BIODIVERSITY CONSERVATION PLAN

FOR "M/S KHYBER INDUSTRIES (P) LTD" TULPOW, KHONMOH, TEHSIL – SRINAGAR, DISTRICT – SRINAGAR, JAMMU AND KASHMIR

Project Proponent

M/S KHYBER INDUSTRIES (P) LTD

Environment Consultant

GREENCINDIA CONSULTING PRIVATE LIMITED

607-611, Shopprix Mall, Level V
Vaishali, Sector V, Ghaziabad 201010
INDIA

May 2020

INTRODUCTION

Business Description:

Khyber Group of Industries is one of the most accomplished and diversified business houses in J&K. Khyber's success has been driven by the company's commitment to delivering quality products with excellence. Through the consistent application of this commitment and more than 33 years of ethical business conduct, Khyber has earned an unparalleled reputation for trust and reliability.

Khyber's ethical and visionary practices have allowed the Group to successfully expand into a number of businesses. Today Khyber is a leading manufacturer of cement in the State. The Group has to its credit thunderous achievements of universal acclaim in terms of quality of the products and services to the latest technology installed coupled with able guidance and skilled work force.

Khyber is the First Cement Plant in private sector in the valley established in 1987 in the name of Khyber Industries Private Limited.

The Plant is equipped with the latest cement manufacturing technology and its product conforms to the highest standard marks in the Industry. The Unit holds the distinction of being the largest cement manufacturing unit in the State, catering needs of the Government establishments as well as of the private sector. With the use of the latest technology from M/s F.L. Smidth Limited, a Danish company, which is one of the leading cement plant machinery suppliers in the world, Khyber Cement has state –of –the-art plant in Khonmoh, District-Srinagar in Jammu & Kashmir, having the capacity of 1580 TPD (tons per day) .The company also has two mining leases of limestone adjacent to the plant over an area of 77.96ha(Tulpow Limestone Mine) and 14.93ha(Sekinar Limestone Mine) with approved production of 700000 Mt and 250000 Mt per annum respectively.

Khyber is the leading market share holder and commands a good market reputation for its super quality cement- Khyber Brand 43 Grade OPC & 53 Grade OPC, super strength, super finish and super fineness manufactured by adhering strictly to the BIS guidelines, in the latest sophisticated Rotary Plant with fully computerized controls. Its wide network of more than 3000 dealers spread across the J&K State and the vast pool of highly trained and dedicated marketing and technical service team helps the company to service its customers at their doorsteps.

The company presently employs more than 550 employees directly and generates employment for more than 5,000 people indirectly. It has a fully functional R&D Department

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which constantly updates the customers about the new trends and developments related to construction. The turnover of the Company is about Rs.300 crores with investment of Rs.225 crores.

Corporate Headquarter:
Khyber Industries Private Ltd.
Khayam Building, Nowpora,
Srinagar-190001, Kashmir (India).
Tel: 0194-2450156/2450174
Fax:0194-2471133.
e-mail:info@khybercement.com.
Web:www.khybercement.com

Coordinates of the projest Site		
Points	**Latitude**	**Longitude**
A	34°5'16.68" N	74°58'12.74" E
B	34°5'16.23" N	74°58'42.39" E
C	34°5'00.56" N	74°58'42.09" E
D	34°5'00.46" N	74°58'55.14" E
E	34°4'57.21" N	74°58'55.09" E
F	34°4'46.24" N	74°58'54.04" E
G	34°4'39.51" N	74°58'48.48" E
H	34°4'42.17" N	74°58'45.49" E
I	34°4'49.68" N	74°58'42.70" E
J	34°4'49.87" N	74°58'25.51" E
K	34°4'39.03" N	74°58'38.11" E
L	34°4'27.89" N	74°58'25.54" E
M	34°4'35.00" N	74°58'25.40" E
N	34°4'35.14" N	74°58'11.97" E

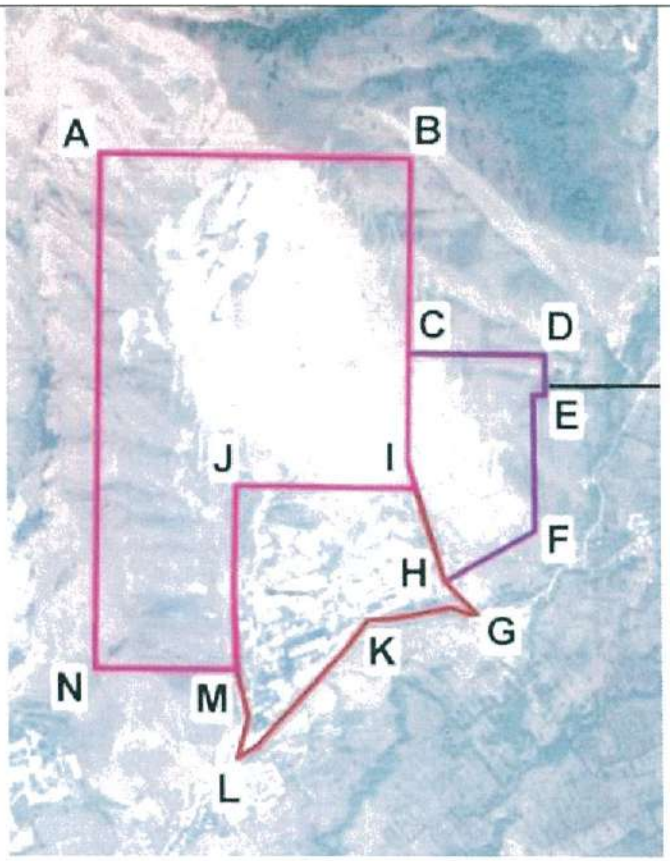

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Fig 1: Project site boundaries

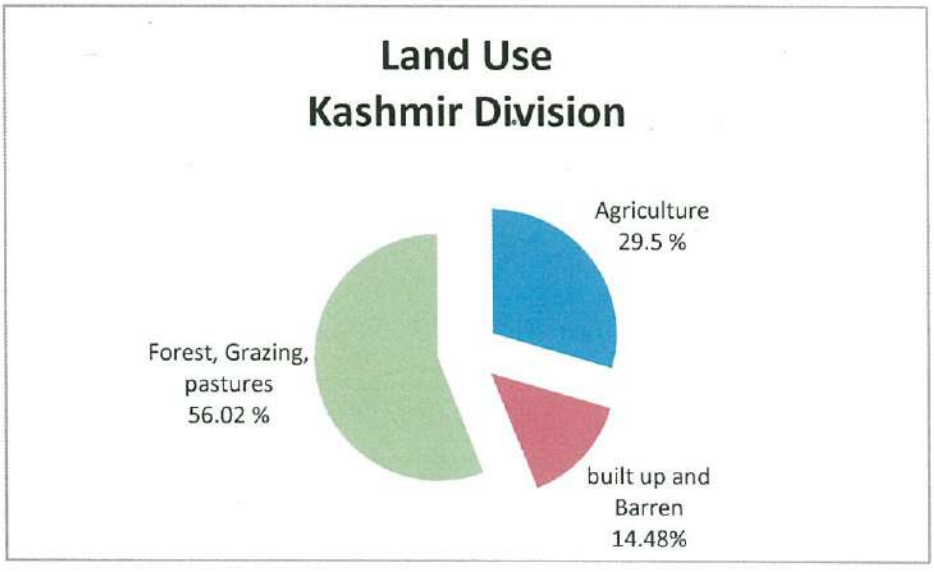
Study

The purpose of this Biological Study is to prepare a Check List of Flora & Fauna present in the study area (Core and Buffer Zone). The basic objective is to study the effect of the Mining Project on flora and fauna in the vicinity of the mining area. For this we have studied the plant community structure of both core and buffer zone using quadrate methods.

Biodiversity is the variety among living organisms and their interaction within ecosystems. Species diversity or biodiversity is a key component to healthy ecosystems. Biodiversity is also the basis of innumerable environmental services that keep us and the natural environment alive- from the provision of clean water and watershed services to the recycling of nutrients and pollination. The objective of this study is to observe and document the Terrestrial and Aquatic biodiversity, focusing mainly on the floral and faunal components present in the core zone and buffer zone of 10 km.

Land Use

In Kashmir zone Region 29.5 % of the geographical area accounts for agriculture land. The built up area and the barren area account for 14.48 %. The remaining area of 56.02 % accounts for forest, permanent pastures, grazing, miscellaneous trees, crops and groves. The commercial forest of the region occupies an area of 48.65 % and is classified as reserved forest.



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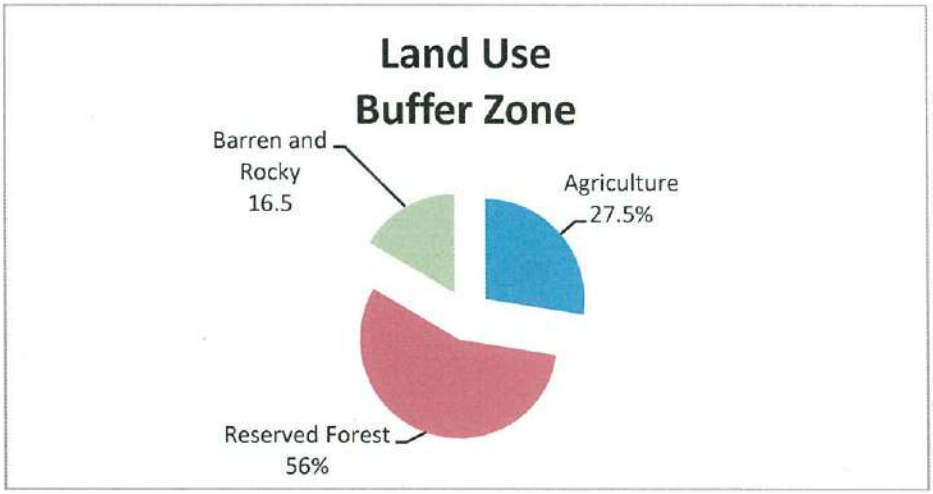
In the buffer zone of 10 km study area with respect to M/S Khyber Industries Pvt. Ltd., 27.5 % of the area accounts for agriculture . The 56 % of the area falls under reserved forest while as 16.5 % is barren and rocky. The study area of core zone and buffer zone of 10 km is lying

between the district Srinagar and Pulwama under the mountainous cores of Zabarwan Hills, Tratkuti and Mahadev Forests.



