

Chapter 9

Environmental Issues and Management of Natural Resources: Community Participation and Government Intervention in Meghalaya

9.1 Introduction

The state of Meghalaya is rich in natural resources. The most important natural resources on which the economy of the state is largely dependent upon are forests, mineral and water resources. During the past few decades there has been excessive pressure on these resources through over-exploitation, misuse and overuse either for sustenance or for developmental purposes. Such activities have not only depleted the natural resources but also have led to considerable deterioration in the quality of environment. The life support systems viz., air, land, water and vegetation are under too much of strain. The major environmental problems result from the population pressure, conversion of forestland into agricultural fields, deforestation, urbanization, mining and industrialization. The increasing anthropogenic stresses of various kinds in the state may further aggravate the environmental problems in the future.

Among all the natural resources, forests contribute maximum to the state's economy. Besides timber, a host of non-timber forest products such as cane, bamboo, mushroom, orchids, oil yielding trees, tree barks, honey, lichens, wax, broom-grass and other commercially important grass species are extracted from the forests every year in large quantities. A large number of families in rural Meghalaya are exclusively dependent on forests for their sustenance. The dependency on the forests has been traditionally for shifting cultivation and restoring fertility of the fallows for future shifting cultivation. The forests have been the main source for collection of edible forest products for day to day livelihood. Besides these traditional forms of dependency, the forest farming using various horticultural species such as beetle nut, beetle vine, orange, bay leaf, plantation of cash crops like broomgrass and cashew nut, undertaking apiculture for honey are some of the modern day innovations of forest-based livelihood earning by the forest-dependent populations in the state. The intrinsic linkage between the forests and the livelihood of the entire rural populations can hardly be undermined.

The recorded forest area in the state is 9, 496 sq. km (State of Forest Report, 2003). According to satellite imageries, the forest cover of Meghalaya in 1980 was 69.06% and in 15 years time the forest area has been reduced to 63.09%. The trend of forest cover shows that during 1980-89, maximum deforestation took place. Shifting cultivation which is widely practiced in the state, mining of coal and limestone, urbanization and industrialization are the major factors contributing to the depletion of forest cover in the state. Due to the rising human population in the state, the pressure on forestland for cultivation has increased, and consequently, the jhum cycle is now reduced to 2-3 years from 10-15 years in earlier days. The population dependent on jhum is 257140 which was about 14 percent of the total rural population and the annual area under jhum in the state is 442 sq. km in 2001¹. The reduction in forest cover and erosion of natural resource base of the state have been directly impacting the livelihood options of millions of forest-dependents, who often do not have any other livelihood alternatives.

The state of Meghalaya is rich in plant diversity with 3,128 species of flowering plants including 1,237 endemic species and several valuable medicinal plant species. Some highly exploited and endangered species include, *Panax pseudoginseng* and *Rouvlfia serpetania*. Most of the endemic

¹http://www.megsoil.gov.in/shifting_cul.htm

and threatened species are confined to protected forest areas including sacred groves. The species endemic to Meghalaya include *Aeschynanthes parasiticus*, *A. superba*, *Callicarpa psilocalyx*, *Citrus latipes*, *Ilex embeloides*, *Impatiens khasiana*, *Nepenthes khasiana*, *Paramignya micrantha* and many others. The species that were common some 20 to 30 years back have become rare (e.g., *Dipteris wallichii*, *Cyathea gigantea*, *Ilex embeloides*, *Styrax hookerii* and *Fissistigma verrucosum*) in the state due to overexploitation, deforestation and habitat destruction. More than 110 mammal species are known from the forests of Meghalaya. These include elephants, wild buffalo, amphibians, reptiles, Sambar and barking deer, red jungle fowl, hornbills, civets etc.

Among the mineral resources, coal, limestone, uranium and quartzites are the important ones, of which coal and limestone are being extracted in large quantities. The unregulated excessive coal mining has damaged the environment to a large extent in the state through forest clearing, and increase in acidity of soil and water. The rural areas are badly affected by unscientific mining activities being carried out in different parts of the state.

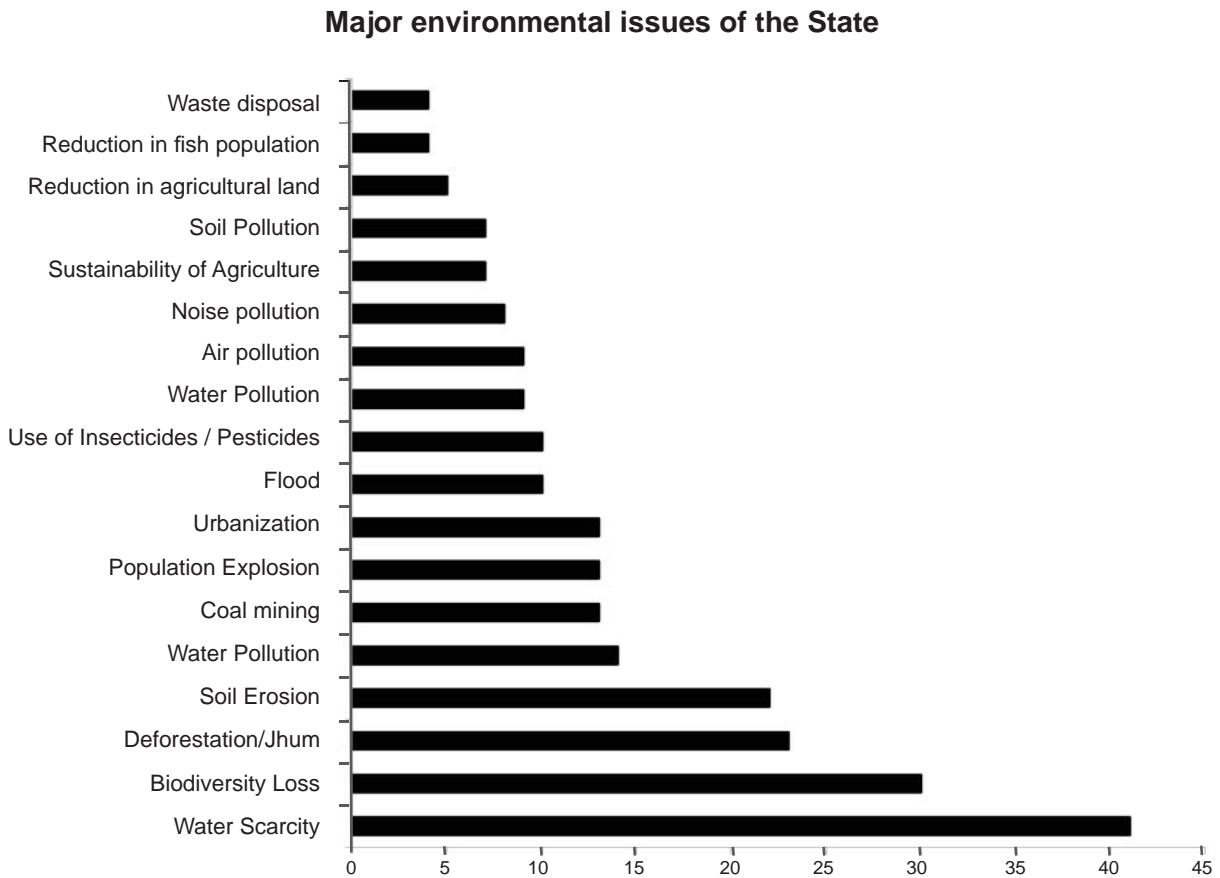
If the shifting cultivation and mining in their present form and magnitude are allowed to continue, land degradation and the impoverished living condition of the poor people of rural Meghalaya is bound to worsen with time. Considering the adverse impacts of deforestation, shifting cultivation, mining, over-exploitation of plant and animal species, suitable interventions need to be introduced by the government with effective participation of the communities. Appropriate policies, strategies and action plans need to be evolved for conserving the natural resources of the state and for protecting the environment for the welfare of the present and future generations.

The rest of the chapter is organised as follows. Section 9.2 deals with some environmental issues in the state highlighting the major issues as well as their trends and causes. Section 9.3 discusses the management of natural resources. It looks at forest resources, mineral resources and pollution of water resources. In section 9.4, we look at government intervention and community participation in the management of natural resources. Section 9.5 concludes, points the challenges ahead and offers suggestions.

9.2 Environmental Issues

In a recent initiative by the Planning Commission, the State of Environment Report (SOE) is being prepared for each state of the country. At the Govt. of India level, the Ministry of Environment and Forests is the nodal agency and in Meghalaya, the State Forest Department is the nodal agency for SOE Reporting process. The Development Alternatives, New Delhi is the National Host Institution and the Department of Botany, North-Eastern Hill University (NEHU) is the State Host Institution. Under this initiative, the SOE Report was prepared by NEHU through a series of exercises including three stakeholders' workshops at Shillong and Tura. Participatory exercises were conducted involving the stakeholders to list out the environmental issues and to prioritize them. The results of these exercises are presented in the figure 9.1. For the entire state, water scarcity came out to be the most important problem followed by biodiversity loss, jhum/deforestation, urbanization, water pollution, population explosion and coal mining.

Figure 9.1: Major environmental issues of Meghalaya: Stakeholders' perception



Source: State of Environment Report, Department of Botany, NEHU, Shillong 2004

9.2.1 AN ANALYSIS OF THE MAJOR ENVIRONMENTAL ISSUES OF THE STATE

The trends and causes of some important environmental issues are given in Table 9.1. Appropriate actions need to be taken to control the causative factors and to reverse the trend of environmental degradation.

Table 9.1: An analysis of environmental issues of Meghalaya

Issues	Trends	Causes
Biodiversity loss	Increasing	<ul style="list-style-type: none"> • Habitat destruction • Deforestation • Shifting cultivation • Over-extraction • Fragmentation • Land use changes
Deforestation	Increasing	<ul style="list-style-type: none"> • Shifting cultivation • Over-extraction • Land use changes • Change in ownership pattern of land • Loosening of the control of traditional institutions
Shifting cultivation	Decreasing	<ul style="list-style-type: none"> • Low output-input ratio • Availability of other alternate incomes due to increased commercial activities • Migration of rural population to urban centres
Coalmining	Increasing	<ul style="list-style-type: none"> • No regulation due to private ownership of land • Easy accessibility to international market
Urbanization	Increasing	<ul style="list-style-type: none"> • Increase in population • Search for better job opportunities and better quality of life
Water scarcity	Increasing	<ul style="list-style-type: none"> • Increase in population • Destruction of catchment areas of water bodies • Poor water supply infrastructure, management and system
Water pollution	Increasing	<ul style="list-style-type: none"> • Coal mining • Domestic waste disposal

9.3 Management of Natural Resources

9.3.1 FOREST RESOURCE AND ITS DEPLETION

9.3.1.1 Forest types: According to Champion and Seth (1968) forest vegetation of Meghalaya can be broadly grouped into two types:

- 1) *Tropical moist deciduous forest*: This type of forest occurs on the lower foot-hills, undulating areas and on gently sloping and flat alluvial deposits. The chief feature of this forest is its leafless canopy during the dry season.
- 2) *Subtropical broadleaved forest*: This type of forest occurs on hills above 1100m where rainfall is generally more than 2000 mm per year. This is mainly composed of evergreen species with some deciduous species. Shifting cultivation has greatly affected the vegetation, which has been replaced by sub-tropical pine forest in some parts of Khasi and Jaintia hills of the state.

