



# SIMPLIFIED MANAGEMENT GUIDELINES : TEKNAF GAME RESERVE

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The management guidelines, developed based on the five year management plan for Teknaf Game Reserve (GR), will be implemented mainly by FD and the project staff of Nishorgo Support Project (NSP). The Plan adopted a landscape approach of PA management by focusing on an appropriate spatial scale to integrate relevant habitat/forest ecosystem, land-uses and surrounding villages/*paras*. This document provides guidelines for managing Teknaf GR for multiple uses by addressing interactions between local economy, stakeholders and natural resource base. Management guidelines cover the following broad elements:

- i) protection and conservation of all remaining natural forests and constituent biodiversity in the Game Reserve,
- ii) conversion of monocultures of exotic tree species into natural and man made regeneration of indigenous plant species,
- iii) development of co-management agreements (and linking Game Reserve conservation with benefit sharing arrangements) with key stakeholders to reduce ongoing habitat damage by helping them achieve sustainable livelihoods through alternative income generation activities and small enterprise development, and
- iv) provision of support to better administration and management of the Game Reserve including capacity development, infrastructure, training, and wider extension and communication.

Main objectives of the Plan included as below:

- To develop and implement a co-management approach that will ensure long-term protection and conservation of biodiversity within the GR, while permitting sustainable use in designated areas by local people as key stakeholders;
- To conserve the biodiversity of the GR by following a co-management approach based on building partnerships with key stakeholders and sharing benefits with local communities and key stakeholders;
- To develop existing elephant movement corridors;
- To maintain connectivity and implement elephant conservation programs
- To refine and strengthen the policy, operational, infrastructural and institutional capacity framework for sustainable management;
- To conserve and maintain viable wildlife population including endangered, threatened, endemic and rare species of plants and animals;
- To implement income generation activities for sustainable livelihood development of local stakeholders and enhance their skills in order reduce rural poverty;
- To restore, protect and develop degraded forest eco-systems, and encourage private nursery development and tree growing; and
- To encourage eco-tourism in suitable areas and develop visitor facilities/amenities

### **I. Assessment of the Present Situation**

Teknaf Game Reserve, as a part of Teknaf peninsula, is located in the country's far south-eastern corner, near to Myanmar border. It was established in 1983 over a reserved forest (RF) area of 11,610 ha covering 10 forest blocks in three Forest Ranges (Whykong, Silkjali and Teknaf) of Cox's Bazar (South) Forest Division. It is situated in Ukhia and Teknaf Upzilas of Cox's Bazar District, and lies in between the Naf river on eastern side and Bay of Bengal on western side. The GR is part of a linear hill range (reaching an altitude of 700m), gently slopping to rugged hills and cliffs running down the central part of the peninsula, with a north-south length of nearly 28 km and an east-west width of 3-5 km. A number of deep gullies and narrow valleys are crossed by numerous streams flowing down to Naf river in east and Bay of Bengal in west. The northern boundary of the GR starts near Whykong town (which is nearly 50 km from Cox's Bazar), extending in south up to Teknaf town. A metalled road connecting Cox's Bazar with Teknaf town runs in between the Naf river and eastern boundary of the GR, and is a major transport

corridor for forest products. Although a four wheel drive can reach Teknaf on western side through an unbroken stretch of beach from Cox's Bazar during low tide, no metalled road exist presently. Many earthen and brick soled roads traverse the GR from east to west including one on the north most boundary.

