CHAPTER -8

STRATEGY FOR FUTURE MANAGEMENT

8.1. INTRODUCTION

Management is a kind of action and like other kinds of action, it depends on many things. The focus of management right at the very out set is on result- oriented performance. Forest as a living organism is to be nursed, protected and developed. The continuous onslaught on forest resource and the consequent massive environmental degradation interms of floods, soil erosion, landslides, lives and property etc., on the other hand, and the desirability of sustained yield of goods and services on the other, call for steps towards rational management of forest resource (Desai, 1991 and Sukla, 2000). However, it is very simple to talk about the management of forest resource but the reality is some what different. From the view point of layman, forest resource management is to stop or check the deforestation and to promote afforestation. Though these two related issues act as stepping stones in the management of the forests, there are several other issues, which should be taken into consideration.

Before proceeding towards the different components of management of forest resource, the clarity regarding what is forest management is necessary. If people are unaware of desirability and aims of forest management, there is little or even no hope to achieve the targets of management. Therefore, let us begin with 'what' rather than 'how' to manage the forest resource. In a very simplified version the management of forest resource is basically "the management of forest eco-system". The forest eco-system encompasses all micro and macro features, conditions and influences of the environment that affect growth and perpetuity of forest. Dwivedi (1984) has rightly emphasized that the forest resource management involves the management of (i) forest land, (ii) forest flora and (iii) forest fauna. The investigator feels that few more variables like marketing, finance, research and development, population both of cattle and of human, need-system, awareness, carelessness of resource managers as well as of inhabitants, political - legal complexities, etc. should be considered. In particular, science and technology provide a boost to forest productivity. The need for scientific management is very much essential for the accelerated growth of forests in the sub - Himalayan North Bengal.

From the environmental and economic stand point investigator broadly categorises the strategy of forest resource management imperatives into :

- Management of protecting existing forest resource and increasing forest productivity.
- Scientific management for social forestry, joint forest management, farm forestry and other.
- Management of natural, cultural and economic environment.

8.2. MANAGEMENT OF PROTECTING EXISTING FOREST RESOURCE.

The state of West Bengal has no forest policy of it`s own. It generally follows National Forest Policy. But the following are the policy issues which can be the basis of framing legislature for legal support.

(i) Optimum vegetative cover that can be achieved:

In the study area, there are 32,46,155 people (Census,1991) reside in rural areas. If average family comprises of 5 member then we will have 6,49,231, families. If by intensive planting process each family rears additional 4 mature trees, preferably multipurpose trees to yield timber / fodder / fruit, then each family can add 6,49,231 x 4 = 25,96,852 trees. In this way private marginal and fallow land can be planted. The trees planted by villagers will create employment opportunity, supplement their fuel and fodder requirement. This village plantation will be able to meet the growing demand of raw materials to wood based industries. On the other hand it can reduce the pressure on natural forest of the study area. Forest department should take necessary initiative to fullfil this goal.

(ii) People's participation :

From the late eighties forest administration of the study area has taken a new strategy in forest management by involving people residing in the fringe of the forest and Forest Protection Committee were formed. Large scale extensions should be done to motivate the people for this joint forest management programme. The advantage of Panchayati

Raj in the study area should be taken and at least two members from local Panchayat to be included in the **Forest Protection Committee**. The forest management is atpresent urban- oriented and preservative. In view of the changes in priorities and emphasis on rural development and afforestation, the National Committee on Environmental Planning (NCEP) has emphasised the need to improve forest management. Further, forest management should be the rural oriented and should endeavour to cater to the needs of the rural society. For a better utilisation of forest resource and rapid afforestations, there is an urgent need to decentralise the administration of management process. At the village level, the management of village forests, social or farm forests should be entrusted to village Panchayats (Chakrabarty,1997). The working of the village Panchayats in the area should be co-ordinated by the forest department. (Figure 8.1)

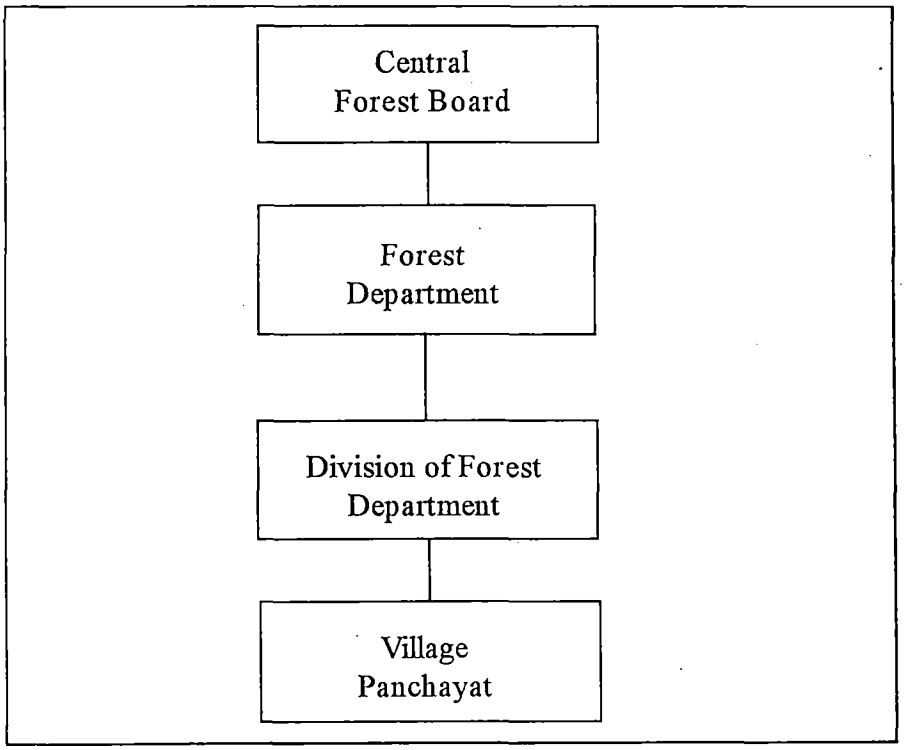

Fig - 8.1. Four - tier forest management process.