9.3.1.2 Forest area: Out of the total recorded forest area of 9496.4 sq. km, only 993.0 sq. km is under reserved forests and 179.0 sq. km is under protected forests which are under the control and management of the State Forest Department. The unclassified forests, managed by autonomous district councils, village durbars and other traditional institutions, and private owners cover an area of 8324 sq. km (Table 9.2).

Table 9.2: Forest area as of 1999-2001

Area (sq. km)

1: Reserved forests including Government	---	993.0
Forests, national parks and sanctuaries		
2: Unclassed forests	---	7,146.5
3: Private forests	---	384.0
4: Protected forests	---	179.0
5: Village forests	---	25.9
6: Raid forests	---	768.0
Total	=	9,496.4

Source : State of Forest Report. FSI, 2001

9.3.1.3 Forest cover: According to the State of Forest Report (FSI, 2005) the actual forest cover of the state is 16988 sq. km. This accounts for around 75.74 percent of the state's geographical area. The forest cover for the entire country constitutes 20.6 percent of the geographical area. Per capita forest area in the state is 0.74 ha compared to the national average of 0.07 ha (Table 9.3). During 1985-87, 73.41% (16,466 sq. km) of the total geographical area of the state was under forest cover. It decreased to 69.75% (15,645 sq. km) by the year 1987-89 and then increased to 69.48% (15584 sq. km) in 1999-2001 (Table 9.4). Increase in forest cover is due to regrowth in shifting cultivation areas in Ri Bhoi, Jaintia Hills and South Garo Hills districts and better protection as observed by FSI officials during field verification (SFR, 2005).

Table 9.3: Forest-man ratio in Meghalaya

Year	Population (2001)	Geographical Area (sq km)	Total forest (sq. km.)		Dense forest (sq km)	Open forest (sq km)	Per capita forest Cover in hectare
			Recorded	Cover			
SFR 2001	2306069	22429	9496 (42.34)	15584 (69.5)	5681	9903	0.68
SFR 2003			9496 (42.34)	16839 (75.1)	6491	10348	0.73
SFR 2005			9496 (42.34)	16988 (75.7)	7146	9842	0.74

Note: Figures in parentheses represent the forest area as percentage of the total geographical area. Dense Forest are those with more than 40% canopy cover, Open Forest are those with 10-40% canopy cover.

Source : State of Forest Report. FSI, 2001, 2003, 2005.

Table 9.4: Change in forest cover of Meghalaya.

Year	Forest cover (sq. km)	% to total geographic area
1985-87	16,466	73.41
1987-89	15,645	69.75
1989-91	15,857	70.70
1991-93	15,769	70.31
1993-95	15,714	70.06
1995-97	15,657	69.80
1997-99	15,633	69.70
1999-2001	15,584	69.48
2001-2003	16,839	75.08
2003-2005	16,988	75.74

Source: State of Forest Report, Forest Survey of India, 1999, 2001, 2003, 2005, Dehradun

Tropical moist deciduous forests occupy 90% area of the total forest cover. The subtropical broadleaved forests and subtropical pine forests occupy 1,018 sq. km and 633 sq. km, respectively. About 71% of the total forest (11,722 sq. km) is situated below 600m above mean sea level. In 2005, dense forests occupied 42% of the total forest land and the rest are open forests. The open forests are highly degraded either because of shifting cultivation or due to felling of trees for timber, fuel-wood and other purposes. The forest cover in different districts is given in Table 9.5.

Table 9.5: District-wise forest cover in Meghalaya (Area in sq. km)

District	Geographic Area	Dense forest	Open forest	Total	Percent
East Garo Hills	2603	714	1535	2249	86.40
South Garo Hills	1849	756	919	1675	90.59
East Khasi Hills	2820	817	1019	1836	65.11
Jaintia Hills	3819	1074	1152	2226	58.29
Ri Bhoi	2376	901	1098	1999	84.13
West Garo Hills	3715	884	2090	2974	80.05
West Khasi Hills	5247	2000	2029	4029	76.79
Total	22429	7146	9842	16988	75.74

Source: State of Forest Report-2005, FSI, Dehradun

9.3.1.4 Non Timber Forest Produce: Besides timber, a number of non-timber forest produce including cane, bamboos, broom-grass, mushrooms, orchids, commercially important grass species, and oil yielding trees, honey and wax are extracted from the forests every year in large quantities. Important medicinal plants such as *Taxus baccata*, *Tinospora cordifolia*, *Vinca rosea*, *Strychnos nux-vomica*, *Dichora febrifuga*, *Hodgsonia hiteroclita*, *Scutellaria discolour*, *Smilax sp.*, *Solanum khasianum*, *Dioscorea deltoides*, *Dioscorea prazerai*, *Dioscorea bulbifera*, *Holarrhena antidysenterica* etc. are found in the forests. Gums, resins, edible wild fruits and tubers and Cinnamomum, large Cardamom are other important non-timber forest resources of the state.

9.3.1.5 Forest ownership and management: Unlike the rest of the country where forests are mostly owned by the state and managed by the state forest department, in Meghalaya substantial forest areas are under the unclassified category and are owned by private individuals, clans, village councils, district councils and other traditional community institutions. The three autonomous district councils, viz., Khasi Hills Autonomous District Council, Garo Hills Autonomous District Council and Jaintia Hills Autonomous District Council, control the unclassified forests of 8,324 sq. km (88%) and are responsible for their management.

Besides the State Forest Department and Autonomous District Councils, private individuals, communities and clans own the forests in Meghalaya. The ownership rights over land and resources are further protected by the sixth schedule of Indian Constitution. The three District Councils of Meghalaya have Legislative, Executive, Judicial and Financial Functions².

Forest Management by the Autonomous District Councils: The district councils have their own forest wings with trained forest personnel appointed for the management of their forests, although the number of such personnel is too inadequate. Sometimes the State Forest Department deputes senior forest officers to the district councils. The forest department collects royalty on all minor minerals which it shares with the district council in a ratio of 40:60.

There are three kinds of forests under the jurisdiction of the district councils:

- i) Old un-classed State Forests, which are under the direct control of district council
- ii) Clan/Community forests and
- iii) Private forests

The control of district council on second and third category of forests is limited only to collection of royalty on the timber exported by the owners outside their own area of trade.

According to the United Khasi-Jaintia Hills Autonomous District (Management and Control of Forest) Act, 1958, the forests of Meghalaya are classified as follows:

- (i) **Ri-Kynti (Private Forest):** These forests belong to an individual or clan or joint clans, which are raised or inherited by him or them.
- (ii) **Law- ri- sumar:** These forests lands belong to an individual clan or joint clans, and are raised or inherited on village or common raij (traditional state) land.
- (iii) **Law-lyngdoh, Law-kyntang, Law-Niam (Sacred groves):** These forests are set-aside for religious purposes and are managed by the lyngdoh (a religious head), or other person to whom the religious ceremonies for the particular locality are entrusted.

²For powers and jurisdiction of the District Councils, please refer Chapter 10, section 10.6.

- (iv) **Law-adong and Law-shnong:** These are village protected forests reserved by the villagers themselves for conserving water, soil, plants, etc. for the use of villages and are managed by the 'Sirdar' or headman with the help of the village Durbar.
- (v) **Protected forest:** These are areas/forests declared protected by the District Council for the growth of trees for the benefit of local inhabitants under the District Council Act, 1958.
- (vi) **Green blocks:** These forests belong to an individual family or clan or joint clans and grow on raj lands and are protected for aesthetic beauty and water supply of the town of Shillong and its suburbs.
- (vii) **Raid forests:** These forests are looked after by the heads of the raid (Traditional institutions comprising of a cluster of villages) and are under the management of the local administrative heads.
- (viii) **Reserve forests:** these forests are declared so by the Executive Committees of the District Councils under the District Council Act, 1958. In this forest human settlement and felling of trees or cutting of branches are prohibited. Such forests are under the control of the State Forest Department.
- (ix) **Unclassed forests:** These are mostly private forests over which local self-government have some controls. They are mostly on the hill slopes and are used by local inhabitants for jhum cultivation.

As already mentioned, an estimated 1000 sq. km area of forest in the state has been maintained as '**Sacred Groves**' by the local tribals based on religious beliefs. The size of these groves ranges from 0.01 ha to 900 ha (Tiwari et al., 1999). At times a stand of 5-8 trees is also given the status of a sacred grove. These patches either belong to clan/community or to individuals and are under the direct control of the clan councils or local village Dorbars/ Syiemships/ Dolloiships/ Nokmaships. They represent the unique forest ecosystem of the region and are very rich in flora and fauna, testifying the efficacy of traditional forest management systems in the state.

Being covered under the Sixth Schedule of the Indian Constitution, the acts and rules framed by the state and national governments are not applicable to the lands under the jurisdiction of the District Councils. Therefore, private, clan, village council and other community forests within the district councils' jurisdiction are not covered under these laws. The district council acts are too weakly enforced, as there are not adequate forest personnel in the district council to enforce them. Hence, most community forests are virtually under no management and do not come under the effective enforcement of any of the forest laws.

Unregulated shifting cultivation by the local populations has been a major threat to forest particularly in unclassified and community forests. In spite of the efforts by many state and national agencies, a viable land-use option to shifting cultivation is yet to be found. There is a need to work out a regulatory mechanism to control over-exploitation of forests, where the landowners themselves will be legally bound to sustainable harvest and manage their own forests.

Forest Management by the State Forest Department: Forest Department of Meghalaya encompasses within its jurisdiction, all forested areas of the state excluding those areas which are vested with the Autonomous District Councils. The Forest Department of Meghalaya started with a modest beginning comprising two forest divisions, the United Khasi and Jaintia Hills Division and the Garo Hills Division. However at present the Forest department of Meghalaya has 17 divisions and 3 more divisions, are likely to be established. The present thrust of Forest Department of Meghalaya is all round restoration of forest ecosystems. The action plan of this thrust emphasize on the creation of

public awareness and greater involvement of people in afforestation programmes. The reserved forests are managed through the working plans, which are prepared on the basis of sustained yield principle. However, of late, the working plans for most reserved forests fail to conform to the sustained yield principle due to excessive human interference and other biotic pressures.