The forests of Teknaf Game Reserve are located in the high rainfall bio-geographic zone and so comprise wet evergreen and semi-evergreen plant species. Although rapidly being degraded, the Reserve still contains important floral and faunal biodiversity. The following 8 broad types of habitats in Teknaf GR and the surrounding landscape are identified as below :

- i) high forests represented by the remaining natural forests,
- ii) plantations including the monoculture of exotics,
- iii) grasslands and bamboos,
- iv) wetlands,
- v) intertidal mudflats and mangrove vegetation along the Naf River to the east,
- vi) sandy beaches along the Bay of Bengal bordering the GR to the west,
- vii) cliffs and steep slopes, and
- viii) cultivated fields and gardens

These habitats support what is considered to be the highest biodiversity in Bangladesh (a documented total of 290 species of plants, 55 species of mammals, 286 species of birds, 56 species of reptiles and 13 species of amphibians). The water bodies and wetlands harbour important fish species, water birds and amphibians. The cultivated fields (mainly of paddies) and grasslands (these get inundated during monsoon rains) harbour mammals, ground birds and reptiles. Presently the GR has natural forests, and the plantations raised earlier by converting high forests of great biodiversity value. The top canopy includes *Artocarpus chaplasha*, *Dipterocarpus turbinatus*, *Elaeocarpus floribunda*, *Dillenia pentagyna*, *Swintonia floribunda*, etc. The proportion of semi-evergreen scrub forests and wet tropical grassland are increasing in those areas where the forests have become heavily degraded due to high biotic pressure. However, few patches of wet evergreen and semi-evergreen forests have developed in some degraded areas due to less biotic pressure and favorable moisture conditions. Various NTFPs being currently obtained from the forests of the GR include medicinal plants, bamboo, canes, sungrass, fish, prawn' leaves and seeds, wild animals, etc. Rural population depends on medicinal plants as traditional medicine, oftenly prescribed by indigenous medical doctors (*Kabiraj*).

The Reserve has long been known for its large mammals (elephants) and was indeed established mainly for their protection. Elephants are still distributed in the area, and although numbers very likely have declined, the Reserve and adjacent parts of the Teknaf Peninsula still support an important population. These elephants are part of a larger population scattered over the Chittagong Hill Tracts and down through the Teknaf Peninsula, and contiguous with populations in adjacent parts of India and Mynamar. Elephants are of high conservation importance as they are considered to be endangered within both their total range in Asia and in Bangladesh in particular. It is home to avifauna of many species dependent on good undergrowth and forest cover. Some of the forest-dwelling and wetland-associated species are at high risk of extinction. The GR supports frogs, toads, turtles, lizards, snakes and a rich diversity of other faunal groups such as invertebrates and fishes. The easy accessibility of Teknaf from Cox's Bazar (a tourist attraction for its beaches) through road networks make the GR very attractive for eco-tourism. Teknaf river entering into Bay of Bengal and surrounding landscape of Mynamar offer added attractions. After the development of minimum visitor facilities a large number of tourists are expected to visit the GR to have a feel of luxuriant vegetation of wet evergreen forests and good landscape with rolling hills, rivers and sea beaches. The chartered eco-tours on the pattern of Sundarbans may in future be popular for Teknaf.

An interface landscape exercises influence around the boundaries of the GR. A large number of villages/*paras*, cultivated fields including betel leaf areas, khas lands, brick fields, prawn farms and water

bodies fall within the zone of influence of Teknaf Game Reserve. It is bordered along most of its northern boundaries by RF, along southern boundary by Teknaf town including BDR establishments, along its western boundary by Bay of Bengal and along eastern boundary by Naf river bordering Myanmar (Figure 1). In view of natural features both on eastern (Naf river with varying distance up to 5 km from the GR's boundary) and western (Bay of Bengal with varying distance up to 5 km from the GR's boundary) sides, the boundaries of a landscape zone are naturally fixed on these two sides. Because of GR's long, narrow shape, its most parts are easily accessible either by vehicle along existing roads, or by foot from the nearest vehicle access points. Keeping in view of both relevant human system and biophysical system a zone of 5 km around the boundaries of the GR is taken as an interface landscape zone.

