reports/ppa/tags/india/1226/7951380
[17] http://megspcb.gov.in/projects.html#1
[18] http://megsoil.gov.in/major_prog1.htm

[19] http://megsoil.gov.in/major_prog1.htm