भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
(सड़क परिवहन और राजमार्ग मंत्रालय, भारत सरकार)
National Highways Authority of India
(Ministry of Road Transport and Highways, Government of India)
प.का.ई., 218 कन्वल कॉप्लेक्स, वार्ड न०1, कृष्णा नगर, हमीरपुर-177001
PIU, 218 A Kanwal Complex, Ward No. 1, Krishna Nagar, Hamirpur -177001
दूरभाष/ Tel. : 01972-223794 /225794
ई-मेल : piuhamirpur@nhai.org, piuhamirpur@gmail.com वैब : www.nhai.gov.in

11018/14/88/HMRBYPASS/FCA/2022/ 1261

Date: 08.01.2026

To
Nodal Officer-cum-APCCF (FCA)
O/O Pr. CCF, H.P. (HoFF), Tolland, Shimla
H.P Forest Department

Subject: Diversion of 12.8537 ha of forest land in favor of NHAI for Construction on New 2 lane with Paved Shoulder of Hamirpur Bypass of NH-88 (New 103 & 3) (Design Chainage 121+175 to 138+295), (design length 17.20 km) in.the State of Himachal Pradesh within the jurisdiction of Hamirpur Forest Division Dist. Hamirpur, Himachal Pradesh (Proposal no-FP/HP/Road/151932/2022)- **Reg. Submission of Compliance of observations raised by Nodal Office - Shimla**

Ref.: **EDS raised by Nodal officer Shimla online Parivesh Portal dated 22.08.2025**

Dear Sir,

With reference to the above, we are pleased to submit herewith point wise compliance to observations raised by Nodal officer -Shimla on the captioned project.

S. N.	Observations	Compliance
1.	The WLMP is not signed by CWLW as asked by GoI.	The Wildlife Management Plan (WLMP) has been approved vide letter No. I/757731/2026 dated 01.01.2026 by the Principal Chief Conservator of Forests (Wildlife)-cum-Chief Wildlife Warden, Dharamsala. An copy of the WLMP, along with the approval letter issued by the CWLW, is enclosed as **Annexure-10.** In addition, Soil and Moisture Conservation Plan (SMCP) has been approved vide letter No. No. Ft. 48-5646/2022 (FCA) dated 11.02.2025 by the Nodal Officer-cum-PCCF (FCA), Shimla. An copy of the SMCP, along with the approval letter issued by the Nodal Officer-cum-PCCF (FCA), is enclosed as **Annexure-9.**

2. It is therefore requested to kindly process the proposal at the earliest for grant of Stage II for the captioned project

Yours faithfully

Encl: As above

(V.S.Meena)
Project Director

Copy to:

1) DCF(T), Hamirpur - for kind information
2) CCF(T), Hamirpur - for kind information
3) HoD (Environment & Social Division), M/s Intercontinental Consultants and Technocrats Pvt. Ltd., A-8 Green Park, New Delhi - for kind information.

Annexure 10

HIMACHAL PRADESH FOREST DEPARMENT
WILDLIFE WING
Office of the PR. CCF (WL)-cum-CWLW, HP
at Dharamshala-176215
☎01792-293001 (O)
e-mail: pccfwl-hp@nic.in

No. WL (Misc.)/NHAI Proposals/ Dated: As per e-Sign.

To:

CF Hamirpur

Subject: Diversion of 12.8537 hectare of forest land for the construction of New 2 Lane with Paved Shoulder of Hamirpur Bypass of NH-88 (New 103 & 3) (Design Chainge-Km 121+175 to Km 138+295) Design Length-17.20 Km) in the State of HP (Online Proposal No. FP/HP/Road/151932/2022). Submission for Wildlife Management Plan for approval.

Memorandum:

Refer to your office memo No. I/699419/2025 dated 29.09.2025 on the subject cited above.

The Wildlife Management Plan for the above proposal amounting to Rs. 1.645/- Crore is hereby approved. Further action to implement the Plan may be initiated immediately under intimation to this office.

This is for information and necessary action please.

Encl: As Above

Signed by
Ralte Lalnun Sanga
PCCF (WL) & CWLW, HP
Date: 01-01-2026 15:31:32

Cc:-

1. CEO HP State Authority CAMPA alongwith the copy of Wildlife Management Plan for the above proposal for information and necessary action.
2. Suptd. Account to this office for information and necessary action.

Wildlife Management Plan (WLMP)

for

Diversion of 12.8537 ha of forest land in favor of NHAI for Construction on New 2 lane with Paved Shoulder of Hamirpur Bypass of NH-88 (New 103 & 3)(Design Chainage 121+175 to 138+295), (design length 17.20 km) in the State of Himachal Pradesh within the jurisdiction of Hamirpur Forest Division Dist. Hamirpur, Himachal Pradesh

(Proposal no- FP/HP/Road/151932/2022)

Submitted by

NATIONAL HIGHWAYS AUTHORITY OF INDIA

Ministry of Road Transport and Highways, Government of India

Project Implementation Unit - Hamirpur,

House No.-218A, Kanwal Complex, Ward No.-1,

Krishna Nagar, Hamirpur, Himachal Pradesh

Month: June 2025 (Revision R3)

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PREFACE

This Wildlife Management Plan has been prepared to fulfill the requirement of the Ministry of Environment, Forest and Climate Change; Govt. of India policy vide which the State Governments are required to submit Wildlife Management Plan (WLMP) along with detailed cost of its implementation into the account of CAMPA along with the Stage I compliance. This document should be cited as:

Wildlife Management Plan for diversion of 12.8537 ha of forest land in favour of NHAI for the construction on New 2 lane with paved shoulder of Hamirpur bypass of NH-88 (New 103 & 3) (Design Chainage Kms. 121+175) to kms. 138-295), (design length 17.20 kms) in the State of Himachal Pradesh within the jurisdiction of Hamirpur Forest Division, Distt. Hamirpur, Himachal Pradesh. (Online proposal no-FP/HP/Road/151932/2022)

The Highways play very important role for development and growth; however, they also impact environment, forests, biodiversity and other natural resources directly and indirectly besides impeding mobility and survival of both terrestrial and aquatic wildlife. For local people, roads can have both positive and negative influences On the positive side roads provide the opportunity of mobility and transport for people and goods, which bring economic prosperity by opening the area for fast development and industrialisation. The Road Transport Sector accounts for about 87% of passenger traffic and 60% of freight traffic movement in the country. Easy availability, adaptability to individual needs and the cost savings are some of the factors which go in favour of road transport. Road transport also acts as a feeder service to railway, shipping and air traffic. On the negative side, roads occupy land resources displacing local people, form barriers to movement of people and domestic animals, and may be detrimental to health due to increased environmental pollution of all kinds, and have serious impacts on ecology, wildlife and biodiversity and valued ecosystem services of the area.

'Wildlife' encompasses both wild animals and plants. Wildlife conservation is not just a strategy aimed at protection of rare, threatened and endemic biodiversity but is a well-recognized means of achieving ecological security, human wellbeing and sustainable development of any country. Fifty years ago, environmental protection was poorly regulated, but now it is recognized that survival and the persistence of wildlife & biodiversity depends upon a wide variety of human and natural factors that operate at different scales.

In recent years, wildlife conservation has attracted great public attention as well as attention of Government of India and State Governments. NHAI is also aware of wildlife related issues because of the rise in wildlife hazards particularly ungulate vehicle collisions, the need to maintain the numerous wildlife mitigation measures and the environmental regulations that require greater protection of habitats and wildlife inhabited roadsides.

Considering conservation of wildlife as focus area, National Highway Authority of India (NHAI) has assured all stakeholders that it will undertake all necessary measures to avoid, minimise and mitigate any impact on wildlife that may result in the course of development of national highways (NH). NHAI, has emphasized the necessity of scientific designing of mitigation measures, so that the project designs could be optimized, safeguarding wildlife while maintaining the cost effectiveness of the projects on long term basis.

EXECUTIVE SUMMARY

The proposed project involves diversion of 12.8537 ha of forest land. Forest division and district wise breakup are tabulated below:

Details of Forest Divisions involved

S. N.	Forest Division	Forest Land (ha)	Non-Forest Land (ha)
1	Hamirpur	12.8587	50.6327
	Total	**12.8587**	**50.6327**

Details of District involved

S. N.	Name of District	Forest Land (ha)	Non-Forest Land (ha)
1	Hamirpur	12.8587	50.6327
	Total	**12.8587**	**50.6327**

Stage I approval for Diversion of 12.8537 ha of forest land for construction of new 2 lane with paved shoulder of Hamirpur bypass of NH-88 (New 103 & 3) (Design Chainage 121+175 to 138-295), (design length 17.20 km) in the State of Himachal Pradesh within the jurisdiction of Hamirpur Forest Division was obtained by NHAI vide MOEF&CC, Shimla letter dated **03.08.2023** The wildlife Management Plan has been prepared to comply with the condition of the Stage-1 Forest clearance.

Impacts of road construction can jeopardize the conservation efforts. To prevent, ameliorate and mitigate road induced negative impacts on wildlife species, several measures need to be considered while aligning, designing and operating a roadway through areas that are sensitive from ecological and conservation standpoint.

The mitigation strategy for the likely impacts due to this road project has been proposed in this Wildlife Management Plan keeping in view the dimensions such as environment and other natural resources conservation, habitat management, biodiversity conservation, sustainable resource development and livelihood improvement. The proposed Wildlife Management Plan distributes and fixes responsibilities of Project Proponent, Wildlife and Forest authorities and other stakeholders to undertake specific mitigating measures. Measures to minimize the road kills on the proposed Highway include best road design and management practices to minimize road accidents, identification of important points of animal crossing including the frequency, provide safe crossings for wild fauna through nicely designed eco-passages, install sign boards for early warning to commuters to reduce speed of vehicles.

The measures suggested for NHAI for mitigating and minimizing impacts concurrently with construction and operationalization of Highway include measures to prevent road kills, minimize impact of fragmentation of habitat and permanent barrier effect, mitigate the effect of pollution of various kinds and to ensure that all labour camps are established at a minimum distance of more than 500m away from the settlements. The labour will be made aware about wildlife laws so that they don't indulge in any poaching, fishing or any other illegal activity, etc. NHAI will also ensure that no construction material is dumped or stored in forest area, ensure that piers of bridges are not

constructed in any water sources with flowing water to the extent possible so that continuity of channels and free flow of water is not obstructed or changed. NHAI will schedule construction activities to minimize disruption during sensitive periods, such as breeding or migration seasons and consider implementing phased construction to allow animals to adapt and adjust to the changing landscape gradually. It will implement measures to minimize noise and vibration caused by construction activities, as these can disturb and displace wildlife. NHAI will also use noise barriers, construction methods that minimize vibration, and schedule loud activities during non-sensitive periods.

There are several types of crossing structures being proposed by the NHAI which will be used to mitigate impacts of highway, if any, animal movement and safety, each with different levels of effectiveness and cost. These structures include bridge, flyover, viaduct, box culvert, pipe culvert, animal underpass etc. A total 89 structures have been proposed along the highway, which includes **22 animal underpasses**. Design length of the highway is 17.120 Km. Therefore, **in every km of the highway, more than 5 structures have been proposed for animal crossing.** Out of 89 structures, 39 structures have been proposed in the forest area.

The mitigating measures are suggested for the Wildlife Authorities (WLA) to work in close association with the Project Proponent (PP) for smooth execution of work of the Highway in the forest area consistent with plan, concurrent monitoring of project to make sure that Construction firms engaged by the PP i.e. NHAI are clear about the mitigation measures to be incorporated and implemented in letter and spirit during construction. The WLA will also ensure that eco-friendly measures are adopted by PP for storage/transportation of construction materials to minimize pollution, ensure safety of animals during construction of highway through continuous watch and ward of the area. This will be the duty of the WLA to complete all works prescribed for amelioration in a fixed time frame to achieve the desired results. The WLA will work with PP to ensure that construction activities which may disturb the wildlife during breeding season and migratory season are kept at a low key. The WLA will be provided with all the rescue equipment viz. vehicle, tranquilizing equipment, nets, cages, etc. to ensure rescue of stranded animals in a professional manner. By following these steps, WLA & PP together can help minimize the negative impacts of road construction on nearby wildlife populations and promote the coexistence of infrastructure development and biodiversity conservation.

As per the clarification given under pare 1.22 of the Consolidated Guidelines issued under the Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980 and Rules, made thereunder vide MoEF&CC letter dated 26th December 2024, actual cost of the interventions required to be made at the site for Wildlife Management is worked out and cost of Plan is **Rs. 1.645 Cr.** The Cost of WLMP as per submitted plan has been deposited by the NHAI in the CAMPA Account

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CHAPTER-1 WILDLIFE CONSERVATION

1.1 INTRODUCTION

Wildlife conservation involves the safeguarding of wild species and their habitats with the aim of sustaining healthy wildlife populations and preserving, protecting, or enhancing natural ecosystems. Various threats to wildlife, including habitat destruction, degradation, fragmentation, over-exploitation, poaching, pollution, climate change, and illegal wildlife trade pose significant challenges. The International Union for Conservation of Nature (IUCN) estimates that 42,100 assessed species are at risk of extinction, while a 2019 UN report suggests that the number could be as high as a million species when considering all existing ones.

Various efforts have been initiated to address this issue by creating a network of wild-life sanctuaries and national parks. A national park is a large area of several ecosystems where plant and animal species, geomorphological sites and habitats for special scientific education and recreation are preserved. A wildlife sanctuary is dedicated to protect the wildlife and concerned species. On the other hand biosphere reserves are created to conserve biological diversity and genetic integrity of plants, animals and micro-organism in their totality. Today in there is a network of 1014 Protected Areas including 106 National Parks, 573 Wildlife Sanctuaries, 115 Conservation Reserves and 220 Community Reserves covering a total of 1,75,169.42 km2 of geographical area of the country which is approximately 5.32%. Under the efforts of conservation of wildlife, the government of India passed the Wild Life (Protection) Act, 1972. In order to give effect to this act many species specific projects were launched in the past five decades which can be seen as: project tiger, project Elephant, crocodile project, brow Antlered deer project, Rhinoceros project, Gir Lion project, Project Snow Leopard, Project Hangul, UNDP Sea Turtle Project.

1.2 Wildlife Protection Act, 1972

This Act provides for the protection of the country's wild animals, birds, and plant species, in order to ensure environmental and ecological security. Among other things, the Act lays down restrictions on hunting many animal species. The Act was last amended in the year 2006. The Wildlife (Protection) Act, 1972 has completed 51 years since its inception, and over the years, it has been successful in protecting several endangered species. The act has played a critical role in conserving the country's diverse wildlife.

About:

- The Wild Life (Protection) Act, of 1972 provides a legal framework for the protection of various species of wild animals and plants, management of their habitats, regulation, and control of trade in wild animals, plants, and products made from them
- The act also lists schedules of plants and animals that are afforded varying degrees of protection and monitoring by the government.

- India's entry to the CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) was made easier by the Wildlife Act.
- Earlier, Jammu and Kashmir was not covered by the Wildlife Protection Act of 1972. The Indian Wildlife Protection Act now applies to J&K as a result of the reorganisation act.

Constitutional Provisions for the Wildlife Act:

- The 42nd Amendment Act, 1976, Forests and Protection of Wild Animals and Birds was transferred from State to Concurrent List.
- Article 51 A (g) of the Constitution states that it shall be the fundamental duty of every citizen to protect and improve the natural environment including forests and Wildlife.
- Article 48 A in the Directive Principles of State policy, mandates that the State shall endeavor to protect and improve the environment and to safeguard the forests and wildlife of the country.

1.3 Key Features of the Wild Life (Protection) Amendment Act, 2022

Rationalizing schedules

- Currently, the Act has six schedules for specially protected plants (one), specially protected animals (four), and vermin species (one).
- The amendment reduces the total number of schedules to four by –
  - Reducing the number of schedules for specially protected animals to two (one for greater protection level),
  - Removes the schedule for vermin species, and
  - Inserts a new schedule for specimens listed in the Appendices under CITES.

Obligations under CITES

- The Amendment provides for the central government to designate Management Authority and Scientific Authority.
- As per CITES, the Management Authority may use an identification mark for a specimen.
- The Amendment prohibits any person from modifying or removing the identification mark of the specimen.
- Additionally, every person possessing live specimens of scheduled animals must obtain a registration certificate from the Management Authority.

Invasive alien species

- Invasive alien species refers to plant or animal species which are not native to India and whose introduction may adversely impact wild life or its habitat.
- The Amendment empowers the central government to regulate or prohibit the import, trade, possession or proliferation of invasive alien species.

Control of sanctuaries

- The Act entrusts the Chief Wild Life Warden to control, manage and maintain all sanctuaries in a state.
- The Chief Wild Life Warden is appointed by the state government.
- The Amendment specifies that actions of the Chief Warden must be in accordance with the management plans for the sanctuary.

Conservation reserves

- Under the Act, state governments may declare areas adjacent to national parks and sanctuaries as a conservation reserve, for protecting flora and fauna, and their habitat.
- The Amendment empowers the central government to also notify a conservation reserve.

Surrender of captive animals

- The Amendment provides for any person to voluntarily surrender any captive animals or animal products to the Chief Wild Life Warden.
- No compensation will be paid to the person for surrendering such items.
- The surrendered items become property of the state government.

Schedules under the Act:

- Schedule I — Animal species that will enjoy the highest level of protection including those which are critically endangered.
- Schedule II Animal species that will be subject to a lesser degree of protection
- Schedule III Protected Plant species
- Schedule IV Specimens listed in the Appendices under CITES (scheduled specimens)

CHAPTER-2 PROJECT DESCRIPTION

2.1 PROJECT PROPONENT

National Highways Authority of India (NHAI) is an autonomous agency of the Government of India. It is responsible for the network of National Highways across the country. NHAI is managing the movement of both passenger and goods through its smart mobility mission under the Bharatmala Pariyojana. It aims at provision and maintenance of national highways network to meet user expectations in the most time bound and cost-effective manner within the strategic policy framework and envisioned to bring connectivity, inclusivity, and prosperity to the people in the country.