In addition to strengthening and expanding the on-going programmes in forestry, the following three new programmes may be introduced:

- **Tree for Every Child Programme :**

This programme envisages the promotion of school forestry programmes based upon the interest of the children themselves in the trees of their choice. Under this project, assistance, the training and supply of relevant seedlings will be provided to all the schools which are

, willing to join in a programme for enabling children to plant and protect one or more tree in their homes. Those schools which have the necessary land and water facilities will be enable to raise nurseries of appropriate seedlings within the school compound itself with the participation of children.

- **Eco-Development Force :**

An eco-developmental force, consisting predominantly of ex-servicemen, will be formed for the purpose of restoring damaged hill eco-system through afforestation and soil conservation.

- **Eco-Development Camps :**

College students draw from the different colleges of the area will be enable to taken up extensive tree planting work in suitable areas such as hills, river bank ,and road side etc. It is hoped that the foregoing programmes, together with the extensive tree planting work which will be under taken under the National Rural Employment Project, will help to arrest the degraded of forests and build up the ecological infrastructure necessary for sustained development.

(iii) Rural energy policy :

Even in urban of the study area a lot of firewood is consumed. So the forest department should have a rural energy policy. Within 5 kms. of forests, people may get free fuel in the form of headload from intermediate thinning and final harvesting in lieu of protection afforded by them. Also 5 kms. from havitation, intregated fuel-fodder plantations should be created, whereas the forest beyond 5 kms. should be devoted on highly productive forestry otherwise the community in the fringe will suffer due to depletion of resources which they otherwise could use for a longer period, if indiscriminate and free access to the forests can be prevented. People residing beyond 5 kms. from the forests or (out side FPCs) should grow their own fuel biomass in their own land. For that proper technology transfer and intensive extension work should be done by the forest department .

(iv) Fodder policy :

The study area has high density of cattle population (1.18 millions as per Census, 1991).

In addition to this, large number of goats, sheep, pigs also add to these and hardly any agricultural or non-forest land is earmarked for fodder cultivation in the area. Forest department should register all the cattle of the village and they should be graded. To certain limits no fees to be levied but beyond that fees should be levied and that income should go to the village development committee/FPC/Panchayat etc. The state government should also frame policy to reduce the number of unproductive cattle and replace the same by high breed cattle by artificial insemination, castration etc.

(v) Wild life conservation :

The action plan of wild life wing of forest department should be divided into three categories-

(a) Species conservation (conservation of particular species)

(b) Protected area conservation and

(c) General public awareness.

As mentioned earlier that there are some important animals existed in the study area which require special attention for their preservation . Such animals are- (i) Tiger, (ii) Elephant, (iii) Rhinoceros, and (iv) Mammals specially Red Panda. National parks and wild life sanctuaries of the study area should be protected and conserved. Few forest area of the districts should be declared as reserve and protected areas. Wetlands and some bird sanctuaries in the study area also need some special attention. There is a proposal for external funding for eco- development at Buxa Tiger Reserve (by global environmental facility which is a window of World Bank), a grant plus IDA (Soft loan) for eco-management of fringe dwellers, 16 FPCs and 16 EDCs at BTR for five years (Working Plan, 2000). This sort of work programme should be extended in other protected areas. The State Government should contribute some funds for public awareness in general and for publicity on the wild life of the area. This programme may reduce the man-animal conflict (Ghosh and Nandi, 1997 & Mani, 2001).

8.2.1. Increasing forest productivity

In order to increase the forest productivity ,the silvicultural practices for multiple use forestry may be used .Clear policy should be adopted regarding the silvicultural system to be followed

in the districts. Considerable areas have been kept reserved in the study area for bio-diversity conservation. So in rest of the areas highly commercial species should be planted. No clear-felling should be allowed in fragile areas of natural forests. Extraction should be limited within sustainable capacity of the forest, following selection system wherever possible and creating condition conducive to natural re-generation of valuable species, by limiting the grazing within carrying capacity, limited collection of leaf litters and fuel wood. But the past experience in the study area indicate the problem of natural regeneration under diffused regeneration system, and so there is no reason why in suitable areas of natural forest clear-felling followed by artificial regeneration should not be adopted. So, it will be unwise to keep the assets locked up and try to follow a silvicultural system which failed in the past and where the natural regeneration is not assured. For the time being clear felling may be extended atleast up to 60% crown density of natural forest, except in fragile areas.

8.3. MANAGEMENT OF FORESTRY PLANTATION

The investigator has catagorised the forestry plantation from the view point of the following :

- Management of social forestry
- Joint Forest Management
- Farm forestry .

8.3.1. Management of social forestry plantations :

Social forestry management aim at putting as much area as possible under forest cover and also to meet various needs of people viz. fuel, fodder, small wood for house building and agricultural implements etc. Changes in management practices, participation of local people and sharing of benefits added a new dimension and also gave impetus to the aspirations of the people living in the vicinity of the strip plantation, who are the target - beneficiary in the management machinery. Commensurating with the avenues provided in the Joint Management of such plantation, coupled with change in social- need, it has become imperative to shift our attention to the primarily objective to give maximum financial return at quickest possible time to the target beneficiary which shall make them interested for the protection of these plantations (Vyas & Dubey, 1997).

8.3.1.1 Species Selection : It is proposed to plant only 5-7 fast growing species in the strip plantation suitable according to site factors. The following species which have been found to grow well in the districts of Darjeeling and Jalpaiguri will be planted in the strip plantations. (Table 8.1)

Table 8.1

Species for strip plantations

Sl. No.	Local name	Scientific name	Best location
1.	Simul	*Bombax ceiba*	School compound
2.	Kadam	*Anthocephalus kadamba*	Road side
3.	Gamar	*Gmelina arborea*	Vested land
4.	Sirish	*Albizzia species*	River embankment
5.	Teak	*Tectona grandis*	Road/Railway line
6.	Sissoo	*Dalbergia sissoo*	River/Road side
7.	Bakain	*Melia azaderach*	Pond/Bill embankment

These species not only grow quite fast but also have great demand as raw material for plywood, veneer, match industries and furniture making industries in the districts.

8.3.1.2 Proposed administrative measures :

In view of lack of technical expertise and trained manpower with Panchayats it is proposed to vest technical aspects of social forestry schemes with officials of forest directorate. While the forest officials would be responsible for raising nursery, soil testing, suggesting fertilizer/growth hormones applications and subsequent silviculture operations such as cleaning, mulching and thinning if necessary, the Panchayat functionaries will be responsible for selecting of beneficiaries who will be engaged in implementing these schemes and also subsequently protecting the strip plantations. It is suggested that selection of beneficiaries should be done from the initial stages of implementation of these schemes.