Forest Management by the traditional institutions: The traditional institutions of the Khasi hills like the Syiems, Myntris, Lyngdohs, Sirdars, Wahadars and village headmen constitute the Khasi political institutions. These institutions continue to exercise their influence over the various activities including forest administration and management through customary laws.

The Khasi state or kingdom has no defined boundaries. A Khasi state is identified and frequently distinguished by number of villages present in the each state; the boundary is taken from a village level upwards of the state. Every village has a Lyngdoh, a Sirdar, a headman etc., as the functionaries of the village. They demarcate their own jurisdiction under the particular Syiem of the villages. It is through the outer perimeter of the village jurisdiction that the Syiem or 'Hima' demarcate their respective boundary. This type of territory demarcation has a long tradition and is recognized by the people concerned.

The Syiemship is composed of a combination of Basans and Lyngdohs of a particular state or territory who formed a voluntary association to institute Syiemship as the upper or supreme power of the institution.

a) Clan Council: The Khasi clans and its authority in Khasi hills reflect interesting attributes. It is said that the clan has its own authority and functions within the clan's affair and not outside which may concern the village. The clan has its own jurisdictions. All internal affairs of the clan are looked and controlled by the head of the clan and the elders.

The different clans have their own respective Durbar known as the 'Durbar Kur' (Clan Council). The council of the clan is presided by the head of the clan. He is the descendent from the female side. He is known to the family as 'Kni' or 'Ma' (uncle). In the council of the clan he is known as the 'Rangbah Kur' or elder of the clan. He is elected by the male members of the clan.

b) Village Council: The villages of the Khasis have their own durbar or council called the 'Village durbar' or 'Durbar Shnong'. The village durbar consists of the male members of the village, the village elders or Basans. The head of the village council/durbar is the village headman, Sirdar or Wahadahar. He presides over the village council. His main function is to supervise the welfare of the villagers. The village durbar oversees to the strengthening and protecting the age-old customs of the villagers and the society as a whole. Cases like disputes and others are settled in the village council. Law and order is enforced and handled by the village headman.

c) Raid Council: Apart from the village council, the Raid is another political unit of the Khasis. It is composed of a number of villages and clans on whom the elected headman, Lyngdoh and four other Myntris manage and control the Ri Raid. The Raid Council is presided by any of the above-mentioned members of the Council. Its main powers and functions are to look after social welfare, civil and judicial administration. The Raid is the largest political unit of the state and it manages the internal affairs within its jurisdiction. Other functions of the Raid are to settle boundary disputes between villages, and control and maintain village property, land and forests. It also checks unauthorized occupation of the land; safeguard the Khasi laws and customs. It may, however, be mentioned that the Syiem is the head of the Durbar Raid. Raid councils are found in some parts of Khasi Hills like Bhoi and are not of universal occurrence.

d) The Syiem and Durbar: A number of villages and Raid, present in the Khasi hills form the state or Syiemship with an elected Chief. The Chief is elected by an electoral college consisting of Lyngdohs, Basans, Sirdars, Headman and the leading clans.

9.3.1.6 Causes of Forest Degradation: We identify two major factors as the causes of forest degradation.

1. Forest fragmentation: Shifting agriculture, logging, mining and other human activities have been responsible for fragmentation, destruction and degradation of the forests in the state. High rainfall and hilly terrain have further accentuated the impact of human activities on the forest. As a result, the forests are getting fragmented into small patches. The pine forests are most disturbed and highly fragmented. The degraded forestlands support a variety of successional communities ranging from weed-dominated communities on recently abandoned Jhum fields to pine forest and grassland on frequently burnt and nutrient-deficient sites. The impact of forest fragmentation are, change in land-cover and land-use pattern, qualitative change in species composition and structural organization of natural communities, decrease in primary productivity of natural and agro-ecosystems, fertility loss in soil due to sediments and nutrient losses, and loss in agricultural and horticultural biodiversity.

2. Shifting cultivation: Shifting cultivation and over-exploitation have been the most important factors causing depletion of forest and biodiversity resources. Almost the entire state is influenced by age-old practice of slash and burn agriculture, except some pockets of valley bottomlands, and reserve forests. This practice destroys the protective and productive vegetation in preference to a very brief period of immediate crop production. Commonly known as “Jhum”, it was valid for those days when human population was sparse and pressure on land was negligible. During that time the Jhum cycle, the intervening fallow period between two cropping periods, was long ranging from 50 to 60 years. Now it has been reduced to 3-5 years in the western Meghalaya and 1-3 years in the central and Eastern parts of the state. This is alarmingly short for the recovery of the soil fertility level, leading to progressive fertility loss and extensive land degradation and imbalance in the socio-economic setup of the village communities.

Because of the hilly terrain, 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 cultivation, and in absence of other viable alternatives to shifting cultivation, the majority of the population of the state continues to depend on shifting cultivation for their subsistence livelihood (Fig. 9.2). As per the data given by the Task Force on Shifting Cultivation, Ministry of Agriculture, 1983, 52290 families in the state were practicing shifting cultivation on 530 sq. km land area annually (Table 9.6). According to FSI 1997, the cumulative shifting cultivation area during the period 1987 to 1997 was 0.18 million ha. Thus, as on 1997, the average annual area under shifting cultivation works out to 180 sq. km, thereby, indicating a declining trend in shifting cultivation area.

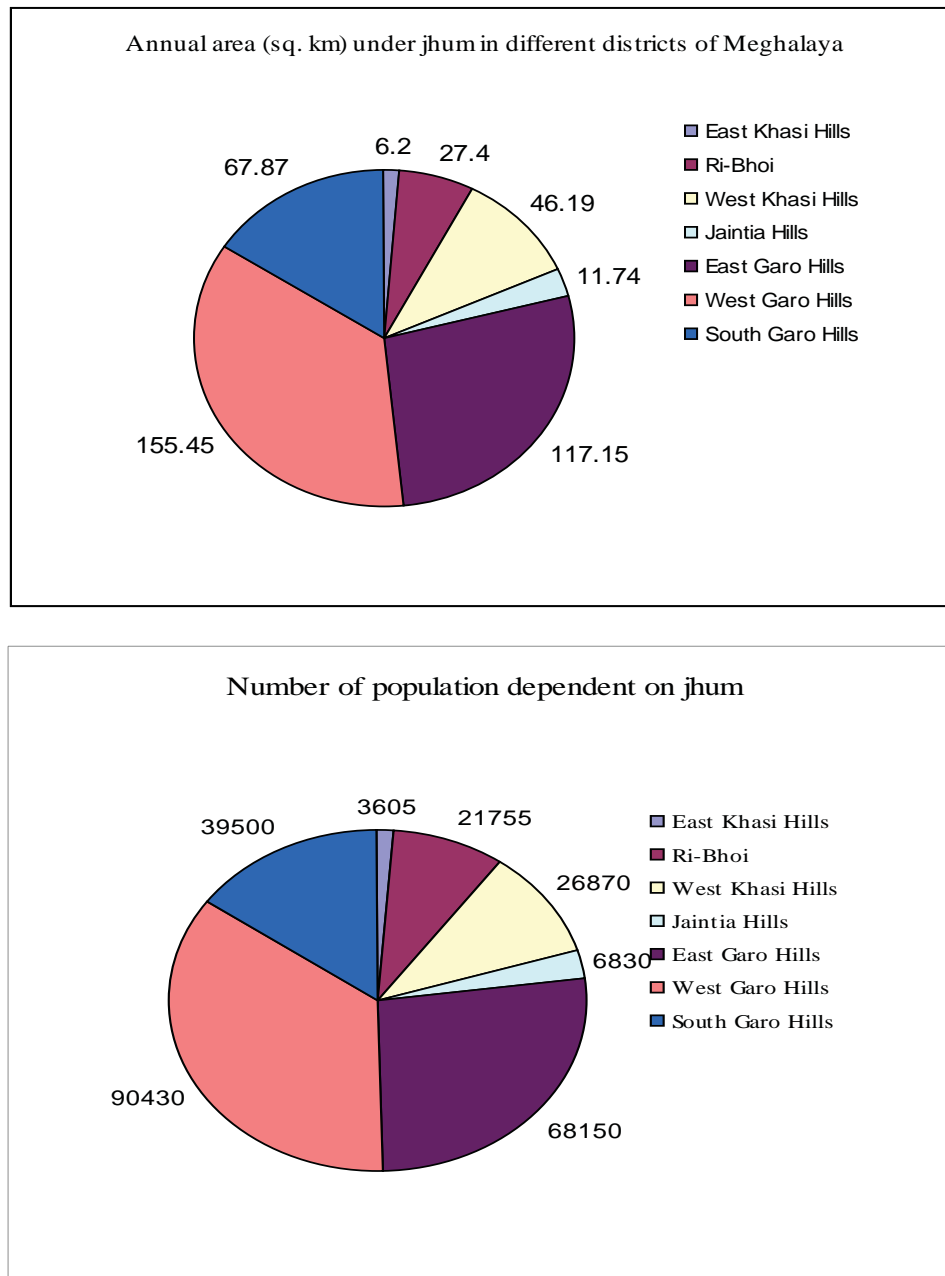
Table 9.6: Shifting Cultivation in Meghalaya in 2001

District	Total Rural Population	Families dependent on Jhum	Population dependent on Jhum	Jhumia population as % of rural population	Annual Area under Jhum in Sq. Km.	Annual Jhum Area as % of geographical area
East Khasi Hills	383027	721	3605	0.94	6.2	0.23
Ri-Bhoi	179630	4351	21755	12.11	27.4	1.53
West Khasi Hills	260595	5374	26870	10.31	46.19	0.88
Jaintia Hills	270669	1366	6830	2.52	11.74	0.31
East Garo Hills	211652	13630	68150	32.2	117.15	4.5
West Garo Hills	457422	18086	90430	19.77	155.45	4.19
South Garo Hills	90462	7900	39500	43.66	67.87	3.67
TOTAL	1853457	51428	257140	13.87	442	1.97

Source: http://www.megsoil.gov.in/shifting_cul.htm

Clandestinely, shifting cultivation is being practiced on the Revenue, Reserve Forests and protected forests. Although shifting cultivation is a non-viable resource-utilization practice, rural populations of Meghalaya are still clinging to this primitive practice to sustain themselves and their families mainly due to non-availability of other employment avenues. Frequent shifting from one land to the other for practicing Jhum has adversely affected the basic life support systems like vegetation and soil. The decline in the area under natural forest, the fragmentation of habitat, local disappearance of native species and invasion by exotic weed plants are some of the ecological consequences of shifting agriculture. Due to shifting cultivation on steep slopes, down-stream siltation of the water bodies is apparent in many districts.