The largest expanses of alluvial soils are located in the plain area of various description also area as inclusion in other soil group with high to moderate fertility. The climax vegetation is mainly coniferous and the dense stands of various coniferous species occur in the mid and high altitudes. The agricultural soils have been created through clearance of native vegetation.

The topography of the area varies from Prohibitive to moderate slopes, various form of erosion are wide spread, especially on slope lands which are used for crop production.

Land use of the Core & Buffer Zone

Primary land use of the study areas are agricultural land (33.51%), Forest-Evergreen/ Semi Evergreen-Dense/Closed land (14.55%), Semi Evergreen-Open (14.1%) and Scrub Forest (18.12%). Other land use are Natural/Semi natural Grassland & Grazing land-Alpine/Sub Alpine, Snow Covered/Glacial Area, Wastelands-Barren Rocky/Stony Waste, Open Scrub and Waterbodies. (**Table 1.1**)

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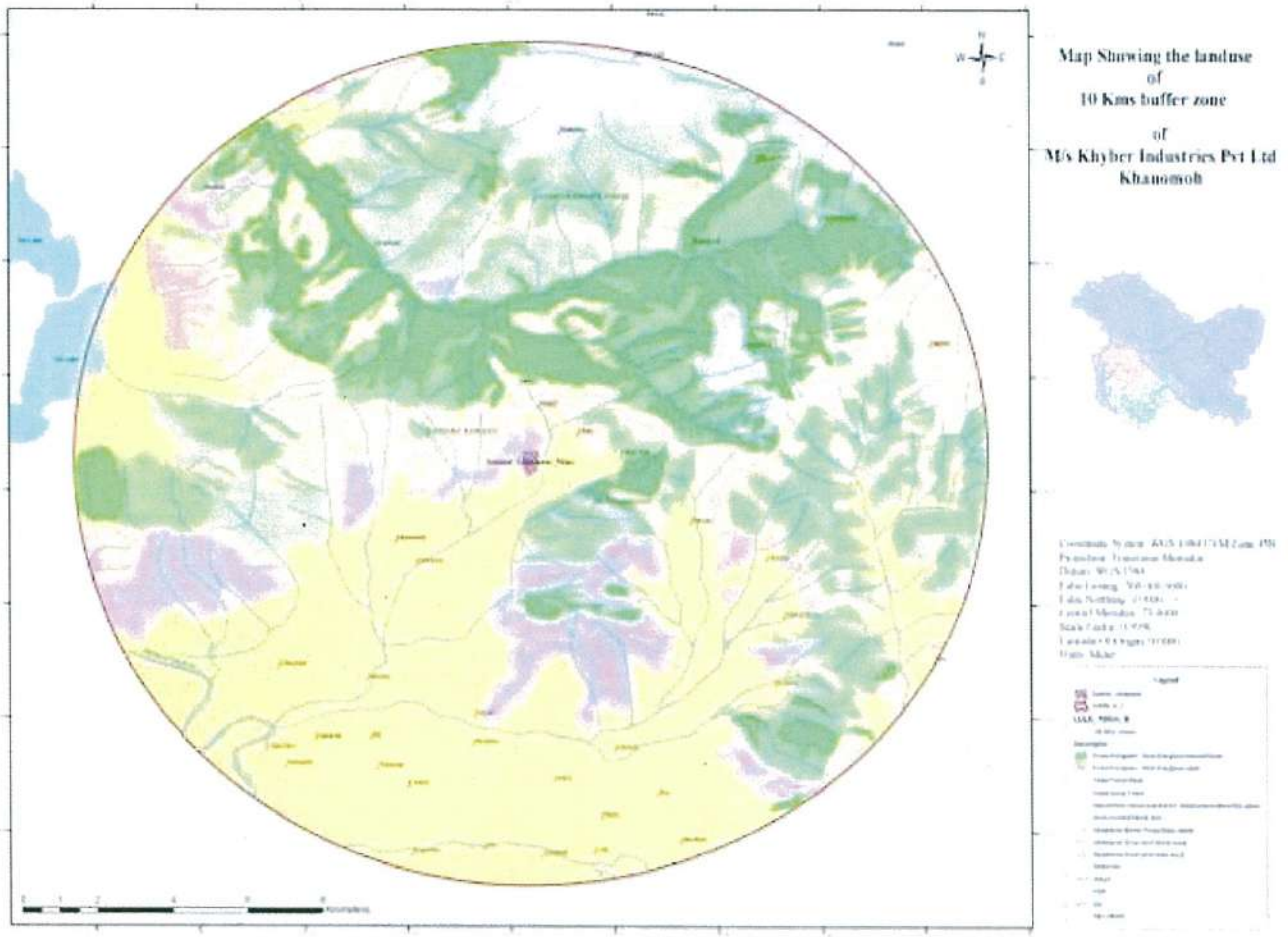
Table No: 1.1. Land Use in study areas

Sl. No.	Landuse Name Name	Area in Ha	Area(%)	Area in Ac
1	Forest-Evergreen/ Semi Evergreen-Dense/Closed	4808.05	14.55	11880.95
2	Forest-Evergreen/ Semi Evergreen-Open	4659.33	14.10	11513.45
3	Forest-Forest Blank	2080.61	6.30	5141.29
4	Forest-Scrub Forest	5988.11	18.12	14796.95
5	Natural/Semi natural Grassland & Grazing land-Alpine/Sub Alpine	168.36	0.51	416.02
6	Snow Covered/Glacial Area	1478.13	4.47	3652.55

7	Wastelands-Barren Rocky/Stony Waste	2213.32	6.70	5469.24
8	Wastelands-Scrub Land-Dense Scrub	273.41	0.83	675.61
9	Wastelands-Scrub Land-Open Scrub	195.69	0.59	483.56
10	Dal/ Jeelam/ Waterbodies	106.50	0.32	263.16
11	Agricultural and Others	11074.13	33.51	27364.78



Total	33045.64	100.00	81657.55

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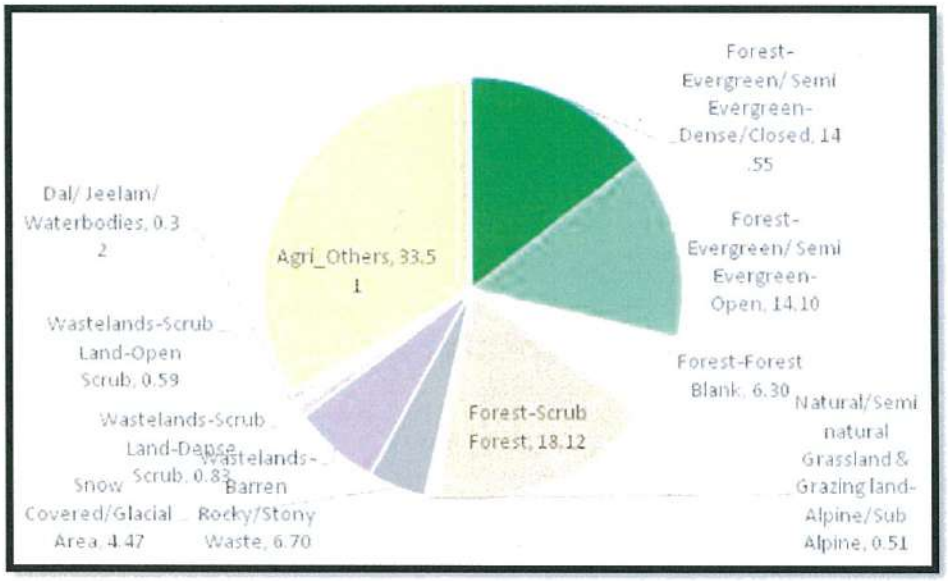

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GEOLOGY & GEOMORPHOLOGY OF THE STUDY AREA.

The entire study area falls within Lower Himalayas and rocks of diverse origin –Marine Sedimentary origin (Limestone, shales, sandstone),Metamorphic (Slate,quartzites) and Igneous rocks(Panjal Trap, Granodiorite sills and dykes). The formations are of Permo-Triassic age.In core zone area Triassic system comprises a thick sequence of Marine continental facies and are characterized by dominant calcareous facies with subordinate argillaceous and arenaceousfacies.The Upper Triassic limestone is high grade to cement grade and is used for manufacture of cement by the Mining lesses.Fluvioglacial deposits of Pleistocene age in the form of clays, sandstone with intercalated boulders and thin laminae of lignite called Karewas are exposed towards lower hillslopes in the valley portion.(Middle Miss C,S 1909, Wadia D,N,1961 and Kapoor H.M.1977).