A part of sale proceeds or net income at the time of harvesting of these plantations

may be shared with these beneficiaries on the lines of sharing of revenue under **Joint Forest Management** in forest areas. For these purpose the beneficiaries may constitute **"Strip Plantation Protection Committees"** on the model of Forest Protection Committees.

It is proposed that Joint Management of strip plantations should be implemented from planning stage to harvesting stage and both Forest Department as well as Panchayat functionaries should participate from the inception to harvesting to make the schemes successful. (Figure 8.2)

In view of change strategy, it is also felt, that there is a need of amending the existing government orders relating to management of strip plantations issued by forest department in this regard.

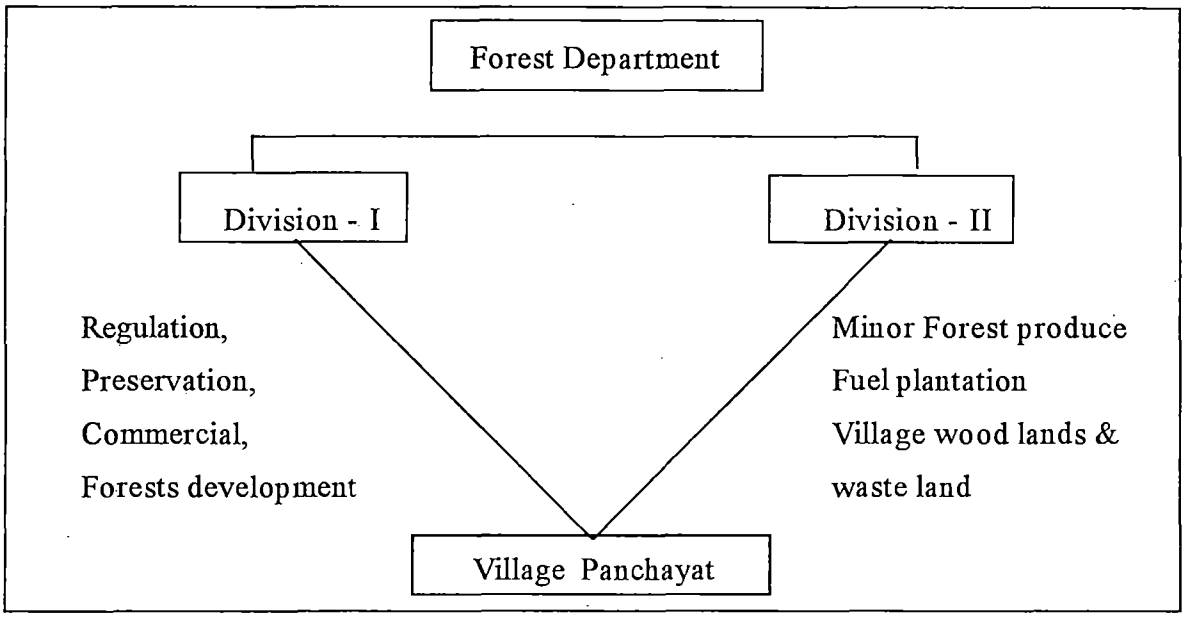

Figure 8.2 - Role of Forest Department and village Panchayats in Social Forestry.

8.3.2. Joint forest management

In joint forest management the objective of both partners, the local community and forest department, must be clearly understood and agreed upon jointly. It was initially assumed that these process of micro-planning will automatically take care of setting up of correct objectives. The present micro-planning will automatically take care of setting up of correct objectives. The present micro-planning process tend to revolve a round the assessment of resource and of community needs. The discussion of these problems and their remedies often obscures the central issue of why, how, by whom and for whom the forest itself

should be managed. For successful implementation of the JFM, micro-planning of individual FPC/EDC areas is most essential. Micro-planning entails extensive ground level survey of both villages and forest resource. The EDC can play a crucial role in stemming the degradation of environment in the hills. The training is also important. The official at the ground level (who are responsible for maintaining liaison with the committees) have to be suitable trained before they can successfully interact with the villagers. The human aspects of JFM demands an imaginative approach and more commitment on the part of the official. Involvement of more tribal people in the afforestation programme should be increased. (Figure 8.3). It will be advantageous to go in for mixed plantation with particular emphasis on some of the species which will be benefit to the tribal (Basu, 1987). There are other tress whose produce falls under minor forest produce. The development of such tree will provide a supplementary source of income for the tribal. Some support activities should be provided by the forest department for the proper implementation of JFM in the study area which include -

(a) Work for more days

(b) Provision of drinking water, electricity and

(c) Medical and education facilities for the children.

In addition to the above, allotment of more funds for the various activities of JFM should be provided by the state government . One of the most important factor is the share of people i.e. FPC in the final harvest. In the districts at present FPC are entitled for 25% whereas in Gujrat it is 50% of the net proceeds. So the share of FPC in final harvesting should be increased from the 25% to 50%.

8.3.3 Management of Farm Forestry

In farm forestry it was found that people interested to grow timber species, like Kadam, Gamar, Sissoo. This trend continued till early nineties. Since last two years there has been noticed that large number of veneer mills have been established in the districts and farmers have become interested to sell even immature trees to these mills at nominal price. This clearly indicates two very important distinctive features (i) expectation for quick financial return and (ii) increasing demand for plywood industries.