Figure 9.2: Dependent population and area under shifting cultivation in Meghalaya, 2001



Source: http://www.megsoil.gov.in/shifting_cul.htm

9.3.2 BIODIVERSITY RESOURCE AND ITS LOSS

The state of Meghalaya is a part of Indo-Burma region, which is one of the mega biodiversity hotspots of the world. It harbours about 3, 128 species of flowering plants and contributes about 18% of the total flora of the country including 1, 237 endemic species (Khan et al. 1997). Nokrek Biosphere reserve, Balphakram National park, Nongkhylllem, Siju, and Baghmara Wildlife sanctuaries and a large number of sacred groves found in different parts of the state are the main preserves of biodiversity (Table 9.7).

Table 9.7: Biodiversity rich areas in Meghalaya

Biodiversity-rich areas	Location/Districts	Area (ha)
Balphakram National Park	South Garo Hills	22,000
Nokrek Biosphere Reserve	East, West and South Garo Hills	82,000
Nongkhylllem Wild Life Sanctuary	Ri-Bhoi	2,900
Siju Wild Life Sanctuary	South Garo Hills	518
Baghmara Pitcher plant Sanctuary	South Garo Hills	2.70
Sacred groves	All over the state	10,000

9.3.2.1 Floral diversity: The floral diversity of Meghalaya is quite rich. Wide varieties of wild cultivable plants, edible fruits, leafy vegetables and orchids are found in the natural forests of Meghalaya. About 40% of the total flora of the state is endemic. The endemic and threatened species are mainly confined to the protected forest areas including sacred groves. The species endemic to Meghalaya include, *Aeschynanthes parasiticus*, *A. superba*, *Callicarpa psilocalyx*, *Camellia caduca*, *Citrus latipes*, *Ilex embeloides*, *Impatiens khasiana*, *I. laevigatum*, *Lindera latifolia*, *Nepenthes khasiana*, *Paramignya micrantha* and *Rubus khasianus* (Balakrishnan 1981-1983). According to Takhtajan (1988), the flora of the Khasi and Jaintia hills is most richly saturated by eastern Asiatic elements, and the area is one of the most important centers of survival of the tertiary flora of eastern Asia.

The species that were common some 20 to 30 years back are becoming rare due to over exploitation, deforestation and habitat destruction. Some fern species namely, *Dipteris wallichii* and *Cyathea gigantea* have become rare in Meghalaya. *Ilex embeloides*, *Styrax hookerii* and *Fissistigma verrucosum*, which are considered to be extremely rare were collected from sacred grove recently after several decades (Upadhaya et al, 2003, Jamir and Pandey, 2003). Several orchid species such as *Dendrobium*, *Pleione*, and *Paphiopedilum*, *Vanda* having ornamental value are becoming rare in nature. *Podocarpus neriifolia*, *Cyathea gigantean*, *Ilex khasiana* and *Balanophora dioica* and saprophytic orchids like *Galeola falconeri*, *Epipogium roseum* and *Eulophia sanguinea* are becoming rare due to habitat destruction. *Nepenthes khasiana* which is one of the rare insectivorous plants, is reported only from a small pocket in Meghalaya. Haridasan and Rao (1985) have reported 54 rare and threatened plants, and Haridasan and Rao (1985-1987) have listed 44 rare dicotyledonous plants from Meghalaya.

A large number of exotic plant species have naturalized in Meghalaya. The species are found growing luxuriantly in a wide variety of places, ranging from forest to crop fields and rural degraded lands, roadsides, walls, etc. These species are posing serious threat to many useful elements of the native flora. Some notable invasive exotic species are, *Acacia dealbata*, *Albizia lebbek*, *Ambrosia artemisifolia*, *Apodytes benthamiana*, *Asclepias curassavica*, *Atylosia scarabaeoides*, *Brugmansia suaveolens*, *Cudrania cochinchinensis*, *Dillenia pentagyna*, *Elatostemma sessile*, *Emilia sonchifolia*, *Eucalyptus spp.*, *Eupatorium spp.*, *Eurya spp.*, *Lagerstroemia indica*, *Malus baccata*, *Mimosa himalayana* and *Psidium guajava*, etc.

Some of the endemic and threatened flora of Meghalaya include, *Michelia punduana*, *Trivalvaria kanjilalii*, *Uvaria lurida*, *Eurya eastanifolia*, *Elaeocarpus acuminatus*, *Impatiens khasiana*, *Inula khalpani*, *Ardisia quinquangularis*, *Nepenthes khasiana*, *Aphyllorchis vaqinnata*, *Corybus purpureus*, *Diplomeris pulchella*, *Gastrodia oxalis*, *Goodyera recurva*, *Hedychium ealearatum*, *Carex rara*, *Agrostis griffithiana*, *Festuca rubra*, etc.

The high taxonomic diversity and the high concentration of endemic and rare species in Meghalaya is attributed to its geographical proximity to the species-rich Eastern Himalayas, South Central China, Burma and Malaya and the favourable climatic conditions of the area and protection afforded to the forests through ages on the grounds of religious belief and taboos.

9.3.2.2 Medicinal plant diversity: The state is rich in medicinal plant species diversity. The indigenous tribes in the state traditionally use plants for treatment of various ailments. Some of the medicinally important species reported from this state are *Acorus calamus*, *Asparagus racemosus*, *Garcinia cowa*, *Myrica esculenta*, *Panax pseudo-ginseng* and *Rauvlfia serpentina*, etc.

9.3.2.3 Faunal diversity: More than 110 mammal species have been reported from the forests of Meghalaya, but none is endemic to the state. Some of the species of conservation importance include, tiger (*Panthera tigris*), clouded leopard (*Pardofelis nebulosa*), Asian elephant (*Elephas maximus*), wild dog (*Cuon alpinus*), Malayan sun bear (*Ursus malayanus*), sloth bear (*Melursus ursinus*), large Indian civet (*Viverra zibetha*), Chinese pangolin (*Manis pentadactyla*), Indian pangolin (*Manis crassicaudata*), Assamese macaque (*Macaca assamensis*), bear macaque (*Macaca arctoides*), and capped leaf monkey (*Semnopithecus pileatus*). The tiger, clouded leopard, Asian elephant, Assamese macaque, bear macaque, capped leaf monkey, wild dog, sloth bear, and smooth-coated otter are threatened species (IUCN, 2000). There are about 2,000 elephants in the Garo Hills and 500 in Jaintia Hills. The wild Buffaloes are also found in the forests of Meghalaya. Frogs and toads represent amphibians. Three types of reptiles - lizards, tortoises and snakes, are reported from the state. Several species of fish and crab are also found. Two varieties of deer - Sambar and barking deer are found. In Sal forests, the red Jungle fowl are a common sight, but their population is dwindling fast. The large pied hornbill and the great Indian hornbill are also found in Meghalaya. The black-necked stork is a common bird in marshland, beels, lakes and rivers. The most interesting rodents are flying squirrel, Malayan giant squirrel, Himalayan squirrel and Indian porcupine. The important civets are large Indian civets, small Indian civets and common palm civet or Toddy cat.

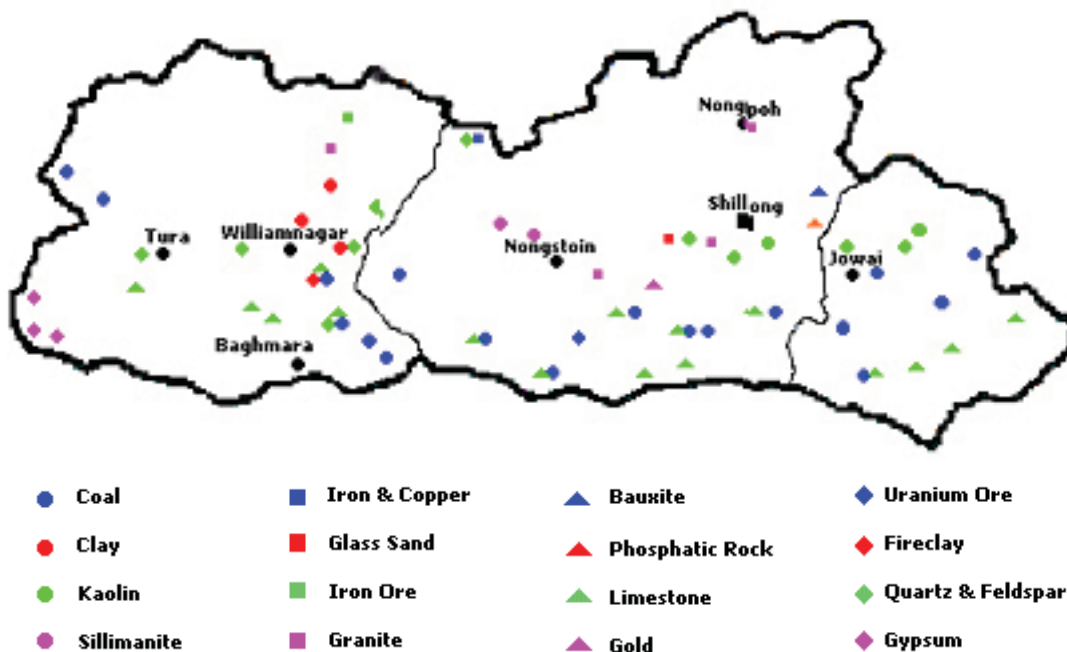
9.3.2.4 Threat to Biodiversity: The rich biodiversity of Meghalaya is under serious conservation threat today due to following factors:

- (i) Land tenure systems
- (ii) Clan-owned forests are mostly over-exploited and the District Council Acts, wherever applicable to these forests, are too weakly enforced.
- (iii) Overexploitation of ornamental and medicinal plants and animal products.
- (iv) Conversion of mixed forests into mono-specific forests and habitat destruction.
- (v) Conversion of forests areas into agricultural lands.
- (vi) Urbanization and Industrialization.
- (vii) Exploitation of Minerals.

9.3.3 MINERAL RESOURCES

The state of Meghalaya is rich in mineral resources. The major minerals present in the state are coal, limestone, clay, quartz and sillimanite. Besides, ores of iron, uranium, copper, granites, gold, etc. are also found in the state (Figure 9.3). The annual revenue income of the state from these minerals is substantial. For instance, total revenue of Rs. 12143 lakh was budgeted (revised estimates) from mineral sector during the year 2007-08. It is estimated at Rs. 13569 lakh for the year 2008-2009³.

Figure 9.3: Distribution of major minerals in Meghalaya



Source: <http://www.meghalaya.nic.in/naturalres/mineral.htm>

9.3.3.1 Coal: Meghalaya has an estimated coal reserve of 559 million tonnes, spread over an area of 213.9 sq. km covering approximately 1% of the total geographical area of the state. The three districts in Garo Hills taken together have the highest coal reserve of 390 million tonnes, followed by West Khasi Hills (98 million tonnes), Jaintia Hills (39 million tonnes) and East Khasi Hills districts (31 million tonnes) (Fig 9.4). Important coal-bearing areas of the state are presented in Table 9.8.