2.2 JUSTIFICATION FOR LOCATING THE PROJECT IN FOREST AREA

The project road is construction of new 2-lane with paved shoulders of Hamirpur Bypass of NH-88 (New NH-103) in the State of Himachal Pradesh. The project road starts from design Chainage 121+175 and ends at design Chainage 138+295. The length of the project road is **17.120 Km**. Hamirpur Bypass is a Green field alignment which is proposed to be 2 lane with Paved Shoulder which commences near Dravsai village in Hamirpur Tehsil at km 121+175 and ends at km 138+295 near Bhalun village in Nadaun Tehsil of Hamirpur district in the State of Himachal Pradesh.

The proposal involves construction 3 Major bridges, 5 Minor bridges. 1 Viaduct, 9 Bus Shelters and a Wayside Amenity. No tunnels have been proposed on this route. The proposed road passes through forest and non-forest areas. Forests are located along the road in scattered patches on either side of the road. The alignment has been finalized keeping in view the forest areas. Also, the project road is located in hilly/rolling terrain and an alternative option to the road is limited. Construction of the Hamirpur Bypass involves bare minimum diversion of forest land.

2.3 PROJECT IMPACT AND REQUIREMENT OF WILDLIFE CONSERVATION PLAN

It's a well-known fact that roads impact environment, forests and wildlife and other natural resources directly as well as indirectly bringing their degradation and depletion. It also includes noise & water pollution, habitat destruction/disturbance and degradation of local air quality; and the wider environmental effects of transport such as habitat fragmentation, ecosystem degradation, and climate change from vehicle emissions.

Wild animals are vulnerable to vehicular traffic passing through forests, especially at night, when blinded by bright headlights, even swift species like cats freeze. Over time, as animals learn to avoid roads, busy multilane highways become barriers that hinder wildlife movement, fragment populations, and restrict gene flow. By blocking access to potential habitats, roads act as a major contributor to habitat loss. Both terrestrial and aquatic biodiversity are significantly affected, which can impede free movement of wildlife and fish movement, obstruct water flows, and degrade water quality. Consequently, undertaking

Road projects such as this, obtaining forest clearances have been made mandatory by MoEF & CC, Government of India.

As per recommendations made in the Forest Advisory Committee meeting held in MoEF&CC GoI on 16th January 2023, it was decided that:

i) In respect of linear projects, the stipulated norms of 2% and 05.% towards the cost of Wildlife Management Plan and Soil and Moisture Conservation Plan, as provided in the Ministry's guidelines dated 8.06.2022, will be proportionate to the extent of forest land involved instead of total project cost or actual cost of implementation of such Plans, whichever is more, should be charged from the user agency.

ii) The provisions of Wildlife Management Plan or Soil Moisture Conservation Plan shall be approved by the competent authority in the State and accordingly, the deficit amount, if any, from the money already realized from to the tune of 2% and/or 0.5% of project cost proportionate to the extent of forest land involved, shall be paid by the user agency, and the same shall be deposited in to the CAMPA account

iii) The State Government shall ensure that details of the finalized WLMP, SMC Plan and disposition of monies, payment of deficit amount, etc. shall be approved by the competent authority and concurred by the concerned IRO of the Ministry within a period of one year from the date of deposit of the said amount.

iv) The Guidelines dated 8.06.2022 stands modified to the extent as indicated above in respect of linear projects

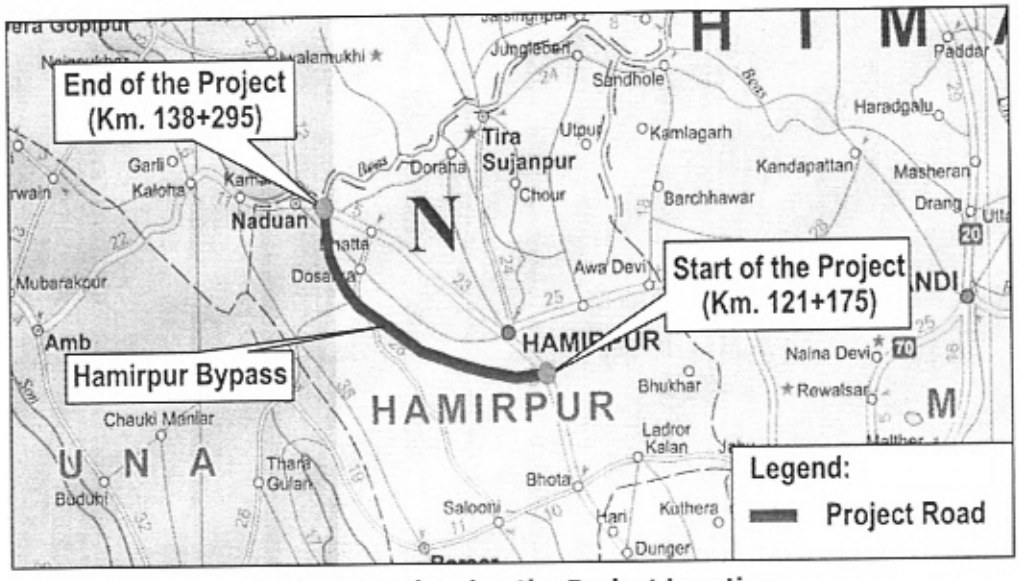
Now there is further clarification on the provisions of guidelines given under pare 1.22 of the Consolidated Guidelines issued under the Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980 and Rules, made thereunder vide MoEF&CC letter dated **26th December 2024** that

- in cases where there is no delay and the WLM/SMC Plan has been prepared by the User Agency before submission of compliance of in-principle approval, the provision of upfront payment of 2% and 0.5% shall not be applicable. In such cases, the User Agency needs to make the payment towards the actual cost of implementation of the WLMP/SMCP, as provided for in the estimate of the approved WLM/SMC Plans.
- Further, measures to be suggested in the Wildlife Management or SMC Plan should be based on the requirement of site i.e. site-specific interventions need to be taken in the area to mitigate the impact of the diversion of forest land. The same should be incorporated in the WLMP and SMC Plans. The values of 2% and 0.5% provided in para 1.22 of the Consolidated Guideline are only indicative values and they cannot be considered as a standard benchmark for preparing the WLMC or SMC which should be based on the specific field requirements. Therefore, it is appropriate for the States/UTs to prepare these Plans **based on the actual cost of the interventions required to be made at the site and not based on the indicative financial outlay totaling to 2% (for WLMP) or 0.5% (for SMCP) of the total project cost**.

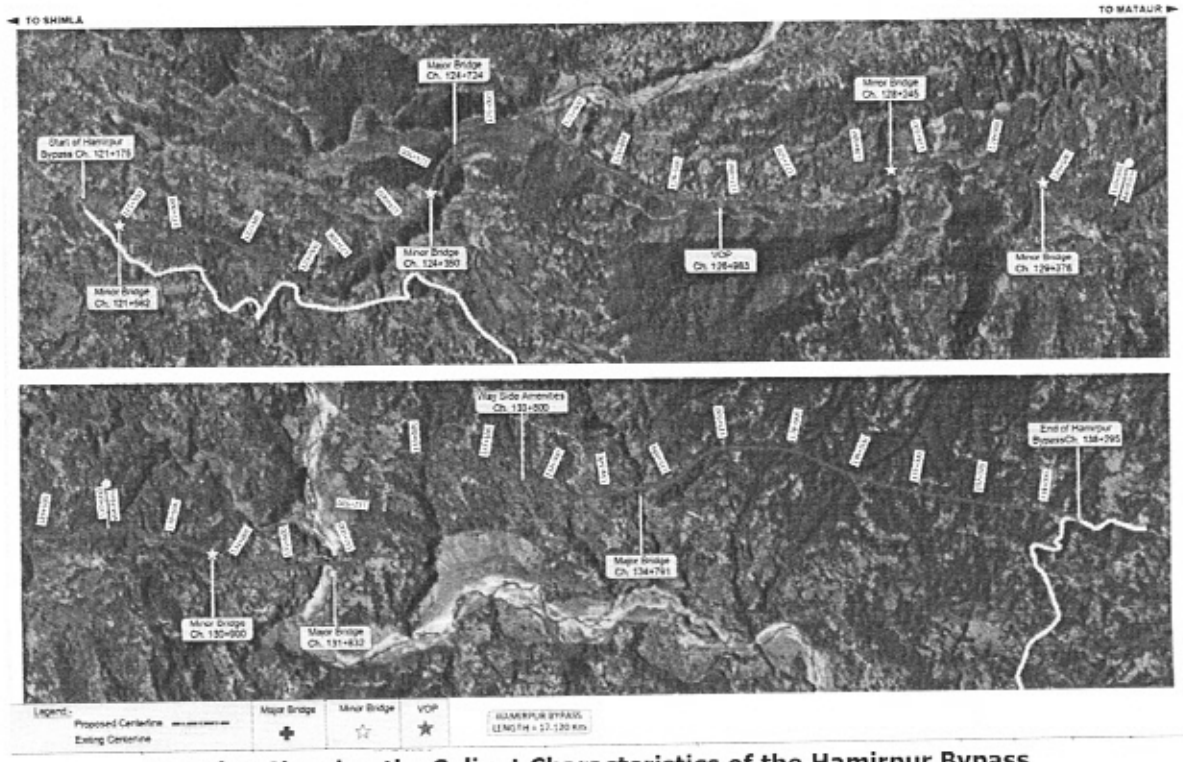
Hence, as per above stipulations, actual cost of the interventions required to be made at the site for Wildlife Management is worked out and cost of Plan is **Rs. 1.645 Cr.**

2.4 PROJECT DETAILS

The Project Road is proposed to bypass the congested location of Hamirpur town. The bypass is 2 lane with Paved Shoulder which commences near Dravsai village in Hamirpur Tehsil at km 121+175 and ends at km 138+295 near Bhalun village in Nadaun Tehsil of Hamirpur district.



Index Map Showing the Project Location



Key Plan Showing the Salient Characteristics of the Hamirpur Bypass

Salient Features of the Project Road

	Particulars	Details
a)	Proposal No.	FP/HP/Road/151932/2022
b)	Name of Project for which Forest Land is required	Construction on New 2 lane with paved shoulder of Hamirpur bypass of NH-88 (New 103 & 3) (Design Chainage Kms. 121+175) to kms. 138-295), (design length 17.20 kms) in the State of Himachal Pradesh within the jurisdiction of Hamirpur Forest Division, Distt. Hamirpur, Himachal Pradesh.
c)	Short narrative of the proposal and Project/scheme for which the forest land is required	The Hamirpur Bypass is is proposed to bypass the congested location of Hamirpur town. The bypass is 2 lane with Paved Shoulder which commences near Dravsai village in Hamirpur Tehsil at km 121+175 and ends at km 138+295 near Bhalun village in Nadaun Tehsil of Hamirpur district
d)	State	Himachal Pradesh
e)	Category of the Proposal	Road
f)	Shape of forest land proposed to be diverted	Linear
g)	Forest land to be diverted	12.8537 ha
h)	Non-forest land required	50.6327 ha
i)	Total period for which the forest land is proposed to be diverted (in years)	99
j)	District/Forest Division	Hamirpur
k)	Seismic Zone	V
l)	Carriage Way	2 Lane (lane width 7.0 meters)
m)	Proposed RoW	60 m (except interchange and wayside amenities)
n)	Major Bridge	03 nos.
o)	Minor Bridge	05 nos.
p)	Flyover	Nil
q)	Viaduct	Nil
r)	Culvert (Widening / Re-construction / New Construction)	81 (80 New + 1 Widening Culverts) (Add 33 New Pipe Culverts on Junctions).
s)	ROB/RUB/VOP	01 no. of VOP
t)	New Toll Plaza	Nil
u)	Way side Amenity	At Km 133+800

	Particulars	Details
v)	Bus Shelter	09 nos.
w)	Tunnel	Nil

2.5 DIVERSION OF FOREST LAND

The proposed project involves diversion of 12.8587 ha of forest land. District, forest division, village and component wise breakup are tabulated below:

Details of Forest Divisions involved

S. N.	Forest Division	Forest Land (ha)	Non-Forest Land (ha)
1	Hamirpur	12.8587	50.6327
	Total	**12.8587**	**50.6327**

Details of Districts involved

S. N.	Name of District	Forest Land (ha)	Non-Forest Land (ha)
1	Hamirpur	12.8587	50.6327
	Total	**12.8587**	**50.6327**

Villages wise breakup of Forest and Non-forest Land

S. N.	Name of Village	Forest Area (ha)	Non-Forest Area (ha)
1	Dravsai (45/14)	0	1.1606
2	Sai Brahmana (45/21)	0	1.7039
3	Sai Ugialla (45/20)	0	0.0471
4	Lahad (46/30)	0	7.583
5	Jasor (46/14)	1.5445	0.0279
6	Masyana (37/17)	6.1419	1.1059
7	Payadkad (37/10)	0	0.0855
8	Bahdla (37/3)	0.0342	2.3942
9	D. P. F. Chak Bajuri (37/13)	0.4722	0
10	Kaswar (37/13)	0.0192	2.0334
11	Ghanotla (37/15)	0	3.6057
12	Khagal (37/14)	0.0174	5.3665
13	Kamlah (37/7)	0	3.6884
14	Baleta Khurd (37/22)	0	2.2458
15	Baleta Kalan (37/29)	0	2.1628
16	Dumpsite - Lahar	0	0.984

S. N.	Name of Village	Forest Area (ha)	Non-Forest Area (ha)
17	Dumpsite - Ghanotla	0	1.7002
18	Dumpsite - Khagal	0	1.8462
19	Dumpsite - Baleta Kalan	0	0.1051
20	Sanahi Kalan (26/10)	0	0.7488
21	Kohlwin (26/8)	0	1.546
22	Atialu (26/12)	0	1.9955
23	Telkad (26/4)	0	1.6026
24	Bharyal (26/1)	0.2506	0.2698
25	Badwana (26/23)	0	2.4812
26	DPF Kunna (25/27)	2.5528	0.1091
27	Kunna (25/27)	0	0.0571
28	Ralian-Di-Bahal (25/49)	0.447	0
29	Syalan-Di-Bahal (25/35)	0.0461	0.1304
30	D.P.F. Loharkad (20/21)	0.2895	0
31	Loharkad (20/21)	0.6251	1.5473
32	Dangri (20/18)	0.3367	1.6896
33	Chilbahal (20/10)	0	0.5326
34	Bhalun (20/23)	0.0765	0.0765
	Total	**12.8537**	**50.6327**

Component wise breakup

S. N.	Component	Forest Land (ha)	Non-Forest Land (ha)
1	Bypass Road	12.4782	43.7631
2	Bridges	0.3498	0.7896
3	VOP	0.0257	0
4	Wayside Amenities	0	1.4445
5	Disposal of excess earth	0	4.6355
	Total	**12.8537**	**50.6327**

CHAPTER-3 ENVIRONMENTAL SETUP OF THE STUDY AREA

3.1 HAMIRPUR DISTRICT

3.1.1 Physical Features

Area & Location: Hamirpur, one of the twelve districts of beautiful state Himachal Pradesh, lies in the middle of the state. The district occupies an area of 1,118 km². The most literate district and well connected by roads from all sides, shares its geographical boundaries with Bilaspur, Mandi, Kangra and Una districts. District is situated between 76°17'50" to 76°43'42" east longitudes and 31°24'48" to 31°53'35" north latitudes. Tract is hilly, covered by Shivalik Range. The elevation varies from 400 meters to 1100 meters. Boundary of Hamirpur Forest Division is co-terminus with geographical boundary of Hamirpur District. The forests do not form a continuous and compact belt but are scattered throughout the division.

Configuration of the ground: It varies from almost flat land bordering Beas River to the broken and precipitous slopes in higher reaches.

Altitude: The altitude varies from 570 m above MSL to 1150 above MSL

Ridges and watersheds: The main hill ranges of the district are known as Jakh Dhar & Sola Singhi Dhar. The Jakh dhar runs in continuation of Kali Dhar range in the Kangra district. It enters in Hamirpur district near Nadaun and transverses it into southeastern direction. The town of Hamirpur lies to the east of this range where the country is undulating but in the north and north east bare and rugged hills, deep ravines with precipitous sides transform the landscape into what has been described as an agitated sea suddenly arrested and fixed stones. The Chabutra hills have the same dip and strike as in the Jakh Dhar and are continued beyond the Beas to what is known as the Changar, a mass of rugged and broken hills. The Sola Singhi Dhar is the longest range of the tract and is known under various names such as Chintpurni and Jaswan Dhar in Una and by Sola Singhi in Hamirpur. Thus Dhar enters Hamirpur to the east of Tappa Daruhi and traverses it in a south-easterly direction more or less parallel to the Jakh Dhar and terminated on the Satluj. Hamirpur district is bounded in the north by river Beas which separates it from Kangra district. In the east Bakar and Seer Khads separate it from Mandi district. In the south, It is bounded by Bilaspur district and in the west by Una district.

Rivers and streams: The Hamirpur is watered by many big and small rivers. Among the big rivers we have Beas and Sutlej. River Beas runs through the northern edge of the district. Kunah Khad, Bakar Khad and Man Khad are some of the perennial streams that run northward to mingle into Beas. In the south we have, Sukkar Khad and Mundkhar Khad draining into Seer Khad, which in its turn drains into River Sutlej. The streams like Kunah Khad, Shukar Khad, Man Khad, Seer Khad and Pung Khad etc have highly variable supply of water, maximum in the months of Monsoon when all of these are in spade and minimum in the months of May and June. The streams like Kunah, Pung and Seer are more or less

perennial because the catchment of these streams is less degraded as compared to Mann or other streams. Mann Khad runs all along the length of the district starting near Barsar and ending up in Nadaun.