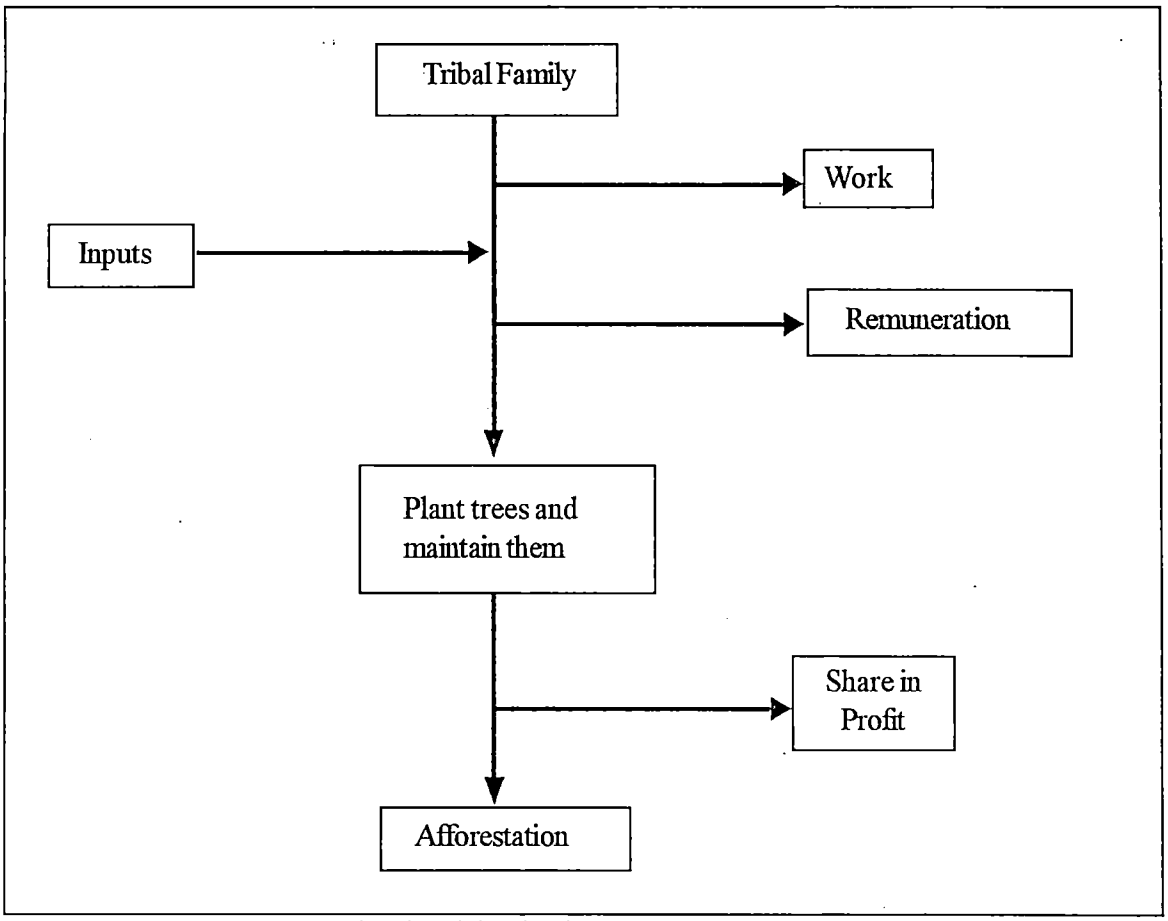

Figure 8.3 - Tribal Participation in afforestation programme of JFM.

8.3.3.1 Finance for farm forestry - A proposal

In the strategy for overall forestry development designed by the Government of India, social forestry has been given great importance, in view of the need to meet the ever-increasing demand for fuel wood, manure, fodder etc. Forming part of the social forestry programme is farm forestry, that is , raising of trees on private agricultural lands for producing timber, fuel, leaf, fruits, flowers, gums, resins, wax and roots. Commercial Banks, Regional Rural Banks, State Land Development Banks and State Co-operative Banks should provide loan facilities for farm forestry. Loans can be had from banks for planting of trees on bunds/boundaries of farmer's agricultural lands and uncultivated lands owned by farmers, for switching over from existing lands cultivation agricultural crops with low yields and low income returns to tree-farming on degraded government lands obtained by farmers or farmers' organisations such as co-operative societies on lease from state governments. Loans should be against mortgage of land and hypothecation of tree crops. The farmers are required to make down payment of 5 to 15 per cent of the capital cost,

depending upon whether they are small, medium or large farmers. Such payment is not necessary if capital subsidy is available from state government. The interest charged is 10.25 per cent for small farmers and 12.5 per cent for other farmers. Repayment period is fixed with reference to the species of trees, gestation period, yield and income from year to year.

The areas selected should be by catchments and satisfy the ecological needs, indigenous requirements or consumption and industrial needs. They may cover recognised agricultural zones based on potential productivity , current uses of produce and legal status of land, as well as on research on matching trees to the appropriate systems of agricultural practices. Compact and contiguous blocks should be selected to that better supervision and monitoring are easily ensured. Inter-cropping may be considered in marginal agricultural lands taken up for growing tree crops. If protection is available, fodder (leaf) and palatable grass can be grown. Depending on the agro-climatic conditions, inter-cropping of groundnut, cotton, bajra, chillies, tapioca, coarse millets and oilseeds can also be done. The three species proposed to be grown should be selected keeping in view the soil, agro-climatic conditions of the area, range of agricultural crops, degree of local adaptation, land development and managerial treatments available in combination with the tree crops. They should be sufficiently quick growing and capable of yielding high economic returns.

Financial assistance may have to be provided to meet the expenditure on land development, raising of mounds and digging of pits, cost of planting material, cost of fertilisers, labour and maintenance expenditure in subsequent years till the trees come up to the yielding stage. No loan should, however, be given for development of infrastructure like roads and buildings. The working capital requirements should be adequately met and the tree crops are to be insured against risk of fire. It is to be ensured that there is a tie-up arrangement with a marketing agency for purchasing the marketable surplus after the farmer's own requirements are met. It is also realised that to achieve the true potential of farm forestry and improve productivity, the individuals should be provided with improved inputs specially planting materials, technical advice for selection of proper species, proper time of planting, spacing and silviculture operation etc. The forest department should make arrangement of the above with the local Gram Panchayats.

8.4 MANAGEMENT OF NATURAL,CULTURAL AND ECONOMIC ENVIORNMENT

This aspects of Forest Management includes three dimensions which are discussed in the following sections.

8.4.1 Management of Natural Enviornment

Natural environment consists of natural features, influences and conditions. The life-system is the replica of prevailing conditions of the natural environment upto a certain extent. Natural environment is composed of climatic conditions, soil and water status, vegetational conditions, and land characteristics etc. All these singularly as well as collectively affect the nature, growth, prosperity and so many things related with forest eco-system (Ali, 1994).

