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Reclamation of East Khasi Forest (At Meghalaya)

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Abstract: ***The structure and function of forest ecosystem is determined by the plant component more than any other living component of the system. The most important characteristics of the tropical and subtropical humid forests are their species richness, Heterogeneity and complex community organization. The state Meghalaya is known for its diverse, extensive and luxuriant forests. Due to both urbanization and its ethnic culture the east khasi forest of the state, undergoes vegetal degradation processes, which is decreasing forest cover area and changing the original quality of the forest cover. The scope of biodiversity is not restricted to species diversity and populations, but also encompasses the strong dependence of local communities on the ecosystem services for subsistence and livelihood purposes. As the definition of REDD- Reduce Emissions from Deforestation and Forest Degradation+ suggests, the regime provides an opportunity for not only carbon oriented management of the natural resources but also the scope to develop biodiversity conservation as an important objective of the management of natural ecosystems. In this paper majors taken by the REDD Organization are discussed.***

Keywords: Biodiversity, REDD, Ecosystem, Reclamation, Degradation

1. Introduction (Former time)

The nature's stability is dependent on bio-diversity and environmental sustenance. Therefore, during the last couple of decades there has been a spurt in the awareness on the need for environmental protection and environmental management for improving the global ecology. Meghalaya state is mostly covered with hills. If I say Khasi region is full of tribal then it's somewhat true. There are countless waterfalls, jungle areas and reserve where can visit in Khasi range.The Khasi Hills region is sometimes called the "Scotland of the East" because of its scenic beauty.Location :Latitude: +25.57 (25°34'12"N) Longitude: +91.87 (91°52'12"E)

The traditional social norms and group of activities that characterized khasicommunity.Ritual continue to be performed in sacred places within and around forest while rules for forest conservation and use are generally well-respected by the community. According to Palmer, forest-dependent means "dependent on forest/woodland/tree-derived goods and services. The dependency includes water, fuelwood, shelter, medicinal plants and culinary herbs, nutritionally important forest fruits and other foods, timber, fodder, dry-season grazing, the broad suite of non-timber forest products (bamboos, rattans, gums, resins, latex, oils, etc.) in response to community concerns about degradation of forests and growing pressures on sacred groves and other natural resources both from their own community meeting fuelwood needs as well as from private sector firms engaged in quarrying, mining, and logging. In the East Khasi Hills District where the project is located, between 2000 and 2006, forest loss exceeded a staggering 5 percent per year, contributing to rapidly deteriorating surface and ground water supplies, erosion, and sedimentation problems, and perceived changes in the micro-climate. Approximately 39 percent of forest lands in the project area are severely degraded as a result of unsustainable fuel wood harvesting, grazing, and fire, as well as by quarrying and timber extraction. Over 95 percent of families in the project area rely on fuel wood for cooking and heating.

Forest cover area

District	Geographic area	Forest Cover				Shrub
		Dense forest	Open forest	Total	Percent	
East Garo Hill	2603					8
South Garo Hill	1849	1038	2737	3775	84.79	
East Khasi Hill	2820	997	1553	2550	90.43	29
Jaintia Hill	3819	890	1047	1937	50.72	117
Ri Bhoi	2376	656	1107	1763	74.2	68
West Garo Hill	3715	1002	1590	2592	69.77	3
West Khasi Hill	5247	1098	1869	2967	56.55	34
Total	22429	5681	9903	15584	69.48	259

Figure 1: District wise forest cover area (Area in Sqkm)
Source: State of forest report 2001

The table shown the ration of Dense forest < Open forest of East Khasi forest (Before Restoration). Also the forest cover area of East khasi hill is more than the other hills.

Flora: Remarkable feature of East khasi Forest of floristic variety is Species of ORCHIDS, and small evergreen tree ILEX KHASIANA. The national orchidarium at Shillong maintain over 300 species of Orchids, also one of feature of khasi hill is a PINE WOOD which known as KHASI PINE .

Fauna: Number of tuskers (218 in 2002 and 179 in 2005) which reveals the status of protection given to the elephant

population in the East KhasiForest.The State of Meghalaya does not have any Project Tiger Reserve or area. Tiger is available in the State like any other feline species and no special protection measure is afforded to this important species. The total tiger estimation carried out in the year 2002 showed a total number of 47 tigers.

Minerals: It deposits in the east khasi hills have acquired a unique place in the geoghaphical map of country. The principal mineral deposits being LIMESTONE and COAL.URANIUM deposits domiasiate (which is a centre of uranium mining debate in Meghalaya) area of west khasi hills district is one of the 12th largest deposite in the world.