Most of the coal is of sub-bituminous type with low ash and high sulphur contents and has high calorific value and hydrogen content (1.5-2.8%). Since the industrial demand within the state is quite low, a major portion of the coal produced in the state is exported to Bangladesh and outside the north-eastern region. The local industries using the coal include, cement plants, lime kilns, brick-burning and pottery industries. Although mining of coal started during British period, its production on regular basis started in the early 1970s. Initially the production was inconsistent and was very low (< 100 MT) till the year 1980. There was a phenomenal increase in production after 1980, which peaked in the year 1999 (>4000 MT) (Fig. 9.5). Maximum coal is produced from Jaintia hills district (2786 MT), followed by East Khasi Hills and Garo Hills district. Among all the coalfields, Bapung area in Jaintia hills is the most extensively exploited area in the state.

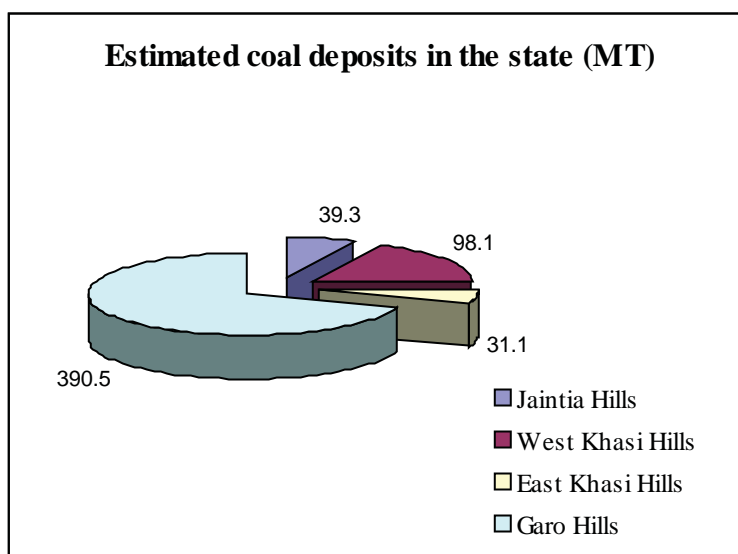
³Source: http://164.100.150.131/budget/receipts/recpt_0853.pdf

Table 9.8: Estimated coal reserve in different coal-bearing areas of Meghalaya

Location	Area (sq. km)	Reserve (million tones)
Khasi Hills		
Laitryngew.	31	2.738
Cherrapunji	36	19.0
Laitduh	0.12	0.12
Mawbehlarkar	0.10	0.12
Mawsynram, Rongsakham, Jathang and Mawsngi area	Coal seams with average thickness of 2.4 m	0.30
Lumdidom	0.2	0.20
Langrin	Four seams with thickness 0.6, 1.21, 0.9 and 1.10 m	97.61
Pynursla- lyngkyrdem	2	0.50
Mawlong- Shella-Ishamati	8	9.0
Garo Hills		
West Darrangiri	47	127
Siju	Coal seam about 11 km in strike length	125
Pendengru-Balphakram	13	107
Jaintia Hills		
Bapung	3 coal seams cover an area of 46	33.66
Lakadong, Umlatdoh	3	1.5
Sutnga	0.16	0.65
Jarain	2.8	1.1
Musiang Lamare		2.31
Ioksi		3.6

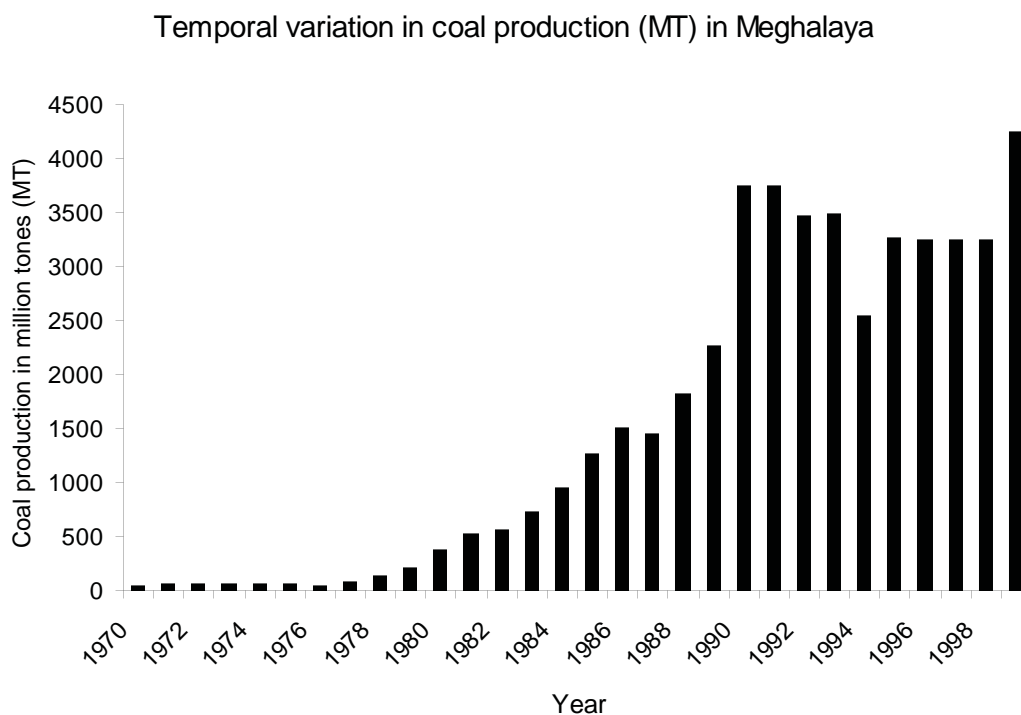
Source: neidatabank@hub.nic.in

Figure 9.4: Estimated coal deposits in different districts of the State



Source: neidatabank@hub.nic.in

Figure 9.5: Coal production in Meghalaya during 1970-1999



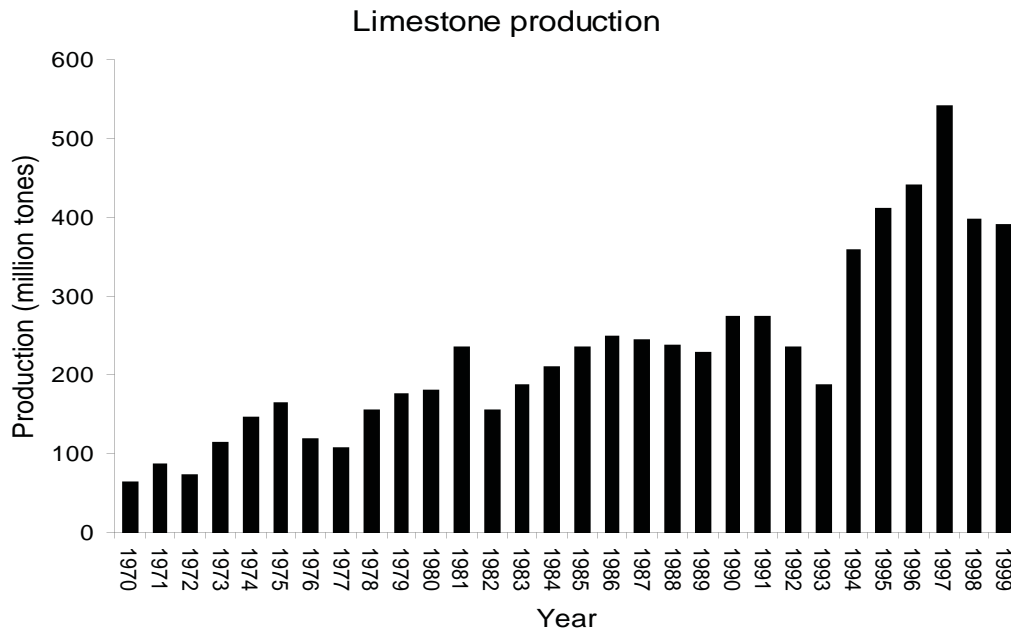
Source: Directorate of Economics and Statistics, 2000

9.3.3.2 Limestone: It is the second most important mineral exploited in the state. Its deposit extends from the southern part of the Garo hills to Jaintia hills through Khasi hills. The major deposits of limestone are in Cherrapunjee and Shella-Bholaganj area in Khasi hills, Nongkhlieh and Lumshong in Jaintia hills and Darrangiri-Era and Anig-Siju in Garo hills (Table 9.9). The total estimated reserves of limestone in the state are 2462.5 million tonnes. The maximum reserve is in Jaintia hills (55%), followed by Khasi hills (38%) and only about 7% is in the Garo hills (Tripathi et al., 1996).

The annual limestone production increased from 65 MT in 1970 to 389 MT in 1999 (Fig. 9.6). The annual production varied from year to year between 1970 and 1990 without showing any consistent progressive trend. But after 1990 there has been a progressive increase in the extraction of limestone in the state.

Table 9.9: Estimated limestone reserves (million tonnes) in Meghalaya

Location	Estimated reserve	Grade
Khasi Hills		
Cherrapunji	40	Cement
Shella-Bholaganj	900	Cement
Garo Hills		
Darrangiri	5.5	Flux
Anig-Siju	165	Cement
Jaintia Hills		
Nongkhlieh	700	Cement
Lumshong	652	Flux

Figure 9.6: Limestone production in Meghalaya during 1970-1999

Source: Directorate of Mineral Resources, Meghalaya

9.3.4 WATER RESOURCE AND ITS POLLUTION

Meghalaya is endowed with abundant water resource in the forms of springs, streams, rivers and lakes, distributed throughout the state. These fresh water bodies are being adversely affected mainly by deforestation, shifting cultivation, mining and urbanization. High rainfall and hilly topography have further compounded the problem. During rainy season silt load in the rivers and streams is increased several fold as they pass through the deforested areas. Deforestation has led to drying of several perennial springs and streams. A case in point is that of Cherrapunjee which receives an average of 10,000 mm of rainfall annually but its 30,000 habitants suffer from water scarcity⁴. Deforestation and soil erosion coupled with lack of water retention facilities have contributed to serious water scarcity problem during the dry months of the year in the area.

Coal mine seepage is another major cause of pollution of water bodies in the mine affected areas of the state. During the past decade, some water supply schemes have been affected which forced the PHE Department to shift to alternative water sources abandoning the polluted water sources. Efforts for the restoration of mined areas have to be initiated and followed up.

Rapid expansion of Shillong, the capital town of the state and development on other urban centers without proper sewage systems and sewage treatment facilities has become the major cause of deterioration of water quality around urban centers⁵. As such, the water is not good for health due to very low dissolved salt content and acidic nature. Further degradation in the water quality due to abovementioned reasons is posing serious threat to human health. Pollution-related ailments such as cholera, typhoid, acute gastroenteritis, diarrhoea, dysentery, poliomyelitis, viral hepatitis, skin diseases and others are common among citizens who use the rivers and streams as sources of water.