Topography is rugged with hilly terrain and dendritic drainage pattern. The River Jhelum is main drainage course of Kashmir Valley and flows through the study area. Number of dry Nallas with a few perinealNalas drain the entire study area during Monsoon seasion.There are a number of springs at village Khonmuh,Khrew and Shar and water is used for irrigation and domestic purpose. The lowest altitude is Bren Nishataltitude1583mM.S.L and the highest altitude is Mahadev3944mM.S.L.The depth of the soil in the entire study area on the slopes from lower to middle reaches is less than 25mm and hence fall under the category of very shallow soils(Bhat 1988)

The climate in the area is sub-Mediterranean type with bixeric regime having two spells of dryness of April –June and September-November (Singh & Kachroo,1977,1978)The area observes an irregular weather conditions with a considerable variation in the amount of

precipitation. Snow is the main source of precipitation and in some parts melts till June. The annual minimum and maximum rainfall of the study area ranging between 32mm to 546mm (Bhat,1988)

FLORA (VEGETATION TYPES AND ITS DISTRIBUTION)

The mixed coniferous forests type extends from 1700 to 2600 mts and corresponds to group of Western mixed coniferous forests of Champion"s classification. It constitutes bulk of forests of the area. The crop comprises of mixed principal coniferous species, the dominance of Kail at particular places is determined by topographic factors like aspect, altitude and site conditions. The Kail gives way to Deodar when site conditions become moist and similarly Fir gets replaced by Deodar when these become drier. The crop is healthy and of good form, the regeneration status is unsatisfactory. Champion and Seth consider this type to be a climatic climax though with much higher proportion of broad leaved trees than at present. In this zone however, the Kail and Fir are of serial character and Deodar is climax species.

Floristic: i. Cedrusdeodara, Pinuswallichiana, Abiespindrow, Piceasmithiana.

ii. Juglansregia, Aesculusindica, Acer spp, Fraxinus spp., Vibernumspp,

iii. Sambucus spp. Rumexspp, Fragariaspp, Phytollacaspp.

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Karthikeyan, 1997). Individuals below 10 cm gbh were considered as saplings and shrubs. This concept was tested further during the fieldwork. Basal area of plants was measured following Philips (1959). The plants were identified using floras by Haines (1921-25), Saxena and Brahmam(1994-96).

The primary data recorded on number of individuals in a species andgirths were utilized to derive secondary attributes like density and frequency following standard phyto-sociological methods of Misra (1968). Relative values were calculated following Philips (1959). Important Value Index (IVI) was calculated by adding up relative frequency, relative density and relative dominance (Curtis, 1959). In the case of shrubs, herbs and saplings; IVI was calculated based only on relative values, i.e., relativefrequencyandrelativedensity.Formulaeusedforvariouscalculationsare:

$$\text{quadrats Density} = \frac{\text{Total number of individuals of a species in all the}}{\text{Total number of quadrats studied}}$$

$$\text{Frequency (\%)} = \frac{\text{Total number of quadrats in which species occurred}}{\text{Total number of quadrats studied}} \times 100$$

$$\text{Abundance} = \frac{\text{Total number of individuals of a species in all quadrats}}{\text{Total number of quadrats in which species occurred}}$$

$$\text{Mean basalarea} = \frac{C^2}{4\pi} \quad (C = \text{Mean of thecircumference})$$

$$\text{Total basalarea} = \text{Mean basal area} \times \text{Density}$$

$$\text{Mean of the circumference (C)} = \frac{\text{Sum of all cbh of a species}}{\text{Total number of individuals of a species}}$$

$$\text{RelativeDensity} = \frac{\text{Density of a the species}}{\text{Total density of all species}} \times 100$$

$$\text{RelativeFrequency} = \frac{\text{The frequency of a species}}{\text{Total frequency of allspecies}} \times 100$$

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The forest Types, cover and food for wildanimals:

As per revised Champion and Seth (1968) the vegetation of Dachigam National Park is typically Himalayan moist temperate forest: sub-alpine forest and alpine forest type and can be classified into following forest types:

- Moist temperate deciduousforest.
- Parrotia (pohu) scrubforest.
- West Himalayan low level blue pineforest.
- Western mixed coniferousforest.
- Deciduous alpinescrub.
- West Himalayan sub-alpine birch-rhododendronforest.
- Dwarf juniperscrub.

Dry temperatescrub

Methodology forVegetation

The study was aimed at enumeration of the available plant resources and obtaining a broad representation of the existing floristic variations in the project affected area and surrounding project affected areas. Enumeration of the plant wealth was done by surveying the area through walking followed by collection and identification of plant specimens. Phyto-sociological aspects of the study were carried out by perambulating and sampling through quadrates method. Sample plots were selected in such a way to get maximum representation of different types of vegetation and plots were laid out in differentpartsoftheareaswithintheminearea aswellasthesurroundingminearea.Selection of sites for vegetation data was done by random sampling procedure.

Accordingly, equal number of quadrates of 10 m x 10 m for the study of tree layer in the project affected area and surrounding project affected area were laid. Within these sample plots, sub-plots of 3 m x 3 m were laid out randomlyfor studyingthe shrub layer and regeneration of tree species. For information on ground layer including herbaceous species, quadrates of 1 m x 1 m size were laid out within the tree quadrate. All species encountered during the transect walk were recorded. The girth at breast height (gbh) of all individuals in each quadrate was measured for all species of trees and woody climbers. All individuals with gbh> 10 cm were considered and recorded as trees (Parthasarathy and

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$$RelativeDominance = \frac{Total\ basal\ cover\ of\ a\ species}{Total\ basal\ cover\ of\ all\ species} \times 100$$

Importance Value Index(IVI)= Relative Density + Relative Frequency + RelativeDominance

Flora of project affected area

Floristic composition varies depending upon the site and its environmental features and it is one of the major characteristic features of any plant communities. A total of 40 quadrats were randomly laid for the data collection of the tree, shrubs and herbaceous species. A total three tree species were found with a total density of 566.66 trees/ha with a total basal area of 611153.56 m2/ha. The tree flora of the project affected area dominatedbyPinuswallichianafollowedbyPiceasmithian.a

Botanical Name	Quadrats					no. of Plants	Total Quadrates studied	No. of quadrates in which a species occurred	Frequency	Abundance	Density	Relative frequency	Relative Abundance	Relative Density	pi	pi*ln(pi)
	1	2	3	4	5											
Ulmuswallichiana	1		1		1	3	5	3	60	100.0	60	21.43	13.04	18.75	0.19	-0.31
Populuscaspica		2		1	1	4	5	3	60	133.3	80	21.43	17.39	25.00	0.25	-0.35
Acer caesium	1		1			2	5	2	40	100.0	40	14.29	13.04	12.50	0.13	-0.26
Morus alba		1				1	5	1	20	100.0	20	7.14	13.04	6.25	0.06	-0.17
Pyrusmalus	1		2		1	4	5	3	60	133.3	80	21.43	17.39	25.00	0.25	-0.35
Quercus robber		1				1	5	1	20	100.0	20	7.14	13.04	6.25	0.06	-0.17
Rubiniapsedoacacia			1			1	5	1	20	100.0	20	7.14	13.04	6.25	0.06	-0.17
Ulmuswallichiana	1		1		1	3	5	3	60	100.0	60	21.43	13.04	18.75	0.19	-0.31
Populuscaspica		2		1	1	4	5	3	60	133.3	80	21.43	17.39	25.00	0.25	-0.35
Total						16			280	766.7	320	Shanon Weiner Index				

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The number of shrubs, and tree saplings together from project affected area was five species. The project affected area was dominated by *Viburnum grandiflorum*and*Abiespindrow*. The forest with open canopy cover and moist soil conditions do not favoured the growth of woody climbers and shrubs. The density values (stems/ha) for different species of shrubs varied from 246.91 to 6666.67.

*Abiespindrow*recorded the highest IVI value (135.49). This particular shrub has very good capacity forregeneration.

Herbaceous vegetation accounted for eight species in the project affected area. The stand density in the case of herbaceous species was 1586700 stems/ha (Annexure I, Table-3) and this strata was dominated by *Trifoliumrepens*(816700 stems/ha) followed by *Fragariavesca*(633300 stems/ha) and *Erianthus sp.* (63300 stems/ha) (Annexure I, Table-3).

Dominance and ecological success of a species is expressed as a single value in terms of Importance Value Index (IVI). This index utilizes three parameters viz., relative frequency, relative density and relative dominance or basal area. High IVI values of a

Botanical Name	Quadrats					no. of Plants	Total Quadrates studied	No. of quadrates in which a species occurred	Frequency	Abundance	Density	Relative frequency	Relative Abundance	Relative Density	pi	pi*ln(pi)
	1	2	3	4	5											
Betulautilis	1	1			1	3	5	3	60	100.0	60	14.3	9.6	15.79	0.16	-0.29
Fraxinushookeri		1		1		2	5	2	40	100.0	40	9.5	9.6	10.53	0.11	-0.24
Ulmuswallichiana	2			1		3	5	2	40	150.0	60	9.5	14.4	15.79	0.16	-0.29
Acer caesium		1	2		1	4	5	3	60	133.3	80	14.3	12.8	21.05	0.21	-0.33
Populuscaspica	2			1	1	4	5	3	60	133.3	80	14.3	12.8	21.05	0.21	-0.33
Morusindica		1		2		3	5	2	40	150.0	60	9.5	14.4	15.79	0.16	-0.29
Quercus robber	1	1	1		2	5	5	4	80	125.0	100	19.0	12.0	26.32	0.26	-0.35
Celtisaustralis		2		1		3	5	2	40	150.0	60	9.5	14.4	15.79	0.16	-0.29
Total						19			420	1041.7	380	Shanon Weiner Index				2.410

species indicate its high regeneration capacity and greater ecological amplitude. Among trees species, *Pinuswallichiana*showed highest IVI (190.79) followed by *Piceasmithiana*(92.85), and *Abiespindrow*(16.36). Among shrubs, highest IVI was recorded as 135.49 and 95.84 in the case of *Abiespindrow*and*Viburnum grandiflorum*respectively (Annexure I, Table-2). Highly regenerating species in the study site among shrubs was *Abiespindrow*.