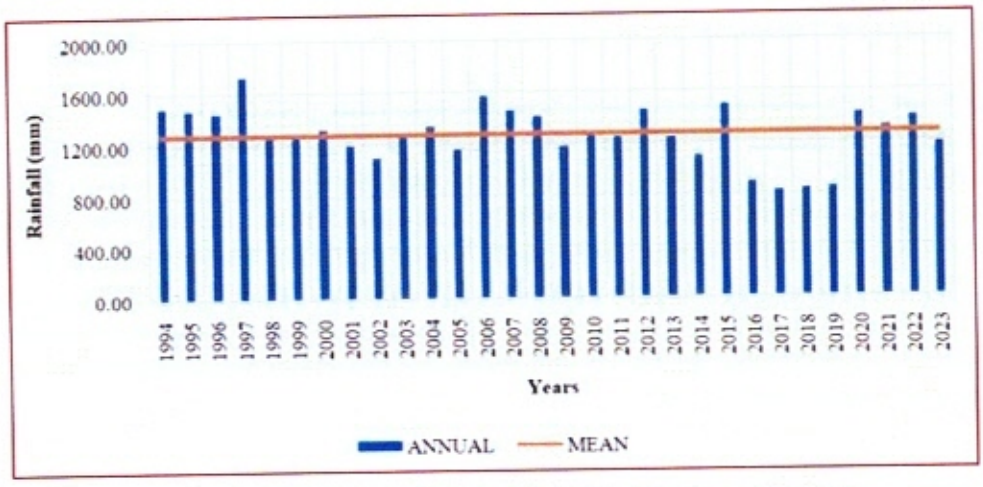
Geology and Rock: The geological formation is represented by the Shiwalik beds of the sub Himalayan Series. The Jakh Dhar has been formed by an up throw on north-east side. This is known as Gumbar fault. It is composed of alternating strata of a blue, softish sand stone and red clay. The sand stone dips at an angle of about 20º to the north-east and is generally expose in sheets where the soil has been washed away due to evenness of the slop. The south-western slope of the ridge is for sharper and usually descends by a series of precipitous sandstone scarps between which the clay strata outcrops. The Sola Singhi ridge is an upthrow between two faults. The undulating land between two ridges is composed of gravels, possibly of post Shiwalik time, or pebbly sandstone of the higher Shiwalik beds. The sandstone belt is fertile and supports good chil forest.

Soil: The composition of the vegetation is determined by the depth of soil and the softness of rocks permitting penetration of roots. The sandstone formations in most parts become soft during rains and permits penetration of roots thus becoming suitable for good chil forests. Along the river Beas and other khads, riverine gravels predominate which support scrub forests.

Climate: Hamirpur district falls in sub-humid sub-tropical zone. The winter prevails from November to March, spring in April and May, summer from June to September and transition season from October to November. The minimum temperature in the winter goes to 4°C and rises to maximum 38°C in summer. The damage by frost is confined to mainly December-January.

Rainfall: There are two seasons of rainfall during the year one from December to March, associated with the passage of western disturbances and the other which is the main one, extending from mid-June till middle of September, caused by the south west monsoons. Some rain is also received in the post monsoon month of October. A major portion of precipitation (74%) is received during monsoon period from June to September. July and August are the wettest months. Main drought periods are from May to June and October to mid-December. Drought in May, June is generally acute. The annual rainfall and average for 30 years (1994-2023) in Hamirpur District are depicted in Fig. 2. The maximum rainfall (1728.20mm) occurred in 1997, followed by 1569.90 mm occurring in 2006. The minimum rainfall (817.20 mm) occurred in 2017, and the second-lowest year (843.2 mm) occurred in 2018. It is shown that the average annual rainfall for the 30-year period is 1274.45 mm.

Temperature: It is not a typical "Hilly & Chilly" type of climate in district Hamirpur, as it is closer to the plains. During winter, the climate is cold but pleasant. During summer the temperature is hot and temperature does sometimes cross the 44 degree Celsius mark in summers.



Annual & average Rainfall in Hamirpur District

Average Monthly Rainfall of Hamirpur District

Average temperatures in Hamirpur

3.1.2 Demographic Features

Demography: According to the 2011 census, Hamirpur district has a population of 454,768. The district has a population density of 407 inhabitants per square kilometre (1,050/sq. mts). Its population growth rate over the decade 2001–2011 was 10.19%. Hamirpur has a sex ratio of 1095 females for every 1000 males, and an average literacy rate of 84.53%. The district comprises 4 sub-divisions: Hamirpur, Barsar, Nadaun and Bhoranj. Hamirpur sub-division consists of 2 tehsils; viz. Hamirpur and Sujanpur. Barsar, Nadaun and Bhoranj sub-divisions comprise only one tehsil as Barsar, Nadaun and Bhoranj respectively. There are five Vidhan Sabha constituencies in the district; namely Barsar, Hamirpur, Sujanpur, Nadaun and Bhoranj.

Occupational Pattern: About 92% population of this district lives in the R\rural areas and most of them are agriculturist. People are also employed in government service. Many people also work in industries in the adjoining areas of state of Punjab.

Literacy rate of Hamirpur district in Himachal Pradesh was 88.15% as per the 2011 census. This was the highest literacy rate in the state. The male literacy rate in Hamirpur district was 94.36% and the female literacy rate was 82.62%.

Agriculture and cropping pattern: Agriculture is the main occupation of the people in the district. The agro-climatic conditions prevailing in the district are favorable for the growing of crops such as wheat, paddy, maize, oil seeds, potato, sugarcane etc. Ravi and Kharif are the two main crops in the district. The main rabi crops are namely wheat, barley, gram and oil seeds. The kharif crops are namely maize, paddy, oil seeds, pulses and potatoes. The land holdings of the farmers in the district are small and scattered. The farmers grow more than two crops in a year so as to get maximum production from the land. The crop rotations followed in this district are: 1. maize-toria-wheat 2. maize-potato and 3. maize-toria-wheat-baisakh Moong. In addition to these rotations the farmers also follow paddy wheat, maize-wheat rotations. In addition to it, efforts are also being made to encourage the farmers for growing vegetables and improved varieties of seeds of vegetables like peas, radish, turnip, lady's finger, tomato etc.

Animal Husbandry: Livestock is the main wealth next to agriculture of rural population. Almost every household in rural areas invariable keeps a few cows, buffaloes, sheep and goats besides some rear pigs and keep poultry birds. Animals are kept for milk, meat and providing manure to the fields. The district has a large number of livestock.

3.1.3 Biological Features

Forests: Forests of Hamirpur division are scattered as they are, over a vast area, support Chil and Scrub forests depending upon the altitude, rainfall, aspect, geological formatiom and their locality factors. The forests are of low hills or outer Shiwalik type. Chil is the most important species. The forests types are Dry Tropical (Northern Dry Mixed Deciduous forests) and Sub-tropical Pine Forests (Lower or Shiwalik Chil Pine Forests) as per Champion

and Seth's classification.

Forest Flora: The important tree species occurring in Hamirpur Forest Division are Chir pine (*Pinus roxburghii*), Khair (*Acacia catechu*). Besides, a number of other trees are also found in the tract.

List of important trees, shrubs, herbs and climbers found in the tract

Botanical Name	Local Name
Abrus precatorius	Rattak
Acacia arabica	Kikar
Acacia caesia	Refan, dhangar
Acacia catechu	Khair
Acacia farnesiana	(Introduced)
Adhatoda vasica	Basute
Aegle marmelos	Bil
Albizzia lebbek	Siris (Sarin)
Antidesma diandrum	Amblu
Anogeissus latifolia	Dhao
Azadirachta indica	Neem
Grewia laevigata	Dhamriana
Aspidopterys wallichii	Dhur bel
Atylosia crassa	Ban taur
Bambusa arundinacea	Magar (cultivated)
Bassia latifolia	Mahwa
Bauhinia malabarica	Karal
Bauhinia purpurea	Karal
Bauhinia racemosa	Karal
Bauhinia vahlii	Taur
Bauhinia variegate	Kachnar
Berberis lyceum	Kasmal
Bischofia javanica	Marak
Boehmiria platyphylla	Padara
Boehmiria regulosa	Ligga
Bombax malabaricum	Semal
Bridelia retusa	Gadi kuri
Bridelia verrucosa	Gondni
Butea frondosa	Dhak, palah
Caesalpinia bonducella	Mechkhar, Kath karanj
Caesalpinia sepiaria	Relan
Calotropis procera	Ak
Caryopteris wallichiana	Ban basuti
Capparis sepiaria	Hium-garna

Botanical Name	Local Name
Caraya arborea	Handabhera
Carissa spinarum	Garna
Casearia tomentosa	Chilla
Cassia fistula	Kaniar, amaltas
Cedrela toona	Tun
Celastrus paniculata	Sankhiren
Celtis australis	Khirk
Clematis gouriana	Jhol
Clematis grata	Charki
Clematis nutans	Chibru, Machrun
Clerodendron infortunatum	Dhak Kari
Cocculus laurifolius	Paror
Colebrookia oppositifolia	Duson
Cordia myxa	Lasura
Crataeva religiosa	Barna (introduced)
Cryptolepis buchanani	Jaman Khumb
Cuscuta reflexa	Akasbel
Dalbergia sissoo	Tahil, Shisham
Deeringia celosioides	Bhirang
Dendrocalamus hamitonii	Mohr (cultivated)
Dendrocalamus strictus	Bans
Desmodium gyrans	Dudli
Desmodium latifolium	Jajru
Dioscorea deltoidea	Janj, Kinch
Diospyrus cordifolia	Kala Dhao
Diospyrus montana	Kendu
Diospyrus tomentosa	Kinu
Dodonaea viscosa	Mendru
Dregea volubilis	Murd-Bel
Ehretia laevis	Chamror
Embelia robusta	Baobring
Elaeodendron glaucum	Mirgu, Morindu
Erythrina suberosa	Pariaru, Greru,
Euonymus pendulus	Dhamela
Euphorbia nivulia	Gangichhu
Euphorbia royleana	Thor
Ficus bengalensis	Barh
Ficus hispida	Dagur
Ficus palmata	Dhura
Ficus nemoralis	Dudla

Botanical Name	Local Name
Ficus clavata	Karndal
Ficus scandens	Kandroi
Ficus infectoria	Padara
Ficus rumphii	Palakh
Ficus religiosa	Pipal (cultivated)
Ficus foveolata	Rudder
Ficus glomerata	Trembal
Ficus roxburghii	Trembal
Flacourtia ramontchi	Kangu
Flemingia semialata	Ban-Chola
Flueggea microcarpa	Girthan
Gmelina arborea	Gumbar
Grewia elastica	Phalsa, Pheruman
Grewia laevigata	Dhamriana
Grewia oppositifolia	Biul, Dhaman
Gymnosporia royleana	Bhadrun
Hamiltonia suaveolens	Gullhain, Padari
Helicteres isora	Maror-Phali
Helinus lanceolatus	Murian
Hiptage madablota	Want
Holarrhena antidysenterica	Keor
Holoptelea integrifolia	Rajain
Hymenodictyon excelsum	Barthua
Ichnocarpus frutescens	Bakkar-Bel
Indigofera dosua	Kathi mattu
Indigofera pulchella	Kathi mattu
Jasminum arborescens	Dhurmalti
Jasminum dispermum	Sarain
Jasminum grandiflorum	Malti
Jasminum pubescens	Ban malti
Kydia calycina	Pula
Leea aspera	Basant Jari
Limonia acidissima	Bernahi, Bilan
Ligustrum compactum	Laluan
Loranthus ligustrinus	Parand
Machilus duthiei	Badrol
Machilus gamblei	Badrol
Mangifera indica	Amb/Am
Melia azedarach	Bakain, Drek
Meliosma pungens	Larand

Botanical Name	Local Name
Milletia auriculata	Salangen
Mimosa rubicaulis	Dadar
Moringa pterygosperma	Suhanjna
Morus alba	Tut (cultivated)
Morus laevigata	Shahtut
Morus serrata	Karun (cultivated)
Mucuna pruriens	Gajal-Bel
Murraya exotica	Nargen
Murraya koenigii	Gandla
Nyctanthus arbor-tristis	Harsingar, Kuri
Odina wodier	Kehmbel
Olea cuspidate	Kao, Kahu
Oroxylum indicum	Tat Palanga
Ougeinia dalbergioides	Sannan
Osyris arborea	Sonan
Pogostemon plectranthoides	Kali-Basuti
Periploca callophylla	Sapri
Phoenix sylvestris	Khajoor
Phyllanthus parvifolius	Amala
Pinus longifolia	Chil
Pistacia integerrima	Kakrain
Porana paniculata	Faindal, Jhol
Premna barbata	Ginani
Premna latifolia	Gin, Bharkhar
Pterospermum acerifolium	Latar Chamba
Punica granatum	Daran
Purtranjiva tuberosa	Salorh
Putranjiva roxburghii	Putajen
Pyrus pashia	Kainth
Randia tetrasperma	Jindru
Randia dumetorum	Rara
Reinwardtia trigyna	Basant
Rhamnus triquetra	Galodan
Rosa moschata	Kujh Kunj
Rubus lasiocarpus	Kala Akha
Rubus paniculatus	Akha
Sageretia oppositifolia	Girgithan
Salix elegans	Bashal
Salix tetrasperma	Badhla, willow
Saurauja napaulensis	Bhakara

Botanical Name	Local Name
Shorea robusta	Sal
Spondias mangifera	Ambra
Stephania elegans	Ratindu
Stephegyne parvifolia	Kalam
Strobilanthes auriculatus	Kapurmingar
Stereospermum suaveolens	Padal
Syzygium cumini	Jaman
Symplocos crataegoides	Lodar
Tabernaemontana coronaria	Tagar
Terminalia arjuna	Arjan (introduced)
Terminalia belerica	Bahera
Terminalia chebula	Harrar
Terminalia tomentosa	Aisan
Trachelospermum fragrans	Dudli, Barora
Tylophora hirsute	Terni
Urena lobata	Dudh-Khal
Vitex negundo	Bana
Vitis trifolia	Chamar Bel
Wendlandia exserta	Pansara
Woodfordia floribunda	Dhawin
Wrightia tomentosa	Khalawa
Xylosma longifolium	Chirindi
Zanthoxylum alatum	Tirmira
Zizyphus jujuba	Ber
Zizyphus cenoplia	Kokal Ber

Medicinal Plants

Botanical Name	Local Name
Acacia nilotica	Kikar, Babul
Aloe barbadensis	Kabbarya, Aloe, Alovera
Aegle marmelos	Bil, Blpatri
Azadirachta indica	Neem
Argemone Mexicana	Bharbhand
Allium sativum	Lahusan, Garlic
Cassia fistula	Kaner, Amaltas
Cassia	Baru, elwan, relu
Dalbergia sissso	Sisham, Talhi
Momordica charantia	Karela
Momordica dioica	Kakroon
Pongamia pinnata	Karanja, Karanjoatra

Botanical Name	Local Name
Syzygium cumini	Jamun
Tinospora cordifolia	Giloe, Gulje
Terrninalia arjuna	Arjun
Trigonella foenum- graecum	Methi
Tamarindus indica	Imli
Vinca rosea	Sadabahar
Withania somnifera	Ashvagandha

Forest Fauna: A wide range in altitude with varied tropical to temperate flora offers diverse type of wild animals and birds capable of thriving under different climatic conditions ranging from densely wooded area to sparse tree growth. The undisturbed forest in the past gave safe harbourage to wildlife and provided guarantee of their survival. With the advancement of civilization, there are hardly few forests left free from intrusion by man. This has a disastrous effect on the wildlife. The increase in human population and breaking of forest lands for agriculture has also reduced the domain available to the wildlife. The forests of the area are full of rich fauna. The important fauna found here is given as under

Mammals

English Name	Zoological Name	Schedule of WLPA	IUCN Red list
Leopard or Panther	*Panthera pardus*	Schedule I Part I	Vulnerable
Jungle Cat	*Felis chaus*	Schedule I Part II	Least concern
Leopard Cat	*Felis bengalensis*	Schedule I Part I	Least concern
Jackal	*Canis aureus*	Schedule II Part I	Least concern
Ghoral	*Nemorhaedus goral*	Schedule III	Near Threatened
Sambar	*Cervus unicolor*	Schedule III	Vulnerable
Barking Deer	*Muntiacus muntjak*	Schedule III	Least concern
Indian Wild Boar	*Sus scrofa*	Schedule III	Least concern
Monkey	*Rhesus maccaq*	Schedule II Part I	Least concern
Indian Hare	*Lepus nigricollis*	Schedule IV	Least concern
Common Mongoose	*Herpestes edwardsi*	Schedule I Part II	Herpestes edwardsi
Indian Porcupine	*Hystrix indica*	Schedule IV	Hystrix indica

Birds

S N	Common Name	S N	Common Name
1.	Black Francolin	2.	Ashy Drongo
3.	Grey Francolin	4.	Spangled Drongo
5.	Jungle Bush Quail	6.	Asian Paradise-flycatcher
7.	Red Junglefowl	8.	Common Iora
9.	Indian Peafowl	10.	Common Woodshrike
11.	Grey-capped Pygmy Woodpecker	12.	Large Woodshrike

S N	Common Name	S N	Common Name
13.	Fulvous-breasted Woodpecker	14.	Blue Whistling Thrush
15.	Grey-headed Woodpecker	16.	Dark-sided Flycatcher
17.	Black-rumped Flameback	18.	Slaty-blue Flycatcher
19.	Great Barbet	20.	Rufous-bellied Niltava
21.	Brown-headed Barbet	22.	Blue-throated Flycatcher
23.	Blue-throated Barbet	24.	Oriental Magpie Robin
25.	Coppersmith Barbet	26.	Indian Robin
27.	Indian Grey Hornamendment	28.	White-capped Water Redstart
29.	Common Hoopoe	30.	Plumbeous Water Redstart
31.	Indian Roller	32.	Common Stonechat
33.	White-throated Kingfisher	34.	Pied Bushchat
35.	Green Bee-eater	36.	Grey Bushchat
37.	Pied Cuckoo	38.	Brahminy Starling
39.	Common Hawk Cuckoo	40.	Common Myna
41.	Eurasian Cuckoo	42.	Jungle Myna
43.	Asian Koel	44.	Great Tit
45.	Rose-ringed Parakeet	46.	Wire-tailed Swallow
47.	Plum-headed Parakeet	48.	Red-rumped Swallow
49.	Asian Barred Owlet	50.	Streak-throated Swallow
51.	Rock Pigeon	52.	Himalayan Bulbul
53.	Spotted Dove	54.	Red-vented Bulbul
55.	Red Collared Dove	56.	Black Bulbul
57.	Eurasian CollaredDove	58.	Striated Prinia
59.	Green Sandpiper	60.	Grey-breasted Prinia
61.	Great Thick-knee	62.	Oriental White Eye
63.	Little Ringed Plover	64.	Common Tailorbird
65.	River Lapwing	66.	Common Chiffchaff
67.	Red-wattled Lapwing	68.	Grey-hooded Warbler
69.	Black-shouldered Kite	70.	Puff-throated Babbler
71.	Black Kite	72.	Black-chinned Babbler
73.	Egyptian Vulture	74.	Jungle Babbler
75.	Little Cormorant	76.	Sand Lark
77.	Little Egret	78.	Pale-amendmented Flowerpecker
79.	Cattle Egret	80.	Purple Sunbird
81.	Indian Pond Heron	82.	Crimson Sunbird
83.	Long-tailed Shrike	84.	House Sparrow
85.	Red-amendmented Blue Magpie	86.	Russet Sparrow
87.	Rufous Treepie	88.	White Wagtail

