

CORE INDICATORS FOR PROTECTED AREAS MONITORING REPORT



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CORE INDICATORS FOR PROTECTED AREAS MONITORING REPORT

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EXECUTIVE SUMMARY

The Nishorgo Support Project (NSP) has been working in five-pilot Protected Areas (PAs) to improve the economic condition of the local people and in return, people are to share responsibility along with FD to conserve bio-diversity.

Against its interventions, the Project envisions the first tier of monitoring framework consisting of fundamental indicators of change for the five PAs. The NSP set the criteria for indicators to be easily comprehensible, easily communicated, objectively verifiable and measurable within the horizon of the Project.

After reviewing existing monitoring literature from different countries, discussions with specialists and after series of consultation among participating organizations (e.g. Forest Department), the NSP team came up with the following indicators:

1. Indicator: Declining incidence in illegal logging in pilot PAs
2. Indicator: Increased production of natural resources in targeted areas,
3. Indicator: Increased biodiversity in targeted areas

The first two indicators are the main threats to our PAs, and are directly linked with NSP's interventions. The first indicator measures the basal area (m^2/ha) of trees and number of trees cut illegally during the Project tenure and will assess success or failure against first year baseline data.

The second indicator – increased production of natural resources, is intended to capture natural re-growth in cleared or denuded areas visually through photo monitoring technique and supplemented by data on hectares of plantation raised. Clearance of ground vegetation either for fuelwood and cultivation is another major cause of degradation.

Due to the above two threats, bio-diversity of our PAs is decreasing. As it is not possible to monitor all living organisms, and we propose to use proxy indicator - bird species that are forest dwellers living in different strata of forest.

We tried to make the methods of data collection and procedure simple requiring less training so that we can involve communities in the monitoring process. We believe such approach will help to create 'feeling of belonging' and enabling communities to actively protect, conserve and manage our natural resources.

Core Indicators	Justification	Project Interventions	Precise definition of indicators	Units of measurement	Sampling Design
Indicator: Declining incidence in illegal logging in pilot PAs.	Major cause of deforestation for all PAs.	(1) Alternative income generating activities, (2) community involvement	Decrease in illegal timber removal.	(1) Basal area (m ²) per hectare. (2) Number of trees felled and number of cases.	(1) Point sampling by either systematic or purposive sampling.
Indicator: Increased production of natural resources in targeted areas.	Seedlings, saplings are used as fuelwood, affecting natural regeneration and forest re-growth.	(1) Alternative income generating activities (2) involvement in production activities, (3) introduction of innovative technologies reducing pressure on fuel wood, and (4) community involvement.	(1) Increase in natural and assisted regeneration of tree species in Core & Buffer area. (2) Increase of herbs, shrubs, grasses and tree species.	(1) Changes in plant coverage in a photo. (2) % area coverage (3) Ha of plantation raised in core or buffer area.	(1) Purposive sampling - sites where mgt. interventions is likely to be manifested.
Indicator: Increased biodiversity in targeted areas.	Due to above reasons, population of forest dwellings birds are decreasing.	(1) Awareness creation by community involvement.	Increased density of 8 indicator bird species.	Density (number/sq.km) of indicator bird species.	Strip transect method.

1. Background Information

The Nishorgo Support Project (NSP) has started working primarily in five-pilot Protected Areas (PAs). The main objective of NSP is to conserve bio-diversity of our forests through shared responsibilities necessary for conservation. The responsibilities are to be shared by local people along with Forest Department (FD) and in return, the local people will be given technical assistant, guidelines and financial support in such a way that they can earn livelihood in a sustainable manner without jeopardizing the surrounding natural resource bases.

Against NSP's proposed objectives and subsequent interventions, it became imperative that a system is necessary that will enable the Project to say – “did we do that we where supposed to do?”, “did our activities make any change in desired direction?” and lastly, “what are the impacts of our activities?”. Reporting such change either positive or negative generally involves use of indicators. The Project proposed and worked on a three-tier monitoring system (Figure 1) to keep track the progress and impact of the Project. These three levels consist of:

Level 1: Monitoring a Core Set of Indicators

Level 2: Monitoring Key Contract and Project Proposal Targets

Level 3: Work Plan Monitoring

The third level is concerned with effective and timely execution of objective wise activities/milestones which are outlined in the Project Work Plan for five years.

Implementation of activities in a coordinated way give outputs in desired direction which NSP designates as ‘Intermediate Results’, ‘Milestones’ or ‘Targets’ that are need to be achieved according to the USAID’s contractual document or Nishorgo Support Project Proposal. This second level keep track of outcomes on socio-economic status of the local people, on forest policy, management, administration, public awareness and a range of other issues which go beyond the spatial scale of PAs to local, regional and at the national level.

The first level measures the impact and applies rigorous scientific protocol to quantify changes in status of specific natural resources of the five PAs.

In brief, all the contractual “Indicators”, “Intermediate Results”, and “Objectives” according to USAID’S Performance Monitoring Plan have been distributed in the first two levels (Level 1 & 2). This document will help the reader from where to get information on these indicators and subsequent data/document.

Table 1: Core Indicators for Protected Areas

Core Indicators	Precise definition of indicators	Units of measurement	Justification
1. Declining incidence in illegal logging in pilot PAs.	Decrease in illegal timber removal.	(1) Basal area (m ²) per hectare. (2) Number of trees felled and number of cases.	Major cause of deforestation for all PAs.
Indicator 2: Increased production of natural resources in targeted areas.	(1) Increase in natural and assisted regeneration of tree species in Core & Buffer area. (2) Increase of herbs, shrubs, grasses and tree species.	(1) Changes in plant coverage in a photo. (2) % area coverage	Seedlings, saplings are used as fuelwood, affecting natural regeneration and forest regrowth.
3. Increased biodiversity in targeted areas.	Increased density of 8 indicator bird species.	Density (number/sq.km) of indicator bird species.	Due to above reasons, population of forest dwellings birds are decreasing.

2. Core Indicators

2.1 Indicator: Declining incidence in illegal logging at five pilot PAs.

2.1.1 Precise definition of Indicator: This indicator will measure the basal area coverage of trees per hectare. Reduction in the basal area coverage within the protected areas will indicate success or vice-versa. This indicator will also collect data of number of trees felled and number of cases from Forest Department's Offence Register on a monthly basis.

2.1.2 Unit of Measurement: Specific measurement units will be (1) basal area (m^2/ha) and also (2) number of trees and cases registered in Offence Register Book of Forest Department.

2.1.3 Justification: The first indicator is the main threat to our PAs based on the five Site Level Field Appraisal Reports (Mollah et al 2004a, b., Mollah and Kundu 2004, Mollah et al 2004 a, b). This indicator will also indicate increased levels of protection resulting in part in improved capacity of FD and serve as proxy indicator that community groups are actively participating in the protection of the PA.

2.1.4 Management utility: Reducing illegal removal of trees from PAs is fundamental to improving the habitat. This indicator will also indicate increased levels of protection resulting in part in improved capacity of FD and serve as proxy indicator that community groups are actively participating in the protection of the PA.