Methodology for Faunal Study

A linear transect of 1 km each was chosen for sampling at each site. Each transect was trekked for 1.5 h for sampling of animals through the following methods. For sampling butterflies, the standard 'Pollard Walk' method was employed and all the species were recorded daily. Voucher specimens of the species that could noidentified in the field were collected using of a butterfly net besides photographing them. For sampling birds, 'point sampling' along the fixed transect (foot trails) was carried out. All the species of birds were observed through a binocular and identified with the help of field guides and photographs. For sampling mammals, 'direct count on open width (20m) transect' was used. In addition, information on recent sightings/records of mammals by the villagersand locals was also collected.In case ofreptilesmainlylizardsweresampled by directcountonopenwithtransects'.

FAUNAL DIVERSITY

To prepare a detailed report on the status of wildlife biodiversity in 10 km radial area (Study Area) around the proposed project affected sites to assess the impacts due to of new generation mountain radar system and air defense sensor activity and evolve suitable mitigation measures to protect and conserve wildlife biodiversity following components were studied:

a) Wildlife survey(diversity)
b) Habitat study (feeding, breeding, roostingareas)
c) Distribution ofbirds
d) Rare & Endangered species offauna
e) Specific local characteristics of biodiversity in studyarea

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Status of Fauna

All three sites of the projected affected area are completely covered with grasses and have no major faunal diversity. Therefore we prepared a complete checklist of fauna from project affected area and surrounding of project affected area. The list of fauna along with their relative abundance, global and national conservation priority status recorded during the survey is given below.

Checklist of Mammals

Common Name	Scientific Name
Common Leopard	*Pantherapardus*
Himalayan Brown Bear	*Ursusarctosisabellinus*
Asiatic Black Bear	*Ursusthibetanus*
Leopard Cat	*Prionailurusbengalensis*
Jungle Cat	*Felischaus*
Red Fox	*Vulpesvulpes*
Jackal	*Canisaureus*
Himalayan wolf	*Canis lupus*
Serow	*Nemorhaedussumatraensis*
Hangul or Kashmir Stag	*Cervuselaphushanglu*
Himalayan Musk Deer	*Moschuschrysogaster*
Himalayan yellow-throated Marten	*Martesflavigula*
Himalayan weasel	*Mustelasibirca*
Long-tailed marmot	*Marmotacaudata*
Indian porcupine	*Hystrixindica*
Himalayan Mouse Hare	*Ochotonaroylei*
Common langur	*Semnopithecusajex*
Rhesus macaque	*Macacamullata*

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A. List of Birds

Bird Species recorded in Dachigam National Park			
Family	**Common Name**	**Scientific Name**	**Status**
1. Accipitridae	1. Black kite	*Milvusmigrans*	R
	2. SparrowHawk	*Hiereatus nisus*	R
	3. BootedEagle	*nisosimilisHiereatuspennat*	M
	4. GoldenEagle	*us*	R
	5. Lammergier	*Aquila*	M
	6. EurasianGriffon	*chrysaetosGypaetusb*	R
	7. White Rumpedvulture	*arbatus Gyps fulvus*	R
		Gyps bengalensis	R
			R
2. Falconidae	8. Common kestrel	*Falco tinnunculus*	RM
3. Phasianidae	9. SnowPartridge	*LerwalerwaLophophoru*	R
	10. HimalayanMonal	*simpejanusTetraogallus*	
	11. HimalayanSnowcock	*himalayensis*	R
	12. WesternTragopan	*Tragopanmelanocephalus*	R
	13. Chukar	*Alectorischukar*	R
			R
4. Columbidae	14. SnowPigeon	*Columba leuconota*	R
	15. RockPigeon	*Columba*	R
	16. Oriental TurtleDove	*liviaStreptopeliaorie*	R
	17. Eurasian CollaredDove	*ntalisStreptopeliadec*	M
	18. SpottedDove	*aocta*	R
		Streptopeliachinensin	R
5. Psittacidae	19. Rose RingedParakeet	*PsittaculakrameriPsi*	R
	20. SlatyHeadedParakeet	*ttaculahimalayanaCu*	R
	21. IndianCuckoo	*culusmicropterus*	R
	22. EurasianCuckoo	*Cuculusconorus*	M
			RM
6. Strigidae	23. Eurasian EagleOwl	*Bubo bubo*	R
	24. LittleOwl	*Athenenoctua*	R
7. Aodidae	25. HimalayanSwiftlet	*Collocaliabrevirostri*	R
	26. AlpineSwift	*sTachymarptis melba*	R
	27. CommonSwift	*Apusapus*	M
	28. HouseSwift	*Apusaffinis*	M
			RM
8. Alcedinidae	29. PiedKingfisher	*CerylerudisAlceod*	R
	30. CommonKingfisher	*oatthisHalcyonsm*	R
	31. White-Throated Kingfisher	*yrnensis*	M
			R

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9. Coraciidae	32. European roller	*Coracias garrulous*	RM
10. Upupidae	33. Common hoopoe	*Upupaepops*	RM
11. Picidae	34. Scaly BelliedWoodpecker 35. Grey-HeadedWoodpecker	*Picussquamatus* *Picuscanus*	R R
	36. Himalayan Woodpecker	*Dendrocoposhimalayensis*	R
12. Alaudidae	37. Crested lark	*Melanocoryphabimaculata*	R
13. Hirundinidae	38. Dusky cragmartin 39. Barnswallow 40. Striatedswallow	*Hirundoconcolor* *HirundorusticaHirun dodaurica*	R R M R
14. Oriolidae	41. Eurasian Golden Oriole	*Oriolusoriolus*	RM
15. Surnidae	42. CommonStarling 43. CommonMyna 44. JungleMyna	*Sturnus vulgaris* *AcridotherestristisAcridotheresfuscus*	RM C R
16. Corvidae	45. HouseCrow 46. AlpineChough 47. JungleCrow	*CorvussplendensPyrrhocoraxgraculus* *Corvusmacrophynchos*	R R R
17. Sylvinae	48. Plain LeafWarbler 49. Tytler'sLeafWarbler 50. Tickell's LeafWarbler	*PhylloscopusneglectusPhylloscopustytleri* *Phylloscopusaffinis*	R R R
18. Passerinae	51. Housesparrow 52. Russetsparrow 53. Eurasiansparrow	*Passer domesticus* *Passer rutilans* *Passer montanus*	

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List of Butterflies

Butterfly Species recorded in Dachigam National Park			
Family	**Common Name**	**Scientific Name**	**Status**
Papilionidae	1. Common Yellow Swallowtail	*Papiliomachaon*L.	Common
Pieridae	2. Indian Cabbage White	*Pieriscanidia*	Common
	3. Large Cabbage White	*Pieriscanidia*	Common
	4. Common Gull	*Ceporanerissa*	Common
	5. Dark Clouded Yellow	*Coliasfieldii*	Common
	6. Pale Clouded Yellow	*Coliaserate*	Common
	7. Bath White	*Pontiadaplidice*	Common
Lycaenidae	8. Common Copper	*Lycaenaphaeas*	Common
	9. Dark Grass Blue	*Zizeeriakarsandra*	Common
	10. Indian Cupid	*Everreslacturnus*	Common
	11. Plains Cupid	*Chiladespandava*	Common
	12. Lime Blue	*Chiladeslajus*	Common
	13. Red Pierrot	*Talicadanyseus*	Common
	14. White Bordered Copper	*Lycaenapavana*	Common
	15. Dusky Hedge Blue	*Oreolycevardhana*	Common
	16. White Hedge Blue	*Udaraakasa*	Common
	17. Lime blue	*Chiladeslajus*	Common
Nymphalidae	18. Common Beak	*Libythealepita*	Common
	19. Club beak	*Libytheamyrrha*	Common
	20. Striped Tiger	*Danausgenutia*	Common
	21. Plain Tiger	*Danauschrysippus*	Common
	22. Indian fritillary	*Argyreushyperbius*	Common
	23. Small leopard	*Phalanthaalcippe*	Common
	24. Common leopard	*Phalanthaphalantha*	Common
	25. Great Satyr	*Aulocerapadma*	Common
	26. Common fourring	*Ypthimabaldus*	Common
	27. Indian fritillary	*Argyreushyperbius*	Common
	28. Large silver stripe	*Childrena children*	Common
	29. Common leopard	*Phalantaphalantha*	Common
	30. Himalayan Sergeant	*Athymaopalina*	Common
	31. Common sailer	*Neptishylas*	Common
	32. Short banded sailer	*Phaedymacolumella*	Common
	33. Painted Lady	*Vanessa cardui*	Common
	34. Mountain tortoiseshell	*Aglaiscasmiriensis*	Rare

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Impact on TerrestrialEcology:

In view of the fact that the vegetation composition of the core zone is also widely distributed in the study area (buffer zone) in abundance and therefore, neither any tree species, shrubs, herb nor any climber or grass species is either vulnerable or endangered. The impact going to be encountered on flora and fauna of the core zone are enumerated hereunder:

1. The development of mines and industries have led to the loss of forest cover and simultaneously affected biodiversity and wildlife in these forest areas. Mining, especially opencast mining and the evacuation, requires large tracts of land for extraction processes, industrial purposes such as cement plants, The existing vegetation in the core zone particularly in Project affected area will be affected which can be recovered by 30 green belt development in the project affectedarea.
2. There are several adverse effects of mining on animals. Since for the mining process, large areas of land have to be used, many animals will lose their natural habitat, however, no major or threatened faunal species have been reported from project affected.