Food: The settlement of shilling existing in East Khasi Hills. The 83% of the population depends on agriculture for livelihood. Tracks of forest land are cleaned and used for cultivation. Follow cycle varies between 4-6 years, after which the farmer return to the same plot. 48% of the total geographical area under cultivation almost near by 50%. Bench terrace or buns are constructed on hill slopes and vegetables and grains are then grown there. This allows for a more sustained form of farming with proper drainage of rainwater and retention of soil.

Healthy/ Non Degraded nutrient cycle in East Khasi Hill

Recycling Nutrients in the ecosystem is important because only plants can create new nutrients by combining molecules from the soil or air. Not all of the building blocks required by plants are readily available, and they must be carefully conserved within the ecosystem. Other members of the food chains re-use the nutrients assembled by plants. Nutrient cycles involve both living and non-living contributors and include biological, environmental and chemical processes and interactions. The health and stability of any ecosystems and the organisms that exist within it is highly dependent on a balanced and table nutrient cycle.The role of each nutrient in the cycle is dependent on the geology, the biological capabilities of the organisms, the chemical processes and reactions.

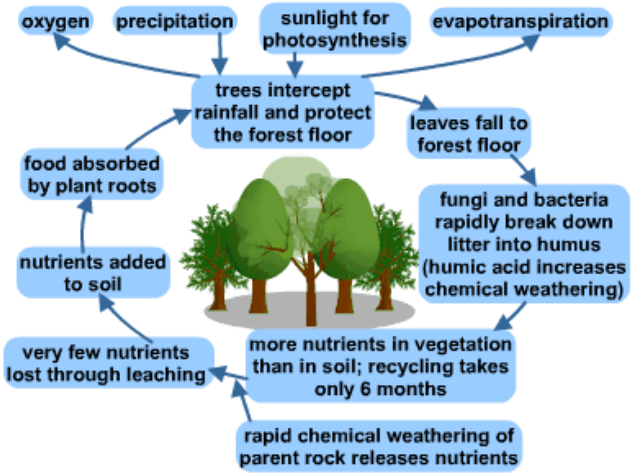

Figure 2: Healthy / Non degraded Nutrient cycle in East khasi hill.
Source :https://www.s-cool.co.uk/a-level/geography/ecosystems/revise-it/the-tropical-rainforest

Degradation of Ecosystem

The forest areas in Meghalaya has reduced from 69.06% to 63.06% over 15 years. The major environmental problems result from population pressure, conversion of forestland into agricultural fields, deforestation, urbanization, mining and industrialization. The increasing anthropogenic stresses may further aggravate the situation in the future. Reasons include shifting cultivation, urbanization. In Khasi Hills, the four most important environmental problems are, water scarcity biodiversity loss, soil erosion and urbanization due to deforestation. The issues were classified under green, blue and brown categories. As mentioned above, three issues under green category (Biodiversity loss, Deforestation), two issues under brown category (shifting and urbanization) and one issue under blue category (water pollution) were analyzed.

Figure 3: Deforestation
Source : Azhove.blogspot.com

Figure 4: Urbanization
Source: Tripadvisor.in

Issues	Trends	Causes	Indicators
Green			
Biodiversity loss	Increasing	Habitat Destruction	Species richness
		Deforestation	Population size of endemics threatened category of species
		Shifting cultivation	
		Over extraction	
		Freagmentation	
		Land use changes	
Deforestation	Increasing	Shifting cultivation	Forest cover
		Over extraction	yield
		Land use changes	Species composition
		Loosing of the control of traditional institutions	
		Change in ownership pattern of land	
Brown			
Urbanization	Increasing	Increase in population	
		Search for better job opportunities and better quality of life	increase in urban population
Shifting cultivation	Incresing	depends on agriculture for livelihood	
Blue			
Water scarcity	Increasing	Increase in population	Difficult in getting water for domestic use
		Destruction of catchment areas of water bodies	
		Poor water supply infrastructure,management and system	
Water pollution	Increasing	Domestic waste disposal	Polluted water bodies

Figure 5: Major environmental issues of East Khasi Hill
Source : www.moef.nic.in

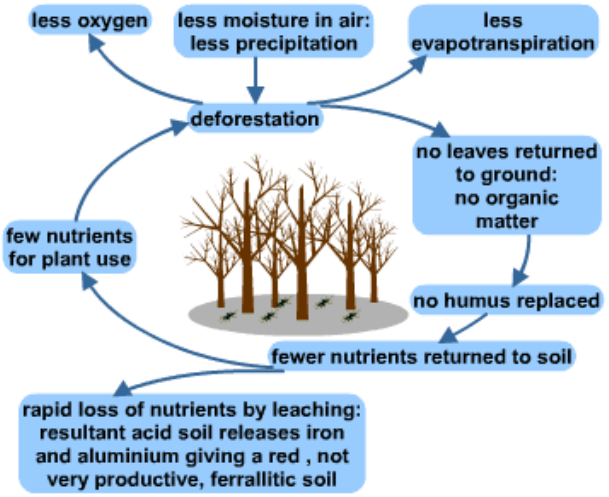

Figure 6: Un Healthy / Degraded Nutrient cycle in East khasi hill.
Source :https://www.s-cool.co.uk/a-level/geography/ecosystems/revise-it/the-tropical-rainforest