S N	Common Name	S N	Common Name
89.	Large-amendmented Crow	90.	White-browed Wagtail
91.	Eurasian Golden Oriole	92.	Grey Wagtail
93.	Large Cuckooshrike	94.	Paddyfield Pipit
95.	Small Minivet	96.	Baya Weaver
97.	White-throated Fantail	98.	Indian Silveramendment
99.	Black Drongo	100.	Scaly-breasted Munia

Reptiles

English Name	Zoological Name
Brook's House Gecko	*Hemidactylus brookii*
Yellow-green House Gecko	*Hemidactylus flaviviridis*
Fan-throated Lizard	*Sitana ponticeriana*
Indian Garden Lizard	*Calotes versicolor*
Kashmir Agama	*Laudakia tuberculata*
Bengal Monitor	*Varanus bengalensis*
Common Sand Boa	*Gongylophis conicus*
Eastern Red Sand Boa	*Eryx jhonii*
Himalayan Trinket Snake	*Orthriophis hodgsonii*
Indian Rat Snake	*Ptyas mucosa*
Banded Kukri Snake	*Oligodon arrensis*
Checkered Keelback Water Snake	*Xenochrophis piscator*
Buff-striped Keelback	*Amphiesma stolatum*
Eastern Keel back	*Amphiesma platyceps*
Black Headed Royal Snake	*Spalerosophis atriceps*
Black Cobra	*Naja oxiana*
Rassel's Viper	*Daboia russelii*
Himalayan Pit Viper	*Gloydius himalayanus*
Brown Roofed Turtle	*Pangshura smithii*
North Indian Flapshell Turtle	*Lissemys punctata andersoni*

Fishes

English Name	Zoological Name
Hamilton's barila	*Barilius bendelisis*
Barred barila	*Barilius barila*
Devario danio	*Deva*
Blackline rasbora	*Rasb*
Two-spot barb	*Pethia ticto*
Rosy Barb	*Pethi*
Spot fin swamp Barb	*Punti*

English Name	Zoological Name
Golden Carp	*Carassius*
Crucian Carp	*Carassius*
Grass Carp	*Ctenopharyngodon idella*
Scale Carp	*Cyprinuscarpio communis*
Mirror Carp	*Cyprinus carpio specularis*
Mirror Carp	*Cyprinus carpio nudus*
Gangetic latia	*Crossocheilus latius latius*

Minor Forest Produce: There is privilege/right of cutting of grass, collection/sale of flowers, fruits, medicinal herbs, honey and nirgals admitted for the right holders. Besides, they can extract slates, stones for their buildings and earth for plastering. The removal of bark from other suitable species is also permitted for tanning. Extraction of torch wood is permissible from stumps of all species.

Invasive species: Lantana camara is perhaps one of the most important invasive alien plant species (exotic weed) in forest ecosystems in Hamirpur Division. Other alien invasive plant species with significant impact on the forests of Hamirpur Division include *Parthenium hysterophorus*, Eupatorium (=Chromolaena) *adenophorum*, and *Ageratum conyzoides*. Whereas the incidence of Parthenium popularly known as 'Congress Grass' is largely restricted to degraded and newly opened drier sites along roads and forest fringes, the other three invasive alien species tend to occupy all possible vacant places even under tree canopy. Even as Eupatorium and Ageratum show a clear preference for moister locales and show gregarious occurrence, at many places these share the niche and grow in an intimate mix with Lantana.

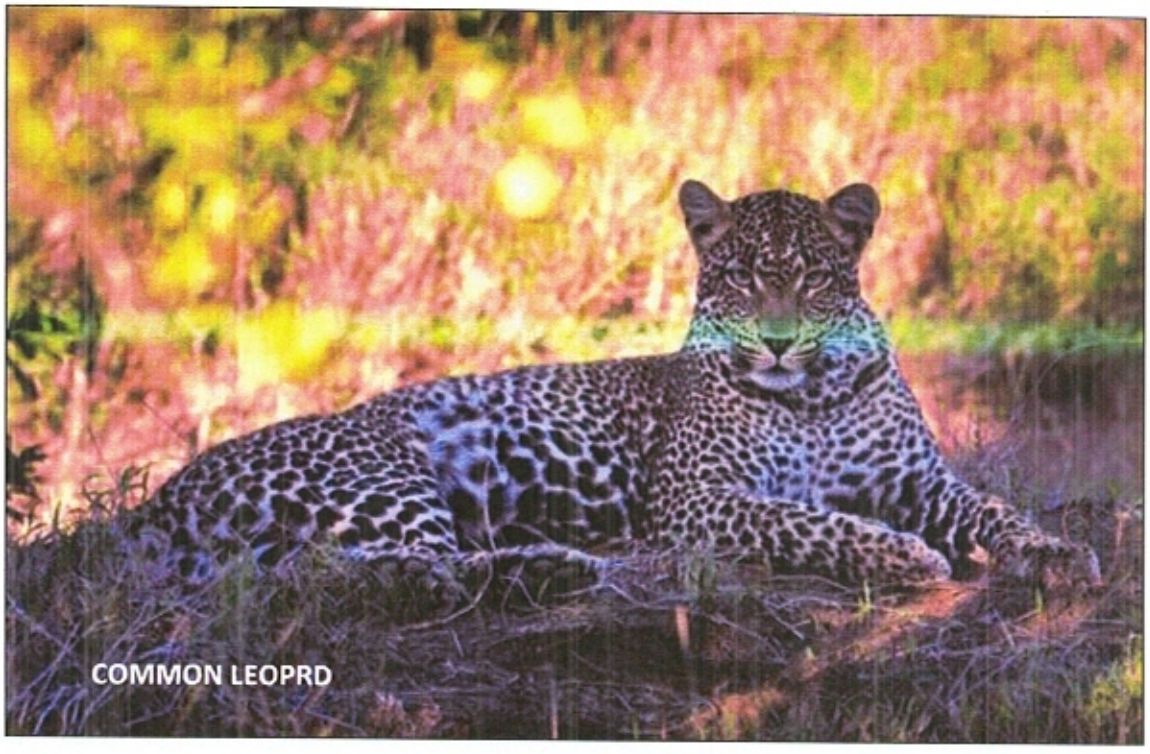
Fire occupies a prominent place among the causes of injury to Chil forests and even to the broad-leaved forests in the tract. Forest fires commonly occur during the dry periods and their intensity depends upon the degree of drought and prevailing temperatures and wind conditions, the type of forest and the amount of grass, fallen wood and other inflammable material present on the forest floor. There are two distinct fire seasons: the pre-monsoon (April to commencement of monsoons) and the post monsoon (October to commencement of winter rains). Of the two, the former is more important and the more damaging fires occur during this period. Broadly speaking, almost all the forest fires are caused by man either accidently, negligently or deliberately. To get the flush of tender grass, the local people burn the grass of Ghasnis and the fire usually spread over to the adjoining forests. It causes damage to the regeneration, sapling and even to the trees. Fire also causes the replacement of higher forest types by lower ones and also encourages the spreading of invasive weeds such as Lantana camera.

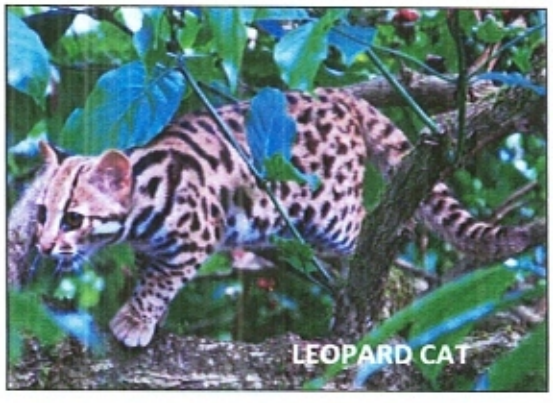
Grazing: The rights to graze domestic and agricultural cattle have been admitted in forests. The population of cattle has also increased manifold in which most of the cattle are unproductive. This further caused the deterioration of these forests. Besides it, the migratory cattle also have adverse impact on the condition of these forests.

Extent of biotic pressure of villages on forest resource: The forests in the project

area are under heavy biotic pressure. The local people depend on these forests for fuel wood, small timber, construction timbers and several NTFP items. Similarly the cattle populations of the area depend solely on grazing. Stall feeding is not practiced in the area. Besides these pressures, Forest fire occurs repeatedly every year which destroys the humus content of the soil and also damages the regeneration.

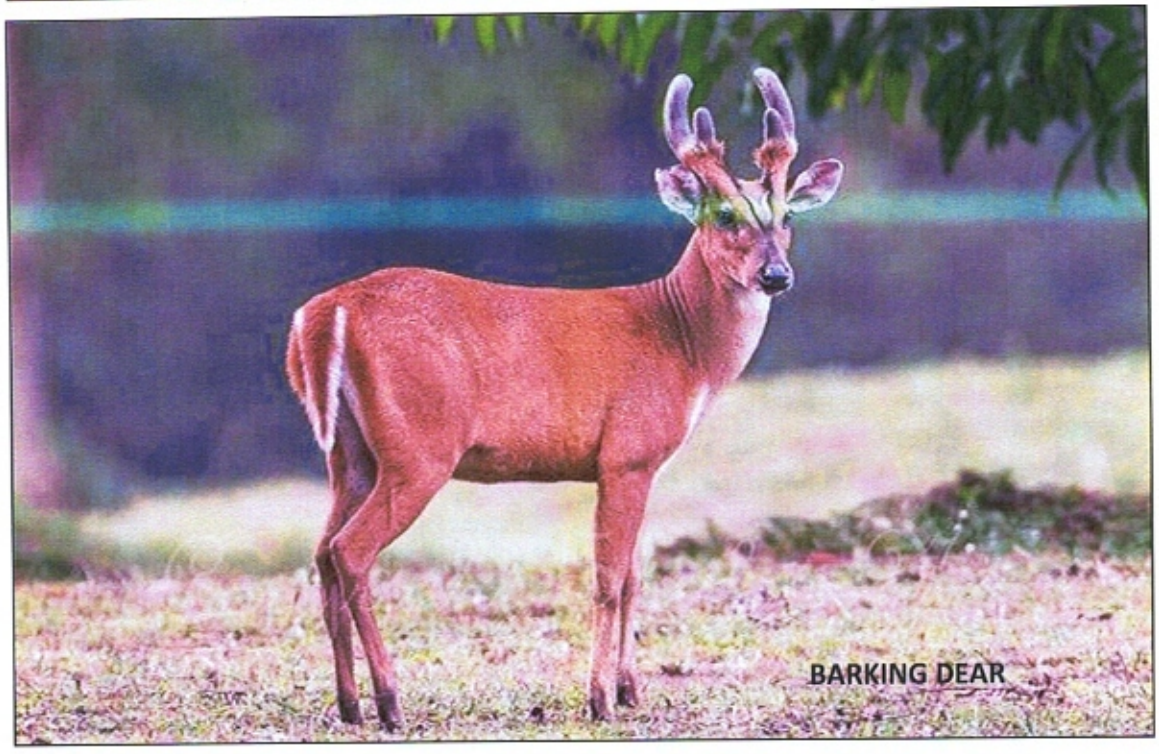
MAMMALS OF HAMIRPUR

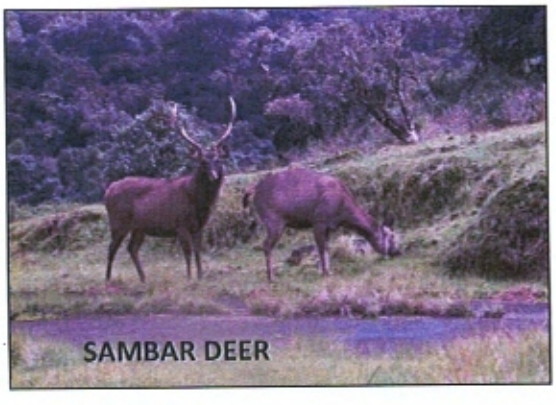




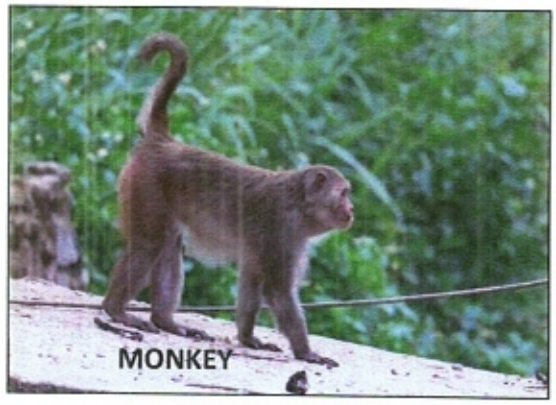

JACKAL


WILD BOAR


BARKING DEAR


SAMBAR DEER


GORAL


MONKEY


NEELGAI


COMMON MONGOOSE


INDIAN PORCUPINE

AMPHIBIANS OF PROJECT AREA

REPTILES OF PROJECT AREA


BANDED KUKRI SNAKE

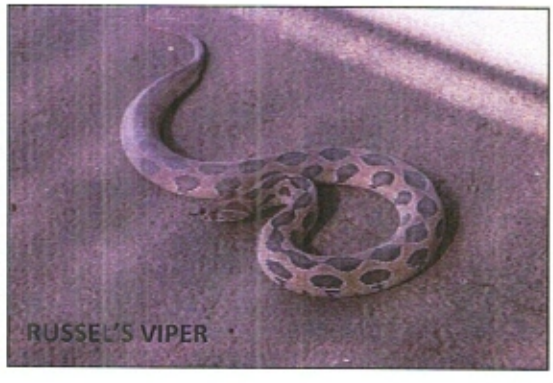

BLACK COBRA


CHECKERED_KEELBACK SNAKE


HIMALAYAN PIT VIPER


HIMALAYAN TRINKET


INDIAN RAT SNAKE


RUSSEL'S VIPER


BUFF_STRIPED_KEELBACK SNAKE

CHAPTER-4 PROTECTED AREA NETWORK IN HP

4.1 PROTECTED AREA NETWORK

The state has a widely spread Protected Area Network of nearly 15% of the geographical area comprising of 26 Wildlife Sanctuaries together with 5 National Parks and 3 Conservation Reserves which serve as harbor for the states' biodiversity which includes a rich assemblage of flora and fauna

The objectives behind establishing protected areas are to conserve nature and natural ecosystems; safeguarding iconic landscapes; maintaining geological diversity and providing resources for recreation and tourism. The Protected areas of the state are extremely rich in Himalayan wildlife. Rare mammals include Musk deer, Asiatic Ibex, Himalayan Tahr, Himalayan Serow, Himalayan Goral, Brown bear, Black bear and Snow Leopard. The avifauna includes rare pheasants such as Western Tragopan and Cheer pheasants. The State bird Western Tragopan is widely distributed in many high-altitude protected areas like Daranghati Wildlife Sanctuary and Great Himalayan National Park.

Details of Protected Area Network

Name of Protected Area (PA)	Area in Sq. km	Name of District
National Parks (NP)		
Great Himalayan National Park	754.4	Kullu
Inderkilla National Park	104	Kullu
Khirganga National Park	705	Kullu
Pin Valley National Park	675	Lahaul & Spiti
Simbalbara National Park	27.88	Sirmour
Total Area under NP	**2266.28**	
Wildlife Sanctuaries (WLS)		
Bandli Wildlife Sanctuary	32	Mandi
Chail Wildlife Sanctuary	16	Solan
Chandratal Wildlife Sanctuary	38.56	Lahaul & Spiti
Churdhar Wildlife Sanctuary	55.52	Sirmour
Daranghati Wildlife Sanctuary	171.5	Shimla
Dhauladhar Wildlife Sanctuary	982.26	Kangra
Gamgul Siyabehi Wildlife Sanctuary	108.4	Chamba
Kais Wildlife Sanctuary	12.61	Kullu
Kalatop-Khajjiar Wildlife Sanctuary	17.17	Chamba
Kanawar Wildlife Sanctuary	107.29	Kullu
Khokhan Wildlife Sanctuary	14.94	Kullu
Kibber Wildlife Sanctuary	2220.12	Lahaul & Spiti

Name of Protected Area (PA)	Area in Sq. km	Name of District
Kugti Wildlife Sanctuary	405.49	Chamba
Lippa Asrang Wildlife Sanctuary	31	Kinnaur
Majathal Wildlife Sanctuary	30.86	Solan
Manali Wildlife Sanctuary	29	Kullu
Nargu Wildlife Sanctuary	132.7	Mandi
Pong Dam Lake Wildlife Sanctuary	207.59	Kangra
Rakchham Chitkul Wildlife Sanctuary	304	Kinnaur
Renuka Wildlife Sanctuary	4	Sirmour
Rupi Bhaba Wildlife Sanctuary	503	Kinnaur
Sechu Tuan Nallah Wildlife Sanctuary	309.29	Chamba
Shikari Devi Wildlife Sanctuary	29	Mandi
Shimla Water Catchment Wildlife Sanctuary	10	Shimla
Talra Wildtife Sanctuary	46.48	Shimla
Tundah Wildlife Sanctuary	64	Chamba
Total Area under WLS	**5883.38**	
Conservation Reserves (CR)		
Darlaghat Conservation Reserve	11.33	Solan
Naina Devi Conservation Reserve	112.47	Bilaspur
Shilli Conservation Reserve	2.79	Solan
Total Area under CR	126.59	
Total Area under PA Network	**8276.25**	
% of Total Geographical Area i.e. 55673 sq kms		

4.2 PROTECTED AREAS IN THE ADJOINING AREA

Project area has an adjoining Wildlife Sanctuary i.e. Pong Dam Lake WLS and its Eco-sensitive Zone. The Flora and Fauna of these areas is discussed in succeeding paragraphs

4.2.1 Pong Dam Lake Wildlife Sanctuary

The Pong Wetland which lies between Latitude 31° 80 to 32° 7'26" and Longitudes 75° 8 to 76° 25 is a man made wetland. It is one of the highest earth core gravel shell dam in India, impounded across the River Beas in Kangra District of Himachal Pradesh. Pong reservoir now called Maharana Partap Sagar came into existence with the construction of Earthen Management Dam at place "Pong" across the river Beas which was completed during the year 1975 1976 It comprises the total geographical area of 207 sq. km mainly upto 1410 ft. mean sea level falling in Nurpur and Dehra Forest divisions. Its Total catchments area of 12562 sq km is lying in Kangra, Mandi and Kullu districts with Himalayas in the back ground and Shiwalik foothills in forefront.