The rich coastal and forest resource base of Teknaf has attracted migration from other parts of the country. It has resulted in a large landless population migrated from other parts of the country, resulting in landless people, who find seasonal employment in agriculture and illegal utilization of forest resources. As a result of refugee influx from Myanmar, a number of Rohingya camps and settlements have come up in between the Naf river and the eastern boundary of GR. A large number of betel leaf cultivation areas are noticed, particularly in and around the western boundary facing the Bay of Bengal. Local people cultivate betel leaf as a cash crop for which they collect forest materials such as bamboo, leaves, grass and small trees from the GR for erecting fences around their betel leaf fields, providing support to betel vines and also for roof construction for shade. On encroached forest lands they burn forest floor for the preparation of betel vine beds and also weed eradication. A part of land adjacent to the eastern boundary of the GR along the Bay of Bengal has been converted to prawn farms.

The human population is concentrated in a narrow strip of agricultural/settled land along the Bay of Bengal, and in more extensive flat topography bordering the GR on the east. So the GR is surrounded by dense populations, who are heavily reliant on fuelwood collected from the nearby forests. A total of 115 settlements locally called *paras* or villages (spread over 6 unions : Zaliapalong, Whykong, Baharachara, Hnilla, Sabrang and Teknaf) have been identified having stakes of different levels in the GR. A total of 53 settlements are located inside the GR boundaries whereas the remainder 62 *paras* are situated (adjacent or outside the GR) in the interface landscape zone. Nearly two-third of total *paras* (the villages inside and on the periphery) have major stakes as local villagers depend on the GR for meeting their basic consumption needs. In addition to fuelwood, timber, bamboo and other NTFPs, they collect vegetables, fruits, fodder and sungrass from the GR. They collect vegetables and fruits, and also hunt wild birds, etc. The remaining one-third *paras* (lying mainly outside the GR) have minor stakes mainly in terms of fuelwood collection. There are a number of tribal settlements (Tonchonga mainly in Shilkhali, Monkhali and Roikhong; and Rakhain - also known as Mogh - mainly in Hnilla and Whykong, etc.). Most of them are poor and get engaged as agricultural labourers, fuelwood collectors, fisherman, jhum cultivators, weavers, etc.

The arrival of Rohingya refugees from adjacent Myanmar during the later part of 1991 and the early part of 1992 resulted in an immediate population increase on the Teknaf Peninsula, thereby creating a resource to population imbalance in a region where forest resources were already heavily exploited. They are located mainly at Jahajpura, Shamlapur and Teknaf, and harvest large quantities of poles, bamboos and fuelwood from the nearby forests to meet their shelter and cooking needs. Only two settlements (Noyapara Camps 1 and 2) of Rohingas are legally recognized by the Government. There are also a number of ethnic settlements (i.e. Chamma Para of Monkhali under Zaliapalong Union of Ukhia Thana, Chowdhuri Para, Nila Para and Kharang Khali of Hnilla and a Chakma Para in Whykong) located within the GR. Primary and secondary stakeholders groups have been identified during the RRA/PRA exercise based on their involvement in the extraction of forest resources directly or indirectly (through forest-based trading, etc.). There are 22 primary stakeholders (fuelwood/timber collectors, betel leaf growers, forest produce collectors, hunters, fishermen, etc.), who are directly involved in forest resources extraction activities with major/moderate stakes whereas 7 secondary stakeholders (brick field owners, timber/fuelwood merchant, saw mill owner, Boat owner/maker, Zeep owner, tea stall owner and outside visitors) have indirect

influence on forests. The institutional/organizational stakeholders include the government organizations (FD, BDR, Police, Local Government, etc.), NGOs and CBOs.

Of the total 8 brickfields in and around the GR, 6 are located inside the boundaries. On an average each brickfield consumes about 300 monds of fuelwood every day during their operation period of 7-8 months in a year and most of this demand is met illegally from the forests. Betel leaf cultivation is quite a popular activity and a large number of people depend on it for their livelihood. Most of the betel leaf cultivation areas are located near to Shaplapur, Shilkhali and Jhazpura. Many times forest land is encroached for establishing a betel leaf vein that is vacated after harvesting the betel leaves. Main inputs in betel leaf cultivation include land, sapling vine, forest material for fences and roofs, irrigation, fertilizer, etc. Family labour is used in harvesting, processing and marketing the betel leaves. Forest land encroachment, particularly near the flat and gently sloping boundaries around the GR, for agriculture, brickfields, refugee camps and settlements is a serious problem in the GR.