Microorganisms are essential for the majority of soil ecosystem functions and services. They play a central and essential role in the biogeochemical cycling of soil nutrients. Microorganisms are responsible for the degradation of organic matter, which controls the release of plant nutrients, but is also important for the maintenance of soil structure and sustainability of soil quality for plant growth. Microbial activity in soil is also responsible for carbon losses to the atmosphere through respiration and methanogenesis, and microorganisms are required for remediation, through degradation of organic pollutants and immobilisation of heavy metals, providing obvious examples of improving soil quality.

Process for Reclamation

An initiative to Reduce Emissions from Deforestation and Forest Degradation (REDD) was launched in December 2007 at the Bali Conference of Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC), yet little progress has been made in Asia in developing certified REDD projects, especially those that engage forest-dependent people.Project has five major aims:

2.01 To build community capacity to implement resource planning systems and mitigation activities in order to reverse

deforestation and degradation trends impacting 9,270 ha of dense forests (under REDD+).

2.01(a) To assist communities to implement a variety of forest monitoring, protection, and restoration activitiesthat facilitates the regeneration of 5,947 ha of degraded forests lands (under ANR).

2.02(b) To implement soil and water conservation measures to check soil erosion and to improve the hydrological function of the Umiam River sub-watershed through PES or carbon sales.

2.03(c) To enhance the economic conditions of participating households targeting the lowest-income forestdependent families. Support sustainable enterprise development among local communities through micro finance and sustainable farming and forestry systems through PES or carbon sales.

2.04(d) To improve environmental services including the protection of endangered flora and fauna species foundin the area through PES or carbon sales.

REDD+ mitigation activities (reclamation to stop deforestation of east khasi forest)
The project seeks to achieve a range of hydrological and biodiversity goals, including storing and sequestering carbon.

3.01 Advance Closure: This initial activity involves mobilizing communities to restrict access and use of degraded forests, which possess good regenerative potential reflected in the presence of saplings and seedlings, rootstock for coppicing species, and favourable soil and moisture conditions.

3.02 Assisted Natural Regeneration: This activity requires 10 person days per hectare for thinning, multiple coppice shoot cutting, and weeding undesirable species.ANR treatment just costs approximately 10 to 20% of plantation costs and results in accelerated forest regeneration with natural species and high survival rates. It involves selecting open forest sites withhigh potential reflected in the presence of viable root stock.

3.03 Controlling Forest Fires:It involves the controlling of ground and canopy forest fires. The establishment of fires lines (a traditional practice in Khasi society), the creation of awareness regarding the need to control fires quickly and the provision of fire watchers during the dry season, both the extent andfrequency of forest fires can be dramatically reduced.

3.04 Sustainable Fuel wood Production: Task requires developing sustainable systemsto produce fuel wood. Khasi households consume between 15kg and 20kg of fuel wood daily. Hacking and collection of firewood both reduces forest biomass and health. The establishment of sustainable fuel wood harvesting systems in natural forests can result in improved forest condition in the project area. Harvesting plans and rules that identify the time and place for fuel wood collection, as well as permitted volume allowed for extractionare established by the village councils to regulate forest use.

3.05 Reduce Fuel wood Consumption: focuses on reducing fuel wood consumption through the installation of fuel-efficient stoves. Traditional stove technologies are inefficient and create health problems by emitting smoke into the household.Fuel-efficient stoves can reduce fuel wood consumption by 30 to 50% and with new smoke stacks can direct harmful smoke out of the house. The project aims to train SHGs and youth in the manufacturing and installation of smokeless, fuel-efficient stoves and the acquisition and distribution of liquid petroleum gas (LPG) cook tops and seeks to install these in at least 80% of project households over a ten-year period.

3.06 Livelihood Program – Farmers' Clubs: The second strategy is the Sustainable Farming Systems Program which targets men. This approach is designed to improve farm incomes and reduce negative environmental impacts from the current heavy dependence on chemical fertilizers and pesticides.