Statement of Significance: This is the first major wetland which potentially offers a transitory wintering ground for the migratory birds such as Bar Headed Geese, Ruddy Shell Duck, Pintails, Coots, Pochards, Gulls, Red Necked Grebes, Cormorants, Mallards etc. coming from the trans Himalayan zone in the winter season when the wetlands in the Europe and North and Central Asia become frozen due to onset of winters and there is great scarcity of food for these birds. Thus, the flocks of migratory birds fly miles together to Pong Lake to spend winter in more congenial climatic conditions from October to March every year. These birds breed in their native land during succeeding summers.

Geography and Terrain: The area surrounding the Pong Reservoir consists of the upper, middle and the lower shiwalik formation which are highly susceptible to erosion. The Kangra Valley has been divided into the 10 major geomorphic zones from Dhauladhar ranges in the north to upper Shivalik ranges in the south. The Catchments of Pong lake sanctuary varies from flat to the precipitous slopes. The draw down area of the fringe is flat and the Dhauladhar mountains are precipitous slopes and hence very difficult to climb. The middle part i.e. Shivalik hills are quite undulating, makes the terrain difficult but approachable and accessible. This area is covered with network of the roads.

Climate: The climate of the Pong wetland is sub-tropical but some-times prolonged droughts and dryness occurs.

Rainfall: The Pong wet land area falls in the semi-arid region. Thus, it experiences a very scanty rainfall. More than 50% of the total annual rainfall occurs during the months of July and August. The area receives high intensity rainfall in Pong catchment. In general southern parts of the catchment receive relatively less rainfall as compared to the other parts of the catchment area.

Temperature: Due to porous texture and gravely strata there are wide variations in the temperature. It ranges between 4° C during winter to 44.5° C during the summers. The surface water temperature of the reservoir varies between 20° C to 40° C.

Wind: The wind in the area of Pong reservoir is of utmost importance in the forenoon of winter season the wind movements are generally from east to the western side and in the afternoon, its movements have been observed from western to east northern direction The Pong reservoir being the huge water body experiences the rising waves depending upon the wind velocity Sometimes, wind velocity goes upto 100 nautical miles per hour

Water Resources: The Dhauladhar Mountains covered with the snow give rise to the perennial stream viz Neugal, Uhl, Lambadug, Baner, Brahl, Manjhi, Dehar. Naker, Gaj khads Buhal Khad has come up at the foot hill

Fauna

- **Mammals:** 24 species of Mammals have been recorded in Pong Common species are as Common Leopard, Sambher Wild Boar Porcupine ,Mongoose-Small Indian Mongoose

Common Indian Mongoose, Jungle Cat, Civets -Common Palm civet, Small Indian civet, Blue Bull Indian Smooth Otter Jackals Monkeys and Langoors, Three Striped Squirrels, Rodents - many species of rats, mice are recorded.

- **Amphibians and Reptiles:** Frogs- 4 Species, Snakes-18 species, Lizards-4 Species. Turtles- 4 Species Venomou Snakes-1. Spectacled Cobra,2. Common Krait, 3.Common Indian Krait, 4. Russel's Viper, 5. Saw Scaled Viper.

- **Fishes:** A variety of fish such as Mehasheer, Katla, Rahoo, Mirgal, Malli, Singhara, Carps, Mirror Carps etc. are found in the lake and its tributaries. A total of 27 fish species belonging to five families

- **Birds:** The Pong wetland harbors more than 420 species of the birds belonging to about 56 bird families out of 77 families of the birds recorded in India Avifauna includes the resident birds of jangle fowls, peafowl, Grey partridges, Black Partridges etc. Among the waterfowls main species are Bar headed geese, Pintails, common pochards, coots, Grebes, Cormorants, Herons, Storks, Ruddy shellduck, common Teal, Shovellers, Moorhen, Stints. Lapwing, Plovers, Shank, Snipe, Gull, Terns, Kingfishers, Kites, Mallards, Gadwall, Egrets, Marsh Harriers etc . An illustrated book "WILD WINGS " on the birds of Pong as well as on the fauna of the area including butterflies has been brought out by Sh. Devindra Dhadwal, HPFS Officer who has spent over 5 years in the Pong area documenting and researching local and migratory birds of the Pong wetland.

Following migratory bird species visit Pong Dam lake WLS:

S. N.	Common Name	S. N.	Common Name
1.	Bar-headed Goose	2.	Wire-tailed Swallow
3.	Common Coot	4.	Grey Heron
5.	Northern Pintail	6.	Common Sandpiper
7.	Common Pochard	8.	Red-rumped Swallow
9.	Tufted Pochard	10.	Rosy Pipit
11.	Common (Green-winged) Teal	12.	Small Pratincole
13.	Little Cormorant	14.	Large (Great) Egret
15.	Great Cormorant	16.	White Browed Wagtail
17.	Northern Shoveler	18.	White-breasted Kingfisher
19.	Oriental Sky Lark	20.	Yellow Wagtail
21.	Brahminy (Ruddy) Shelduck	22.	Curlew Sandpiper
23.	Eurasian Wigeon	24.	Black-tailed Godwit
25.	Gadwall	26.	Marsh Sandpiper
27.	River Tern	28.	Indian Shag
29.	Black-headed Gull	30.	Common Redshank
31.	Common Swallow	32.	Common Greenshank
33.	Sand Lark	34.	Common Shelduck
35.	Mallard	36.	Black Ibis

S. N.	Common Name	S. N.	Common Name
37.	Greylag Goose	38.	Slender-amendmented Gull
39.	Little Grebe	40.	Tawny Pipit
41.	Little ringed plover	42.	Median (Intermediate) Egret
43.	Purple Swamphen	44.	White-breasted Waterhen
45.	Great Crested Grebe	46.	Pied Kingfisher
47.	Spot-amendmented Duck	48.	Pied Avocet
49.	Moorhen	50.	Common Snipe
51.	White Wagtail	52.	Common Merganser
53.	Eurasian Sky lark	54.	Indian Pond Heron
55.	Unidentified geese	56.	Purple Heron
57.	Barn Swallow	58.	Dunlin
59.	Little Egret	60.	Gull-amendmented Tern
61.	Unidentified ducks	62.	Eurasian (White)
63.	Temminck's Stint	64.	Eurasian Thick-knee
65.	Water Pipit	66.	Sarus Crane
67.	Cattle Egret	68.	Osprey
69.	Pallas's Gull	70.	Yellow-legged Gull
71.	River Lapwing	72.	Garganey
73.	Brown-headed Gull	74.	Spotted Greenshank
75.	Red-crested Pochard	76.	Ruff
77.	Red-wattled Lapwing	78.	Long-amendmented Pipit
79.	Greater White Fronted Goose	80.	Wood Sandpiper
81.	Little Tern	82.	Little Gull
83.	Northern Lapwing	84.	Whiskered Tern
85.	Crested Lark	86.	Black-bellied Tern
87.	Paddyfield Pipit	88.	White-necked Stork
89.	Little Stint	90.	Falcated Duck
91.	Black-winged Stilt	92.	Ferruginous Pochard
93.	Unidentified gulls	94.	Pheasant-tailed Jacana
95.	Kentish Plover	96.	White-tailed Lapwing
97.	Citrine Wagtail	98.	Spotted Redshank
99.	Great Thick-knee	100.	Greater Painted Snipe

4.2.2 Vulture Conservation

It was over two decades ago that the Wildlife Department had embarked on the project to preserve vultures, mentioned as one of the critically endangered species in the International Union for Conservation of Nature (IUCN) Red List. The number of vultures, estimated to be merely 45 in 2004, has risen considerably over the years, as feeding station has been set up in Nagrota Suriyan in Pong Dam Lake WLS. The creation of the feeding station has given an impetus to the conservation of vultures in the area. The population estimation of vultures in

Kangra and its adjoining areas has not been undertaken but the annual count of their nests and fledglings indicated that their number has gone up considerably to over 400. The wildlife wing has adopted the strategy to protect natural habitats of vultures rather than undertake their in-situ breeding and conservation and adopted a different strategy where focus is on protecting their nesting and roosting sites.

4.2.3 Recreation and Tourism

The Pong Lake boasts incredible untapped potential for a range of activities, including bird watching, camping, water sports, trekking, dense forests, religious sites, heritage villages, and the conservation of rare and endangered species, ultimately driving tourism. This wetland possesses all the qualities sought after by children, students, authors, poets, saints, environmentalists, anglers, tourists, adventurers, and sports enthusiasts. It has the potential to become the world's best Birds Paradise and could generate substantial revenue for the Government of Himachal Pradesh.

The Pong Dam Lake bird sanctuary stands out as a marvelous creation of nature, being the largest man-made reservoir in northern India. The lake, adorned with a variety of chirping birds, resembles a splendid sea. The backdrop of the Dhauladhar range to the north, with its beautiful snow-covered mountains, enhances the overall appeal of the area. The Pong Lake presents extensive opportunities for promoting adventure tourism, including water sports like yachting, canoeing, surfing, water skiing, boat racing, and swimming. Four islands—Rancer, Karu, Rajeli, and Jatan-da-kawal hold significant tourism potential.

The diverse bird species that inhabit the area attract bird enthusiasts and environmentalists alike. Engaging in eco-tourism can provide alternative sources of income for the local communities. Overall, the Pong Lake has the potential to be a thriving hub for various recreational and conservation activities, contributing significantly to the region's economic growth.

BIRDS OF PONG DAM LAKE WILDLIFE SANCTUARY

BAR-HEADED GOOSE

BLACK HEADED GULL

BLACK-TAILED GODWIT

BLACK-WINGED STILT

BROWN HEADED GULL

CATTLE EGRET

COMMON COOT

COMMON GREENSHANK

COMMON POCHARD

COMMON SANDPIPER

COMMON SHELDUCK

EURASIAN SPOONBILL

BIRDS OF PONG DAM LAKE WILDLIFE SANCTUARY

FERRUGINOUS DUCK

GADWALL

GARGANEY

GREAT THICK-KNEE

GREATER PAINTED-SNIPE

GREY HERON

KENTISH PLOVER

LITTLE GULL

LITTLE GULL

BIRDS OF PONG DAM LAKE WILDLIFE SANCTUARY

NORTHERN LAPWING

NORTHERN PINTAILS

NORTHERN SHOVELER

OSPREY

PAINTED STORK

PALLAS'S GULL

PHEASANT-TAILED JACANA

PIED AVOCET

PURPLE HERON

RIVER LAPWING

RIVER TERN

RUDDY SHELDUCK

BIRDS OF PONG DAM LAKE WILDLIFE SANCTUARY

SAND LARK

SARUS CRANE

SMALL PRATINCOLE

TEMMINCK'S STINT

WHISKERED TERN

WHITE WAGTAIL

WHITE-BREASTED WATERHEN

WOOD SANDPIPER

WOOLLY-NECKED STORK

WHITE-THROATED KINGFISHER

PURPLE MOORHEN

PADDYFIELD PIPIT

4.2.4 Eco-Sensitive Zone of Pong Dam Lake Sanctuary

Government of India vide its notification dated 28-04-2022 in exercise of the powers conferred by sub-section (1) and clauses (v) and (xiv) of sub-section (2) and sub-section (4) of section 4 of the Environment (Protection) Act, 1986 (29 of 1986) (hereafter in this notification referred to as the Environment Act), read with sub-rule (4) of rule 5 of the Environment (Protection) Rules, 1986, the Central Government hereby notifies an area to an extent varying from 50 meters to 1.5 kilometres around the boundary of Pong Dam Wildlife Sanctuary, in the State of Himachal Pradesh as the Pong Dam Wildlife Sanctuary Eco-sensitive Zone (hereafter in this notification referred to as the Eco-sensitive Zone)Extent and boundaries of Eco-sensitive

The Eco-sensitive Zone shall be to the extent of 50 meters to 1.5 km around the boundary of Pong Dam Lake Wildlife Sanctuary with Eco-sensitive Zone area of 114.7 sq. km

List of activities prohibited or to be regulated within the Eco-sensitive Zone.- All activities in the Eco sensitive Zone shall be governed by the provisions of the Environment (Protection) Act, 1986 (29 of 1986) and the rules made there under. The list of activities as specified in the above mentioned act as follows:

Prohibited Activities

a) Commercial Mining, stone quarrying and crushing units.
b) Setting up of saw mills
c) Use or production of any hazardous substances
d) Setting up of industries causing water or air or soil or noise pollution
e) Establishment of new major thermal and hydro-electric projects
f) Protection of hill slopes and river banks
g) Commercial use of firewood
h) Use of plastic bags
i) Undertaking activities related to tourism like over-flying the aircraft, hot-air balloons
j) Setting up of brick kilns
k) Discharge of untreated effluents and solid waste in natural water bodies or land area

Regulated Activities

a) Establishment of hotels and resorts
b) Construction Activities
c) Trenching ground
d) Discharge of treated effluents and solid waste in natural water bodies or land area
e) Air and Vehicular Pollution
f) Noise pollution
g) Extraction of ground water
h) Felling of trees
i) Migratory grazers

j) Existing establishments
k) Insulation of electric lines
l) Widening and strengthening of existing roads and construction of new roads
m) Fencing of existing premises of hotels and lodges
n) Timber Distribution (TD) Rights
o) Collection of small Fodder
p) Muck Dumping
q) Drastic change of Agriculture system
r) Commercial use of Natural water Resource including Ground water Harvesting
s) Movement of vehicular traffic at night.
t) Introduction of exotic species
u) Sign Board and Hoardings

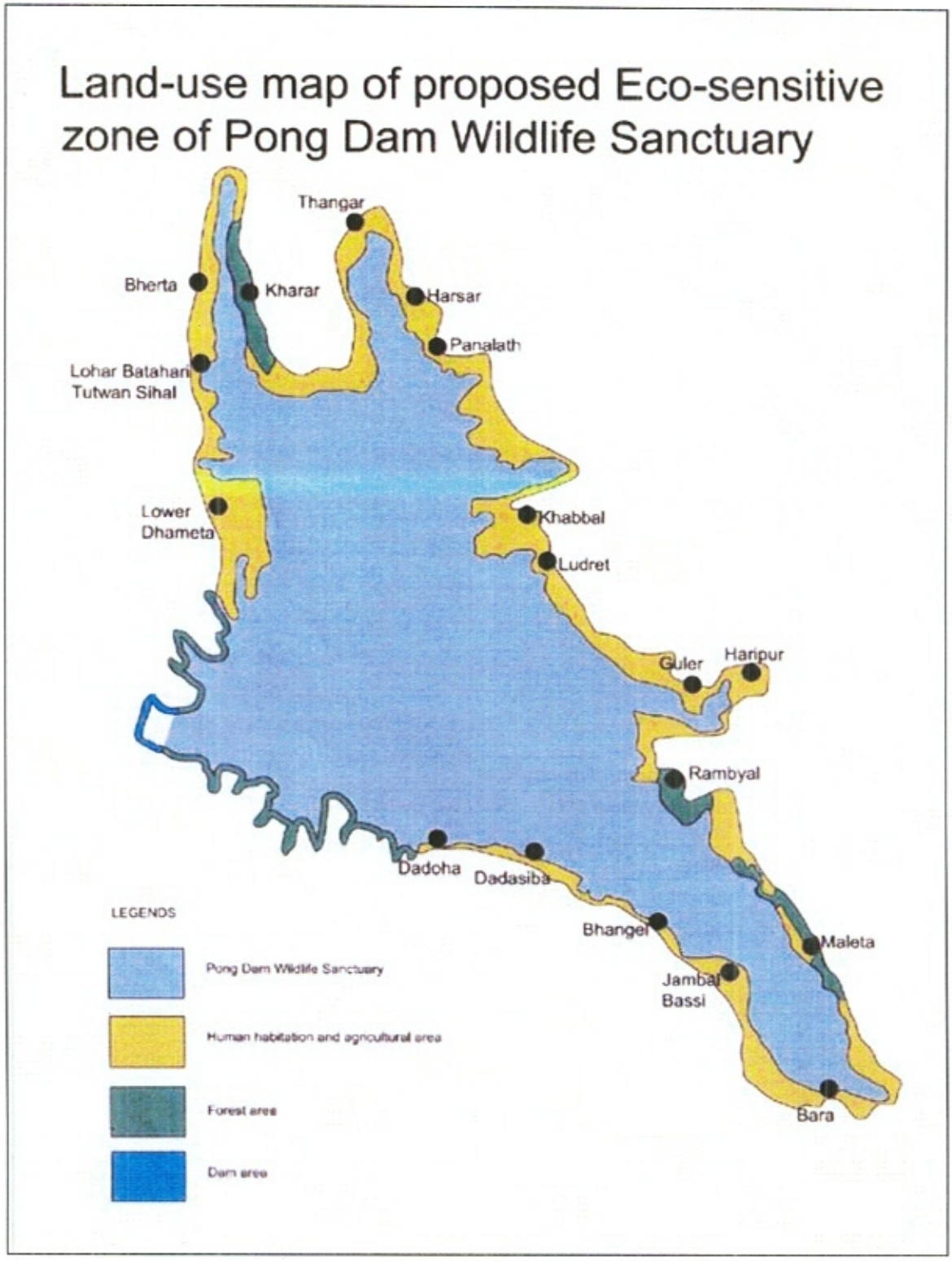
Promoted Activities

a) On-going agriculture and horticulture practices by local communities along with dairies, dairy farming, aquaculture and fisheries
b) Organic farming
c) Adoption of green technology for all activities
d) Small scale industries not causing pollution
e) Rain water harvesting
f) Cottage industries including village artisans
g) Use of renewable energy sources
h) Environmental awareness
i) Restoration of Degraded Land/ Forests/ Habitat.
j) Skill Development.
k) Use of eco-friendly transport.
l) Plantation of Horticulture and Herbals.
m) Agro-forestry