## **II. Recommendations for Strategic Programs**

### **1. HABITAT PROTECTION PROGRAMS**

Main objective of this program is to provide adequate protection to the GR for the conservation of its constituent biodiversity. Main activities to be carried out to achieve this objective will include :

- i) updating forest cover and interface landscape maps,
- ii) identifying the GR boundary,
- iii) controlling illegal removals from the GR, and
- iv) checking encroachment of forest lands.
- v) reconnaissance surveys, followed by detailed surveys in the identified areas, will be helpful in verifying actual ground situation.
- vi) mapping will be carried in such a way that it includes relevant landscapes within a 5 km-wide interface landscape zone around the GR boundaries.
- vii) all the peripheral boundaries of the GR will be identified, surveyed and marked on the ground.
- viii) posts or other markers (wooden or iron pillars, mounds, etc.) will be put in place at all important and/or turning points and will be labeled.
- ix) effective protection against illicit felling, poaching, forest fires and grazing for the conservation of biodiversity of the GR will be provided by gainfully associating local stakeholders.
- x) effective checking of organized smuggling of timber and fuelwood will require concerted efforts from FD by using modern equipments and transport facilities.

The following specific activities will be taken for controlling illicit felling, poaching, forest land encroachment, and forest fires :

- community patrolling groups, formed from local stakeholders, will jointly (with FD field staff) patrol identified forest areas.
- co-management councils/committees will be responsible for overseeing community patrolling groups and sharing intelligence. They also will review annual field activity plans regularly.
- forest user groups, formed by including poor stakeholders dependent on nearby forests, will help in biodiversity protection by not getting involved in illicit activities but also by extending assistance to community patrolling groups and sharing intelligence.
- Organized illicit felling and land encroachment would be checked by FD by using modern equipments and specialized protection units.
- Mobility of FD field staff will be improved by providing jeeps and motor bikes, and also improving communication network including mobile telephones, walkie talkies, etc.

- Public awareness program will be implemented for spreading appropriate messages on biodiversity protection
- Forest fire control measures such as forest fire lines, fire fighting tools, fire extinguishers, etc. will provided for.

## 2. MANAGEMENT PROGRAMS

It is recommended to declare Teknaf GR as Wildlife Sanctuary, where main objectives of the management program will be to :

- i) maintain ecological succession in constituent forests by providing effective protection against biotic interference,
- ii) develop and maintain natural forests as good habitat, favoring wildlife including elephants,
- iii) conserve the forest resources including the constituent biodiversity,
- iv) identify and conserve elephant movement corridors, and
- v) establish co-management practices through stakeholders' consultations and active participation.

### Core Zone Management

The entire forest area gazetted by the Government of Bangladesh as GR is designated as core zone (Figure 2) due to its high conservation value and its proximity to riverine, marine, intertidal or beach areas. Forest management in the core zone will focus on conserving remaining natural forests and bringing back natural vegetation (in composition and structure), wherever possible. This will be achieved by carrying out the following activities :