3. Most of the species are protected as their respective families have been listed under Schedule I of Indian Wildlife (Protection) Act 1972. However, *Cervuselaphushanglu*and*Moschuschrysogaster*are threatened species globally as per IUCN Red List2008.

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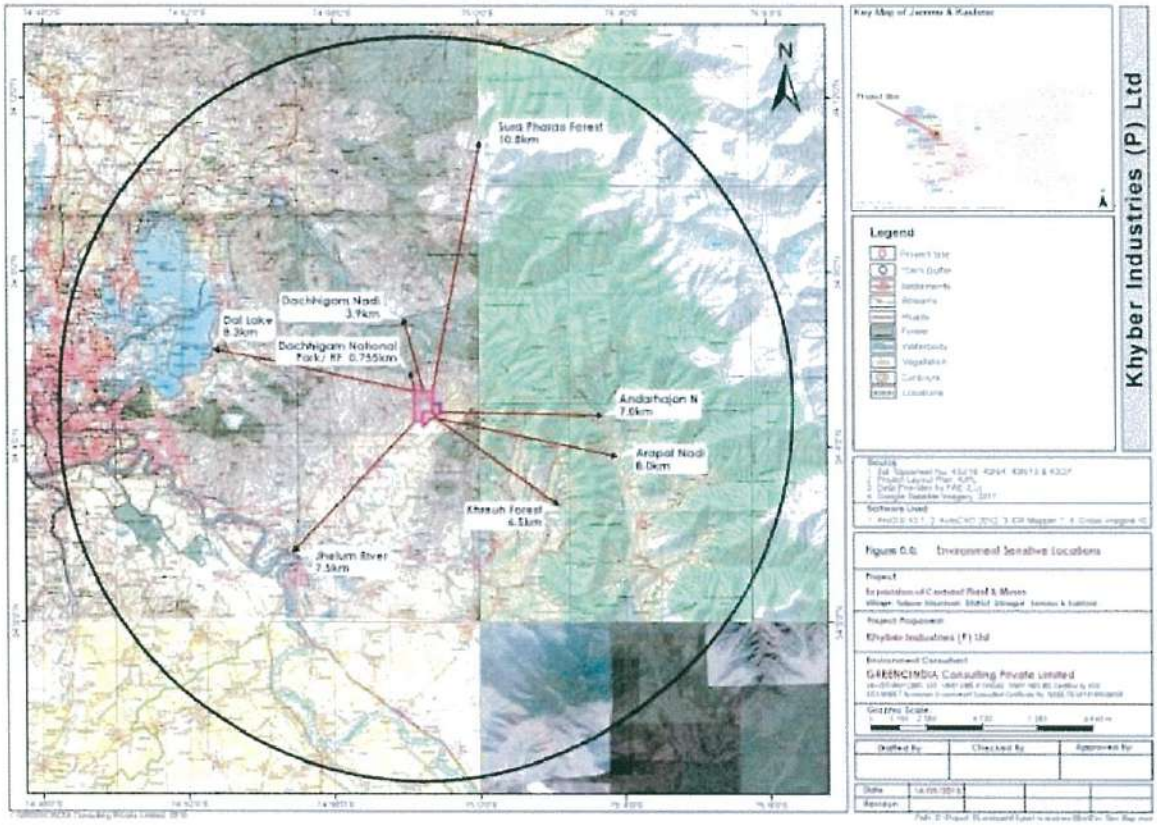
OBSERVATIONS

Study of biological environment is one of the most important aspects in view of the need for conservation of environmental quality and biodiversity. Ecological systems show complex interrelationships between biotic and abiotic components including dependence, competition and mutualism. Biotic components comprise of both plant and animal communities, which interact not only within and between them but also with the abiotic components viz. physical and

chemical components of the environment. Generally, biological communities are the indicators of climatic and edaphic factors. Studies on biological aspects of ecosystems are important for safety of natural flora and fauna. Information on the impact of environmental stress on the community structure serves as an inexpensive and efficient early warning system to check the damage to a particular ecosystem. Studies on biological aspects of ecosystems are important for safety of natural flora and fauna. In order to mitigate the in occurrences change in the flora and fauna of the area a comprehensive conservation plan has been prescribed in the project area.



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STATUS OF WILDLIFE BELONGING TO SCHEDULE-I

1. Asiatic Black Bear (*Ursusthibetanus*):

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The Asiatic black bear is one of the least known bear species in the world (Servheen 1990). It is commonly known as 'moon bear' because of the characteristic V- mark on the chest that may vary from white, yellow to buff. These are big-headed mammals with large, heavily built bodies, short powerful limbs, and short tail. The body size of male is

larger than female. The average body weight ranges from 110-150 kg in males and 65-90 kg in females.

Habitat: Asiatic black bears occupy a variety of forested habitats, both broad-leaved and coniferous, from near sea level to an elevation up to 4,300m above MSL. They also infrequently use open alpine meadows. Individual bears move to different habitats and elevations seasonally (Izumiyama and Shiraishi 2004), tracking changes in food abundance.

Home Range: In India, the Asiatic black bear inhabits forested hills ranging from 1,200m to 3,300m above MSL in the Himalayas and Northeastern hill States (70 - 4,300m). There is an estimated potential habitat of about 270,000 km2 for black bears in India (Sathyakumar and Choudhury 2007). Its range overlaps with that of the sloth bear below 1,200m and the Himalayan brown bear above 3,000m. The Asiatic black bear is distributed throughout the Himalayan ranges in the northwest (Jammu and Kashmir, Himachal Pradesh), west (Himachal Pradesh and Uttarakhand), central (Sikkim and northern West Bengal) and east (Arunachal Pradesh). The species is also present in some hills of other northeastern States of India (Meghalaya, Mizoram, Tripura). Asiatic black bear distribution in the Indian subcontinent is contiguous with Nepal (eastward from Uttarakhand to Sikkim) and Bhutan (eastward from Sikkim to Arunachal Pradesh).
Asiatic black bears are known to be fairly common in the State of Jammu and Kashmir. They have been reported to occur in 16 Protected Areas (PAs) and more than 20 Forest divisions and Reserve forests. The areas with fairly common black bear population include: Dachigam National Park (Dachigam NP), Kishtwar NP, Overa-Aru Wildlife Sanctuary (WS), Limber WS, LachiporaWS,Thajwas WS, Pinjore FD, Naranag-Wangat FD, Tral, Shikargarh, Shar, and Daksum conservation reserves, Pahalgam and Ajas forest area.

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Food: Foods include succulent vegetation (shoots, forbs and leaves) in spring, turning to insects and a variety of tree and shrub-borne fruits in summer, and finally nuts in autumn and sometimes scavenge on carcasses. In temperate forests, Asiatic black bears rely heavily on hard mast in autumn, to accumulate sufficient fat reserves for winter denning

(hibernation). Therefore, these bears tend to focus their activities in habitats with high abundance of oak acorns, beechnuts, walnuts, chestnuts, hazelnuts, or stone pine seeds. Asiatic black bears form characteristic platform or "nest" by breaking branches and piling them up in the canopy to feed on hard mast trees. Males may socially exclude females from rich stands of hard mast.

Threats: In most of its distributional ranges Asiatic black bear shares habitats with humans. Threats to this species are habitat loss due to excessive use of natural habitats by humans and uncontrolled developmental activities in forested areas. Habitat loss due to expansion of human settlements, agricultural/horticultural areas, roadway networks, and hydropower stations pose a serious threat to black bear survival. Apart from these, hunting for skins, paws and gall bladders are the main cause of rapid depletion of population in several areas. Human-bear conflicts around black bear habitats and consequent retaliatory killing are other threats. In India, much of black bear distribution range is outside PA network and is subjected to varying levels of human use.

Conservation Status: The Asiatic black bear is totally protected throughout Southeast Asia in every range country. It is listed as 'Vulnerable' in the Red Data Book (IUCN 2013), in Appendix I of CITES in India since 1990 and in Schedule II of the Indian Wildlife (Protection) Act.

Conservation Measures:

1) Education will help to reduce bear-human conflicts and enhance a conservation ethic among locals,
2) Habitat improvements (government or community-based reforestation) would be helpful in alleviating conflicts.
3) Planting of fruit trees form an important diet to the animal.
4) Red ant (*Oecophyllasmaragdina*) can be promoted easily to form colonies in the trees. This will serve as important source of insect diet and may compensate for the termite.
5) Artificial method to promote termite colonies should be developed.
6) Den like structures should be developed in the area if such structures are lacking or less in number in the area.

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7) Villagers should avoid growing crops of liking to bear like ground nut and corn etc. particularly near their den sites.
8) Translocation of bears from isolated habitat patches to more suitable areas should be carried out.

2. Indian Leopard (*Pantherapardus*):

Habitat: Indian leopard has high capability to adopt any type of habitat where it can get sufficient food and covers. Leopards avoid overlapping their territory or the home range with the tigers. Therefore they try to occupy the fringe areas of the forests, as well as dare more to enter the human inhabited areas.

Behavior: leopards are highly territorial. Leopards are not only the widest ranging of all Big Cats but are actually one of the most adaptable and are found in a variety of different habitats. The Leopard can be found inhabiting numerous different areas providing that there is a good source of cover and an ample supply of food including tropical rainforests, tree-lined savannah, barren deserts and mountain highlands. One of the reasons why they are thought to be still surviving successfully throughout much of their natural range is that Leopards have adapted to the growing presence of people and are known to both live and hunt in areas close to urban activity. However, in some parts of their natural range populations are threatened by loss of their natural habitats to both deforestation and growing settlements.

Food Habits: The diet of these big cats is surprisingly varied which includes: wildebeest, impalas, reed-bucks, Thomson's gazelles, jackals, monkeys, fish and storks. However, at times they seem to show a preference for canines, even attempting to snatch dogs right from the feet of their masters. They can also eat fish and domestic stock such as goats and cows. They will even eat carrion.