List of Villages Falling In Eco-Sensitive Zone of Pong Dam Lake Wildlife Sanctuary

S. N.	Name of Village	Area (hectares)
1	Badhela	40.95
2	Bajhera	278.56
4	Balgat Guralla	11.04
4	Balohal (lower)	14.20
5	Blohar Sukhnara	219.71
6	Banara	86.49
7	Bara	10.24
8	Barial	50.55
9	Bhanger	52.28
10	Bhatoli	24.56
11	Bherta	150.25

12	Bhial	47.00
14	Chabbar	50.40
14	Chatwal	22.44
15	Churunu Dhantu Balla	44.87
16	Dehra Bari Rajgarh	122.26
17	Dukhi Baglahar	88.08
18	Gadohal	40.19
19	Gheori	64.44
20	Guler	21.40
21	Hawal	47.21
22	Haripur	12.21
24	Harsar	48.24
24	Jagnoli	199.11
25	Jakhara(G. Panchayat)	244.50
26	Jallarian	22.20
27	Jambal Bassi	147.45
28	Jarot	124.26
29	Jawali	56.57
40	Jhounk Ratial Chabbuan	128.67
41	Khabbal	175.55
42	Kharar	219.06
44	Kather	49.54
44	Lohara Batahri Tutwan Sihal	179.64
45	Lower Dhameta,Man Samkad, Hadwal, Badi Barla	246.00
46	Ludret	47.95
47	Maheba	17.10
48	Maleta	12.40
49	Nandpur Ranial	101.66
40	Nangal	45.79
41	Panalath	50.68
42	Papahan Guglara	401.90
44	Ranital	2.85
44	Rod Dibber	46.44
45	Samked	187.76


Land-use map of proposed Eco-sensitive zone of Pong Dam Wildlife Sanctuary
Thangar
Bherta
Kharar
Harsar
Panalath
Lohar Batahan
Tutwan Sihal
Lower Dhameta
Khabbal
Ludret
Guler
Haripur
Rambyal
Dadoha
Dadasiba
Bhangel
Maleta
Jamba
Bassi
Bara
LEGENDS
Pong Dam Wildlife Sanctuary
Human habitation and agricultural area
Forest area
Dam area

4.2.5 Dhauladhar Nature Park-Gopalpur

Brief History: Himachal Pradesh has been bestowed by Nature with diverse climatic conditions. The climate and terrain ranges from sub-tropical to alpine and cold desert conditions which inhabits a wide spectrum of flora and fauna. To enable the public and visitors to enjoy & know about Nature and Wildlife, Dhauladhar Nature Park was inaugurated on 23.4.1992.

Objective:

- To create awareness among visitors about Nature and Wildlife
- Conservation & breeding of wildlife and related research
- To acquire knowledge of wildlife through research, education and study of animal behavior

Strategy

- Display of wild animals
- Display of wildlife pictures, models etc.
- Distribution of stickers, cards, brochures on wildlife & nature
- Publicity through films on wildlife and other audio-visual aids
- Arrangement of ecological and nature awareness tours for school children & Eco-groups

Location: Dhauladhar Nature Park is located at Gopalpur in District Kangra, H.P. at a distance of 20 km. from Dharamshala, 13 km. from Palampur and 6 km. from the famous Chamunda Devi Temple on Dharamshala – Palampur Road.

Attractions: At present Zoo houses 181 animals of 20 different species. These 20 species includes 9 mammalian species, 2 reptile species, 5 species of pheasants and 4 species of birds.

CHAPTER-5 ECOLOGICAL IMPACTS OF ROAD PROJECTS

5.1 HUMAN – WILDLIFE CONFLICT

Human-wildlife conflict is a major issue in this state which poses numerous challenges ahead for its better management and effective mitigation. Roads may disrupt the normal home ranges of wild animals, forcing them to explore new areas for foraging where they may come into conflict with human beings. Human settlement or cultivation of land along road corridors may also increase human-wildlife conflict and, occasionally, lead to mortality of wild animals. In case of already fragmented habitats, wild animals are known to use particular corridors to move between various patches. If roads obstruct these corridors, the animals may stray into human localities and feed on crops and livestock, increasing conflict. Road corridors may provide access to previously inaccessible areas, increasing the pressures associated with human presence. Roads may induce ribbon development along their length; cases of encroachment on either within or on the fringes of forests are common. Road corridors may also increase human access for poaching of wild plants and animals, and ilegal removal of timber, firewood and other non-timber forest products (NTFPs). Increased access and human pressures are particularly likely during construction and maintenance of road when construction workers enter and camp within forests. Roads are also misused by the mafias in certain areas to smuggle timber and wildlife from forests.

In Himachal Pradesh, most of the cases of man animal conflict pertain to leopard killing livestock both at the animal sheds and in open. Habitat degradation, shrinking space and shortage of food often forces the wild animals towards populated areas and it has resulted into the loss of the lives of domestic animal; as well as property local people. Due compensation is granted to the grieved family. The cases of killing the domestic animals and cattle are reported every year.

In recent years, a few cases of monkey bite have also been reported. As in other part of the state, monkeys are attracted to towns and other habitation for easy availability of food which is also catered to them by piles of garbage lying in open. To address this issue, proper management of garbage needs to be done in addition to planting of wild fruit plants in the area.

Agriculture is the major source of livelihood for the majority of rural population in mountainous regions of India where the farming community generally practices mixed farming to meet their multifarious demands. With the advancement of agricultural technology and extension services, the production and income generating potential of traditional farming systems have improved through the diversification and intensification. Despite of farmers' efforts and public safety nets, farming still remains a risky venture. Since the inhabited villages and farming lands are surrounded by forests, rivulets and gorges which are natural hideouts for wild animals (monkey, sambar, wild boar, nilgai, etc.) and the fragmentation of forest lands has led to the constant increase in the human- animal conflict (Agriculture is the major source of livelihood for the majority of rural population in

mountainous regions of India where the farming community generally practices mixed farming to meet their multifarious demands. With the advancement of agricultural technology and extension services, the production and income generating potential of traditional farming systems have improved through the diversification and intensification. Despite of farmers' efforts and public safety nets, farming still remains a risky venture. Since the inhabited villages and farming lands are surrounded by forests, rivulets and gorges which are natural hideouts for wild animals (monkey, sambar , wild boar, nilgai, etc.) and the fragmentation of forest lands has led to the constant increase in the human- animal conflict (increase of the population of wild boar has substantially increased the crop damage in the state. Since, wild boar observed to be the most problematic animal for the farmers in regard to crop damage.

Agriculture and horticulture are the major source of livelihood for the majority of rural population in mountainous regions of Himachal Pradesh where the farming community generally practices mixed farming to meet their multifarious demands. With the advancement of technology and extension services, the production and income generating potential of traditional farming systems have improved through the diversification and intensification. Despite of farmers' efforts, farming still remains a risky venture. Since the inhabited villages and farming lands are surrounded by forests, rivulets and gorges are natural hideouts for wild animals (monkey, sambar, wild boar, neelgai, porcupine, etc.) that very often raid the farmlands resulting in to major crop damage.

5.2 IMPACTS ON ECOLOGY

5.2.1 Habitat Modification

- Fragmentation of landscapes that include wildlife habitats
- Split up habitat by creating physical and psychological barriers for wildlife
- In-migration of people who further alter and often eliminate wildlife habitat
- New roads cause additional loss and habitat changes
- Changes in the biophysical conditions of a habitat i.e. increased temperature, noise, or air pollution
- Changes in productivity, under-storey species, species diversity, and micro-climatic conditions
- Cutting of canopy trees leads to complete floristic transition from shade-loving species to pioneering and sun-tolerant plants
- Division of large habitat areas into smaller patches that becomes isolated from each other

5.2.2 Destruction/ Degradation of natural habitat of Wildlife

- Destruction of topography/ physical features/ landscape
- Erosion and loss of productive silty clayey with gravel, silty clayey sandy with gravel
- Disruption of surface water run-off system, groundwater and contamination of water bodies

- Spread of dust, debris and waste in air, water and land
- Improved access increases population density, which further increases fire risk
- New roads become grounds for the establishment of exploitative industries, often leading to the fragmentation and destruction of critical wildlife habitats

5.2.3 Impact on Wildlife due to traffic movement

- Wildlife mortality/Injury (kill/accident)
- Noise-induced physiological and behavioural changes
- Barrier to wildlife movement
- Impacts of headlight glare on wildlife

5.2.4 Road Construction

- Landslides and soil erosion
- Adversely affect local hydrology
- Cutting of vegetation resulting in weed proliferation and suppression of regeneration
- Disturbance related to construction and maintenance
- Increased risk of fires, deliberate and due to desiccation
- Pollution, sedimentation, and changed discharge regimes into water bodies

5.2.5 Barrier Effect of Roads

- Discontinuity of movement of arboreal species of mammals (macaques, squirrels, flying foxes)
- Ecological barrier to movement of understorey bird species
- Physical barrier for movement of small burrowing mammals
- Inhibition of movements due to human disturbances
- Physical barrier for reptiles, amphibians and small burrowing mammals
- Collisions with vehicles, leading to injury and mortality
- Temporary blinding and risk of collision

5.2.6 Human-Wildlife Conflict

- Forest destruction
- Habitat intrusion
- Ecological destabilization
- Contamination of flora and fauna
- Transmission of diseases
- Increased Human Pressure due to easy accessibility
- More the access roads, greater is the management problem
- Increased visitation results in hunting and poaching

Summary of road construction activities and Impacts on ecology and wild life

Project activities	Ecological impacts	Impacts on wildlife
Design Stage		
• Selection of route alignment and design, including road cross-section, vertical alignment, culvert and underpass design and enhancements • Land consumption	• Loss of wildlife and habitat and /or community welfare • System of tradeoffs often invoked	• Tradeoffs decided on in the absence of up-to-date technical information about the wildlife resource(s) to be traded undermines conservation efforts
Construction Stage		
• Clearing of vegetation • Rehabilitation and resettlement of property, resources, and local people • Establishment of associated work, supporting infrastructure and construction camps • Resource harvesting by project labourers (fuelwood and food)	***Changes in vegetation and ecology*** • Reduced plant cover • Lowered plant diversity Adverse changes in species composition • Disruption of succession and nutrient cycling. Invasion by exotic species • Increased pressure on natural resources due to resource competition and exploitation • Changes in faunal number and diversity	***Habitat Loss, Fragmentation*** • Habitat loss • Habitat disruption or fragmentation • Habitat modification Decline in species sensitive to sedimentation • Decline in prosperity of flow-dependent ecosystems
• Water impoundment • River and stream diversion and channelization • Reclamation of pools, ponds, and other wetlands • Extraction of water for construction work • Transportation of raw materials, pre-assembled components, machinery and labour to project site • Mining, quarrying or dredging for obtaining raw material	***Water quality and hydrology*** • Modification of surface and ground water flows • Shifts in water balance due to extraction of water for construction *Soil characteristics and productivity* • Compaction of soil • Loss of productive soil • Decline in porosity and permeability to water • Decline in productivity	***Barrier effect*** • Obstruction of daily and migratory movements • Under-utilization of habitat and resource competition ***Induced threats*** • Increased accessibility to pristine areas • Increase in hunting and poaching incidences • Increase in probability of induced fire

Project activities	Ecological impacts	Impacts on wildlife
• Excavation and filling • Blasting, rock cutting, drilling and or tunneling • Road surfacing and construction of underpasses and culverts • Restoration of exposed areas through planting and land stabilization • Transportation of waste generated during construction • Management of waste material at dumping sites	• Destabilization of slopes and erosion • Mass movements of soil and rock in mountainous terrain • Generation of tipped material due to imbalance between volumes of earth cut and filled • Displacement of soil on dunes in desert ecosystems • Loss of wet soils in riparian and marshy lands during construction of channels and under passes	• Increase in human-wildlife conflicts • Increase in resource exploitation
Operation Stage		
• Movement of vehicles • Transportation of goods, and finished and raw industrial products • Road maintenance	• Wildlife population depletion • Headlight glare *Air quality* • Pollution due to emission of NO_X, SO_X, PM10, CO and HC • Pollution due to generation of particulates due to combustion of fuels, re-entrainment of road dust and material transformation *Noise pollution* • Movement of traffic and the sound of horns and signals at crossing induce significant noise pollution	***Safety hazards and health impacts*** • Vehicle-wildlife collisions • Decline in wildlife health due to air, water and noise pollution • Competition for dwindling resources *Long-term impacts on population/biodiversity* • Increase in in-breeding and decline in size and population • Reduction of genetic diversity • Local extinction of species in isolated habitats • Changes in animal behavior

CHAPTER-6 WILDLIFE MANAGEMENT PLAN

6.1 OBJECTIVES OF THE PLAN

Mitigation should be focused on achieving explicit conservation goals within clear timeframes, to be integrated in the broader ***'green infrastructure development'*** approach. These goals should be informed by the significance of affected biodiversity, priority of conservation goals and the values of natural systems to the affected communities.

Use of the SMART approach also is recommended to evaluate the likely effectiveness of alternative mitigation strategies or measures: 'SMART' refers to measures that are specific, measurable, achievable, realistic and timely.

An environmentally acceptable road project should budget for the mitigation of road induced impacts and, as a last resort, for compensation of unavoidable losses. Mitigative measures should not be restricted to the road corridor to avoid or reduce ecological disturbances by means of technological and ecological improvements. Compensation measures have to replace losses and degradation of natural systems and affected communities by restoring lost wilderness values or creating, replacing, at different locations, features damaged by the project. Mitigation should be focused on achieving explicit conservation goals within clear timeframes, to be integrated in the broader 'green infrastructure development' approach.

The **objective of this Plan** is to find solutions for mitigating impacts on wildlife in the road project and adjoining areas. During the construction work the disturbance of the habitat will be more and so the impact will be greater. Regular contact with the Forest Department will be maintained to monitor wildlife movement when the work starts. The mitigation work will start simultaneously with as the construction work starts on priority based in the forest area diverted.

6.2 STRATEGIES TO BE FOLLOWED

- Avoid or prevent adverse impacts as far as possible by considering spatial or design alternatives. Where impacts are highly significant or could lead to loss of irreplaceable biodiversity or conservation assets, avoidance is the only real option if development Is to be sustainable
- Minimise or reduce adverse impacts to 'as low as practicable' levels
- Restore areas damaged by construction Compensate for adverse residual impacts which are unavoidable and cannot be reduced further
- Specific budget, manpower, measuring parameters for the proposed mitigation measures with the targeted and desired output
- Strengthening the infra-structure within Forest Department to take up the measures in an effective way

- Continuous monitoring of the implementation strategies
- Reframing of strategies in case planned scenario alters
- Focus on the most sensitive and extinction-prone taxa and habitats
- Sustain prey populations and other elements of the ecosystem that support conservation of species having high significance
- Stringent measures in areas representing specialised habitats of protected species, that are crucial to effective conservation in the long term

6.3 ANIMAL PASSAGE

'Smart' or 'green' linear infrastructure must aim to reduce mortality and make linear structures conducive to safe movement of animals across the landscape. The design and number of structures to improve the permeability of road must facilitate animal movement and maintain habitat connectivity across the landscape.

The siting and design of animal passages must consider the specific requirements and behaviour of target species; where communities of animals may be affected, passages will need to be designed and managed to accommodate multiple species with different needs. The siting and design must also consider site-specific variables such as vegetation, topography and hydrology. The more naturally a wildlife passage fits into the surrounding area, the more likely it will be that animals will use it. In the hilly terrain such as in the instant project, most of the bridges (small & large) and culverts will act as underpasses for wildlife passage.

6.4 MITIGATION MEASURES TO TAKEN UP BY PROJECT AUTHORITY (NHAI)

There are several types of crossing structures being proposed by the NHAI which will be used to mitigate impacts of highway, if any, animal movement and safety, each with different levels of effectiveness and cost. These structures include bridge, flyover, viaduct, box culvert, pipe culvert, animal underpass etc. A total 89 structures have been proposed along the highway, which includes **22 animal underpasses**. Design length of the highway is 17.120 Km.

Therefore, **in every km of the highway, more than 5 structures have been proposed for animal crossing.** Out of 89 structures, 39 structures have been proposed in the forest area.