Other programmes
Assisted natural regeration low density enrichment planting, transplanting and coppice regeneration social fencing to improve forest structure and composition .Youth volunteers monitor over 47 permanent plots to document forest growth.
4.01 Base line data : Mapping of the block.
Tree species (Present).
Tree species taken up for monitoring.
Identify area for enrichment planting in May – June, 2015.
Select / Set-up area for laying permanent plots
Set up permanent photo spot for time series.
Tree species planted and exixting.

4.02 Tree nursery training, also in animal husbandry : To promote wider community changes, grants are provided to invest in pig and poultry farms to promote a shift in diet away from beef, a more environmentally damaging source of protein.

4.0377 Home – based nurseries : The intervention areas are restored through assisted natural regeneration, which involves enrichment planting, thinning, weeding and the creation of fire lines, by the community members themselves. When enrichment planting is necessary, the seedlings are sourced from local community-based nurseries.

4.04 Training in sustainable farming : provides direct employment opportunities in the form of regional community facilitators, forestry managers, accountants, assistants etc. The Khasi are one of the world's few matrilineal societies so women are well represented in the project.

Benefits
Livelihood benefits :

Food and Agricultural production	Environmental services (Water,Soil etc)	Energy	Forest Product	Land and tenure security	Used rights to natural resources	Social and Cultural assets
Support for farmers, Providing training and capacity building to improve agricultural production and book-keeping	Reduce soil erosion through forest protection	The dispersal of improvedcook stoves,LPG cook stoves	Regeneration of forest allows for better provision of non forest timber products	Strong tradition of community rights,sense of ownership to local communities managing their own resources	Regulation for access to natural resources through forest management plans and participatory decision making	Increasing social cohesiveness and cooperation between different hima heads
Improved incomes leading to increased purchase power and greater food	Better water infiltration through forest regeration and protection	Provision of alternate energy source,	Assigned plots for wood harvesting prevent over exploitation of forest resources	Increasing focus on community based forest management		Mobilization of communities,bottom-up approach to improving livelihood
Community based irrigation to improve crop production						Empowerment of women

Figure 7: Livelihood benefit after reclamation of East Khasi forest
Source: www.moef.nic.in

Ecosystem and biodiversity benefits :

Intervention type (technical specification)	Biodiversity impact	Water/ Watershed impacts	Soil productivity/conservation impacts
REDD	Habitat protection and expansion,creation of a wildlife corridor	Stabilising ground and surface water levels	Prevention of soil erosion,Improved nutrient cycling natural regeration improves soil productivity

Figure 8: Biodiversity benefit after reclamation of East Khasi forest
Source: www.moef.nic.in

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Figure 9: District wise forest cover area (Area in Sqkm)
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In the above table shown the ration of Dense forest > Open forest of East Khasi forest (After reclamation). For compare refer fig 1,We can find the dense forest is increased.

Ecosystem service benefit

Activity	Activity indicator (Measure annually)	Annual Target		
		Full target achievement	Partial Target Achievement	Missed target
Fire control	Number of hectars burned during dry season	< 50 Ha	51 - 100	> 100 Ha
	Length of fire lines constructed	> 60 Km	40 - 59 Km	< 40 Ha
Forest Restoration	Number of hectares with advance closure treatment	> 200 Ha	100 - 200 Ha	< 100 Ha
	Number of hectares with silvicultural tretment	> 50 Ha	25 - 49 Ha	< 25 Ha
Impact (After 5 years)	Impact indicator	Means of assessment	Baseline (2016)	Target (2021)
Forest condition	Average in dense forest monitoring plots	Plot measurement	157 Ha	200 Ha
	Average in open forest monitoring plots		26 Ha	34 Ha
Fire damage	Area burnt by wildfires during year		64 Ha	32 Ha

Figure 10: Ecosystem service benefit
Source: www.moef.nic.in

2. Conclusion

A close observation of the analysis reveals that in East Khasi Hill,The intervention areas are restored through assisted natural regeneration, which involves enrichment planting, thinning, weeding and the creation of fire lines, by the community members themselves. To allow the forest to regenerate in isolation from animal grazing and human interference, the project employs 'social fencing', in other words, the agreement of 'no-go' zones. Since the area is rich in plant and animal species the reforestation efforts have implications for biodiversity as well. Indeed, the project reconnects habitat patches via forest corridors. It also has a number of biodiversity, water and soil conservation measures in place. Human driven climate change, deforestation and over-consumption is posing a continued threat to the forest ecosystems of this planet. It is very important that we act right now to protect these beautiful, fragile and mysterious ecosystems for future generations. Forest ecosystems are not just valuable in their own right, they are also crucial for maintaining the health of the planet as a whole.

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