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Status: The species has been assigned almost all the categories of IUCN Red List Categories including: Near threatened, Threatened, Endangered, Critically endangered to Vulnerable, by different workers and agencies. However these categories have been assigned mostly on regional basis. On global basis the species has been assigned Lower

Risk Status. The species has been included in Shedule I in The Wildlife (Protection) Act, 1972 of our country.

Conservation Status:*CITES APPENDIX*: I; *Indian wildlife (Protection) Act (1972) (As amended up to 2002)*; Sheduled-1; Part-1; *Indian Red Data Book (IUCN, 1994)*; Vulnerable; (*IUCN 1998*) (Proposed); Vulnerable (National) and Data Deficient (Global).

Man-leopard Conflicts: Major conflicts arise when leopards start preying on livestock. These conflicts have increased in recent years due to population growth among humans. The conflict becomes more severe when some leopards become man-eaters. They can prey on children and even enter homes at night to attack humans.

Threats: The Indian leopard (*Pantherapardusfusca*) is facing the crisis of adaptation. The species could soon qualify for Vulnerable under criterion A4 (30% decline over a period of 30 years = three generations, including both past and future). Despite being the most widespread cat, the Indian leopard faces several types of threat. The animal shares its habitat with other animals, which include tigers, bears, wolves, Asian elephants, hyenas, and wild dogs. These animals may kill leopard cubs if given a chance. Apart from its natural enemies, the leopard's main threat is people. For years, it has been threatened, due to loss of habitat and poaching. A rapidly increasing threat to Leopards is the poisoning of carcasses targeting carnivores as a form of retaliation as well as a means of predator control. An estimated 50% of the population lives outside Protected Areas and so it is vulnerable to habitat destruction.

Conservation: Capture and translocation to protected areas has been practiced more as a means of conservation. However, investigations have shown that the animal is highly territorial. Shifting causes inter and intra specific fighting to establish a territory in the translocated area. They are so much particular about their territory that they may make all the efforts to reach back to their original territory. However, Leopards are somewhat tolerant of habitat conversion, and may persist close to large human populations provided they have suitable cover and prey. The MoEF&CC has issued guidelines:
Guidelines for Dealing with Man-leopard Conflict, Press Note, Ministry of Environment

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and Forests, Govt. of India, moef.nic.in/downloads/public-informat. Accessed on, 01-08-2011.

The guidelines suggest a three pronged strategy to deal with man-leopard conflict as a means to their conservation:

i. Awareness generation among local communities, media and officials of various departments.

ii. Establish trained teams at two levels; the primary response team and the emergency response team, and

iii. Use of latest technology and scientific know-how to improve efficacy of capture, handling, care and translocation of the animal.

3. Leopard Cat (*Prionailurusbengalensis*):

Habitat: The Leopard Cat is a widespread species. It is found through parts of India, west into Pakistan and Afghanistan (Habibi 2003), through the Himalayan foothills, throughout most of China, and north to the Korean peninsula and into the Russian Far East (Nowell and Jackson 1996). Its range extends south throughout Southeast Asia, and includes the islands of Sumatra, Java, Borneo and Taiwan. The Leopard Cat is found on numerous small offshore islands of mainland Asia.

There are many recent records from protected and non-protected areas throughout its range. Leopard Cats can range up to 3,240 m asl and occur in a wide variety of habitats from tropical rainforest to temperate broadleaf and, marginally, coniferous forest, as well as shrub forest and successional grasslands. The northern boundary of its range is limited by snow cover, as the Leopard Cat does not occur in deep snow. It is not found in the cold steppe grasslands, and generally does not occur in arid, treeless areas.

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Food Habits: Leopard cats are carnivorous, feeding on a variety of small prey including mammals, lizards, amphibians, birds and insects. In most parts of their range, small rodents such as rats and mice form the major part of their diet, which is often supplemented with grass, eggs, poultry, and aquatic prey. They are active hunters, dispatching their prey with a rapid pounce and bite. Unlike many other small cats, they do not "play" with their food, maintaining a tight grip with their claws until the animal is

dead. This may be related to the relatively high proportion of birds in their diet, which are more likely to escape when released than are rodents.

Reproduction: The breeding season of leopard cats varies depending on climate. In tropical habitats, kittens are born throughout the year. In colder habitats farther north, females give birth in spring. Their gestation period lasts 60–70 days. Litter size varies between two and three kittens. Captive born kittens weighed 75 to 130 grams (2.6 to 4.6 oz) at birth and opened their eyes by latest 15 days of age. Within two weeks, they doubled their weight and were four times their birth weight at the age of five weeks. At the age of four weeks, their permanent canines break through, and they begin to eat meat. Captive females reach sexual maturity earliest at the age of one year and have their first litter at the age of 13 to 14 months. Captive leopard cats have lived for up to thirteen years.The estrus period lasts 5–9 days.

Threats: *Prionailurusbengalensis* is listed in CITES Appendix II; *Indian wildlife (Protection) Act (1972)* Sheduled-1.

4. **Hangul (*Cervuselaphus*):**

The Hangul (Cervuselaphushanglu) or Kashmir Red deer is the state animal of Jammu and Kashmir. It was first reported by Alferd Wagner in 1844 and was assigned taxonomic serial number 202406. It is one of the six eastern most subspecies of the European Red deer, that are found in Asia and was once widely distributed in the mountains of Kashmir along the Zanskar Mountain range from Shalurah and Karen in the Kishenganga catchment over to Dorus in Lolab Valley and the Erin catchments in Bandipora in the north to Bringi Valley and Marwah/Wadwan in Kishtwar High Altitude National Park (NP) in the lower Chenab Valley, and Ramnagar in the south. The GamagulSiya-Behi Sanctuary in Himachal Pradesh is the only area outside Jammu and Kashmir that retains an isolated Hangul population of unknown status. At present the genetically viable population of Hangul is restricted to the Dachigam National Park with few stray populations in the adjoining areas.

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Habitat: The Hangul prefers dense riverine forests, high valleys, and mountains of the

Kashmir valley as their habitat. Dachigam National Park has been serving refuge for last 50 years now. Their territory is very limited now, no new territory available to expand.

The habitat selections by Hangul like other Himalayan ungulates and Red deer is influenced by various factors like nutritional requirement, season, altitude, aspect, and slope, which determine the vegetation of the area in addition to availability of water, shelter and escape cover. The Hangul habitat is reported to vary between sexes and across seasons. The female habitat use is consistent across seasons but male Hangul showed differences in seasonal use of habitats. Hangul show strong preferences for Riverine and Grassland/Scrub habitats. The Hangul use primarily the mixed oak forests followed by mixed Morus and riverine habitats during winter months, and mixed oak forests and coniferous forests during the summer months, as these habitats provided sufficient food, shelter and cover to avoid not only chilly winds, but also predators.

Ecology and Behavior: This deer has a light rump patch without including the tail. Its coat color is brown with a speckling to the hairs. The inner sides of the buttocks are greyish white, followed by a line on the inner sides of the thighs and black on the upper side of the tail. Each antler consists of five tines. The beam is strongly curved inward, while the brow and bez tines are usually close together and above the burr.

Big stags cast their horns about March 15 to April 1st. Young ones often carry their antlers into May. After shedding their horns most go up hill and congregate under the snow line, as soon as the weather gets warm. The rutting seasons commence about September 15. In hard winters when there is heavy snowfall the stags come down in March also. Where there is green pasturage, they descend.

The female has no horns. The colouring depends on the climate of the place where they live and also on the age. The hair on the neck is coarse, long and sometimes thick. This is much less marked on the female than on the male. The hair on the lower part of the neck of the stag is very long and in an old animal very dark brown.

The weight of male Kashmir stag is between 150 to 250 kg., and weight of female is between 100 to 160 kg. Head to body length measures about 180 to 220 cm. They are about 100 to 135 cm high at the shoulder.

Food: Hangul is ruminant herbivores; it is the availability of food that determines the

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habitat selection of all ruminants. Some deer populations prefer to graze, while others rely more heavily on browse. Males seek habitats where food is abundant and of high quality in order to maximize body growth. Grasses and forbs are preferred during spring and early summer, and woody browse is preferred during winter. They browse conifers in areas where snow covers other forage.

Hangul is a mixed feeder, but it ingested disproportionate amounts of browse in almost all seasons, and also bark-stripped woody species. The Hangul feeding habits varied according to resource availability in different seasons and constituted mainly dicotyledonous shrubs and trees, forbs and herbs and monocotyledonous grasses and herbs in spring and winter, respectively.

The winter diet mainly constituted browse (trees and shrubs) respectively although during significant number of sightings Hangul was observed debarking on trees. During spring, the diet comprised mainly forbs, beside grasses/sedges, and browses. During summer, the percentages of grasses and sedges increased in the diet to 19.05 and 28% respectively, while forbs constituted 42.86 and 60% with browse (trees and shrubs) constituting 38.10 and 12%). Among the monocots, the species consumed by Hangul in maximum sightings were *Carexcernua*, *Panicumcrusgalli*, *Poaannua* and *Hamerocallisfulva*. Also, debarking on *Prunuscerasifera* and *Parrotiopsisjacquimontiana* has been reported in autumn and on *Pinuswallichiana*, *Loniceraquinqueloculari*s and *Parrotiopsisjacquimontiana* during winter.

Threats: Like other environmental problems in Jammu & Kashmir, the armed conflict of the last 25 years has also caused terrible pressures on the Hangul Deer population.