Summary of Structures Proposed along the Highway

Description	No. Structures
Animal Underpass	**22**
Major Bridge & Viaduct	3
Minor Bridge	5

Description	No. Structures
Vehicular overpass	1
Box culvert	58
Total	**89**

Chainage Wise details of Structures Proposed along the Highway

Sl. No.	Chainage	Description	Type of Land	Length (m) /Size (m)	Latitude	Longitude
1.	121+360	Box Culvert	Non-Forest	2 x 2	31.65507	76.54768
2.	121+582	Minor bridge	Non-Forest	33	31.65667	76.54628
3.	121+860	Box Culvert	Non-Forest	2 x 2	31.65827	76.54411
4.	122+709	Box Culvert	Non-Forest	2 x 2	31.66207	76.53672
5.	122+813	Box Culvert	Non-Forest	2 x 2	31.66277	76.53599
6.	123+012	Box Culvert	Non-Forest	3 x 3	31.66411	76.53459
7.	123+146	**Animal Underpass**	**Non-Forest**	4 x 4	31.66485	76.53348
8.	123+358	Box Culvert	Non-Forest	2 x 2	31.66502	76.53130
9.	123+547	Box Culvert	Non-Forest	2 x 2	31.66446	76.52942
10.	123+837	Box Culvert	Non-Forest	2 x 2	31.66358	76.52654
11.	123+947	Box Culvert	Non-Forest	2 x 2	31.66324	76.52545
12.	123+987	Box Culvert	Non-Forest	2 x 2	31.66312	76.52505
13.	124+193	Box Culvert	Non-Forest	2 x 2	31.66242	76.52304
14.	124+350	Minor Bridge	Non-Forest	17	31.66152	76.52180
15.	124+724	Major Bridge cum Viaduct	Forest	219	31.65949	76.51880
16.	125+122	**Animal Underpass**	**Forest**	4 x 4	31.65956	76.51472
17.	125+207	Box Culvert	Forest	2 x 2	31.65979	76.51387
18.	125+567	**Animal Underpass**	**Forest**	4X4	31.66161	76.51084
19.	125+600	**Animal Underpass**	**Forest**	4X4	31.66184	76.51062
20.	125+907	Box Culvert	Forest	2 x 2	31.66402	76.50862
21.	125+998	Box Culvert	Forest	2 x 2	31.66458	76.50792
22.	126+272	Box Culvert	Forest	2 x 2	31.66635	76.50591
23.	126+327	Box Culvert	Forest	2 x 2	31.66672	76.50553
24.	126+432	Box Culvert	Forest	2 x 2	31.66738	76.50473
25.	126+477	Box Culvert	Forest	2 x 2	31.66762	76.50435
26.	126+536	**Animal Underpass**	**Forest**	4 x 4	31.66791	76.50383
27.	126+807	Box Culvert	Non-Forest	2 x 2	31.66906	76.50131
28.	126+983	Vehicular overpass	Forest	12 x 5.5	31.66962	76.49957

Sl. No.	Chainage	Description	Type of Land	Length (m) /Size (m)	Latitude	Longitude
29.	127+077	**Animal Underpass**	**Forest**	4 x 3	31.66983	76.49861
30.	127+272	**Animal Underpass**	**Forest**	5 x 5	31.67011	76.49658
31.	127+398	Box Culvert	Non-Forest	2 x 2	31.67011	76.49525
32.	127+437	Box Culvert	Non-Forest	3 x 3	31.67009	76.49484
33.	127+542	**Animal Underpass**	Non-Forest	5 x 5	31.67004	76.49374
34.	127+600	Box Culvert	Forest	2 x 2	31.67003	76.49313
35.	127+750	Box Culvert	Non-Forest	2 x 2	31.67013	76.49155
36.	128+145	Box Culvert	Non-Forest	2 x 2	31.67086	76.48747
37.	128+245	Minor Bridge	Forest	49	31.67105	76.48644
38.	128+785	Box Culvert	Non-Forest	2 x 2	31.67230	76.48095
39.	128+872	**Animal Underpass**	Non-Forest	3 x 4	31.67268	76.48015
40.	128+980	**Animal Underpass**	Non-Forest	4 x 4	31.67318	76.47917
41.	129+376	Minor Bridge	Non-Forest	49	31.67535	76.47589
42.	129+580	Box Culvert	Non-Forest	3 x 3	31.67682	76.47459
43.	129+690	Box Culvert	Non-Forest	2 x 2	31.67769	76.47406
44.	130+095	Box Culvert	Forest	2 x 2	31.68026	76.47112
45.	130+485	Box Culvert	Non-Forest	2 x 2	31.68237	76.46783
46.	130+647	Box Culvert	Non-Forest	2 x 2	31.68339	76.46660
47.	130+900	Minor Bridge	Non-Forest	40	31.68539	76.46537
48.	131+342	Box Culvert	Non-Forest	2X2	31.68855	76.46281
49.	131+652	Box Culvert	Non-Forest	3X3	31.69006	76.46005
50.	131+832	Major Bridge cum Viaduct	Non-Forest	160	31.69107	76.45857
51.	132+306	**Animal Underpass**	Non-Forest	4 x 4	31.69127	76.45415
52.	132+432	Box Culvert	Non-Forest	2 x 2	31.69049	76.45319
53.	132+482	**Animal Underpass**	Non-Forest	4 x 4	31.69017	76.45281
54.	132+665	Box Culvert	Non-Forest	2 x 2	31.68916	76.45131
55.	132+753	Box Culvert	Non-Forest	2 x 2	31.68894	76.45042
56.	132+995	Box Culvert	Non-Forest	3 x 3	31.68948	76.44802
57.	133+112	**Animal Underpass**	Non-Forest	5 x 5	31.69019	76.44710
58.	133+457	Box Culvert	Non-Forest	2 x 2	31.69237	76.44451
59.	133+527	Box Culvert	Non-Forest	3 x 3	31.69287	76.44405
60.	134+147	**Animal Underpass**	Non-Forest	4 x 4	31.69772	76.44082
61.	134+202	**Animal Underpass**	Non-Forest	4 x 4	31.69811	76.44047
62.	134+552	Box Culvert	Forest	3 x 3	31.70009	76.43762
63.	134+791	Major Bridge cum	Non-Forest	75	31.70123	76.43548

Sl. No.	Chainage	Description	Type of Land	Length (m) /Size (m)	Latitude	Longitude
		Viaduct				
64.	135+067	Box Culvert	Non-Forest	2 x 2	31.70217	76.43282
65.	135+395	Box Culvert	Non-Forest	2 x 2	31.70225	76.42939
66.	135+462	Box Culvert	Non-Forest	2 x 2	31.70249	76.42874
67.	135+557	Animal Underpass	Forest	3 x 3	31.70297	76.42792
68.	135+642	Box Culvert	Forest	2 x 2	31.70349	76.42726
69.	135+747	Box Culvert	Forest	2 x 2	31.70414	76.42645
70.	135+854	Box Culvert	Forest	2 x 2	31.70480	76.42562
71.	135+970	Animal Underpass	Forest	5 x 5	31.70560	76.42484
72.	136+060	Box Culvert	Forest	2 x 2	31.70630	76.42436
73.	136+188	Box Culvert	Forest	2 x 2	31.70736	76.42381
74.	136+226	Box Culvert	Forest	2 x 2	31.70767	76.42365
75.	136+400	Box Culvert	Forest	2 x 2	31.70905	76.42278
76.	136+485	Box Culvert	Forest	2 x 2	31.70971	76.42233
77.	136+600	Animal Underpass	Forest	4 x 4	31.71061	76.42172
78.	136+717	Animal Underpass	Forest	3 x 3	31.71151	76.42108
79.	136+785	Box Culvert	Non-Forest	2 x 2	31.71202	76.42068
80.	136+947	Animal Underpass	Forest	4 x 4	31.71319	76.41964
81.	137+002	Box Culvert	Forest	3 x 3	31.71357	76.41928
82.	137+112	Box Culvert	Forest	3 x 3	31.71434	76.41855
83.	137+237	Animal Underpass	Forest	4 x 4	31.71522	76.41771
84.	137+400	Box Culvert	Non-Forest	3 x 3	31.71636	76.41663
85.	137+522	Box Culvert	Forest	3 x 3	31.71720	76.41580
86.	137+680	Animal Underpass	Forest	4 x 4	31.71827	76.41470
87.	137+970	Box Culvert	Forest	2 x 2	31.72024	76.41269
88.	138+057	Box Culvert	Non-Forest	2 x 2	31.72084	76.41209
89.	138+215	Box Culvert	Forest	2 x 2	31.72194	76.41104

Apart from the above mentioned engineering measures, following mitigation measures have been proposed to minimize impacts of

Wildlife accidents/ kills

- Any mortality of wild animal will be reported to the Forest Department.
- Signage at 1 km on the non-forest area and at 500 mt. in the forest area with warning to follow the speed limit of not more than 60km/hr
- Speed cameras using radar technology to be fixed at atleast 5 kms interval to detect speeding vehicles
- Signage of important species of animals with short information will be erected on both

side of forest area.

- Use of appropriate lighting system for illumination of road alignment in the forest area.
- At other places lights should generally be discouraged and reflective posts should be used instead.
- Protection wall / fencing for the safety purposes for wild animals in the project design

Habitat loss/ fragmentation/ degradation

- Though the road is not traversing through ESZ of the Protected Area, precautionary measures may be proposed for avoiding any possible degradation/ loss of animal habitat.
- In any case, if there is a water course (whatsoever small or large may be) will not be disturbed, blocked or diverted and water to be allowed to flow uninterrupted.

Landslide and Soil erosion

- Soil and water conservation measures to be practiced normally at the site.
- Construction of breast wall on hill side of the road and retaining walls on the other side to protect the road embankment, wherever required
- Installation of soil and debris traps and soak pits alongside river/drains at key locations.

Increased human presence and pollution

- No blasting/ drilling or sound producing activities will be initiated between sunset and sunrise. It is binding for all units to use modern noise reducing techniques during the work operation or any other activity.
- Vehicles will not exceed speed limits and wildlife warning signs to be installed in high density areas and at known crossings locations as a result of wildlife monitoring.
- Hunting and disturbing of wildlife by project staff will not be permitted while working/ operations of the project sites.
- No firearms will be permitted at construction sites.
- Herbicides will not be used for weed eradication.
- The construction phase within the forest area should be quick, with minimum disturbance.

Disturbance related to construction and maintenance

- During construction the digging of large pits sometimes lead to casualty of wildlife animals. Precautions/ barricading will be taken to protect the animals.
- The project authority will take utmost care to motivate the labourers to avoid conflict with wild animals.
- Wildlife will not be fed, befriended or harassed at construction areas.
- Any problem related to wildlife will be reported immediately to the Forest Department. Any wildlife killed or injured by vehicles during construction phase will be reported to Forest Department.
- Orientation for Contractors and employees to be conducted that should include awareness of environmental protection measures for wildlife and wildlife habitat.
- Regular contact with the Forest Department shall be maintained to monitor wildlife movement when the work starts.

Pollution, sedimentation, and changed discharge regimes into water bodies

- Any substance creating pollution will not be left at the project sites.
- No substance will be discharged in the water regimes. The User Agency has proposed to use most of the hill cutting material to correct the road profile by raising it.

6.5 MITIGATION MEASURES TO TAKEN UP BY FOREST AUTHORITY (HPFD)

Awareness signage and warning systems

The purpose of animal **warning signs and detection systems** is to prevent or reduce the number of Animal-Vehicle Collisions. Signs warning of wildlife will be put up along stretches of roads where animals are known to occur or use local habitat, to caution drivers about the potential presence of animals. Signs that highlight the conservation importance of the area through which the road passes, can help garner support for reducing traffic speed and increased awareness of drivers, thereby helping to protect wildlife.

All warning signs can be grouped into the following categories:

- Simple caution signs are commonly used to alert vehicle drivers to the presence of wildlife crossing zones together with a prescribed speed limit or written message. The size, shape, color and material (reflective, non-reflective) of signs should be chosen to make the signs most effective.
- Colored posters and road side amendment boards shall be put up as part of program and campaigns to reduce animal mortalities due to collisions with vehicles. They also help to generate awareness of this issue among the public.

Habitat Improvement for Flora and Fauna in adjoining Protected Areas and outside PAs

- To plant prioritized native wild fruit bearing species in suitable forest areas and develop multilayered plantation models in next seven years.
- To provide ample natural food resources to monkeys and other wild animals in the forest areas and lessen their tendency to raid agricultural and horticultural crops in search of food
- In no case exotic/alien species will be planted in the project area.
- The invasion of alien species should be checked by eradication at regular intervals.

Conservation Breeding Programme

- Conservation Breeding Programme for rare and Endangered Species like Vulture (*In-Situ Conservation & Ex-Situ Conservation*)
- The CZA has identified some species which need immediate intervention in the form of ex-situ conservation breeding for the protected areas.
- The improvement of existing Zoos / Dhauladahr Nature Park Gopalpur etc. is the other component of the programme.

Community Development through Participation

- The conservation of wildlife or forest cannot be dealt in isolation. The need of the people, who are traditionally depended on forest for their livelihood, should get benefit from the project so that their support in wildlife conservation measures can be obtained. Forest authorities may carry out following activities for surrounding villages so that dwellers do not disturb the forest main land:
- Providing Eco-tourism Guide training to local youth
- Alternate livelihood for fringe communities- training to local artisans for upgradation of artistic skill & value addition
- Community welfare activities for poor household (Providing Solar lights, Solar Geysers, LPG etc.)

Wildlife Protection and Conservation Activities

- Deployment of Anti-poachers and Anti-grazers from amongst the villagers
- Incentive to informers for giving information regarding poaching/illicit tree felling
- Vaccination of cattle/livestock in the villages
- Augmentation of salt licks for wild animals in nearby forests
- Augmentation of water holes for wild animals
- Removal of plastics & solid waste

Human-wild animal Conflict

- Training to staff on rescue of Wild animals
- Education and awareness material/workshops for locals & school children
- Incentives to local communities for protection of Wildlife
- Strengthening of livestock corrals
- Providing a rescue facility for injured/rescued wild animals
- Sterilization of feral dogs
- Garbage management in towns and villages
- Strengthening of local veterinary facilities
- Compensation for losses caused to human beings and domestic livestock by wild animals

Wildlife & Eco-Tourism Management

- Preparation of comprehensive Wildlife & Eco-Tourism Plan for PWLS
- Creation of nature trails for Wildlife/Bird watching
- Development of alternative camping sites
- Construction & Maintenance of existing trekking paths
- Operational support to the existing Eco-tourism Societies
- Training/study tours/workshops/exposure visits for community based organizations and forest staff

Capacity building/training/research/monitoring

- Capacity building of forest staff to be enhanced by holding training, workshops, seminars, exposure visits etc.
- Research should be carried out to collect various important data of the wildlife.
- The overall objective of environmental and social monitoring is to ensure that mitigation

measures are implemented.

- Weather Monitoring System to be established to monitor overall impact on wildlife due to temperature, humidity, rain/ snow, etc.
- Estimation of population abundance of various critically enlisted and endangered species etc.

Infrastructure Development

- Construction of residential/office buildings for forest staff and maintenance of the existing buildings
- Construction of Patrolling huts/ Transit Camps / Dormitories
- Construction of Field Hostel / Labour huts, etc.
- Construction of new Management Roads, Inspection/Bridle Paths

6.6 Species specific Wildlife Management Strategies

6.6.1 Herbivores

The key wildlife management strategies for herbivores like barking deer, sambar deer, and nilgai include:

- **Habitat conservation and restoration:** Protecting and restoring the natural habitats of these herbivores, such as forests, grasslands, and wetlands, is crucial. This involves measures like limiting deforestation, reforestation, and controlling human encroachment.
- **Regulating hunting and poaching:** Implementing strict regulations and enforcement to prevent illegal hunting and poaching of these species. This helps maintain healthy population levels.
- **Mitigating human-wildlife conflicts:** Adopting strategies to reduce conflicts between herbivores and humans, such as improving crop protection, providing alternative fodder sources, and educating local communities.
- **Monitoring and research:** Conducting regular population surveys and research to understand the ecology, behaviour, and population dynamics of these herbivores. This informs conservation decisions and management plans.
- **Community engagement:** Involving local communities in conservation efforts by providing incentives and alternative livelihood opportunities. This helps build support for wildlife protection.
- **Translocation and reintroduction:** In some cases, translocating or reintroducing herbivores to suitable habitats can help restore populations and genetic diversity.

By implementing these comprehensive strategies, wildlife managers can effectively protect and manage the populations of barking deer, sambar deer, nilgai, and other herbivores, ensuring their long-term survival and the health of the ecosystems they inhabit.

6.6.2 Carnivores

Leopard is the main carnivore species in Hamirpur district which has been in direct conflict with the local population since times immemorial. Effective techniques to mitigate human-leopard conflicts are as follows:

- **Conducting population surveys and research:** Leopards are elusive and difficult to monitor, so regular population surveys using techniques like camera trapping are essential to understand their ecology and inform conservation decisions.
- **Raising Awareness and Community Engagement:** Conducting regular awareness campaigns to educate local communities about leopard behaviour, the need to avoid provoking them, and measures to prevent conflicts is crucial. This includes advising villagers not to disturb or pick up leopard cubs, as it can provoke aggressive behaviour from the mother. Appointing school children as "leopard ambassadors" to assist with outreach and education programs has also proven effective.
- **Establishing Early Warning Systems:** Regular monitoring of conflict hotspot areas for leopard presence and activity, in partnership with local institutions like community forest user groups or municipalities, can help establish citizen-led early warning systems. This allows communities to be better prepared and take necessary precautions to avoid potential attacks.
- **Improving Habitat Management:** Prioritizing conservation interventions in rugged, remote areas with high leopard presence, such as providing resources to raise awareness and support safety measures, can help increase preparedness and reduce human injury and fatalities. Maintaining adequate wild prey populations in protected areas can also discourage leopards from venturing into human settlements in search of food.
- **Predator-Proofing Livestock Enclosures:** Adopting predator-proof husbandry practices, such as herding livestock into sturdy sheds that leopards cannot breach and regularly monitoring their activities, can significantly reduce leopard attacks on livestock. This not only secures the livelihoods of farmers but also minimizes human-leopard interactions.
- **Rapid Response and Rescue Operations:** Trained volunteers and efficient & well-equipped Rapid Response Teams can help manage crowds, provide passage for trapped leopards, and prevent conflicts from escalating until forest department officials arrive.

By implementing a combination of these strategies, tailored to the specific needs of each conflict-prone area, human-leopard coexistence can be improved and the welfare of both humans and leopards can be safeguarded.