⁴Apart from deforestation and soil erosion, water scarcity in Cherrapunjee is also attributed to the geomorphic condition of the area, which does not allow underground water retention. In this connection, the PHE Department has already taken up water supply scheme by tapping surface water sources situated away from Cherrapunjee so as to supply drinking water to Cherrapunjee and its surrounding areas.

⁵In Shillong, the Government has already contemplated Sewerage scheme in the City Development Plan for Shillong City under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM).

Fine particles of coal, sand, mud and other mineral particles deposited at the bottom of the water bodies destroy the benthic habitat and reduce availability of oxygen for benthic animals. Continuously increasing human population and lack of proper sanitation are responsible for organic enrichment of water bodies of the area. Coal mining and acid mines drainage containing heavy metals and coal and sand particles originating from mines and spoils flows into the nearby stream or river and pollute it.

The colour of the water in most of the rivers and streams in the mining area has turned brownish or reddish orange due to the presence of iron hydroxides $[(Fe(OH)_3)]$. Low pH (between 2-3), high conductivity, high concentration of sulphates, iron and toxic heavy metals, low dissolved oxygen (DO) and high BOD are some of the physico-chemical and biological parameters which characterize the degradation of water quality. The turbidity of water caused by suspended inorganic particles like clay, silt and sand and organic (bacteria, algae and plant debris) substances reduces light penetration and influences plant life. The rivers and streams during lean flow period are generally clear except those which flow in coal mining areas. Dissolved oxygen concentration in aquatic bodies though is much higher than the standard 3mg/l, it shows a decline from 5.1-11mg/l in 1996 to 5.8- 8.5 mg/l in 2002.

Water bodies in coal mine area have become acidic. There has been a decrease in pH of streams and rivers from 4.48 - 8.4 in 1996 to 3.1 - 7.5 in 2002. The rivers, streams and springs which supported rich biodiversity and were source of potable and irrigation water in the area have become unfit for growth of aquatic flora and fauna as well as for human consumption. The abundance and diversity of macro-invertebrates in the water bodies has declined, except a few tolerant species of benthic macro-invertebrates, and there is lack of commonly found aquatic organisms such as fish, frog and crustacean. There is an overall decline in agriculture productivity in coal mine areas.

9.4 Government Intervention and Community participation

The rate at which various natural resources are being exploited in Meghalaya has been a matter of concern for the past two decades. Such exploitation has not only depleted many of the non-renewable resources, but also altered the social, physical and biological environment of the state to a great extent. Both the state as well as national governments have tried to regulate such activities broadly in two ways: 1) Regulation through legislations and 2) Preventive and mitigative measures through action projects. Since 1972, the year in which Meghalaya attained statehood, several such measures have been taken. However, the results of such interventions have rather been very dismal. Of late, it is now realized that unless the communities are motivated enough to participate in solving the complex issues of natural resource management, no amount of enforcement of acts, regulations and laws is going to help. This realization has now led the government to formulate such people-oriented policies as Joint Forest Management, Biodiversity Act etc., that keep people at the centre-stage of forest and biodiversity resource management. Although implementation is still in a juvenile phase, positive results have started showing up and such experiments need to be extended to other natural resources as well. In this section we discuss what has been done and what remains to be done to protect the environment so that development is sustainable.

9.4.1 GOVERNMENT INTERVENTION FOR CONSERVING THE FORESTS AND BIODIVERSITY

9.4.1.1 Notification of forest areas for scientific management: The government has declared about 713 sq. km of forest area as reserved forests (RF) (Table 9.10) and has been managing these forests on sustained yield principle under working plan prescriptions. However, due to excessive biotic pressure, inadequate protection, insincerity in preparing the working plans and strictly implementing them, a few of these RFs stand degraded. Besides RFs, some forest areas have been declared as protected forests (Table 9.11) and some have been notified under Wildlife Protection Act, 1972 as Wildlife Sanctuaries and National Parks. Nokrek has been notified as a Biosphere Reserve (Table 9.12).

Table 9.10: Reserved forests in Meghalaya

A. Jaintia hills			
Sl. No	Name of Reserved Forests	Gazette Notification No. and Date	Area (ha)
1.	Saipung	No. 26 of 25/07/1876 and No. 5 of 17/10/1877	15,035.30
2.	Narpuh (Block I)	No. 3978 F of 17/06/1906 Bl. I	6,241.88
3.	Narpuh (Block II)	No. 1106 R of 09/03/1918 Bl. II	9,867.87
Total			31,145.05
B. East Garo hills			
Sl. No	Name of Reserved Forests	Gazette Notification No. and Date	Area in hectares
1.	Chimabangshi	No. 28 of 19/06/1883 and for Sectt/492/63/9 dt.22/12/1965	2,328.48
2.	Dhima	No.28 of 19/06/1883 & 3715 R of 11/08/1904	2,071.99
3.	Dilma	No.28 of 19/06/1883	258.99
4.	Rajasimla	No.28 of 19/06/1883 & 665 R of 15/02/1899	1,812.99
5.	Iidek	No.28 of 19/06/1883	258.99
6.	Darengiri	No.28 of 19/06/1883 & 373 R of 29/01/1932	1,035.99
7.	Rongrengiri	No.28 of 19/06/1883 & 375 R of 29/01/1932	3,625.98
8.	Dambu	No.22 of 12/03/1880 & 4276 R of 14/10/1962	1,812.99
9.	Songsak	No.29 of 01/10/1885 & 3583 R of 05/09/1902	2,330.99
Total			15,537.43
C. West Garo hills			
Sl. No.	Name of Reserved Forests	Gazette Notification No. and Date	Area in hectares
1.	Dribru Hills	No.28 dt.19/06/1883 & 3526 R of 10/12/1930	1,502.19
2.	Baghmara	No.12 dt.24/02/1887	4,428.88
3.	Angratoli	No.3 dt.07/11/1883 & R of 15/06/1915	3,010.86
4.	Rewak	No.44 dt.07/11/1883 & 1699 R of 26/07/1932	647.49
5.	Emanggiri	No.44 dt. 07/11/1883 & 1699 R of 26/07/1932	828.79
6.	Sirju	No.44 dt.07/11/1883 & 2323 R of 26/07/1932	517.99

7.	Tura Peak Catch	No. for 10/75/32 dt.23/06/1982 R of 29/01/1932	418.63
Total			11,354.86
D. East Khasi hills			
Sl. No.	Name of Reserved Forests	Gazette Notification No. and Date	Area in hectares
1.	Riatkhwan	No.806 R of 05/03/1892 & 4287 R of 01/09/1892	391.33
2.	Nongkhylllem	No.4692 F of 23/07/1909 & 864 G.J. of 04/02/1939	12,590.84
3.	Umsaw	No. G.F.R. 234/46/3 of 16/12/1946	43.70
4.	Shyrwat	No.179/80/187 of 28/03/1988	44.16
5.	Riat Laban	No. for 179/80/187/ of 28/03/1988	204.66
Total			13,274.69
Total Reserved Forests			71,312.06

Table 9.11: Protected forests in Meghalaya

Sl. No.	Protected forests	Area (ha)
1	Upper Shillong P.F	799.47
2	Laitkor P.F	324.92
3	Green Block No.2	20.74
4	Short Round P. F.	133.31
5	Umkhuti	13.64
Total		1,239.09

Table 9.12: Protected Areas in Meghalaya

Protected Area	District	Area (ha)
Balphakram National Park	South Garo Hills	22,000
Nokrek Biosphere Reserve	East, West and South Garo Hills	82,000
Nongkhylllem Wild Life Sanctuary	Ri-Bhoi	2,900
Siju Wild Life Sanctuary	South Garo Hills	518
Baghmara Pitcher plant Sanctuary	South Garo Hills	2.70

9.4.1.2 Policy, Acts and Rules enforced by the government for forest conservation:

(a) **State Government and National Government:** National Forest Policy 1988 is the guiding policy of the forest management in the state. The Forest (Conservation) Act, 1980, The Wildlife Protection Act, 1972 and JFM Guidelines, 1990 and 2002 are some of the national legislations/policies that guide the management of state's forest. Biodiversity Act, 2002 and Biodiversity Rules, 2004 are important regulations being enforced by the national government through the state governments for conservation of biodiversity. Both these regulations and the JFM guidelines have strong elements of community

participation for their implementation. Other Acts and Rules impacting the extraction of forest produce in Meghalaya are:

- Meghalaya Forest Regulation, 1980 (Adapted from Assam Forest Regulation, 1890)
- The Garo Hills Regulation, 1882 (Regulation 1 of 1882)
- Meghalaya Forest Regulation (Application and Amendment) Act, 1973
- Meghalaya Forest (Removal of Timber) Regulation Act, 1981
- Meghalaya Tree Preservation Act, 1976
- Meghalaya Protection of Catchment Areas Act, 1988
- AWIL Fees Act, 1960
- The Bengal Cruelty to Animal Act, 1869
- The Meghalaya Wild Animal and Birds Protection Act, 1971 (Act 9 of 1971)
- The Cattle Trepass Act, 1871 (1 of 1871)
- The Elephant Preservation Act, 1879 (VI of 1879)
- Indian Fisheries Act 1897
- Livestock Importation Act, 1898
- Wild Birds and Animals Protection Act, 1912
- Prevention of Cruelty to Animals Act, 1960
- Prevention of Cruelty to Animals Rule 1960
- Prevention of Cruelty (capture of animals) Rules 1972
- The Wildlife (Transaction and Taxidermy) Rules, 1973
- The Wildlife (Stock declaration) central Rules, 1973
- The Wildlife (Protection) Licensing (additional matters for consideration) Rules, 1983
- Transport of Animals Rules, 1978
- The Prevention of Cruelty to Animals (Registration of Cattle Premises) Rules, 1978

Although there is no formal forest policy adopted yet in the state (a draft policy paper was prepared in 1980 but not yet approved), the policy of the state forest department has been to increase the forest cover of the state by discouraging and regulating the felling in all categories of forests and greening the barren areas which are under the constitutional jurisdiction of the District Councils and the state forest department. Attempts are also being made to streamline the administration of the forest and forestland under a single umbrella christened as 'unified control and management of the forests' of District Councils and the State Forest Department. Many rounds of discussions have taken place between the authorities of the District Council and the State Government but no tangible result has come out so far. Besides, it is also the intention of the Department to create village reserve forests all over the State, in the same manner as the erstwhile village forests established by the people themselves during the pre-British period. The policy, inter alia, also lays stress upon the regulation of shifting cultivation, which is one of the major factors causing deforestation in the state.