2.1.5 Community involvement in monitoring: Co-management committee will be informed by the NSP team on a monthly basis on the status of illegal felling. Later, a sub-monitoring committee will be formed which will lead the data collection and report to the Co-management Committee.

2.1.6 Baseline Data on Basal Area:

2.1.6.1 Method: Point sampling (or variable plot cruising) method was applied using Wedge Prism with BAF 2 (metric) by systematic sampling method. Proper identification of half tally tree was crossed checked by measuring plot radius factor. The distance between sampling units (within line or row and between lines) varies from PAs to PAs.

For example, in Lawachara National Park the distance between sampling units was 50 meters in rows which were 200 meters apart. The number of sampling points was 286 distributed over different stands of Teak, Jarul, Gamar, and Chapalish of 1923 to 1967. Recent plantations (planted in 1987 and later) of Eucalyptus, Acacia, Molucana, Teak, Chapalish, Gamar were not included.

For Satchari National Park, the sampling points were taken in Acacia Plantation, not in the natural forest areas of the Park as during the reconnaissance survey it was found that all most all illegal felling occurs in Acacia plantation part. The 51 sampling points were distributed at random and minimum distance between points was 10 meters.

For Rema-Kalenga Wildlife Sanctuary, point sampling was done in two locations based on reconnaissance survey. The first location is along the eastern side of the road from Kalenga to Rema Beat office where Teak plantation lies under the Wildlife Sanctuary. The road is the boundary between the Reserved forest and the Wildlife Sanctuary. It was found that most illegal felling is concentrated in Teak plantation of the Reserved forest area but approaching towards the Sanctuary area as well. Thus purposively two lines (300 meter apart) running parallel the road was established and 24 sampling points were established along these lines at variable distances. The minimum distance between points was 20 meter.

The second survey location is situated in the north tip of the Rema-Kalenga Wildlife Sanctuary. On two sides of a natural trail (2 km), purposively 13 sampling points were taken at variable distance in this part of the natural forest.

At Chunati Wildlife Sanctuary, the sampling was done in the only standing Garjan patch located in the Chunati Beat. Rest of the Sanctuary is denuded. A total of 16 sampling points purposively selected, distributed in the patch in such a way that the plots do not over lap.

At Teknaf Game Reserve, survey was done in the western side at the Silkhali Garjan forest patch. A total of 9 sampling points were taken only.

2.1.6.2 Results: It should be noted that apart from Lawachara National Park, the following figure of basal area for the five Protected Areas do not reflect the actual basal area of the forest.

- ◆ LNP – 10.43m²/ha
- ◆ SNP – 14.76 m²/ha
- ◆ RKWS – 18.49 m²/ha
- ◆ CWS – 20.25 m²/ha
- ◆ TGR – 19.33 m²/ha

2.1.7 Baseline Data on Number of trees and cases registered in Offence Register:

2.1.7.1 Methods: Nishorgo started working in the field beginning of year 2004. So the data for financial year 2003-04 was taken as baseline year against which the subsequent year data will be compared. From respective Beat Office, the data on number of cases and trees were taken. The baseline figures as well as subsequent years are shown in graphical and tabular format below.