- providing protection (against illicit removals of forest produce, poaching, encroachment, grazing and fire). Effective protection against biotic pressure (illicit felling, poaching, forest fires and grazing) will allow natural processes of regeneration in degraded forests ecosystem;
- encouraging natural processes for regeneration and rehabilitation of degraded forests ecosystem;
- in monoculture of teak and other exotic species doing gradual canopy manipulation in order to create more favorable habitat for wildlife. This will encourage natural regeneration of indigenous trees, shrubs, herbs and palatable grasses;
- implementing co-management practices (through key stakeholders, user groups and co-management councils/committees to be formed at different levels) for strengthening protection efforts against illicit felling, poaching, forest fires and grazing;
- in lieu of reduced removals (due to control of illicit felling) by the local communities from the core zone, providing them alternative means from interface landscape zones, and resources for alternative income generation activities for sustainable livelihoods;
- the visitor use of the core zone will be regulated to allow low impact tourist activities in terms of hiking and wildlife watching; high impact visitor activities such as motorized transport and group pick nicks will not be allowed;
- the protection efforts will be facilitated through communication outreach activities, public awareness, and stakeholders' access to interface landscape zones in meeting their subsistence requirements.

Inside the core zone there are patches of pure teak and other exotic tree species that are not favored by wildlife (they inhibit bushy undergrowth and middle storey to provide food and shelter for wild animals). Based on the following guidelines, the areas of monoculture will be identified for gradual (say 2-4 ha each year) canopy opening in teak and other exotic plantations :

- Dense teak and exotic plantations will be taken up for marking the trees, whose removal will open the canopy for natural regeneration to come up.

- Canopy opening will be done in small but irregular plots of say 2-4 ha, staggered to minimize disturbance to wildlife and its habitat (mosaic pattern of opening will provide better ground light penetration for natural regeneration).
- No canopy opening will be undertaken near waterbodies including *cheras* in order to avoid soil erosion.
- At least 50-100 trees/ha will be retained along with all the existing natural regeneration and advance growth.
- Marking of trees will be done after monsoon rains are over, and felling operations completed by February.
- After felling, the first year will be devoted for obtaining natural regeneration. During the second year suitable gaps will be identified for raising enrichment plantations (see below) of indigenous fruit bearing shrubs/trees (suitable for wildlife) and palatable grasses.

Degraded habitats within the core zone will be restored naturally by carrying out the following activities :

- low capital but labour intensive land-based habitat restoration activities in identified micro-watersheds.
- protection against biotic factors will be taken up before low-input oriented land husbandry practices can be implemented for facilitating eco-restoration process.
- enrichment and buffer plantations (see guidelines below) of indigenous species will be taken up in those areas where natural regeneration does not come up well due to lack of existing rootstock and/or mother trees.
- fruit bearing species for wildlife and palatable grasses will be planted up in those areas where adequate regenerative rootstock may not exist.
- existing grasslands will be maintained and will be further developed by taking up the plantations of palatable grass along with other tree species as a part of enrichment plantations.
- natural waterbodies are present in the GR will be maintained for use of wildlife including elephants, and also for local people as a source of drinking water.
- an inventory of existing water bodies and a list of wildlife using different water bodies will be developed.
- desiltation, cleaning and repairing may be necessary in those waterbodies, where soil erosion has taken place.

Elephants movement corridors will be maintained within the core zone to :

- i) ensure unhindered elephant movement by checking any further fragmentation of elephant habitat,
- ii) provide community protection to both habitats and wildlife including elephants, and
- iii) provide diversified food, water and adequate shelter to elephants by restoring forests, water bodies and the habitat.

Elephants as large herbivore mammals require huge amount of forage, and water bodies for drinking and bathing. They prefer a mosaic of habitat types including patches of forests, scrub forests, bananas, forest clearings and intermittent open spaces, succulent grasslands and savanna. Teknaf habitat meet these requirements in terms of good amount of palatable grasses, scrub forests with open spaces, bamboo and herbs/shrubs, and a number of streams flowing through the GR. Main available fodder species for elephants in Teknaf include bamboo, jackfruit, blackberry, mango, coconut, banana, fig, potato, grasses, etc..