The existing Assam Forest Regulation adopted by the state as the Meghalaya Forests Regulation is far from adequate to achieve the aims and objectives of the policy. Therefore, a few other acts have been legislated like the Meghalaya Removal of Timber Regulation Act, the Meghalaya Tree Preservation Act, etc. The Meghalaya Tree Preservation Act was legislated with the prima facie objective of preventing the felling of trees within a radius of 10 km from the heart of Shillong. There is also an enabling provision to extend the same to the other district headquarters. However, the enforcement of the provisions of most of the Acts has been far from satisfactory.

Normally, as per provision of the Sixth schedule of the constitution of India, it is not possible for the State Government to interfere with the administration of forests in the Sixth scheduled areas. But through separate legislation, the State Government acts and rules can supercede the existing District Councils Acts also. Therefore, to discourage the felling of small trees in the District Council areas, the Acts attempt to regulate the marketing of the forest produce outside the state. This has been done based upon the logic that about 80 per cent of the timbers extracted from these forests go outside the state and the people of the state, utilize hardly 20 per cent. Likewise, to conserve and preserve the forests in the critical catchment areas of the important rivers of the state, it is contemplated to legislate an Act, which will ban tree felling in these forests.

(b) District Council Forest Acts: The District Councils have legislated separate forest acts and rules more or less in line with and in the same pattern as that of the State Forest Regulation. Three Autonomous District Council Forest Acts (viz., The United Khasi and Jaintia Hills Autonomous District (Management and Control of forest) Act, 1958, Jaintia Hills Autonomous District Council Forest Act and Garo Hills Autonomous District Council Forest Act, 1958 are applicable in their respective jurisdictions. According to the preamble of one of such acts (the United Khasi-Jaintia Hills Autonomous District (Management and control of forests) Act, 1958), "it is expedient to make laws relating to the management and control of forests in the areas of the Autonomous United Khasi Jaintia Hills District within the jurisdiction of the District Council as specified in the Sixth scheduled of the constitution of India". Unfortunately, this provision of the Acts could not be enforced and implemented in the true sense of the term. The Acts are self-contained with all the relevant desirable provisions, but the enforcement is not satisfactory. As a result of this, these forests have been subjected to indiscriminate felling during the last four decades.

(c) Traditional community forest laws: Most of the acts and laws passed by the Govt. of India, Govt. of Meghalaya and Autonomous District Councils remained less effective in managing the forests of the state. Contrary to this, the traditional institutions such as Syiemships, Doloiships, Sirdarships and Nokmaships have been forceful and effective till recently in managing the forests under their jurisdiction following customary laws. For instance, for Tangmang community forests, the following restrictions for forest management have been imposed under the customary law by the village durbar:

- No entry to the forests without permission from the durbar
- Tree felling allowed only for construction of community halls and other community works
- Fuelwood collection only by hand for bonafide domestic use
- Extraction of NTFPs is allowed only for personal consumption
- Hunting inside the community forest is not allowed
- Violators of the above restrictions and miscreants are heavily fined.

9.4.1.3 Joint Forest Management (JFM): The Ministry of Environment & Forests, Government of India, on 1st June, 1990 issued guidelines to the State Governments for involving local communities in the protection and development of the degraded forests. The primary objective of JFM is to provide

visible role to the local communities in planning, management and protection of forests and to give them a share in the benefit of these forests. JFM is a concept of developing partnership between the Forest Department and fringe forest user groups on the basis of jointly defined roles and responsibilities. The basic element in JFM is to establish grass root community based institutions for protection and management of forests. The programme aims at empowering local people for their active participation as partner in the management of forest resources and sharing the benefits derived from its protection and management.

The Government of Meghalaya institutionalized people's participation in conservation of forests when it notified implementation of JFM principles on September 9, 2003. Forest Development Agencies (FDAs) have been constituted in all the seven districts to better administer afforestation programmes and to achieve people's participation in such programmes. The constitution of FDAs envisages transparency and grassroots level democracy in implementing afforestation and ecodevelopment schemes.

The areas to be covered under JFM are (i) degraded forest areas including those owned by communities, clans and individuals; (ii) Any other land which has ecological significance or which needs management intervention on ecological/ environmental considerations.

The types of work proposed to be executed through JFM are (i) artificial regeneration to be undertaken on barren land; (ii) Aided natural regeneration measures for degraded forests; (iii) forest and wildlife protection; (iv) various entry point activities to elicit and ensure continued cooperation between local communities and Forest & Environment Department/ Autonomous District Councils. Such activities may include creation of community assets like roads and culverts, water harvesting structures, sheds for schools and community halls, etc.; (v) any other work including that related to protection of environment and management of eco-system.

Table 9.13: Joint Forest Management Committees in Meghalaya during the 10th Five Year Plan (2002-2007)

District	Number of JFMCs	Intervention area (in hectare)		Number of Households involved	Approved Outlay (Rs. Lakh)
		Proposed	Sanctioned		
East Khasi Hills	9	1250	1000	1573	164.77
Ri-Bhoi	18	1654	1200	1612	187.21
West Khasi Hills	13	2739	1100	2492	185.95
Jaintia Hills	5	1600	900	1309	145.51
East Garo Hills	8	1785	1000	3275	164.88
West Garo Hills	14	2150	1200	3756	192.33
South Garo Hills	6	2150	1000	779	159.64
TOTAL	73	13328	7400	14796	1200.29

Source: The Chief Conservator of Forests, Social Forestry and Environment Department, Government of Meghalaya, Shillong.

The FDAs and JFMCs implemented the National Afforestation Programme (NAP) from the year 2004-05 only. Plantations raised require 5 years of maintenance as per the norm. These will require maintenance beyond the 10th Plan period. Meghalaya has about 5780 villages but only 73 JFMCs could be constituted. One JFMC has the territorial limit of one village or a cluster of villages. The remaining villages need to be covered either under NAP or any other afforestation programme during the 11th Plan period. The effective implementation of the NAP through JFMCs will go a long way in generating gainful employment opportunities for rural people. It is felt that people's participation is a key to sustainable management of natural resources which is one of the strongest means of development for the masses.

9.4.1.4 Supreme Court Orders: In addition to the above policies, rules and acts, the supreme court orders (dated 12 December, 1996, 15 January, 1998 and 12 May, 2001) have direct impact on the forests, shifting cultivation and biodiversity conservation in Meghalaya. Tree felling has been prohibited in all the forest areas irrespective of ownership unless they are worked under the central government approved working plans/schemes. Although considered to be a welcome step for forest conservation in the state, many view it as a step to curb the autonomy of the traditional institutions and private forest owners.

9.4.1.5 Government intervention to control shifting cultivation: Various attempts have been made by the Government to settle those who practice jhum. These schemes have, however, not yielded the desired results. Failure of the schemes led the National Commission of Agriculture to reformulate the schemes only after assessing their impact on forest. The practice of jhum could be minimized by:

- (i) Providing employment opportunities and income generation on a regular basis through proper utilization of the land resources.
- (ii) By encouraging cooperative efforts for carrying out forest-based livelihood activities, such as basket making, rope making, cane furniture making, processing of non-timber forest produce, honey collection, etc. All these initiatives have to be made commercially viable by providing proper marketing facilities. These will not only discourage people from practicing shifting cultivation but will also improve their economic condition.
- (iii) By forming Village Forest Committees for the protection and development of the degraded forests. These committees may provide suitable incentives to the tribal by generating employment opportunities during the lean season.
- (iv) Determining the population-supporting capacity (PSC) of the area may be one of the major aspects for checking the degradation of environment and depletion of resources. This should include not only the food production and land availability but also consider other factors which may increase the carrying capacity.

9.4.1.6 Other Government initiatives to ensure community participation in forest and biodiversity management:

- Large-scale plantation programme both by state and national government through community participation on community areas by implementing effective schemes such as FDA.
- Externally funded projects for the management of upland agriculture including the livelihood issues and forest development, e.g. IFAD project
- Biodiversity conservation projects of NEC and Ministry of Environment and Forests, GOI
- JFM policies involving communities effectively
- Preparation of working schemes for community forests for initiating scientific management.
- Encouraging the people's innovations in shifting cultivation by introducing tree crops and switching to horticultural crops.
- Supporting community initiatives for sustainable management and harvest of NTFPs.
- Initiative by communities, government and external agencies to regenerate the degraded sacred forests.
- Increase in awareness level among the people.

9.4.1.7 Role of women in Natural Resource Management: In spite of 33% reservation given to women in the executive committee of each Joint Forest Management Committee (Meghalaya JFM Resolution, 2003), the involvement of women in natural resource management remains negligible. The marginal role that is currently being played by the women at grassroots level in the management of natural resources in Meghalaya continues to remain an area of concern for the policy makers and natural resource managers. There is a need to take corrective measures for better involvement of women in natural resources management (NRM). Such measures need to address basic policy issues of government governing the NRM as well as the customary practices being followed by different communities.

The reorientation of policies and practices relating to forest management at village level to make space for women in decision making process perhaps the most vital requirement at this juncture. In order to address this issue, traditional community institutions not only need to reexamine their NRM practices but also need to change their certain traditional and customary practices to accommodate the new role of the women. The state government also need to reexamine the efficacy and implementation potential of each NRM policy in the state to achieve true participation of women in forest management. Although legally and customarily, woman is the custodian of land and resources in Khasi Hills, ironically, woman has little say in decision making process concerning the management of resources in these areas. Similarly, in Garo Hills though the Nokmaship is centered around a woman, hardly she has any say in the matters relating to forest management. Considering the respect that the women command among the Khasi, Jaintia and Garo communities, 'true participation' of women will certainly go a long way in resolving the crisis that the natural resources of the state are facing. This necessitates the empowerment of women in the state so that they actively take part in the decision making processes relating to NRM. As has been reported in case of Uttaranchal, Rajasthan and Jamatia tribes of Tripura, women folks are proved to be better natural resource managers than their male counterpart if they are given a chance. Adequate education, access to information, capacity building for NRM and development of leadership skill among the women are some of the prerequisites for effective involvement of women in the management of natural resources. Further, economic upliftment and independency of the woman has to be ensured to make their role more meaningful. Besides, a favourable social and policy environment needs to be created so that the women get a much broader niche for themselves to manage the natural resources.

9.4.1.8 Bio-Resources Development Centre (BRDC)⁶: The centre, situated at 5 ½ Mile, Upper Shilong, was constituted by the Government of Meghalaya and registered under the Societies Registration Act, 1983. It was inaugurated on August 23, 2008. It is an autonomous registered society of the State Government under the control of the Planning Department. Its mission is to ensure meaningful conservation and sustainable utilization of the bio-resources of the State. Its function is to undertake research, field experimentation and development of value-added products/technologies for conservation and sustainable utilization of bio-resources of the state of Meghalaya. The Centre is manned by a core-staff comprising of scientific, technical and administrative personnel headed by a Scientist-in-Charge. The Centre identifies, formulates, executes/ coordinates and follows-up projects on various aspects of conservation and sustainable utilisation of bio-resources of the State. Besides the core-staff, a number of project staff are engaged by the Centre from time to time for execution of various projects of the Centre. The Centre is funded by Planning Department (S&T), Govt. of Meghalaya and Department of Biotechnology (DBT), Govt. of India.