2.1.7.2 Results:

Figure 1: Total Number of Cases Registered at five pilot PAs

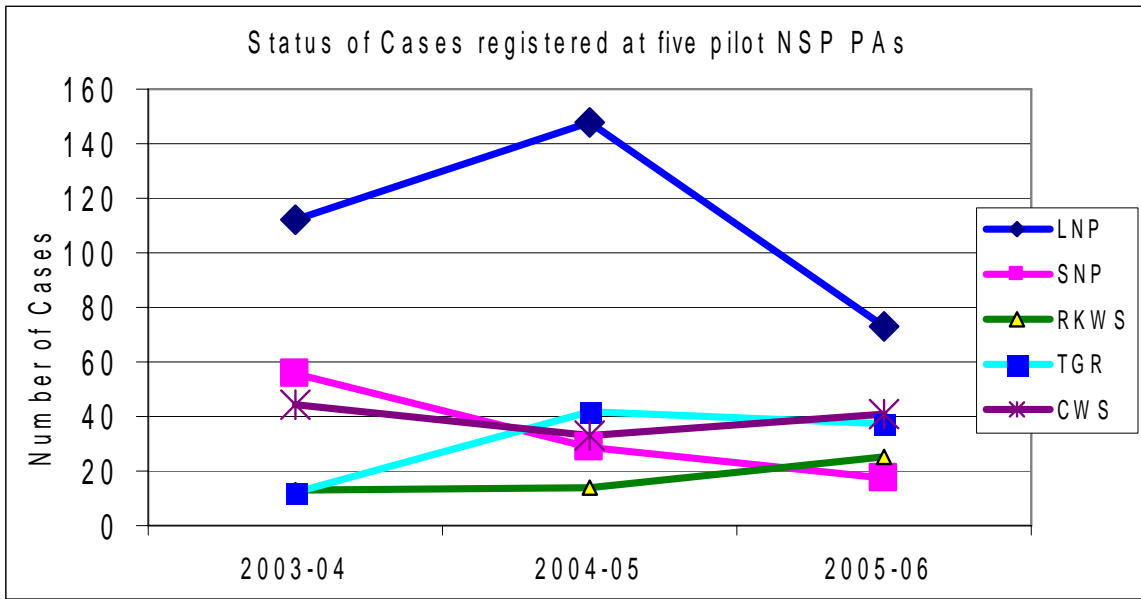


Figure 2: Total Number of Tree felled at five pilot PAs

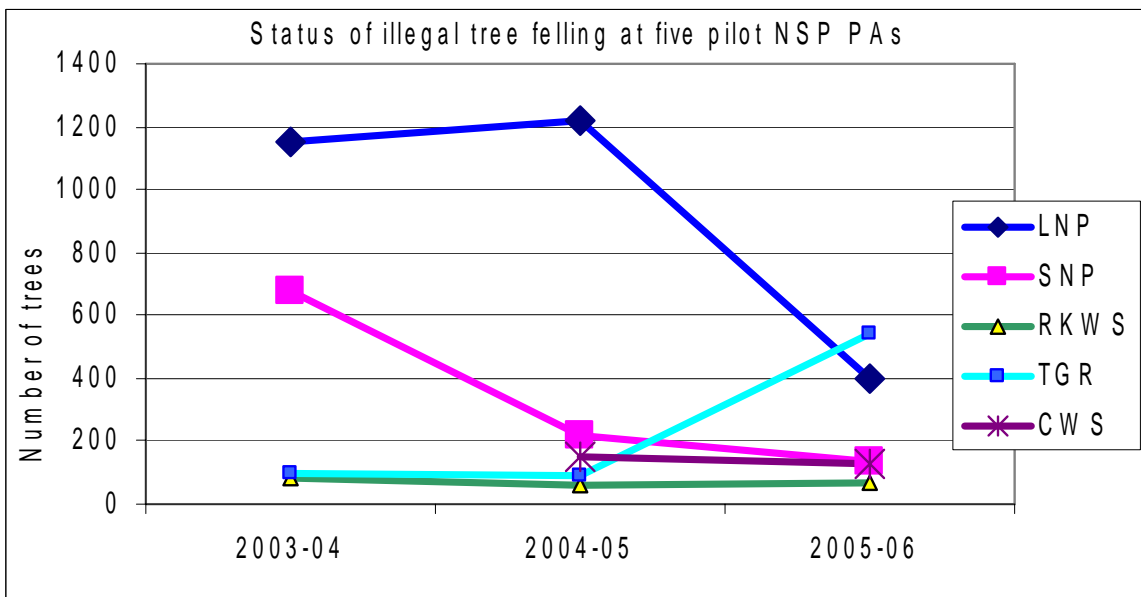


Table: 2: Number of cases registered in Offence Register Book

Year	2003-04	2004-05	2005-06
Lawachara National Park (LNP)	112	148	73
Satchari National Park (SNP)	56	29	17
Rema Kaleng Wildlife Sanctuary (RKWS)	13	14	25
Chunati Wildlife Sanctuary (CWS)	12	42	37
Teknaf Game Reserve (TGR)	44	33	41

Table: 3: Total Number of Felled Trees Registered in Offence Register Book

Year	2003-04	2004-05	2005-06
Lawachara National Park (LNP)	1152	1218	396
Satchari National Park (SNP)	679	219	135
Rema Kaleng Wildlife Sanctuary (RKWS)	81	58	69
Chunati Wildlife Sanctuary (CWS)	*	148	128
Teknaf Game Reserve (TGR)	99	89	544

* = The then beat officer (under territorial division) declined to give data on number of tree felled. The Offence Register Book was not handed over to Wildlife & Nature Conservation Division from Territorial Division during regime change.

It should be noted that in the Offence Register Book, cases are filed against people for illegal tree felling, destruction of seedling either due to grazing or collection of saplings or seedlings to be used as fire wood, failed to produce proper road permit to transport logs passing the PA/check points etc. The above data on number of cases represents all such cases, and the number of trees represents only the trees felled inside the PAs.

Illegal tree felling drastically reduced in Lawachara in the next year (2005-06), due to the high number of trees had been felled, resulting in prompt action by the management initiating patrolling by the community. A lot of credit should go to the then Beat Officer and Sub-divisional Forest Officer (SDFO) as well as NSP Lawachara Team members. Similarly illegal felling reduced to one-third in Satchari NP than the base year.

While the registered number of tree felled increased marginally in Rema-Kalenga Wildlife Sanctuary (RKWS), the actual figure is quite high. Around 628 (estimated by field monitoring officer of NSP) number of trees was felled in the year 2005-06, and was not registered in the Offence Register Book. Beat Officer was directly related. Local people (newly formed Co-management Committee members) were very vocal against him, and subsequently removed by the Forest Department.

Like that of RKWS, similar incident occurred in Teknaf Game Reserve, however, the number was registered in the Book. Again, Forest Department took step to remove the Beat Officer (Whykheong Range, Roikheong Beat). It should be noted that, among three administrative Ranges of TGR, (i.e. Whykheong, Shilkhali and Teknaf) NSP started working in the Whykheong Range during the first year, followed by Shilkhali Range in the 2005-06, and Teknaf Range in 2006-07. The data represented here are under the first two Ranges to see management impact. Data of all three Ranges are being collected from this year.

Administratively Chunati Wildlife Sanctuary is governed under two Ranges, i.e. Chunati Range and Jaldi Range. Illegal tree felling in Chunati Range is quite low as there is only one patch of Garjan trees remains. Upon initiative of NSP, local people and Forest Department came together to protect this patch and they proposed to number all the trees. A total of 817 Garjan trees were numbered in the year 2004-05 and patrolled by the community. Since then, only 1 (one) tree was uprooted by storm. So the figures of trees felled represent Jaldi Range. NSP started working at the end of 2005-06 in Jaldi side. No community patrol is operating over there.

Although, illegal tree felling is a major threat, among others, destruction of young seedlings or saplings (young plantation) is another threat for rejuvenating the Protected Areas especially in the Teknaf Game Reserve (Table 3). Demand for fuel wood is high, leading to cutting or burning of young plantations. Although there is an allegation within the Forest Department that such reporting of failed plantation is made in order to get more funding for the same piece of land, however, that is not the case at least in the Game Reserve.

Table 4: Destruction of young plantation at Teknaf and Shilkhali Range of TGR

Year	2002-03	2003-04	2004-05
Number of seedlings	1500	1505	769

Such is the pressure around Chunati WS, however, the Sanctuary has very limited number of young plantations. Very recently (2004-06) the Department has started planting the Sanctuary with local variety of fruit bearing tree species. Local people in the Chunati WS meet their demand for fuel wood by burning the bamboo groves, or shrubby vegetation. Such repeated action leads to growth of Sun Grass which they extract and sell in the market.

2.2 Indicator: Increased production of natural resources in targeted areas.

2.2.1 Precise definition of Indicator: This indicator will visually show the natural regeneration of all kinds of tree or plant species in target PAs through photo monitoring technique. A recent decision was made to measure natural regeneration and/or area coverage (%) to support evidence shown in the photos. This indicator will also show hectare of plantation raised in the landscape area.

2.2.2 Unit of Measure: (1) visually change of vegetation in a photo; (2) for natural regeneration: density of seedlings & saplings per hectare; (3) for plantation: Total area (ha) under plantation and number of seedlings distributed in the buffer area (landscape). Photo monitoring technique will be applied for visual representation, communication and will supplement the above quantitative data.

2.2.3 Disaggregate by: Core and Buffer area of a PA.

2.2.4 Justification: From five Site Level Field Appraisal Reports (Mollah et al 2004a, b., Mollah and Kundu 2004, Mollah et al 2004 a, b), it was found that young seedlings and saplings are being used as fuelwood that negatively affecting regrowth into a forest especially in Chuant WS and Teknaf GR.

In general, this indicator assumes that due to project interventions, pressure on PAs will be reduced and as a result natural regeneration will occur; however, some severely degraded areas in the PAs need assistant to regenerate into a forest, and hence, areas (hectare) under artificial regeneration will also be documented. Similar documentation will be done in areas under participatory plantation in the buffer area around the PAs to reduce the pressure on the PAs for fuelwood and building materials, fruits and fodder.

2.2.5 Management utility: Regeneration and plantation and subsequent survival of timber, fuel, fruit and fodder seedlings in the protected areas is a sign of improved community level need oriented production system (Indicator 6a) through better management practices which also contributes directly in reducing pressure on the PAs (IR 6.2).

2.2.6 Community involvement in monitoring: Committee or local young people can be trained up and help in taking and recording data. Method is simple, can be adopted by layman, less time consuming and have the potential to have more impact on the community.