#### **Enrichment Plantations Guidelines :**

Enrichment plantations will be taken up in identified areas of the core zone as discussed below :



- Collection of seeds and nursery development activities will be taken timely (at least one year in advance of planting season).
- Suitable gaps for enrichment planting will be identified in January and advance closure measures will be taken against illicit felling, grazing and forest fires.
- On an average 360 seedlings per ha mainly of mixture of indigenous species (multi-species plantations to optimize species and habitat heterogeneity) will be planted.
- Pits of size 45m x 45m x 45m will be dug in the month of Feb. – March (1 kg of cowdung/fertilizer will be applied) in identified gaps (of more than 0.5 ha). The application of fertilizer will be 50 gms per seedling (20 gms TSP, 20 gms MP and 10 gms Urea).
- No burning and clear cutting of existing vegetation will be taken up. In case of weeds a circular area around the pit (say of 1 m radius) can be cleared before taking up planting on the onset of monsoon rains (in the month of June-July). The dead and hollow trees will not be salvaged.
- Subsidiary silvicultural operations such as cleaning, climber cutting and freeing of natural regeneration from suppression will be taken up as a part of encouraging natural regeneration. Priority will be given to clean those saplings and seedlings firstly that have shown manifestations of diseased/dead/crooked growth, damage, and infestation. In coppice species, stump dressing, stool thinning (retaining 2-3 shoots per stool) and cleaning will be taken up. Wherever needed bamboo clumps will be decongested.
- Half-moon trenches around the planted seedlings are suggested in the slopes as an integral part to conserve and trap soil and retain soil moisture.
- Weeding, beating up and cleaning will be taken up as and when required. Normally 3 weeding are taken up in the 2<sup>nd</sup> financial year and 2 weeding in the 3<sup>rd</sup> financial year. Vacancy filling will be done along with weeding.
- Suitable species for enrichment plantations are mainly mixture of indigenous species that may include siris, sisoo, simul, chikrasi, jarul, gamar, garjan, telsur, koroi, champa, mahogany, kadam, arjun, haritoki, pitali, chapalish, boilam, agar, hargoja, padauk, jam, dhakijam, toon, bazna, jalpai, chalta, amla, bahera, ficus species, jackfruit, bamboo, etc. Cane planting and other monoculture will not be permitted.
- Exotic species such as acacia, eucalyptus and mangium will not be planted inside the core zone.
- Palatable grasses for fodder plantations may include *Typha angustifolia*, *Alpimia nigra*, *Themeda arundinacea*, *Saccharum arundinaceum*, *Sacharum longisetosum*, *Sacharum narenga*, *Sacharum hookeri*, *Phragmites karka*, *Arundo donax*, *Impreta cylinder*, *Sacharum spontaneum*, *Cymbopogan flexuosus* and *Setaria palmafolia*. These grasses may also be used for gully plugging in case soil erosion takes place due to gradient and run off.
- Plantation of shrubs and vegetables may be taken up around waterbodies by involving local stakeholders.
- Forest fire control measures will be taken up in fire prone areas.

In areas having large blank patches inside the core zone the buffer plantations can be taken by following the guidelines as described in the next section.

### **Landscape Zone Management**

Interface landscape zone will focus on the surrounding landscape that is helpful in protecting and conserving the core zone, and also maintaining elephant movement corridors. As opportunities for receiving tangible benefits from the conservation-oriented management of core zone are less, adequate provisions will be made for off-forest livelihood opportunities provided to the local stakeholders in the interface landscape. Subsistence consumption needs of local people for fuelwood, NTFPs and timber will be met through co-management practices. Interface landscape zone is categorized into four sub-zones (buffer reserve sub-zone, intensive use sub-zone, transport corridor sub-zone and elephant movement corridors sub-zone) depending upon the uses to which different areas are managed.

Proposed Extension Sub-Zone comprises the remainder natural vegetation/plantations and degraded forests (an extension to the north of the GR incorporating the remaining portion of Whykheong Range

and parts of Ukhia and Inani Range), which can be gazetted (10,985 ha of RF land) by FD as part of core zone. Expansion to include adjacent forests would nearly double the size of GR where main long-term aim will be to maintain the maximum possible area under forest cover with significant potential for biodiversity conservation, nature-based recreation and eco-tourism.