The objectives of the centre are:-

- * Genetic improvement/up-gradation and multiplication of horticultural and medicinal plants.

⁶Source: http://www.megplanning.gov.in/orgchart_brdc.pdf

- * Improvement and health care of livestock.
- * Germplasm collection of non-mulberry silk moths and their wild relatives for genetic enhancement.
- * Development of human resource in biotechnology.
- * Collection, conservation, breeding, improvement and multiplication of orchids.
- * Multiplication and marketing of ornamental plants.
- * Ex-situ conservation, improvement, agro-technologies and sustainable use of medicinal plants.
- * Development of bio-informatics system.
- * Providing opportunity for training in bio-technology relevant to the activities of the Centre.

It currently has the following Programmes

- Horticultural Resources Development Programme.
- Medicinal plant Resources Development Programme.
- Human Resources Development Programme.

9.4.2 INTERVENTION NEEDS FOR REGULATING EXPLOITATION OF MINERAL RESOURCES

The performance of government in regulating the unscientific mining largely due to ownership issue has been dismal. The only viable solution to this complex problem seems to take people into confidence and implement an effective policy to regulate uncontrolled and unscientific mining.

Filling of mine pits, channeling of seepage water for checking contamination of water bodies and crop fields, afforestation with native species, undertaking effective soil conservation and water resources management programmes are some of the measures that can mitigate the problem and restore the degraded ecosystems of the area.

9.4.3 INTERVENTION NEEDS FOR CONTROLLING WATER POLLUTION AND CONSERVATION OF WATER RESOURCES

The efforts of the government in conserving the water resources and controlling water pollution in important water bodies have been far from satisfactory. Effort has also not been made to involve communities in these activities. Some of the interventions suggested are:

- A programme should be undertaken for regular monitoring of both surface and ground water for quality assessment and quality improvement.
- Minimum flow should be ensured in the perennial streams for maintaining hydrological balance and meeting societal needs.
- Necessary legislation is to be enacted for preservation of existing water bodies by preventing encroachment and deterioration of water quality.
- Water use efficiency should be optimized and an awareness about water as a scarce resource should be fostered.

- Conservation consciousness should be promoted through education, regulation, incentives and disincentives.
- Need for a water policy for planning, development and management of water resources.
- Reforms in rural drinking water by adoption of a demand-driven, and community participation approach based on empowerment of villagers to plan, design, implement and manage water supply schemes.
- Water purification by using low cost simple technology.
- Rain water harvesting and its storage.

9.5 Conclusion: The Challenges Ahead and Suggestions

As mentioned above, for effective management of mineral and water resources a series of interventions need to be taken by the government and people need to be taken into confidence while effecting such interventions. Similarly, in order to check or reduce shifting cultivation following measures need to be taken:

- Controlling the population growth: With increase in population, land area available for cultivation has to be increased. Thus, area under shifting cultivation increases at the cost of undisturbed forest area.
- Alternate livelihood strategies: Alternate sources of income such as development of handicrafts through cottage industries, local value addition of forest and agricultural products, popularization of new land-based activities such as fisheries, horticulture, apiculture, mushroom farming and sustainable NTFP production from forest areas need to be encouraged. Effective market-linkage must be ensured to sustain such activities. Grassroots level organizations such as Self-Help Groups have been effective in working out alternative livelihood strategies and thus, reducing the area of shifting cultivation.

In order to check biodiversity loss, following measures need to be taken:

- Policies for protecting the existing biodiversity-rich areas both at community and government levels should be formulated.
- Adequate funding for conservation of such biodiversity-rich areas should be ensured after inventorization and demarcation of these areas.
- Capacity building programme for the communities should be undertaken to assess, document, monitor and manage the biodiversity at local level.
- More areas irrespective of ownership need to be brought under Protected Area network
- Research support for conservation of fragile ecosystems and threatened category of species should be provided.
- Regeneration efforts for the degraded areas and restoration of biodiversity-rich landscapes need to be initiated.
- Studies on key stone species and their conservation need to be undertaken.

As already mentioned, forests are the most important natural resource in Meghalaya and most of them are owned by the communities such as by clans, village durbars, syiems, Sirdars, Dolois and Nokmas. Although such forests are supposed to be managed according to the provisions of the respective District Council Forests Act, in practice, hardly there exists any management system. District Councils virtually have no control over these forests and no scientific management system is followed. Although selection felling is practised in certain community forests, most of these forests are harvested when the need arises and are quite often over-exploited under the influence of some dominant/influential community members. Weakening of traditional and customary laws, gradual conversion of community lands into private lands, and diminishing influence of the traditional institutions over the society have resulted into either very little control or no control regime for the community forests. All these have contributed to unregulated tree felling in these forests. In addition, because of the low productivity (in absence of scientific forestry) and long gestation period, many of these community forests are being converted to cash crop plantation areas such as Broom grass (*Thysanolaena maxima*), Rubber (*Havea brasiliensis*) and Arecanut (*Areca catechu*). Substantial areas of community forests are also being diverted for growing horticultural crops such as pineapple, ginger, orange orchards (*Citrus spp.*) and often Lichi (*Litchi chinensis*) and Bayleaf (*Cinamomum tamala*) mixed with forestry tree species. All these activities though commercially beneficial, have a direct impact on the biodiversity and ecosystem functioning at a landscape level. Besides, these activities mostly benefit a few land/forest owning community at the cost of the poor majority whose livelihood options are severely affected due to vanishing of multi-species community forests.

Even the sacred forests, also one type of community forests, are fast vanishing. A study conducted by Tiwari et al., in 1998 reveals that barring only 1% of the total sacred forest area of the state, all other sacred forest areas is moderate to highly degraded.

It is often argued that the indigenous forest management systems are time-tested and are adequate for the sustainability of the community/private owned forests. As a testimony to this statement, there do exist certain patches of well-conserved/preserved community forests throughout Meghalaya. This has been primarily possible because of strong regulatory mechanism that is still in force at village durbar level. However, the number of such patches is depleting year after year indicating the inadequacy of self-governed traditional institutions to sustain the community forests. This is also apparent from the overall scenario of the condition of forests in the state, which have become considerably degraded both quantitatively and qualitatively over the years. In the absence of long-term data on forest cover and forest health (growing stock), empirically, it may not be possible to prove this point. However, when discussed with elderly persons having exposure to the forestry issues or if asked to a common man, and from our own field experience over the years, the above conclusion is found to be correct. Although the FSI data over a decade shows more or less constant forest cover in the state, it does not indicate the dynamics of growing stock thereby remaining silent on the conditions of forest health. The decline in dense forest cover over the years, as reported by FSI, although does prove this point.

The communities in general, the land owning clans/communities, private forest owners and the management systems in place for the management of these forests are to be blamed for such a decline in quantity and quality of the forests of the state, as the government do not have any interference in the management of community forests. In fact, in Meghalaya, before the intervention of the Supreme Court, there was absolutely no regulatory and controlling power of the state in relation to the land ownership, use and disposal of forest produce pertaining to the forests which are in the hands of communities and private individuals. Therefore, it is amply clear that there is some inadequacy in the regulatory mechanism of the traditional management systems resulting in the large-scale degradation of forests

in the state. It could be due to growing need of the land/forest owning communities, operating market forces, sheer, human greed and aspiration for adopting a modern life style, leading to the degradation of the forests. Even wherever the traditional forest management system is still strong, the forests have not been able to withstand the pressure arising from these factors because of inherent weaknesses in the traditional systems which are based mostly on the principle of 'preservation' and 'low production forestry'.

All these facts bring home one point, and that is, there is a need to strengthen the traditional forest management mechanism through peripheral intervention. The Supreme Court verdict in this context is a welcome measure. In fact, in its series of verdicts/judgements, the Supreme Court has tried to regulate the indiscriminate tree felling and attempted to introduce scientific management in the community forests through introducing the concept of working schemes for achieving sustained yield. Thus, the Supreme Court verdict should not be seen as a setback to the 'greater autonomy of the forest management by the institutions of self-governance' (Nongbri 2001). Of course, a lot still needs to be done to implement and operationalize the verdict in its right spirit. For instance, the myths about the Supreme Court rulings such as (i) complete ban of tree felling from the forest, and (ii) that the Supreme Court is facilitating the increased state control over the community forests, etc. need to be clarified in the minds of the people. Besides, preparation of working schemes for such a huge forest track is not an easy task to be accomplished within given time framework. The forest department at present does not have that huge man power to accomplish the task neither the village communities have the capacity to undertake such task. Therefore, there is a need to work out a well-planned policy outlining the strategies to be adopted for achieving the broader objective of sustainable forest management in community/private owned forest areas.

In order to effect sustainable forest management practices in the community forests, specific areas of intervention and the extent of intervention are required to be identified very carefully. A people-friendly policy needs to be developed by the government that would ensure a favourable environment for government and community participation in conserving the community and private forests. The areas where facilitation is required, and the areas where regulatory mechanisms are to be there, strategies for strengthening the traditional institutions for effective forest management need to be identified for formulating an effective and implementable community forest policy of Meghalaya. While identifying such areas of intervention, sensitivity regarding government interference in community affairs and autonomy of traditional institutions should be kept in mind. The fear of land alienation due to government interference in people's mind and the issue of possible alteration of land ownership, must be given top priority while undertaking such an exercise for developing the appropriate policy.

Research needs to be taken up to identify the bottlenecks and deterrents that retard the spirit of forest conservation among the communities. In order to create a favorable environment for communities to work towards sustainable forestry, all the existing acts, rules and regulations need to be critically reviewed and points for amendment need to be identified in close consultation with the communities.

Considering the need of practicing scientific forestry in community and private forests, which is viewed to be a viable strategy to ensure the continued existence of forests on community and private land, and given the limitations of the state forest departments in terms of number of forestry personnel vis-à-vis the large forest areas under community/private ownership, it is desirable to train the representatives of village durbars on various aspects of technical forestry. Researches need to be under taken for identifying the areas and topics for capacity building programme for the communities. The *modus operandi* to commence such programme also needs to be worked out.

Given the fact that most natural resources such as land, forest, mineral resources and water bodies belong to the people and the sixth schedule of the constitution protects their rights over these resources, the community participation models tried elsewhere in the country do not necessarily succeed here where people's participation is sought in government's programme to conserve natural resources mostly owned by the government. Due to this contrasting ownership pattern of natural resources, government of Meghalaya have to design a well-thought out intervention agenda to check further degradation of natural resources through persuasion, regulation and facilitation processes with an objective to encourage the land/resource owning communities to take up conservation programmes, where government agencies participate.