2.2.7 Baseline Data on Photo Monitoring:

2.2.7.1 Method: This method is going to be used for the first time in Bangladesh and a couple of literatures were considered namely, Edelen and Crowder (1996), Hall (2002; 2 parts), Reynolds (1998), Swiecki and Bernhardt (2001). Based upon the readings mentioned above, basic procedure and guidelines of photo monitoring is described below in brief.

General concept or rule to establish of photo-plots (or photo-points) is that such points should be carefully chosen in such a way where specific management intervention is supposed to manifest. Hence photo-points are generally selected purposively.

However, given NSP's activities concentrated more on landscape area to mobilize people and less on specific activities in core area (or inside the PAs), it was difficult to predict where change is more likely to be occur. Hence, photos were taken along the periphery (not inside) of the PAs as most pressure occurs their.

Generally there are three types of themes that are covered in the photographs viz., general photographs, topic photographs and close up photographs. General photographs provide a representative view of the entire area and are necessary for documentation of large-scale changes. Topic photography focuses on specific subject of interest. Close-up photographs exhibit detailed site characteristics such as soil surface, herbaceous and woody plant cover, height and organic litter.

The pictures that were taken in five PAs mostly cover general photographs and topic photographs, and in few instances close-up photographs. In all cases, the following instruments and data were recorded in order to visit the same place and take same pictures again. A total of 156 pictures from 99 locations were taken in the five PAs.

- ◆ Used Canon A75 automatic camera
- ◆ Used tripod stand
- ◆ Aperture value, shutter speed, bearing, height, date and time, coordinates (GPS)

Table 5: Number and corresponding location of photos.

Number of pictures	Number of location
41	21-LNP
30	16-SNP
37	26-RKWS
31	21-CWS
17	15-TGR

As it is not possible to show all pictures in this report, a couple of pictures are shown as an example below. A separate report on photo monitoring will be published in the last year.



Photo 1: A general photograph at Teknaf Game Reserve showing demand for fuelwood leading to clearance of vegetation cover down to soil by burning of hills followed by cutting of all dried vegetation. If NSP is successful in mobilization and protection, such hills should re-vegetate again (Snap no: 157, GPS record $92^{\circ}11'29.4''$, $21^{\circ}5'50.2''$, 5° from north). Similar pictures are taken in Chunati WS.



Photo 2: A topic photograph at Chunati WS showing hill side burned in order to fertilize betel leaf plantation. Topic is more to do with betel than vegetation (Snap no 200, GPS record $21^{\circ} 57' 30.5''$, $92^{\circ} 2' 23.2''$, 20° from North). Such activity is very common in CWS.



Photo 3: A topic photograph at Satchari NP showing ground vegetation clearance for cultivation of lemon (Snap 28, 24⁰7' 25.8", 91⁰ 26' 44.1", 250⁰ from North). Similar photos are taken in Rema-Kalenga WS and Lawachara NP.



Photo 4: Topic photograph at Rema-Kalenga WS showing intrusion of agricultural land (Snap 525, 24⁰ 11' 16.8, 91⁰ 39' 7.7, 205⁰ from North). See on the left hand side the WS land cleared totally for conversion into agricultural land. NSP's success depends on stopping of such activity and regeneration of such land into forest.

2.2.8 Baseline Data on Hectares of Plantation Raised:

2.2.8.1 Method: To capture the production of natural resources in the landscape area we collect data in four categories: (1) Sustainable timber: this includes all social forestry plantations under Forestry Sector Project (FSP) adjacent to PAs. The beneficiaries of FSP are brought under NSP through AIG support to protect not only the plantation raised under FSP but also to protect PAs. Data also include Forest Department's new social forestry activities implemented/overseen by the Co-Management Council.

(2) Reforestation/Aforestation: This includes plantation raised directly by Forest Department and or other institutions through help of NSP within the landscape but outside the PA.

(3) Agro-forestry: This data includes agro-forestry (home gardening) done within the landscape of each PA through support from NSP.

(4) Sustainable agriculture: This includes other sustainable agricultural activities (e.g. nursery, fish culture etc) except home gardening.

2.2.8.2 Results:

Table 6: Increased production of natural resources in five pilot PAs

Category	2005 (baseline Year)	2006
Sustainable timber	50	163
Reforestation / Aforestation	0	316
Agro-forestry	0	69
Sustainable agriculture	3	6
Total	53	554

2.3 Indicator: Increased biodiversity in targeted areas.

2.3.1 Precise definition of Indicator: This indicator will measure the increase in population of eight (8) forest bird species requiring specific habitat requirement – top canopy, middle layer, shrub and ground dwelling birds. An increase in population of bird species that attest to the forest health status of PAs will indicate increase in biodiversity as a whole and application of improved practices, regeneration of forest cover and reduced disturbances.

2.3.2 Unit of measure: density per km² of eight indicator bird species.

2.3.3 Disaggregate by: Protected Areas.

2.3.4 Justification: Felling of trees in the PAs, ground vegetation clearance for any type of agriculture, burning of hills for fuel wood destroy the habitat of wildlife. As a result overall biodiversity decreases over time. Birds are good indicator of forest health, as different birds have different habitat requirements within a forest and are sensitive to change in structure of forest. They reflect overall condition of a forest and act as a proxy indicator for other wildlife.

2.3.5 Management utility: This indicator is the resultant impact of effective resource management mechanisms implemented (IR6.1) and public awareness (IR 6.4) and will contribute directly to the attainment of the increased biodiversity (Indicator 6c).

2.3.6 Community involvement in Monitoring: Local young people were trained up and helped in taking and recording data.

2.3.7 Baseline Data on Indicator Bird Survey:

2.3.7.1 Method: A detailed description of selection of eight (8) indicator birds, the method of survey, baseline and next year figure can be found in (1) Using Participatory Bird Counts to Assess Protected Area (PA) Management Impacts: A Proposal and Design for Bangladesh, (2) Using Participatory Bird Survey to Assess Protected Area Management Impacts: Baseline Report and (3) Using Participatory Bird Survey to Assess Protected Area Management Impacts: Second Year Report.

In summary, NSP (Nasim Aziz & Philip J. DeCosse,) laid out the criteria for selection of birds and based on those three eminent ornithologists (namely Enam ul Haque, Paul Thompson, William J. Collis) selected eight indicator bird species (Table 4). Based on that, a separate team was formed headed by Dr. Monirul H. Khan (Associate Professor,

Department of Zoology, Jahangirnagar University), members from Bangladesh Bird Club and local young people (who were trained later) conducted the survey for two (2) consecutive years. Strip transect method was applied and the total number of strips are as follows: LNP – 6, SNP – 3, RKWS – 4, CWS – 5, and TGR – 5. Minimum length of strip is 0.5 kilometer and maximum length is 2.5 kilometer. Each year, the strips were visited twice to collect density information. The results are shown below in tabular and graphical format.