8.4.1.1 Management of Soil Environment.

The role of soil in determining the growth of natural vegetation hardly needs emphasis. The management of soil environment is an urgent need of the day from the qualitative as well as quantitative perspectives of forest resource. Soil can be managed in many ways through different techniques and also by various approaches. The first and foremost aim of soil management is to check the heavy loss of soil. In the area under study, the problem of soil erosion has become very critical specially in the hill areas of Darjeeling and in the southern plain region. Control over rapid soil runoff can be exercised through the following measures:

Terracing : The most common practice to control the soil erosion in the hill areas is terracing of lands. The practice of terracing requires some basic knowledge of surface gradient, nature of parent rock and the intensity of rainfall. Despite low density of population, the regions of steep slope with high intensity of rainfall face acute problem of soil erosion, hence it is advisable to make inward terracing in such areas instead of outward and flat terracing.

Gully checking : Gully actions cause little erosion in initial stage, but after some time with increasing gully action soil erosion increases tremendously. Thus, it is a must to prevent the process of gully formation at the initial stage itself. However, the main technique to control gully action is plugging through boulders, pebbles and other resistant eartnen ,materials.

Check dams : The quantum of soil erosion can be reduced to a considerable extent by constructing check dams at suitable sites and elevations. The number and size of check dams should be based on the water catchment area.

Nutritional management of soil : Soil is the basic source of nutritional stock and the amount of various organic and inorganic constituents present in the soil directly affect the amount and growth rate of different and divergent forest species. Thus by doing the nutritional management of the soil by alternation or additions of proper organic/inorganic nutrients, the targets of forest resource management can be achieved to a certain extent. For the purpose of better output of the forest flora, manuring and chemical fertilization are necessary.

Soil moisture and water management : Soil water is the basic ingredient for seed germination and for the sustenance of plant growth. On account of a canopy of tree leaves and an under growth of grass, seedling and herbs along with a dense litter of leaves and twigs, forest floor, water loss through evaporations is reduced. Further, permeability is increased, a significant amount of water infiltrates into the soil and surface runoff of water is reduced. Excess water in the subsoil is transpired and water logging is prevented. Thus, through proper afforestation programmes, soil water of a given area can be maintained and even enhanced and higher levels of natural regeneration target can be achieved. Through the process of organic manuring also, soil moisture relations can be improved.

8.4.1.2. Management of slope failure

Slope failures are the basic problems of the Darjeeling Himalayan region. Among the main causative factors - geological conditions, slope and gradient, hydrological conditions and biotic activities are worth mentioning. Emphasis should be given on the role of vegetative component of the system. In many areas in spite of favorable geo-hydrological conditions, the failure of slopes is due to the destruction of vegetations. The management and control of slop failures is necessary because of their dual role in disturbing the vegetation .Firstly in the places where slope failures occur, the loss in vegetation is an obvious feature. Slope failures can be checked considerably by controlling the hapazard construction of road networks which is being done without considering the local environmental conditions, and by planting vegetation in affected areas. The construction should be avoided on steep

slopes and if the constructional works are necessary they should be along the lower terrace of rivers. The other important factor to be taken into account is the nature of rocks because weak and friable rocks are specially susceptible to slope failures. Thus, be avoiding areas with such rocks, roads can be constructed for the overall development of Darjeeling hill areas. Even then, the local environmental conditions should not be overlooked. Indeed, there is a requirement to develop new techniques for constructing the roads in the hills of Darjeeling district.

8.4.1.3 Management of Natural Regeneration :

Since long, natural regeneration has been the main source of sustained forest wealth. However, the forest wealth can be sustained only if the exploitation does not exceed regeneration. In recent times the concept of massive afforestation has originated because of a rapid decrease in the forest cover and consequent natural regeneration (Mukherjee, 1995). Natural regeneration means production and successful growth of seedlings of plants under existing suitable environmental conditions without interference of man. In fact for the seeds falling naturally on the ground, there is a greater possibility of germination provided natural conditions of the environment are undisturbed. But during recent times, the situation has reversed. The whole process of natural regeneration is crying for immediate help. This is true not only for the Darjeeling Himalaya but also for the plains of Jalpaiguri district. Due to the paucity of natural regeneration, several species are endangered and many among them are on the verge of extinction.

8.4.1.4 Management of landslide affected areas in Darjeeling Himalayas.

The major problem in hill areas is mainly landslide caused forest degradation, unauthorised quarrying of boulders from the natural streams, faulty agricultural practices and faulty building construction etc. Though, apparently water conservation may not be necessary due to heavy rainfall but actually the rain concentrated within 4 to 5 months of a year followed by a long dry spell. So, both water disposal and water conservation measures should be taken up along with soil conservation.

For safe disposal of water during rainy season, excess water should be channelised though catchwater drain, chutes with proper apron, to break the velocity of the speeding water. For stabilizing the landslide, grassy and suitable vegetation which can sprout naturally are

to be planted after making backward terraces. Palisade with self-sprouting species will check soil erosion. Ground vegetation should be restored by preventing grazing.

Quarrying in natural stream should be strictly prohibited as this practice leads to widening of channel, loss of cushion and subsequent bank erosion and sliding. Toe cutting in streams rivulets should also be prevented by sausage work at the bottom. Along the slope cultivation and construction work on steep are should also be avoided.

8.4.2. Management of cultural environment

The scale of developmental speed and also the degree to which environment is exploited, must be correlated to under stand 'what are the actual gains' and 'what are the actual losses'. Modern resource planners have started thinking about the developmental impacts and the degradation of environmental niches. This is indeed a good sign for whole of the contemporary civilization.

Developmental activities of the man, ostensibly for the man, have generated many more problems by destructing the natural vegetation. Thus, there is an urgent need to reduce the scale of man-made activities in forest exploitation. Under the heads of cultural environment following are the prime importance and may not be kept in isolation especially from management approaches of forest resource.

Population management :

The management of rapidly increasing population can help in reducing the burden on various resources. Population management is concerned basically with the demographic aspects of population and their spatial distribution. The increasing population means more land for building, more pressure on agriculture, more fuel, more fodder and more infrastructural development, etc. And all these additional requirements are directly or indirectly related with the forests. In short, population governs the level and rate of consumption of various forest products directly and various associated influences indirectly in the study area. The decadal population growth rate (1991-2001) in the area is 22.53%resulting in heavy pressure on forests. It will be difficult to keep pace with the clearing of forests by the present rate of plantation. For this purpose, it is essential to control population growth on the one hand and to plan plantation of trees on available

denuded and vacant areas, on the other. This can be achieved by legal tools and through the creation of awareness among the people with the help of mass-media. It is imperative that the state government should also come forward with necessary forestry courses from the primary school levels itself to educate children regarding the importance of forests in shaping the environment and economy.