Buffer Reserve Sub-Zone comprises the remainder open forests/plantations (nearly 4,100 ha of RF in Ukhia and Inani Ranges) that can be put under sustainable use to reduce biotic pressure in the re-gazetted GR. Management of this area will focus on intensive production of replacement resources, particularly fuelwood, poles and timber, and on maintaining stability as elephant habitat. Existing short and long rotation plantations will be brought under participatory benefit sharing agreements (PBSAs) as applicable under Forestry Sector Project. However, the participants will, in addition to the protection of plantations, be responsible for providing biodiversity protection. These plantations will not be clearfelled but instead be managed under selection felling (mainly of exotic species) so that the area can be naturally regenerated. The participants will be well compensated through off-PA alternative income generation activities to be carried out for sustainable livelihoods.

It is important to ensure good connectivity between the re-gazetted GR, buffer reserve sub-zone and, the existing FD lands/elephant habitat (nearly 600 ha) that lies to the east of proposed buffer reserve sub-zone. The management focus in the elephant movement corridor sub-zone will be on ensuring that existing or traditional elephant movement corridors through this area are maintained. Intensive Use Sub-Zone incorporates the relatively small areas required for administrative buildings and staff quarters, visitor accommodations and other facilities. The GR HQ will be developed at Teknaf with administrative buildings (GR Hqs, Beat Office, etc.), staff quarters, visitor facilities (e.g. Nature Information Centre) and other infrastructure facilities.

#### **Buffer Plantations Guidelines :**

The following guidelines will be adopted while raising buffer plantations in buffer reserves of interface landscape zone :

- Block plantations of both indigenous (list as in case of enrichment plantations) and fast growing species such as acacia will be taken in mixture at 2m x 2m (2500 seedlings/ha) by associating local stakeholders (e.g. members of community patrolling groups and user groups).
- The rotation age for the fast growing species would be 10 years (two thinning at 4<sup>th</sup> and 7<sup>th</sup> year) and 30 years (two thinning at 10<sup>th</sup> and 20<sup>th</sup> year) for long rotation species. The fruit bearing trees suitable for wildlife will be retained at the time of felling.
- The usufructury benefits from 2<sup>nd</sup> thinning and final felling will be shared by following the FSP guidelines (45% of the total proceeds to FD, 45% to participants and 10% to co-management committee - as in case of Tree Farming Fund under FSP).
- Other guidelines will be as described above for enrichment plantations.

### **3. LIVELIHOOD PROGRAMS**

Main objective of livelihood program is to develop appropriate livelihood opportunities that will reduce biotic pressure on the GR by providing alternative income to local stakeholders. Up-scaling of skills will be taken up for generating value additions through capacity building of local stakeholders. Landscape Development Fund will be used to set up community assets and enable micro-enterprises to generate value additions locally. The benefits from eco-tourism will be ploughed back partially for the development of local communities and the GR. Networking with relevant NGOs active in the area will be established for rendering other rural development services to local stakeholders. Appropriate production technologies, which may be implemented as a part of off-PA development interventions include agricultural and horticultural crops, nursery and homestead planting, fisheries, livestock rearing, etc.

### **4. FACILITIES DEVELOPMENT AND MAINTENANCE PROGRAMS**

Facilities development will be done as below while keeping in view sound environmental standards :