2.3.7.2 Results

Table 7. Eight indicator bird species of different canopies of the forest

Sl. No.	English Name	Scientific Name	Forest Canopy Where it Lives
1	Hill Myna	<i>Gracula religiosa</i>	Upper canopy
2	Oriental Pied Hornbill	<i>Anthracoceros albirostris</i>	Upper canopy
3	Red-headed Trogon	<i>Harpactes erythrocephalus</i>	Middle canopy
4	Greater Racket-tailed Drongo	<i>Dicrurus paradiseus</i>	Middle canopy
5	White-rumped Shama	<i>Copsychus malabaricus</i>	Undergrowth to lower strata.
6	White-crested Laughingthrush	<i>Garrulax leucolophus</i>	Lower strata
7	Puff-throated Babbler	<i>Pellorneum ruficeps</i>	Ground & undergrowth
8	Red Junglefowl	<i>Gallus gallus</i>	Ground floor

Table 8: Density (number/sq.km) of eight (8) indicator bird species at five pilot PAs.

Indicator Birds	LNP		SNP		RKWS		CWS		TGR	
	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006
Oriental Pied Hornbill	14.34	13.21	15.25	14.88	9.25	8.31	0	0	11.65	11.12
Hill Mayna	21.51	21.19	12.38	13	10.99	10.07	7.57	7.32	32.23	32.51
Red-headed Trogon	3.87	3.9	3.44	3.56	2.12	2.15	0	0	1.06	1
Greater Racket-Tailed Drongo	31.07	31.93	33	33.69	36.59	37.04	9.96	10.03	37.28	37.34
White-rumped Shama	89.99	90.02	86.63	87.02	64.87	64.94	23.78	23.99	18.98	18.21
White-crested laughingthrush	0	0	0	0	0	0	4.12	5.77	0	0
Puff-throated Babbler	26.29	29.55	33	36.16	18.98	22	9.76	12.57	14.35	17.39
Red Junglefowl	7.17	10.66	8.25	11.17	8.32	12.02	11.78	14.5	6.33	8.97

Note: LNP – Lawachara National Park, SNP – Satchari National Park, RKWS – Rema-Kalenga Wildlife Sanctuary, CWS – Chunati Wildlife Sanctuary, TGR – Teknaf Game Reserve.

Figure 3: Status of Red Junglefowl at five pilot Protected Areas

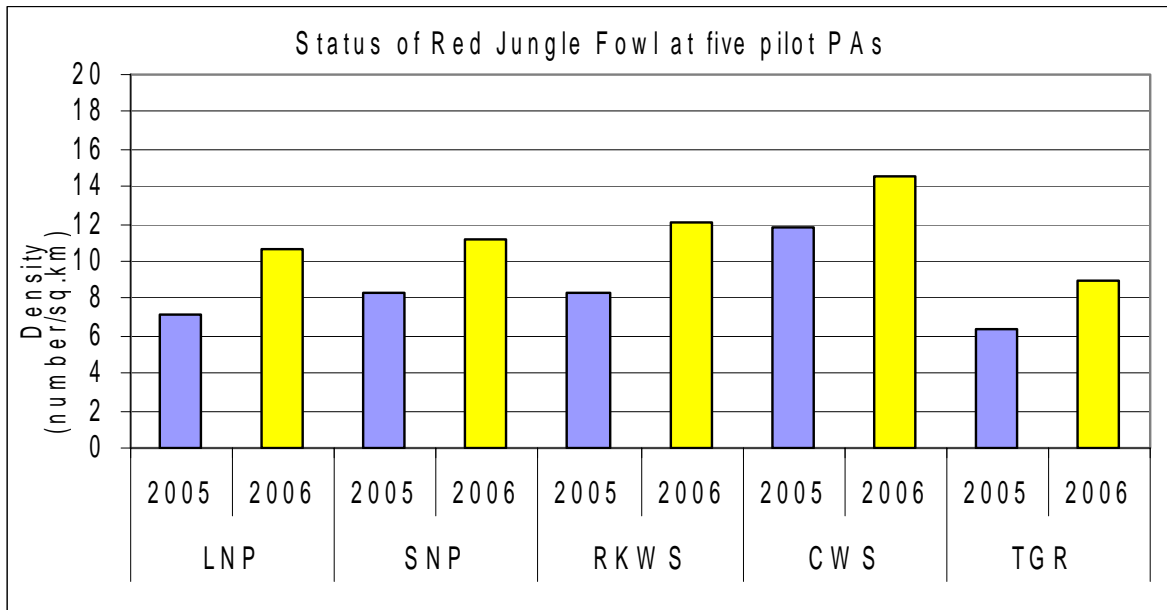
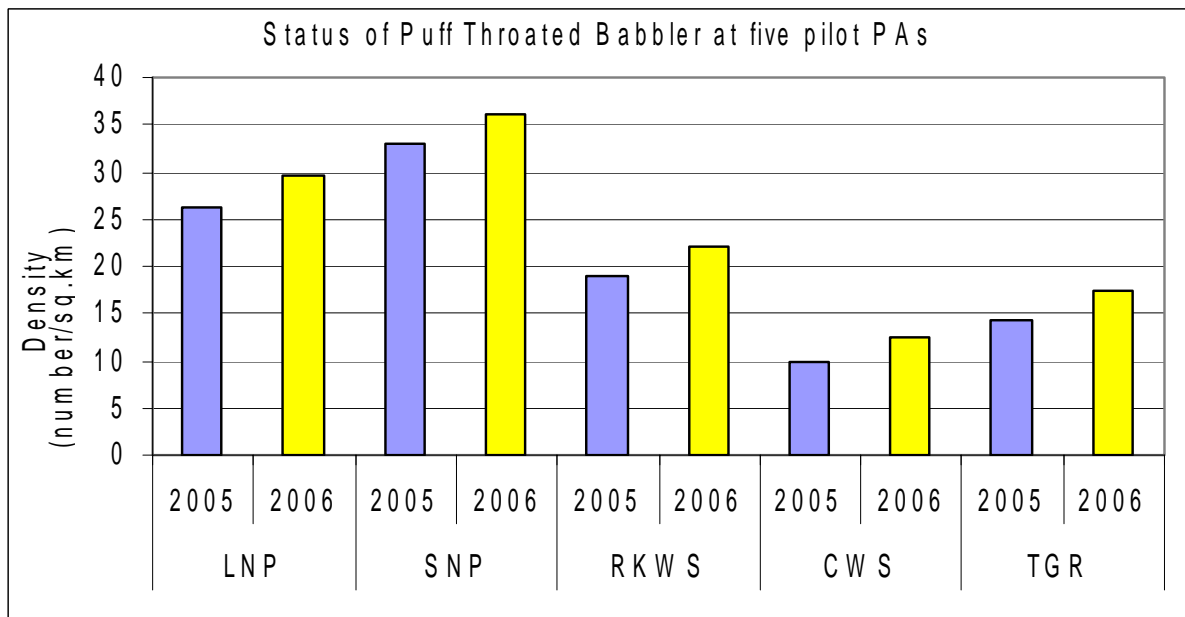


Figure 4: Status of Puff-throated Babbler at five pilot Protected Areas



Density of both these two birds (Figure 5 & 6) has increased significantly from Year 2005 to 2006. Marked change is seen in case of Red Junglefowl probably due to decreased hunting, burning or clearing of ground vegetation. Note that density of Red Junglefowl is highest in CWS as the major vegetation is shrubs, sungrass, and bamboo groves.