Research Work :

Research should be conducted to find out suitable plant species for different bio-climatic regions. Care should be taken that such plan species be grown on village lands which can provide oilseeds, honey and seasonal fruits. In the materialistic society man has forgotten that there are other lives also on planet earth. We have not spared any component of environment for their survival in a healthy and prosperous condition. In forest management programmes emphasis should be given to plantation of those species which can provide leaf fodder. It is advisable to grow fast regenerating scrubs of such variety which can provide firewood on a sustained basis. The State Government should establish a Forest Research Institute (F.R.I) in the area. A short course on Forestry Management can be introduced at the North Bengal University. The State Government as well as forest department should take necessary initiative in this regard.

8.4.2.1. Management of Intersectoral Linkage :

There are some sectors/departments in the study area which have close linkage with the forest department. The policy of forest department and other linkage sectors should be property linked. This will bring a bright future of the forests of the area. These sectors include the followings :-

Land Revenue Department

- Large areas of forest / waste land are still under the custody of Tea Gardens for their future expansion. But at present they are not utilising their land and not making any working scheme for management of such excess land, though they have huge labour force in their gardens who consume lot of fuel wood. Therefore, the Land Revenue Department should ensure that all the tea gardens manage their land properly, particularly the forest and waste land, so that short rotation fuel wood species should be grown there to meet the demand of their labours and thereby minimise the pressure on adjacent forests. Further they allot their excess land to their surplus labour force

in an unplanned manner which delink the continuity of the tree cover and that hinders easy movement of wild animals from one part of forests to another particularly the elephants which cause lot of depredation in such situation.

- The Land Revenue Department of the study area also distribute the agriculturally unproductive land to the farmers (beyond Class - IV Land) which cause serious soil erosion due to faulty agricultural practice there. Therefore, the lands which are above Class - IV should be allotted to forest department for afforestation purposes.

- In the past large forest areas were allotted to the Defence Industries for refugee rehabilitation and to other developmental agencies. In this way valuable forests were lost for establishment of Sevoke Cantonment and to the Medicinal Plants Directorate in Darjeeling hills and plains. Therefore, the use of forests land for non-forestry purposes should be examined very carefully before releasing it for other developmental purposes.

Agricultural Department :

This department is primarily concerned with development of agriculture taking least responsibility for pasture development or fodder production. Though agricultural residues supply about 60% of the cattle feed, but it has no nutrative value and only it is used as a ruffages with low or nil C.P.C. (Consumable Protein Content). So, policy should be framed and effort should be made by this department for pasture development

In the catchment areas of important river Mahananda, W. P. R. (Watershed Project Report) is made for entire catchment on sub-watershed basis which also includes agricultural lands and the forest officers are made the Nodal Officers. So, close co-ordination of this department should be established for proper saturation of the entire watershed.

Tribal Welfare Department

Lot of fund of this department can be utilised in forestry development, as the tribals are generally inhabiting inside or in the fringe of forests. If proper planning can be made it will generate lot of employment to the tribal people from the fund received from various agencies

which includes central and overseas assistance.Further, monopoly rights for collection and disposal of sal leaves, were given to Tribal Cooperatives. But due to organisational weakness, the resources are not fully collected and disposed of at reasonable rate. Thereby the tribals are deprived of the benefits of these monopoly rights. This can be improved with close linkage with the forests department, so that timely collection, disposal and reasonable rates are received from such products.

Animal Resource Development Department. (A.R.D.D)

There are two major reasons for which forest resource is depleting rapidly. One of such is the collection of fuel wood and the next is pressure of grazing. The study area has a largest cattle population, but most are unproductive. Due to development of agriculture and introduction of multicrops on the same land, the cattle get very little time to graze in the agricultural land and most of them are diverted into the forests causing rapid degradation of the latter as it is beyond its carrying capacity.So, A.R.D.D. should try to minimise the number of cattle by enriching the livestock and encouraging stall feeding as far as practicable and the close co-ordination will help producing fodder crop and tree within and outside forests by people's in participation and under farm forestry.

Home and Customs Department

To prevent felling and smuggling of the forest produce and killing of wild animals, close co-ordination with the Police and Customs Departments is a must. Only then the biodiversity can be restored properly.

Small Scale & Cottage Industry

The small scale and cottage industry should conduct the training programme on processing of wood based small industry such as artifact from Sabai rope, decorative wood, Sal leave plate making, apiculture, mushroom culture etc.

Department of Alternative Energy Resource

The Department of Alternative Energy Resource should arrange to supply and establish manufacturing units for fuel-efficient chullhas in cluster of FPCs, so that sufficient quantity of fuel wood can be saved in the study area.

Local University

The North Bengal University has a big role in biotechnological aspects particularly initiating various types of pilot projects, so that effective technology will be transferred from laboratory to land. A course on forestry should be introduced at the degree course level of different colleges under North Bengal University

Local Development Council

Recently in the study area a local development council has been establised in the name of Uttar Banga Unnayan Parisad to promote socio-economic development in the North Bengal as a whole. It is a state government agency. This parisad should allocate some funds for the development of local forests . The local forest department and this parisad should work together specially in afforestation programme and controlling rapid deforestation .

Local Panchayat

There is a strong Panchayat Raj in the study area. Recently the tea garden and forest villages of Darjeeling Himalaya has brought under Panchayat raj. The linkage of forest department and Panchayat system should be improved specially in the social forestry plantation. All village level plantation should be handed over to Panchayat. Members of Panchayat should also be included in the local FPCs to frame a joint policy for protecting and conserving the forest plants of the study area.

8.4.3 Management of economic environment

Economic environment of the forests basically means the industrial aspects of the forests. A large number of forest based industries of the study area is dependent on forest products. These industries consume huge amount of forest produce and provide large number of employment to the villagers resulting in rural development. There are various NTFPs on which the tribal people are closely related (Shiva,1998). Management of economic environment of forest, indicates the management of wood based and non- wood based industries in the study area with the people who are involved in the forestry activities.