- The large scale biotic interferences in its habitats, in the form of excessive livestock grazing in its erstwhile summer habitats, grass cutting, fuel and firewood collection, human trampling owing to men and vehicles of hundreds of paramilitary (CRPF) forces camped inside Park and employees of more than seven Government departments including the Sheep breeding farm spread across 100 hectares of prime Hangul habitat in lower Dachigam and poaching have contributed largely to the Hangul habitat degradation and hence decline of the Hangul during the recent past.

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- However, the highly skewed female biased sex ratio and very low fawn-to female ratio, predation by Leopard, Asiatic black bear and other meso-carnivores, and summer dispersal of the Hangul to unknown unprotected areas outside Dachigam NP, are major issues concerning the decline in the population and alarming threat to the long term conservation and survival of this endemic Hangul deer.

Conservation Status: The species is therefore listed as endangered under the Schedule I of the Wildlife (Protection) Act 1972 of India.

Action Plan:

- To maintain a viable population of this specie every 2 hinds require a stag, while as the ratio between hinds and stags was 3:1 in 1936 and 4:1 in 1965 and to an alarmingly low of 6:1.
- The desired natural ratio for up-keeping the Hangul race disturbed thus may have drastic change in not only the procreation of race but is a straight threat to future generation bearing various abnormalities.
- The low fawn to female ratio and fawn survival is presumed to be attributed to stress owing to the heavy biotic disturbance in Dachigam compounded with nutritional stress and fawn predation by common leopard, Asiatic black bear, Golden Jackal, Red fox and stray dogs of shepherds which seems to be the worst threat for Hangul deer.
- A captive breeding plan for the Hangul is important to repopulate existing good habitats in the Hangul range.

Strengthening of intensive population monitoring programme and reproductive ecology studies to better understand factors affecting the population growth and biology and low male/female adult sex and fawn/female ratios besides reassessment of this subspecies of red deer into appropriate threat category by the IUCN Red list have been recommended to be required for effective management and long term conservation of Hangul.

5. **Himalayan Musk Deer(*Moschuschrysogaster*):**

The general colour of the coat, composed of brittle hairs, is a slightly grizzled sandy brown. As the name suggests, on the chest is a wide vertical whitish-yellow stripe which extends up the throat to the chin. The ears are tipped with yellow or orange hairs. On the

nape of the neck are several horizontal blotches of yellowish hairs. The body slopes forward, as the hind legs are almost one third longer than the forelegs, causing the height at the rump to be almost 10 cm / 4 inches above the shoulder. The ears are large and rounded, generally lined with whitish fur. Both sexes have well-developed upper canines, and in males these grow 7-10 cm / 3-4 inches long and protrude from the mouth in a fang-like manner. The canines are constantly growing, but, due to their mobility and fragility, they are easily broken. There are no antlers in this, as well as other musk deer, species.

Ecology &Behaviour: Himalayan musk deer are most active between dusk and dawn, alternately resting and feeding throughout this period. At night, musk deer can be seen in the open areas of their habitat as they graze, while during the day, they remain in dense cover. Neighbouring individuals may utilize common latrines, an activity with becomes more frequent during the mating season. Himalayan musk deer are sedentary, remaining wthin a defined home range throughout the year. In females these are about 125 acres in size, while male musk deer will control a territory which encompasses the ranges of several females, defending it against intrusion by rival males. The Himalayan musk deer does not undertake any seasonal migrations, remaining in the same area year-round despite harsh weather conditions. A shy animal, the musk deer depends on its sense of hearing to locate sources of danger. When frightened, they make broad leaps, each measuring up to 6 meters / 19 feet in length. Drastic changes in direction are made during flight, and every few jumps the animal will stop and listen. Communication between individuals is thought to be based primarily on their sense of smell, due to the high development of the glands of musk deer. Primarily silent, musk deer will emit a loud double hiss if alarmed, and may scream plaintively if wounded. Population densities are about 3-4 animals per square kilometer.

Habitat: Himalayan musk deer are thought to inhabit a similar habitat to their close relative *Moschuschrysogaster*, which occupies meadows, shrublands, and sparse forests, such as fir forests. Because Himalayan musk deer roam at elevations higher than 2,500 m, their habitat predominantly consists of vegetation typical of alpine regions. This mountainous species is accustomed to navigating moderately to very steep slopes.

Himalayan musk deer are sedentary, occupying small home ranges of up 0.22 km^2,

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though males defend a much larger territory. Male Himalayan musk deer are quite territorial of other males and fight those which attempt to enter their territory. Members of this species are thought to use latrine.sites and other strong-smelling secretions to mark their territory.

Food: Himalayan musk deer are herbivores and feed on what is seasonally available. Accordingly, they eat grasses, forbs, mosses, lichen, twigs, shoots, and plant leaves. They are ruminants, so they can quickly leave feeding grounds if threatened and further digest their food at a later time when safe from harm.

Occasionally, Himalayan musk deer travel great distances at night to forage for food. They may travel 3 to 7 km per night, but they always return to their usual territories by daybreak.

Threats: Himalayan musk deer are threatened by hunting, habitat fragmentation, habitat reduction, and habitat destruction. Because it is difficult to distinguish Himalayan musk deer from similar species such as *Moschuschrysogaster*, the exact rates of their population declines are debatable. Although many musk deer reside in one of several protected areas, poaching activities continue to increase as musk becomes more valuable

Conservation status: Himalayan musk deer are listed as endangered on both the IUCN Red List and the US Federal List. CITES lists the small number of Himalayan musk deer that inhabit China in Appendix II and all other Himalayan musk deer in Appendix I and under schedule-I of*Indian Wildlife (Protection) Act (1972)*.

6. **Mainland Serow(*Naemorhedussumatraensis*):**

The Himalayan Serow (*Capricornisthar*) is a vulnerable goat-antelope, native to eastern and southeastern Bangladesh, the Himalayas (Bhutan, northern India, and Nepal), northeastern India, and probably western Burma. It has been considered a subspecies of *C. sumatraensis*.

Belonging to a group known as the goat-antelopes, the serow is a rather small-bodied animal, with dark upperparts that vary in colour, and whitish underparts. The hair of the coat is long and coarse, and a long mane of white, brown or black occurs on the neck. Male and female serows are similar in appearance, with both bearing stout, slightly

curved horns which can be used to defend themselves to deadly effect. The long ears are narrow and pointed, the face bears large scent glands below the eyes, and the tail is fairly bushy.

Habitat: Eachserow inhabits a small area which is well marked with trails, dung heaps, and scents. This small area of habitat is selected so it can provide all the needs of the serow, such as sufficient grass, shoots and leaves on which to feed on during the early morning and late evening, and suitable sheltered resting places in caves or under overhanging rocks and cliffs. This home range is defended against any intruding serowsby using their dagger-like horns, which are also used by this rather aggressive goat-antelope to fight off predators, such as the leopard.

Threats: Threats come mainly from disturbance and from habitat destruction caused by mining activities, grazing of livestock and poaching within their habitat, and by deforestation of the hill dipterocarp forests for logging and agriculture. Serows also suffer from substantial poaching for its meat and body parts that are used for medicinal purposes.

Conservation Status: This species is listed as Vulnerable under IUCN Red List version 2.1 because this species is believed to be in significant decline (probably at a rate of mores than 30% over three generations, taken at 21 years) because of both over-hunting and serious habitat loss taking place within its range and under schedule-I of*Indian Wildlife (Protection) Act (1972)*.

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CONSERVATION PLAN FOR WILDLIFE

1.1 Conservation Plan for fauna requires knowledge on:

1 Home range of the animal

2 Territorial requirement of the animal

3 Deciding the number of animals to be conseved and accordingly evaluating the carrying capacity of the habitat

4 Conservation is aimed at single species or multiple species

5 Conservation is proposed in a managed ecosystem or an un-managed, natural ecosystem.

6 However, very little knowledge exists on the above parameters of most of the animals.

1.2 Reasons for decline of wildlife:

Several reasons for the decline of wild life and methods for their conservation are proposed. However the best method for the conservation of wild life is related directly to the maintenance of ecosystems in their natural condition, allowing their natural development and protection to the wildlife and their habitat. Both these phenomena (ecosystem development and habitat protection) are related to anthropogenic factors. Some of the important anthropogenic factors are listed below:

I. Habitat fragmentation and destruction

II. Man-animal conflict

III. Forest fire

IV. Poaching

V. Stake holders dependence on forest resources

VI. Creating awareness amongst forest stake holders

To the above mentioned factors may be added a non-anthropogenic but important factor:

VII. Water scarcity

The plan for wild life conservation with respect to above situations is detailed as under:

1.3 Habitat Improvement:

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A green belt will be developed along the boundary of the proposed projectarea.The area for green belt plantation consists of undisturbed soil; hence plantation couldbe made as in any garden or road side plantation. Green belt is erected not frombiodiversity conservation point of view but is basically developed as a screen tocheck the spread of

dust pollution. Following considerations will be there in theselection of plant species.

The green belt should consist of plants:

a) Having tolerance to dust pollution.
b) Should maintain leaves for as longer a time as possible.
c) Combination of plants should be such so that almost a screen of plants is formed to check the dust from escaping the area. Thus the green belt plants will consist of mainly the trees and shrubs with some herbs also.
d) The trees should provide shade.
e) Plants possessing economic and/or aesthetic value should be given preference.
f) Trees less affected due to pruning should be given preference because pruning will yield fuel wood.
g) Every plant species to be planted in the green belt should have some basis for its selection to be planted in the green belt.
h) Only local species will be taken for plantation.

1.4 Elimination of Man Animal Conflict:

Man-animal conflict is a difficultproblem to be eliminated. The conflict is both deliberate as well as inadvertent. However, conflict can be minimized through employing local persons to form anti-depredation team. The conflict can be minimized also through protecting the area, preventing the entry of human beings or the cattle in the area. First aid facilities should be provided in the villages to meet exigencies in case of any conflict.