Figure 5: Status of White-crested Laughingthrush at five pilot Protected Areas

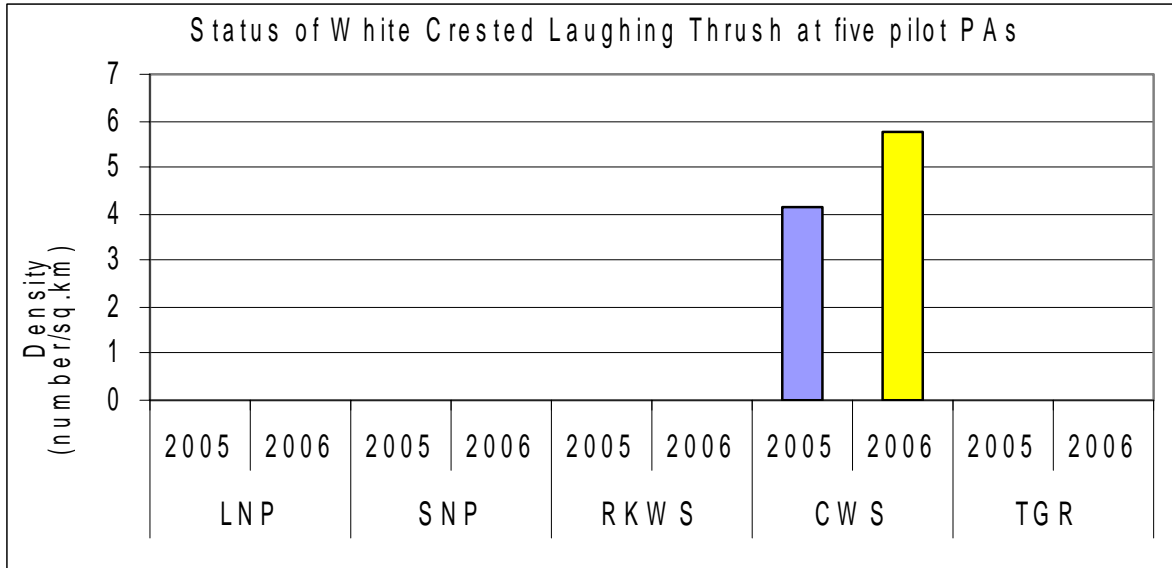
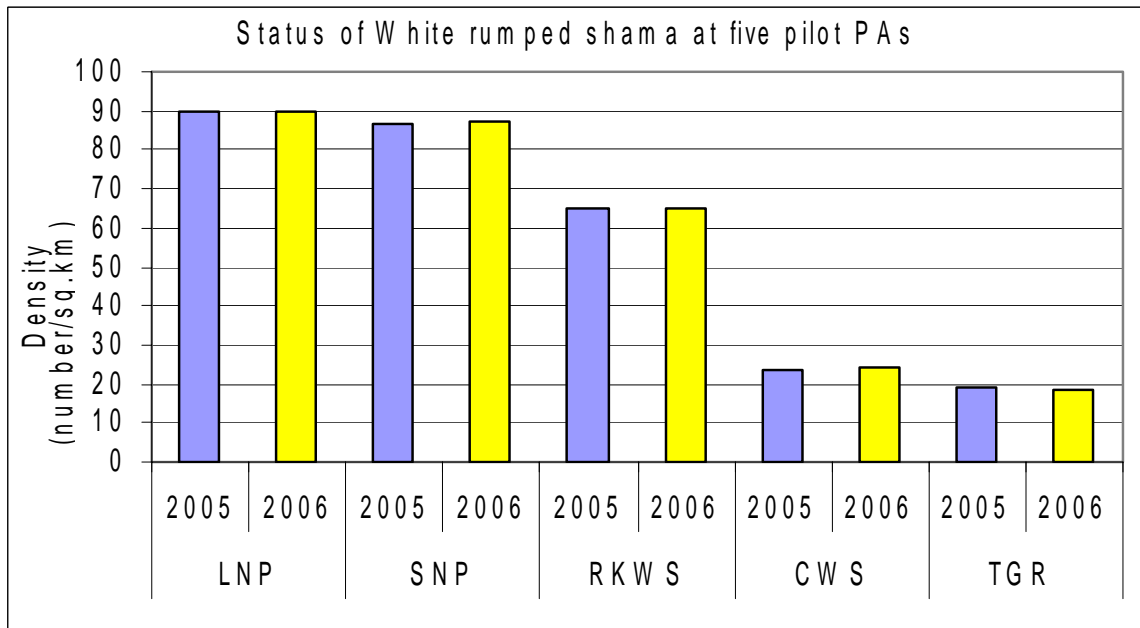


Figure 6: Status of White-rumped Shama at five pilot Protected Areas



White-crested Laughingthrush a lower story bird, feeds from the ground, and was only found in CWS (Figure 7) among five PAs. Habitat of this species is forest undergrowth, and second growth forest. Density of White-rumped Shama, lower canopy bird remained unchanged in two year (Figure 8). Its lower density in CWS and TGR bears reflects the degraded condition of lower strata in these two PAs.