8.4.3.1 Forest Based Industries

Forest industries play an important role in the economic development of the districts. These industries are the important sources of employment in the study area. At present, the wood

based industries are facing various type of problems. The most serious problem is the lack of supply of raw materials to the local wood based industries due to the imposition of restriction on clear felling by the government. Moreover, the National Forest Policy 1988 clearly mentions that the forest can not only be exploited for industrial purposes. Natural forests serve as genepool resource and help to maintain ecological balance. So the forest based industries which have a direct impact on local economy should be managed properly. The investigator has suggested some guidelines for the survival of forest based industries. These guidelines should be as follows:

- A forest based industry should raise the raw material needed for meeting its own requirements, preferably by the establishment of a direct relationship between the factory and the individuals who can grow the raw material by supporting the individuals with inputs including credit, constant technical advice and finally harvesting and transport services.

- Emphasis should be given on the use of labour intensive technologies, and preferential encouragement should be given to small scale industries.

- Forest industries must not only provide employment to local people on priority basis but also involve them fully in raising trees and raw materials.

- Industries should be encouraged to grow their own raw material on the land assigned to them or preferably through contract with smaller tree farmers. If the industry is assigned land on a large scale , it should be obliged to grow a fixed quantum of fuel and fodder on this land and guarantee employment to the local population.

In addition to the above consideration, there are some steps which should be taken by the state government . Government regulations and present methods of auction of timber by forest department should be more flexible. Import of wood and wood products should be liberalised. There should be greater liberalisation and freedom in trading of wood. Marketing networks for the sale of forest products should also be developed.

8.4.3.2 Development of Eco-tourism Industry

Management of forest will certainly beautify the hilly landscape of Darjeeling and *duars* regions of Jalpaiguri district, which will help in encouraging eco-tourism. There are some national parks, and wild life sanctuaries as well as one tiger reserve project in the study

area. Very recently the forest development corporation has establised some nature interpretation centres on the way of some reserve forests . These centres are getting more attention to the nature lover tourists. Forests of the area can give much aesthetic satisfaction to the tourists. So there is a bright prospect for the development of eco-tourism industry which will be the engine of economic development of the districts. Theinvestigator has prepared a model through which the eco-tourism industry in the study area may be developed. The model is given in figure 8.4.

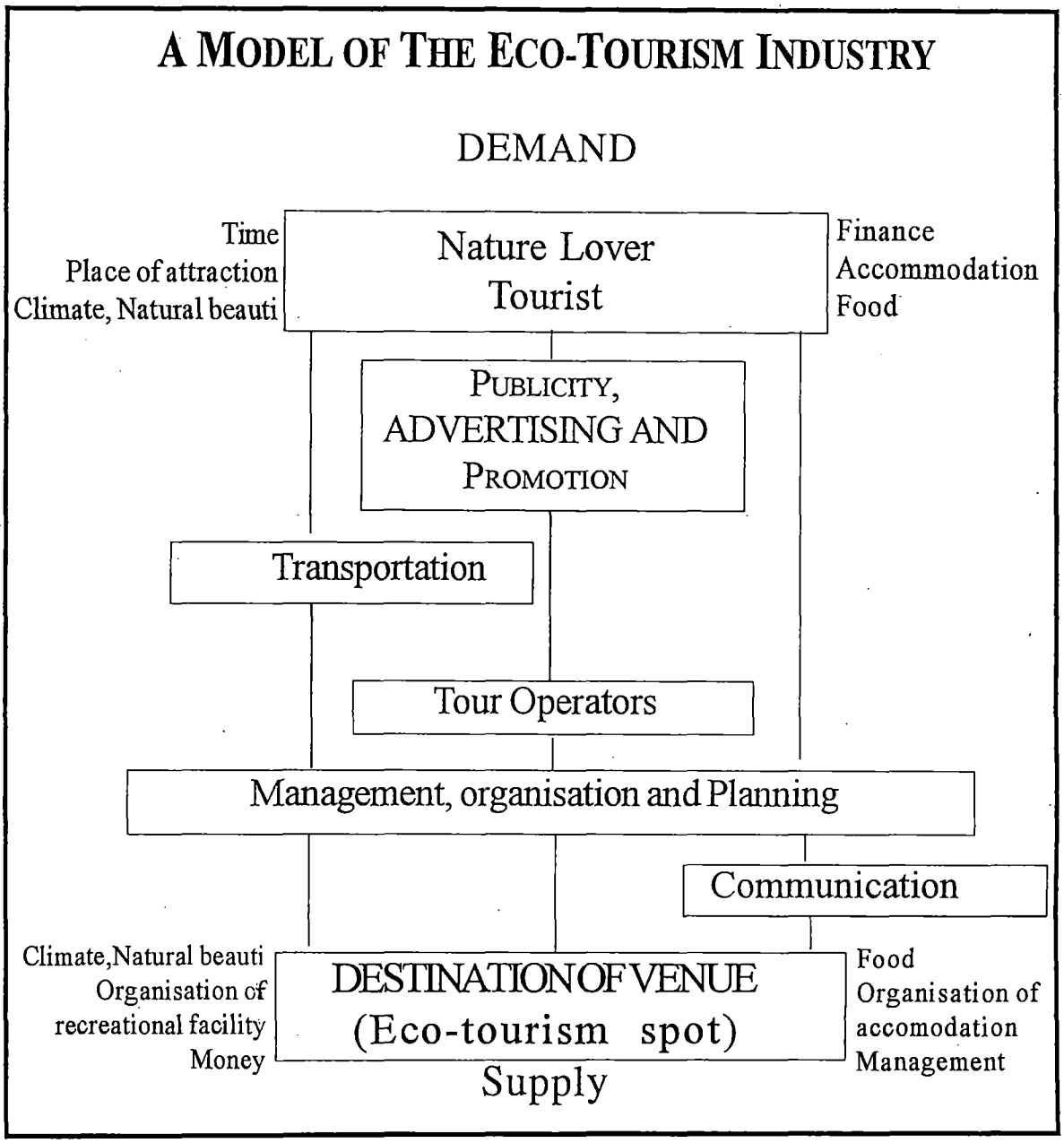

Figure 8.4 Model of eco-tourism in the districts

8.4.3.4. Economic Policy for NTFPs and Tribal Welfare in the Study Area.

The tribal population in the area primarily subsists on NTFPs and the major objectives of the state government in managing NTFPs have been to increase tribal welfare through income and employment generation. Income generation can be enhanced through the development of local value addition activities and NTFPs market. Though there are some limitation about market and value addition opportunities, the self-interest motive of tribal collectors is the prime force to invigorate the NTFPs economy. Forest department's role is very important in this regard. Enough income and employment opportunity must be generated in the study area and for which forest department must intervenes in the price formation of NTFPs market. Stocks of NTFPs should be extracted on sustainable basis and they should not decline (Figure 8.5)