1.5 Prevention of Forest Fire:

Forest fire is caused both naturally as well as bythe human beings. Anthropogenic causes will be minimized through forming a fire line around the forest area. To add to the prevention of fire local persons will be employed as fire guards, during the fire prone season. The team will be instructed to fight the fire as soon as it is detected. Watch towers will also be constructed to detect forest fire. Awareness program against forest fire will also be run in adjoining villages.

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1.6 Prevention of Poaching:

Poaching is undoubtedly a serious problem in theconservation of wild life. Several methods are employed by the poachers, to kill or trap the wild life, of which poisoning and traps of different types are more common. A proper vigilance will be maintained to check such menace. Poaching menace will be eliminated seriously neither all the efforts to promote wild life survival in the area will go in to waste. This will be achieved through employing, properly equipped, two ex-army jawans to assist the forest officers.

1.7 Reducing Stake Holder's Dependence on Forest Produces:

People fromadjoining villages have already exploited the forest to the extent that the forests have become a grazing land or a source of fuel wood. Timber and medicinal species have either disappeared or have become scarce. However, regenerating the forest will again attract the villagers towards the forest. To keep the people away from the forest their economic condition will be improved. This will be achieved through financial and technical help to develop Dairy, Poultry, Vegetable cultivation, Horticulture and Agro-forestry. Promotion of agro-forestry, in particular, will reduce their dependence on forests for timber as well as for fuel wood.

1.8 Creating Awareness amongst Forest Stake Holders:

Awareness aboutthe environment and wild life will be created amongst the adjoining villages. They will be informed about the importance of a good environment, a healthy ecosystem and more importantly about the wild life. Through slide and film shows they will be convinced about the sustenance of natural ecosystems. They will be convinced that their own survival depends upon the survival of a healthy ecosystem, to which a wide variety of wild life is an essential component. To develop affection of the people towards the wild life some of them will be taken to some zoos and wild life sanctuaries. Awareness programmes will be run with the help of Forest Officers and more importantly some national experts will be invited to deliver talk's awareness, related to wildlife conservation.

1.9 Water Availability:

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However, due to lack of proper storage, severe water scarcity develops during the summer months. To make the water available throughout the year it is essential to create water storage facility. Multiple water storage places will be created in the Buffer zone

through improving the existing ponds, constructing stop dams in the water channels and through creating water holes. Also, camouflage and hiding places should be created. Some wildlife species fulfill their salt requirement through licking the soil..Salt deposits will be arranged for such species adjacent to the water holes. These water holes will also be helpful in recharging the ground water and thus will be supporting good growth of the vegetation.

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ACTION PLAN AND FINANCIAL PROJECTION FOR CONSERVATION PLAN

1.1 Introduction

What if a few species of wildlife become endangered or extinct? How are we concerned if the Indian Cheetah has been lost forever or the Asiatic lion is precariously perched on the verge of extinction? Why should we spend crores of rupees to protect the tiger? The answers to these questions of what, how and why should form the basis for creating conservation awareness among the public can understanding of the importance of biological diversity of inter-relationships in nature, of the sustenance and stability of ecosystems and of man's impact on the natural world. Protected areas and threatened species could most effectively be safeguarded if local people considered it in their own interest to do so. Working with rather than against local people has become a major working principle for IUCN.

1.2 Action plan

1.2.1 Non-formal Education

Conservation education and awareness will be imparted both at the formal and non-formal levels. At the formal level, it will be given at school, colleges and university levels. Formal education, in spite of all the curriculum development and introduction of the study of ecology, wildlife and conservation at the school and college levels, however, largely remains text book and examination oriented. Because of the situation, non-formal education becomes all the more necessary for creating the right kind of awareness and attitude among people at all levels- children, teenagers, adults, family groups, teachers, administrators, politicians and policymakers. To achieve this some local tours of school and college students will be arranged to nearby National Parks.

1.2.2 Institutional Infrastructure

The prime requisite for building up an understanding and awareness about wildlife and conservation is to develop an appreciation, respect and love for nature. Most people lack the curiosity to know even the names of animals and plants they come across in their day-to-day life. Development of an inquisitive mind, a keen sense of observation and curiosity about the fauna and flora are, therefore, very important. Concern for conservation can only emanate from a love for nature and awareness about the

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interdependence of all species of animals and plants, including the man. To arouse curiosity about the wildlife in the young mind some quiz and essay competitions will be arranged in the schools and colleges of the buffer zone and some nearby areas

1.2.3 Indian Tradition of Conservation

The theme of conservation, wildlife and reverence for life is reflected in some of the exquisite images in Indian art paintings, sculpture, architecture and decorative art. The most wide-ranging wild life imagery is found in Indian miniature paintings. Early literatures like the *Panchatantra*and*Hitopadesha*contain animal fables that have been used to preach both wisdom and morals. The long term tradition and abiding faith in conservation of nature is vividly seen in recent times also like the Chipko and Appiko movements. These conservation themes will be popularized through pamphlets and posters.

1.2.4 Role of the Individual

Each individual should develop a personal ethic towards nature and wildlife which could pave the way for commitment and conviction not to destroy wildlife particularly that of not considering hunting as a sport, nor to use products made out of skins or other parts of endangered animals. Unless these products are boycotted by their users, the clandestine killing and poaching of wildlife at the hands of unscrupulous people will continue. Everyone can play important role in spreading the message of conservation among their friends, family and community at the large.

1.2.5 Eco-Development Works:

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People in and around the forest area generally are hostile against the forest department and its staff, because they are prevented from taking out timber and other forest products illegally. Such antagonistic behaviour is mainly because little effort is made to meet their genuine demands either from outside the forest area or from the forest area but in a sustainable manner. Regular interaction with them with agreement for sustainable utilization of forest resources combined with some incentives can completely change their indifferent or even un-concerned attitude to conservative attitude.

1.2.6 Checks and control on the Movement of Vehicle:

Due to movement of vehicles injury to animals and reptiles may take place. For this reason speed limit of vehicles will be fixed and operators will be educated and advised

regularly to drive vehicle safely and slowly. All operators will also be advised to stop the vehicle on seeing such reptiles or animals and let it go away before moving the vehicle further.

1.2.7 Pressure horn:

Noise generated by pressure horn disturbs the wildlife and forces them to leave the place. No pressure horn will be fixed on vehicle plying in the area. All the drivers will be advised to make minimum use of horn while working hours.

1.2.8 Vehicles head lights:

Efforts will be made to cover the lights suitably with paint so that strong beam of head light is not formed and light falls in front of the vehicle only.

1.2.9 People Participation:

With the help of the local people and employees of the Company watch will be kept on the wild life as well as illegal tree felling. Forest and police department will be informed if such incident occurs, to take legal action against the offenders. For this they will be trained for motivation.

1.2.10 Encourage local villagers to grow trees on their on their field bounds/court yards:

In consultation with Forest Department the company will provide some finance, to grow saplings of tree species, having importance for wood, small timber and fuel wood to distribute to the villagers. Bamboo will be another important species with a lot of environmental and economic value. This no doubt will help reduce dependence of people on RF forest; as a result the ecological condition of the area will improve so the wild life will be attracted to this area.

1.2.11 Reducing Environmental Pollution:

To keep the environment frees from smoke, cooking gas cylinders will be provided to all the project workers particularly. To control pollution from project measure outlined in EMP will be followed.

1.2.12 Provide employment to the villagers:

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On the basis of their suitability, jobs in project will be provided to the nearby villagers. As a result their economic condition will improve. This well keep them busy also, so they will not be tempted/compelled to cause destruction to forest which will help improve the status of wildlife.

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1.3Plantation in the Buffer zone

Trees will be planted in the buffer zone also. This plantation will be done at selected places only and only local species will be used in the plantation. Water, particularly during drier seasons, becomes the most important factor to all types of wild animals including the mammals, birds and reptiles. If water is available safely, then all other factors become secondary for the presence and survival of the wild life in any forested area.

Places suitable for mini watersheds will be identified in the core as well as in the buffer zone to store rainwater. Further, to make water available at all the times, throughout the year, some of these water holes will be recharged through artificial means. Proper slope will be given to approach these water sources so that the wild animals will be able to drink water without any difficulty. Proper cover through vegetation or any other type of even artificial cover will be developed near to these water sources so that the prey species will be able to hide themselves from the predators, at the time of approaching the water sources. To attract the birds, plants yielding food to the birds will be planted on priority basis. If water and food are available to the birds without any anthropogenic disturbances the area can become an

Financial Projection

Rs.170.00 Lakhs has been allocated towards conservation of scheduled fauna in the area for the implementation of conservation proposal.

Table : Budget for Conservation/Management Plan

S.No	Components Intervention	Provision in Lakhs
1	Planting of Tree groves in buffer zone and surrounding villiages	10
2	Promotion of Agro Forest in the villages by planting fruit trees	10
3	Plantation of shelterbelt along the road and canal side in surrounding villages and maintenance	10
4	Construction of Khels/ water holes (small water points) in the surrounding villages and regular filling of water	10
5	Soil and Moisture Conservation works	30
6	Strengthening of Village Level Institutions	10
7	Fencing of Mining area	20
8	Post mining rehabilitation works	20
9	Awarenessgeneration traning of labour and local people, distribution ofposters, pumphlets, fixing signages	10
10	Plantation of herbs/ shrubs / bushes along/ on sand dunes and mining prohibited area for roosting	10

11	Development of Pastures in the surrounding villages	10
12	Purchase of Animal ambulance	10
13	Study on impact of Mining on Wildlife	10
	Total	**170**

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