Figure 7: Status of Greater Racket-tailed Drongo at five pilot Protected Areas

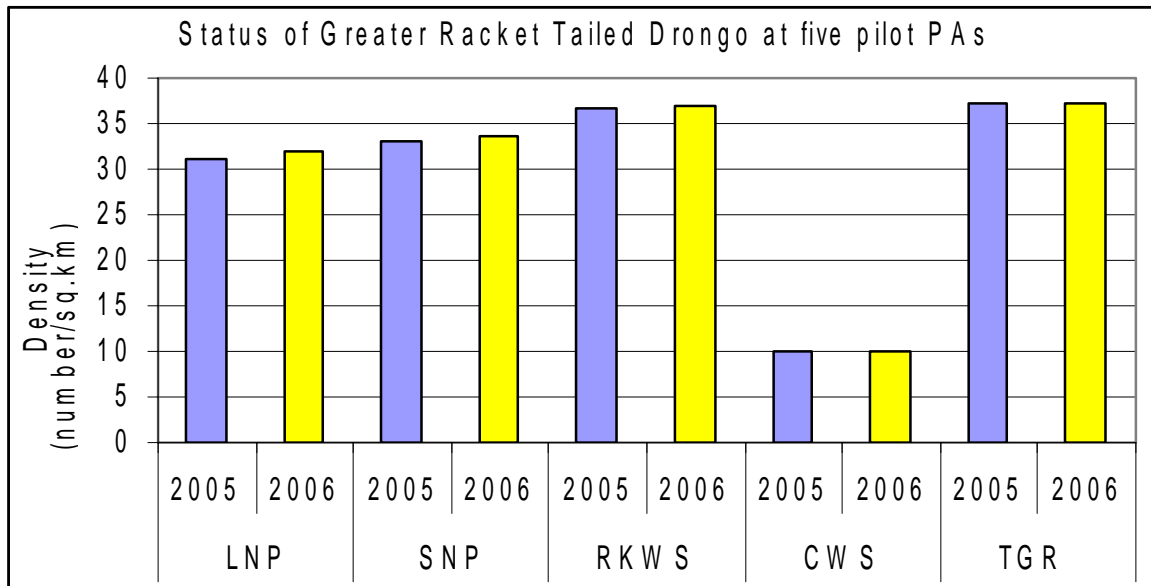
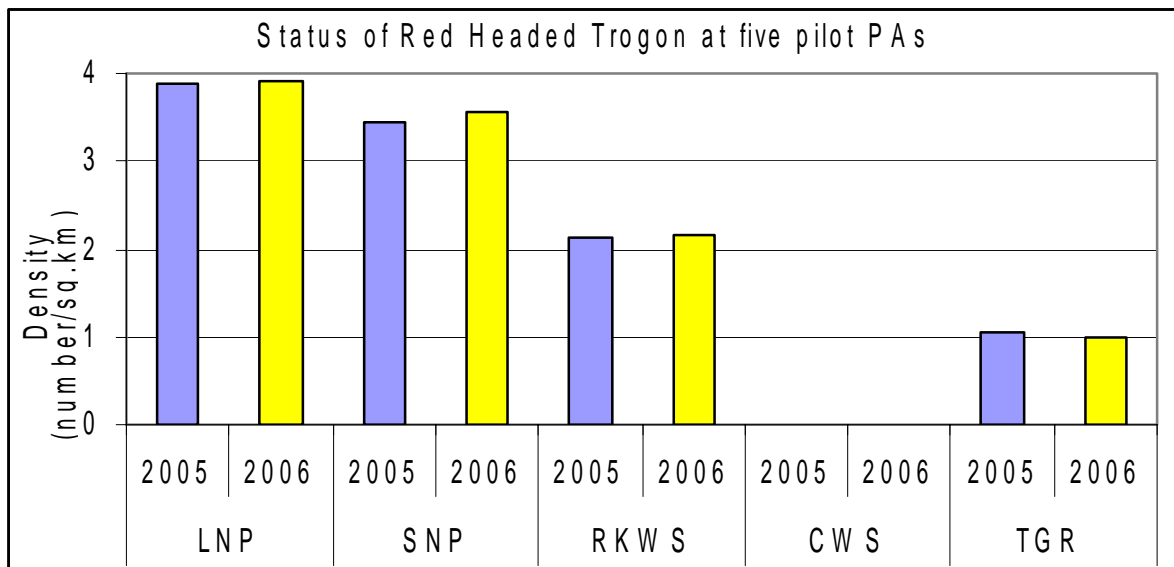


Figure 8: Status of Red-headed Trogon at five pilot Protected Areas



These two birds are mid story birds, Drongo makes nest in tree branches and Trogon nests in tree holes. Their density remained mostly unchanged among the protected areas. Drongo although being a common bird, its density is lowest in CWS due to degraded condition (Figure 9). Currently there is no habitat for Red-headed Trogon at CWS (Figure 10).

Figure 9: Status of Hill Mayna at five pilot Protected Areas

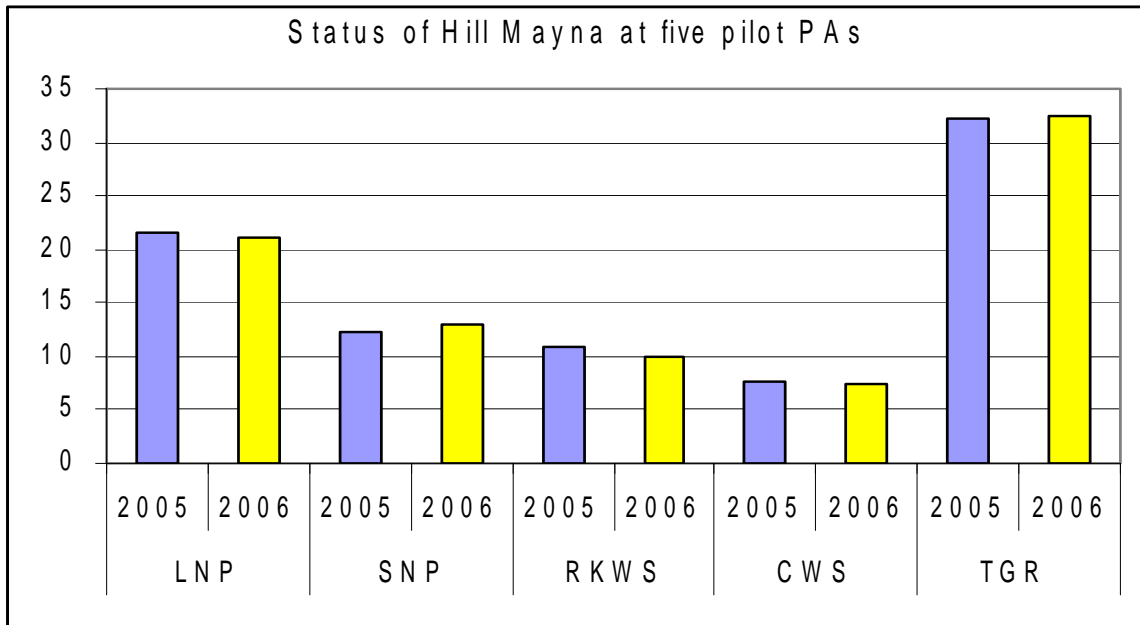
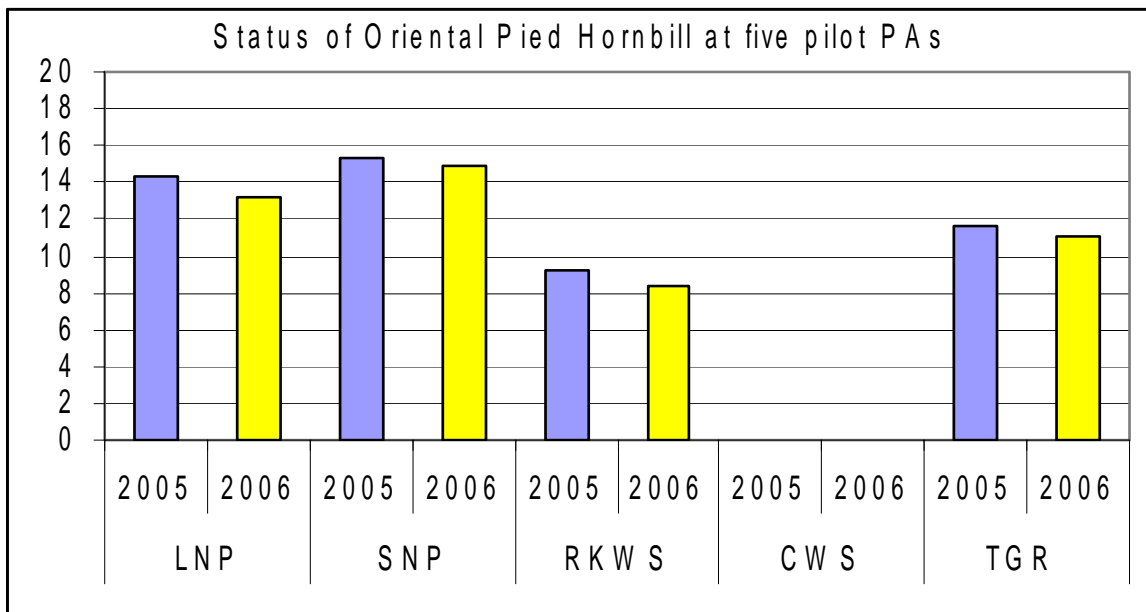