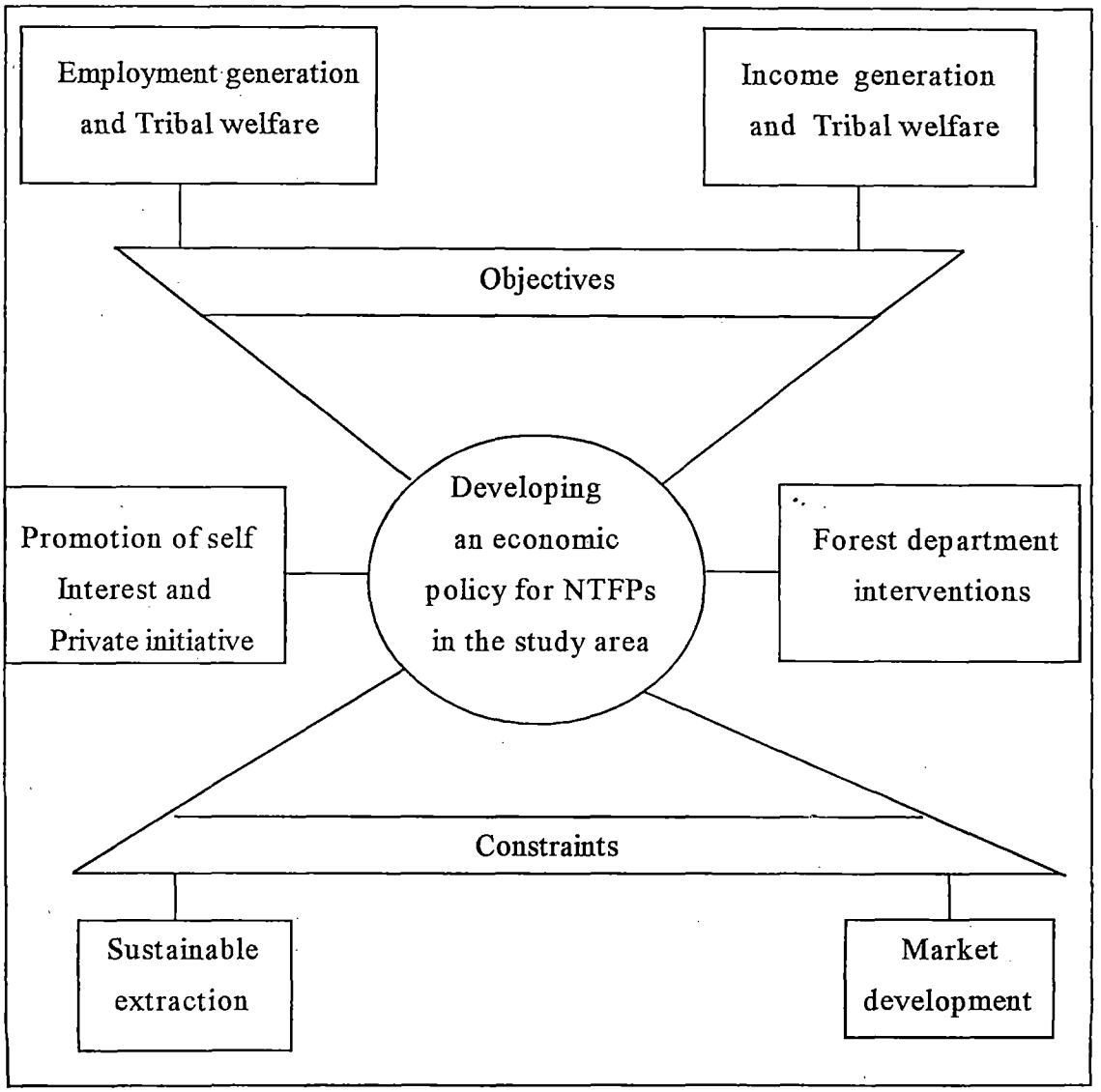

Figure - 8.5 - An economic policy for developing NTFPs and tribal welfare in the study area.

8.5 CONCLUSION :

The success of government policy will not only depend on what the government itself does but on what it can do to motivate the people. Induced development may be far more successful than the policies imposed through laws, departmental activities and sanctions. If villages can be given incentives for the development of farm forestry and of building timber stock by planting trees between fields and on village common lands etc., it would not only result in greater awareness and education concerning the importance of trees but would also generate more physical production. Selected species of trees and hedge crops can supply both fuel and fodder. Similarly, forest based industries and commercial establishment in the towns of the study area can be motivated through incentives, laws and through moral pressure on plant trees on their plant sites. There is also a considerable amount that can be achieved through education and in making each school adopt ecology programmes in their own compound and surrounding areas. The subject may also be included in school curricula.

It is imperative to assess the level and magnitude of degradation of forest cover through satellite image at regular intervals. Besides, like population census, there should also be a census for assessing regeneration of major species in different altitudinal zones / water sheds at regular intervals taking into account individuals of all ages. Simultaneously for the development and conservation of forests, there should be allocation of more funds because in all previous plans, the forest development was accorded very low priority in the hierarchy at state's and national budgets.

Before executing various development activities like construction of big dams, reservoirs, roads and bridges etc., particularly in forested areas, their overall environmental implication should be taken into account. Keeping these facts in view, it is suggested that a District Ecology Council should be setup under the chairmanship of leading ecologists to decide the future course of development and forestry. The activities of this council should be find out various ecologically sensitive zones and to suggest appropriate measures for their speedy recovery.

It is expected that if the above mentioned strategies are adopted, the study area will be richer in forest resource resulting in both economic and environmental development.

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