- Existing FD facilities will be fully utilized and incorporated in GR management where these can be renovated on a cost-effective basis.
- Built facilities will be concentrated at GR Headquarters (incorporating the existing Teknaf Range Office) and Range Offices at Whykheong and Silkhal.
- Renovations, and a regular schedule of maintenance, will be initiated during the first year of the Plan implementation.
- New constructions will be initiated during the second year of the Management Plan implementation.
- Existing toilets will be removed and replaced with a new facility.
- FD staff quarters will be renovated to provide electricity and piped water, and will be repainted and maintained on a regular basis.
- Restoration of existing trails would provide quick and easy access to the GR for management staff.
- Vehicles, field equipments and office equipments will be needed to support the management and administration programs.
- Double-cab pickup will be provided for the ACF/OIC. In addition, two 100 cc motorcycles will be provided for use at GR Headquarters, and one at Beat Offices.
- Two walkie-talkies will be provided for use at GR Headquarters, and one each at Range/Beat Offices.
- Compasses, binoculars, GPS and other field equipment will be provided as required for support of the GR management programs.
- Office equipments (telephone, computer, etc.), furniture (desks, filing cabinets *etc.*) and supplies will be provided as required for use at GR Headquarters and Range/Beat Offices.

## **5. VISITOR USE AND VISITOR MANAGEMENT PROGRAMS**

Regulated eco-tourism (keeping in view carrying capacity) in the form of nature education and interpretation tours will be an important objective of visitor use and management programs. This will help promote biodiversity conservation and educate the visitors as enlightened nature tourists. The following activities will be carried out :

- Socio-economic benefits of eco-tourism will be directed to local people by establishing forward and backward linkages.
- An initial tourism region encompassing the three hiking trails (including Kudum Guha), and Mochini trail has been identified. However, during the first year of Plan implementation a broad eco-tourism region will be identified around the GR by linking with other local and regional attractions including Guest Houses, tribal villages, rolling landscapes, Naf river banks, sea beaches, wetlands, existing forest roads and trails. However, the facilities will be developed by observing sound environmental standards.
- Existing roads and trails will be renovated for easy movement in eco-tourism zone. Elephant ride may be considered by FD as many tourists may be interested to have a close look of nature from elephant back.
- Existing Forest Rest Houses (FRH) will be made available to eco-tourists for night halts on payment.
- The tourists can travel to Teknaf on a day trip and return back to Cox's Bazar where a number of hotels are available for night halt.
- Nishorgo clubs and scouts will be involved with eco-tourism activities.
- Publicity and information materials having basic information about the GR will be provided to visitors by means of fixed signs, brochures, leaflets, printed guides, etc. at key road access points. An awareness campaign will be mounted for visitors on their expected behavior (e.g. litter disposal, vehicle use, noise pollution, etc.) while visiting the GR.

- An Environmental Education Centre to be established at the GR's office will serve as Nature Interpretation Centre (NIC) with updated information.

## **6. CONSERVATION RESEARCH, MONITORING AND CAPACITY BUILDING PROGRAMS**

A research, monitoring and capacity building program will be developed with main objectives : i) to better understand the biodiversity resources, ecosystem and landscape environment, ii) to establish a baseline listing of all flora and fauna species for assessing their current abundance, distribution, and functional relationship among biotic communities, iii) to develop quantitative population estimates for elephants, and develop detailed information on their current distribution and habitat use, iv) to identify and map key patches of remnant forests and other critical habitats, v) to identify priority research and monitoring topics to help guide the development of GR's management program, and vi) to gradually reduce the extent and degree of uncertainty while taking management decisions.

A detailed methodology for establishing benchmark data and measuring the volume of timber loss (cubic meter/ha) during the project period will be used. A survey of natural regeneration (density of seedlings and saplings per ha) in the forests of GR will be taken. This will be complemented by photo monitoring technique, focusing on changes in plant height as a visual evidence of success of NSP interventions. Benchmark measurements will be taken to establish initial set of values, which will act as reference for future comparison with subsequent measurements taken periodically for assessing socio-economic impacts of project interventions.

The conservation training will be imparted to the FD field staff responsible for managing the GR. Other stakeholders including the beneficiaries and NGO staff also need conservation training. An exhaustive conservation training plan, covering both in-country and overseas training, will be developed under NSP and implemented over the project period. A training strategy dealing with both quality and quantity of training including refresher and orientation training courses will form part of the training plan.