Figure 10: Status of Oriental Pied Hornbill at five pilot Protected Areas



Density of Hill Mayna remained unchanged in all PAs from baseline year, and is highest in TGR (Figure 11). Density of Hornbill showed decreasing trend in all PAs (other than CWS) although not statistically significant (Figure 12). Hornbill nests in tree-holes, found high in canopy, frugivorous, and have specialized nesting requirements. Its density is highest in SNP all though being the smallest PA (242 ha) among the lot. Its higher density may be due to presence of more Fig trees (ficus) compared to other PAs.

3 Conclusions:

Indicators data shows mixed results among PA to PA. While illegal tree felling reduced significantly in LNP & SNP, however, at CWS it reduced to a lesser extent. On the other hand, illegal felling increased at TGR and RKWS. However, for the later two PAs, staff of FD was directly related and upon pressure from Co-management Committee/Council, the Department had to remove (transfer) them. Illegal felling cant never be stopped given the socio-economic, political situation of the country, I assume, however, we need to bring it down to a minimal level. It is at least a positive sign that one of the objectives of the Project was to establish transparency and improve management of PA, which seems to take its effect.

Proxy indicator of forest health – the birds also showed mixed results. Density of ground dwelling two indicator birds i.e., Red Jungle fowl and Puff-throated Babbler increased significantly, while on the other hand, lower to mid story bird's density didn't not vary much. Density of Hornbill living in highest story of forest showed decreasing trend in all PAs (other than CWS). Although statistically not significant, however, a decreasing tread across all PAs raise concern, indicating the illegal felling should stop.

Basal area and photo monitoring are scheduled to take place in the last year, so at this point in time, nothing can't be ascertained.

Given the results, it can be said that, the positive impact have started to manifest, gradually and slowly.

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Appendix 1: Protected Area Characteristics

Note: **1** - Nishat *et al.* 2002; **2** – the land use were obtained from RIMS Data base: Forest Type Maps in 1997-98 were produced from Aerial Photo (1:15,000) under FRMP for Cox’s Bazar Forest Division (which includes Teknaf) and Chittagong Forest Division (which includes Chunati). Forest Type Maps (1:50,000) for Sylhet Forest Division were also produced in 1997-98 from SPOT XS images under the same project.

Protected Areas	Bio-ecological Zone ¹	Area and Land Use ² (Hectare)	Forest Types	Location		
				Forest Administrative location	Civil Administrative location.	Latitude & Longitude
Lawachara National Park	9b – Sylhet Hills	Total Area: 1221.20 Natural forest: 0.00 LR plantation: 850.80 SR plantation: 170.70 Bamboo: 17.80 Cane: 3.40 Forest Village: 129.80 Agriculture: 18.50 Others : 30.10	Semi-ever green and mixed deciduous forest.	Beats: Lawachara Range: Moulavibazar Division: Sylhet Forest Div.	Thana: Kamalgonj; District: Moulavibazar	24° 30' – 24° 32' N & 91° 37' – 91° 39' E
Satchari National Park	9b – Sylhet Hills	Total Area: 242 Natural Forest: 120.23 SR plantation: 103.21 Others: 18.56	Semi-ever green mixed forest.	Beats: Satchari Range: Habiganj Division: Sylhet Forest Div.	Thana: Chunarughat; District: Habigonj	24 ⁰ 12' – 24 ⁰ 4' N & 91 ⁰ 22' – 91 ⁰ 29' E
Rema-Kalenga Wildlife Sanctuary	9b – Sylhet Hills	Total Area: 1795.00 High forest: 1404.90 Scattered trees: 84.90 LR plantation: 97.90 Agriculture: 206.50 Others: 0.80	Tropical ever green and semi-ever green forest.	Beats: Rema, Chonbari, Kalega. Range: Habiganj; Division: Sylhet Forest Div.	Thana: Chunarughat; District: Habigonj	24° 06' – 24° 14' N & 91° 36' to 91° 39' E

Appendix 1: Protected Area Characteristics (continued)

Note: **1** - Nishat *et al.* 2002; **2** – the land use were obtained from RIMS Data base: Forest Type Maps in 1997-98 were produced from Aerial Photo (1:15,000) under FRMP for Cox’s Bazar Forest Division (which includes Teknaf) and Chittagong Forest Division (which includes Chunati). Forest Type Maps (1:50,000) for Sylhet Forest Division were also produced in 1997-98 from SPOT XS images under the same project.

Protected Areas	Bio-ecological Zone ¹	Area and Land Use ² (Hectare)	Forest Types	Location		
				Forest Administrative location	Civil Administrative location.	Latitude & Longitude
Chunati Wildlife Sanctuary	9a – Chittagong Hills and the CHTs	Total Area: 7761 Water: 0.4 Scattered Trees: 4837.4 Plantation: 1342.2 Open Area: 29.1 Natural Forest: 4.3 Encroachment: 228.2 Brush: 732.5	Evergreen, semi-evergreen and wet deciduous forest.	Beats: Chunati, Aziz Nagar, Harbang; Puichari Napora, Jaldi, Chambal. Range: Chunati, Jaldi; Division: Chittagong South	Thana: Chunarughat; District: Habigonj	21 ° 48' – 22 ° 05' N & 91 ° 58' – 92 ° 08' E
Teknaf Game Reserve	9a – Chittagong Hills and the CHTs	Total area: 11615 Brush: 252.5 Brush & agriculture: 253.4 Encroachment: 18.6 High forest: 2699.2 Low forest: 3717.1 Plantation: 2467.7 Non productive, steep slope: 21.5 Scattered trees: 918.5 Sungrass: 58.1	Tropical ever green and semi-ever green forest.	Beats: Raikheong, Saplapur, Madhya Nhila, Nhila, Silkhali, Mathabhanga, Mochani, Rajarchara, Teknaf Range: Teknaf, Whykong & Shilkhali; Division: Cox’s Bazaar South	Thana: Teknaf District: Cox’s Bazar	20° 55' – 21° 09' N & 92° 07' – 92° 18' E