CHAPTER-7 COST ESTIMATE

7.1 COST OF WILDLIFE MANAGEMENT PLAN

As per the clarification given under pare 1.22 of the Consolidated Guidelines issued under the Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980 and Rules, made thereunder vide MoEF&CC letter dated 26th December 2024, actual cost of the interventions required to be made at the site for Wildlife Management is worked out and cost of Plan is **Rs. 1.645 Cr.** as detailed in **Table 7-1**

Table 7-1 Cost of Wildlife Management Plan

S. N.	Activity	1st Year	2nd Year	3rd Year	4th Year	Total
		Fin. (Rs.)	Fin. (Rs.)	Fin. (Rs.)	Fin. (Rs.)	
A.	Infrastructure Development	6,00,000	6,00,000	5,00,000	4,50,000	21,50,000
B.	Habitat Improvement in adjoining Protected Areas	3,90,000	4,21,000	4,57,500	4,74,000	17,42,500
C.	Capacity, building /training /research /monitoring	3,00,000	3,00,000	3,00,000	3,00,000	12,00,000
D.	Education and awareness generation	2,60,000	2,60,000	3,60,000	3,90,000	12,70,000
E.	Wildlife Protection and Conservation Activities	2,42,500	2,45,000	2,47,500	1,97,500	9,32,500
F.	Community Development through Participation	2,50,000	2,50,000	2,50,000	0	7,50,000
G.	Human-wild animal Conflict	8,25,000	8,25,000	2,25,000	1,75,000	20,50,000
H.	Wildlife & Eco-Tourism Management	9,00,000	8,00,000	1,75,000	0	18,75,000
I.	Zoo Management (Dhauladhar Nature Park, Gopalpur)	3,50,000	3,50,000	3,50,000	3,50,000	14,00,000
J.	Field Equipment	1,90,000	90,000	20,000	0	3,00,000
K.	Office Expenses	1,75,000	1,75,000	75,000	75,000	5,00,000
L.	Amenities to staff	1,30,000	1,10,000	1,10,000	1,10,000	4,60,000
M.	Budgetary Provision for the office of Principal Chief Conservator (Wildlife), Himachal Pradesh	5,00,000	5,00,000	3,50,000	1,50,000	15,00,000
	Total (A to M)	51,12,500	49,26,000	34,20,000	26,71,500	1,61,30,000

S. N.	Activity	1st Year	2nd Year	3rd Year	4th Year	Total
		Fin. (Rs.)	Fin. (Rs.)	Fin. (Rs.)	Fin. (Rs.)	
	Add 2% contingency	1,02,250	98,520	68,400	53,430	3,22,600
	Grand Total	**52,14,750**	**2,24,43,570**	**2,15,70,960**	**1,49,11,890**	**1,64,52,600**
						Rs. 1.64 Cr.

The Cost of WLMP amounting to Rs. 1.64 Cr. as per submitted plan has been **deposited by the NHAI in the CAMPA Account.**

Details of Proposed Physical and Financial Outlay

ACTIVITY	1st Year		2nd Year		3rd Year		4th Year		Total	
	Phy	Fin. (Rs.)	Phy	Fin. (Rs.)	Phy	Fin. (Rs.)	Phy	Fin. (Rs.)	Phy	Fin. (Rs.)
(A) Infrastructure Development										
ii) Maintenance of the existing buildings		2,50,000	0	2,50,000	0	2,50,000	0	2,50,000		10,00,000
vii) Maintenance of Management Roads & Inspection/ Bridle Paths		3,50,000	0	3,50,000	0	2,50,000	0	2,00,000		11,50,000
Total		**6,00,000**		**6,00,000**		**5,00,000**		**4,50,000**		**21,50,000**
(B) Habitat Improvement in adjoining Protected Areas										
i) New Plantation of native wild fruit bearing species	5	3,00,000	5	3,00,000	5	3,10,000	5	3,10,000		12,20,000
ii) Nursery cost of 800 plants per hectare		90,000		90,000		95,000		95,000		3,70,000
v) Maintenance of old plantations			5	31,000	10	52,500	15	69,000		1,52,500
Total		**3,90,000**		**4,21,000**		**4,57,500**		**4,74,000**		**17,42,500**
(C) Capacity, building /training /research /monitoring										
i) Survey/census /estimation of Flora and Fauna		1,00,000		1,00,000		0		0		2,00,000
iv) Training for wildlife staff on Wildlife techniques		1,00,000	0	1,00,000	0	1,00,000	0	1,00,000		4,00,000
vi) Workshops/Seminars		1,00,000		1,00,000		2,00,000		2,00,000		6,00,000

ACTIVITY	1st Year		2nd Year		3rd Year		4th Year		Total	
	Phy	Fin. (Rs.)	Phy	Fin. (Rs.)	Phy	Fin. (Rs.)	Phy	Fin. (Rs.)	Phy	Fin. (Rs.)
Total	**0**	**3,00,000**	**0**	**3,00,000**	**0**	**3,00,000**	**0**	**3,00,000**	**0**	**12,00,000**
(D) Education and awareness generation										
i) Publicity material (Brochures, Flyers, Coffee Table Book etc.)		1,00,000	0	1,00,000	0	1,50,000	0	1,50,000		5,00,000
ii) Awareness programmes for staff & locals		1,00,000	0	1,00,000	0	1,50,000	0	1,50,000		5,00,000
iii) Books/magazines		10,000	0	10,000	0	10,000	0	15,000		45,000
iv) Nature education camps for school children		50,000	0	50,000	0	50,000	0	75,000		2,25,000
Total		**2,60,000**	**0**	**2,60,000**	**0**	**3,60,000**	**0**	**3,90,000**	**0**	**12,70,000**
(E) Wildlife Protection and Conservation Activities										
i) Deployment of Anti-poachers and Anti-grazers (man days)	100	37,500	100	37,500	100	37,500	100	37,500	400	1,50,000
ii) Deployment of Fire Watchers (man days)	100	37,500	100	37,500	100	37,500	100	37,500	400	1,50,000
iii) Control burning/cleaning of pine needles	0	50,000	0	50,000	0	50,000	0	50,000	0	2,00,000
iv) Fire extinguishers	0	25,000	0	25,000	0	25,000	0	25,000	0	1,00,000
v) Fire-fighting personnel kit-dangri glove, shoes, bag, helmet, mask, torch etc.	0	50,000	0	50,000	0	50,000	0	0	0	1,50,000
vi)) Hiring of vehicles for patrolling and nakas etc.	0	10,000	0	10,000	0	10,000	0	10,000	0	40,000
viii)) Vaccination of cattle/livestock	0	12,500	0	15,000	0	15,000	0	15,000	0	57,500
x) Augmentation of salt licks	0	10,000	0	10,000	0	12,500	0	12,500	0	45,000
xi) Augmentation of water holes	0	10,000	0	10,000	0	10,000	0	10,000	0	40,000
Total		**2,42,500**		**2,45,000**		**2,47,500**		**1,97,500**	**0**	**9,32,500**
(F) Community Development through Participation										
i) Providing Eco-tourism Guide training to local youth		50,000		50,000		50,000		0	0	1,50,000

ACTIVITY	1st Year		2nd Year		3rd Year		4th Year		Total	
	Phy	Fin. (Rs.)	Phy	Fin. (Rs.)	Phy	Fin. (Rs.)	Phy	Fin. (Rs.)	Phy	Fin. (Rs.)
iii) Community welfare activities for poor household (Providing Solar lights, Solar Geysers, LPG etc.)		1,00,000		1,00,000		1,00,000		0	0	3,00,000
iv) Alternate livelihood for fringe communities- training to local artisans for upgradation of artistic skill & value addition		1,00,000		1,00,000		1,00,000		0	0	3,00,000
Total		**2,50,000**	**0**	**2,50,000**	**0**	**2,50,000**	**0**	**0**	**0**	**7,50,000**
(G) Human-wild animal Conflict										
i) Training to staff on rescue of Wild animals		50,000	0	50,000	0	50,000	0	50,000	0	2,00,000
ii) Education and awareness material/workshops for locals & school children		25,000		25,000		25,000		25,000	0	1,00,000
v) Providing a rescue facility for injured/rescued wild animals		1,00,000		1,00,000	0	0	0	0	0	2,00,000
vii) Garbage management in towns and villages		50,000	0	50,000	0	50,000	0	0	0	1,50,000
viii) Strengthening of local veterinary facilities (providing of tranquilizing guns, drugs, rescue material, capture & transportation cages etc. and one fully equiped Rescue Vehicle i/c wages of driver of such vehicle)		5,00,000	0	5,00,000	0	0	0	0	0	10,00,000
ix) Compensation for losses caused to human beings and domestic livestock by wild animals		1,00,000		1,00,000		1,00,000		1,00,000	0	4,00,000
Total		**8,25,000**	**0**	**8,25,000**	**0**	**2,25,000**	**0**	**1,75,000**	**0**	**20,50,000**
(H) Wildlife & Eco-Tourism Management										
iii) Creation of nature trails for Wildlife/Bird watching		2,00,000	0	1,00,000	0	1,00,000	0	0	0	4,00,000
iv) Development of camping sites		1,00,000	0	1,00,000	0	0	0	0	0	2,00,000
v) Construction & Maintenance of existing trekking paths		1,00,000	0	1,00,000	0	0	0	0	0	2,00,000
vii) Providing Benches/Pergola		50,000	0	50,000	0	25,000	0	0	0	1,25,000

ACTIVITY	1st Year		2nd Year		3rd Year		4th Year		Total	
	Phy	Fin. (Rs.)	Phy	Fin. (Rs.)	Phy	Fin. (Rs.)	Phy	Fin. (Rs.)	Phy	Fin. (Rs.)
viii) Operational support to the existing Societies		1,00,000	0	1,00,000	0	50,000	0	0	0	2,50,000
x) Training/study tours/workshops /exposure visits for community based organizations/staff		1,00,000	0	1,00,000	0	0	0	0	0	2,00,000
xii) Tourist facilities like toliets, drinking water etc.		2,50,000	0	2,50,000	0	0	0	0	0	5,00,000
Total		**9,00,000**	**0**	**8,00,000**	**0**	**1,75,000**	**0**	**0**	**0**	**18,75,000**
(I) Zoo Management (Dhauladhar Nature Park, Gopalpur)										
ii) Veterinary Facility		50,000	0	50,000	0	50,000	0	50,000	0	2,00,000
iv) Capacity building		1,00,000		1,00,000		1,00,000		1,00,000	0	4,00,000
v) Zoo Education & Outreach Programme		1,00,000		1,00,000		1,00,000		1,00,000	0	4,00,000
vii) Security & Disaster Management		50,000	0	50,000	0	50,000	0	50,000	0	2,00,000
x) Campus Habitat Imrovements		50,000		50,000		50,000		50,000	0	2,00,000
Total		**3,50,000**		**3,50,000**		**3,50,000**		**3,50,000**		**14,00,000**
(J) Field Equipment										
i) Binocular	3	30,000	3	30,000	2	20,000	0	0	8	80,000
ii) Digital Camera	1	30,000	1	30,000	0	0			2	60,000
iii) Camera Trap	3	30,000	3	30,000	0	0	0	0	6	60,000
vi) Camping Gear/Equipment		1,00,000		0		0		0	0	1,00,000
Total		**1,90,000**		**90,000**		**20,000**		**0**		**3,00,000**
(K) Office Expenses										
i) Computers and accessories		1,00,000		1,00,000		0		0	0	2,00,000
ii) Stationary, Electricity bills etc		50,000		50,000		50,000		50,000	0	2,00,000
iii) Maintenance of Vehicles/ POL		25,000		25,000		25,000		25,000	0	1,00,000
Total		**1,75,000**	**0**	**1,75,000**	**0**	**75,000**	**0**	**75,000**		**5,00,000**
(L) Amenities to staff										

ACTIVITY	1st Year		2nd Year		3rd Year		4th Year		Total	
	Phy	Fin. (Rs.)	Phy	Fin. (Rs.)	Phy	Fin. (Rs.)	Phy	Fin. (Rs.)	Phy	Fin. (Rs.)
i) Providing LED based Solar lamps for the staff deployed in Anti-poaching Camps	10	40,000	5	20,000	5	20,000	5	20,000	25	1,00,000
ii) Support for communication Mobile phone allowance for frontline staff		50,000		50,000		50,000		50,000	0	2,00,000
iii) Conducting Health camps/Vaccination programmes for staff against endemic diseases		10,000		10,000		10,000		10,000	0	40,000
iv) Providing Ration for group patrolling Frontline Staff in the field		30,000		30,000		30,000		30,000	0	1,20,000
Total		**1,30,000**	**5**	**1,10,000**	**5**	**1,10,000**	**5**	**1,10,000**		**4,60,000**
(M) Budgetary Provision for the office of Principal Chief Conservator (Wildlife), Himachal Pradesh										
ii) Capacity building, Human Resource Development (Training, Education, Exposure Visits etc.)		1,00,000		1,00,000		1,00,000		0	0	3,00,000
iii) Education & Awareness Generation		1,00,000		1,00,000		50,000		50,000	0	3,00,000
iv) Human Wildlife Conflict		1,00,000		1,00,000		1,00,000		1,00,000	0	4,00,000
v) Wildlife & Eco-Tourism Management		1,00,000		1,00,000		1,00,000		0	0	3,00,000
vii) Field Equipment		1,00,000		1,00,000		0		0	0	2,00,000
Total		**5,00,000**	**0**	**5,00,000**	**0**	**3,50,000**	**0**	**1,50,000**	**0**	**15,00,000**
Total (A to M)		**51,12,500**	**0**	**49,26,000**	**0**	**34,20,000**	**0**	**26,71,500**	**0**	**1,61,30,000**
Add 2% contingency		**1,02,250**	**0**	**98,520**	**0**	**68,400**	**0**	**53,430**	**0**	**3,22,600**
Grand Total		**52,14,750**	**0**	**50,24,520**	**0**	**34,88,400**	**0**	**27,24,930**	**0**	**1,64,52,600**
									or Say	**1,64,52,000**

Conservator of Forests
Hamirpur Forest Circle
Hamirpur (H.P.)

****

(Ankit Kumar, IFS)
Deputy Conservator of Forests,
Hamirpur Forest Division
Hamirpur (H.P.) 177001

Annexure 9

No. Ft. 48-5646/2022 (FCA)
H.P. Forest Department.

From: Nodal Officer-cum-PCCF (FCA), O/o Pr.CCF, H.P, Shimla-1.

To: CF Hamirpur

Dated Shimla-1, the 11 FEB 2025

Subject: **Diversion of 12.8537 ha. of forest land for construction of New 2 Lane with paved shoulder of Hamirpur Bypass of NH-88 (new NH-103 & amp ;03) (Design Chainage –Km 121-175 to km 138-295, Design length 17.120 Km) in the state of Himachal Pradesh (Online proposal No. Fp/HP/ROAD/151932/2022). Submission of Soil Moisture Conservation Plan & Wildlife Management Plan for approval.**

Memo:

This is with reference to your office letter No. 2996 dated 05.12.2024 vide which the copy of Soil Moisture Conservation Plan is furnished to this office for approval.

2. In this regard it is informed that SMC plan has been approved by the Pr.CCF (HoFF) as well as APCCF (Fin.) respectively dated 08.01.2025 & 10.01.2025. You are therefore requested to direct the UA to submit/upload the copy of SMC plan and the copy of this letter alongwith the compliance report of Stage-I approval. Copy of SMCP is also enclosed herewith.

Nodal Officer-cum-APCCF (FCA)
O/o Pr.CCF(HoFF), H.P. Shimla.

Annexure 9

National Highways Authority of India

(Ministry of Road Transport & Highways)

Government of India

Construction on New 2 lane with paved shoulder of Hamirpur bypass of NH-88 (New 103 & 3) (Design Chainage Kms. 121+175) to kms. 138-295), (design length 17.20 kms) in the State of Himachal Pradesh within the jurisdiction of Hamirpur Forest Division, Distt. Hamirpur, Himachal Pradesh.

(Online proposal no-FP/HP/Road/151932/2022)

SOIL & MOISTURE CONSERVATION PLAN

Annexure 9

National Highways Authority of India

(Ministry of Road Transport & Highways)
Government of India

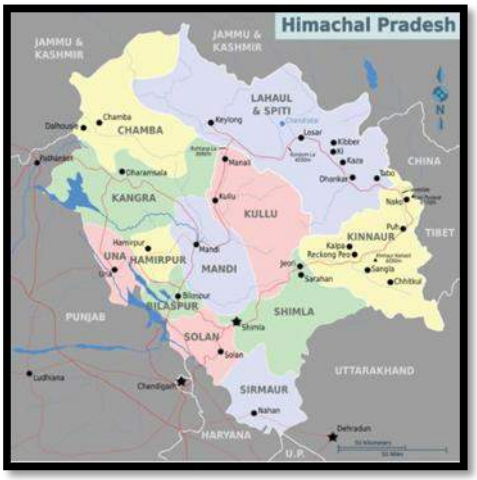
Construction on New 2 lane with paved shoulder of Hamirpur bypass of NH-88 (New 103 & 3) (Design Chainage Kms. 121+175) to kms. 138-295), (design length 17.20 kms) in the State of Himachal Pradesh within the jurisdiction of Hamirpur Forest Division, Distt. Hamirpur, Himachal Pradesh.

(Online proposal no-FP/HP/Road/151932/2022)

SOIL & MOISTURE CONSERVATION PLAN

Annexure 9

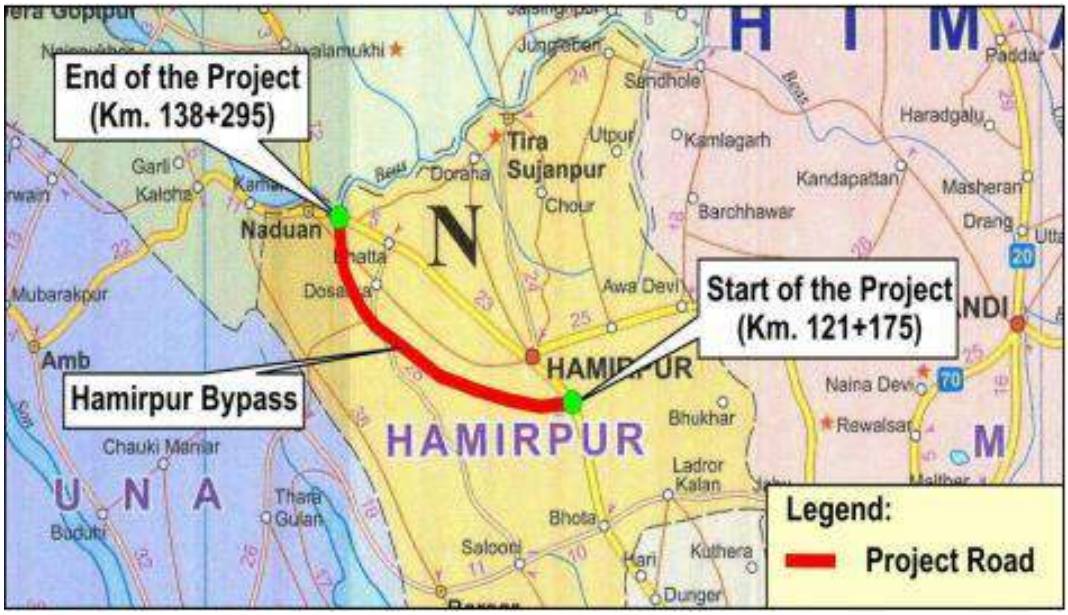
Map of India



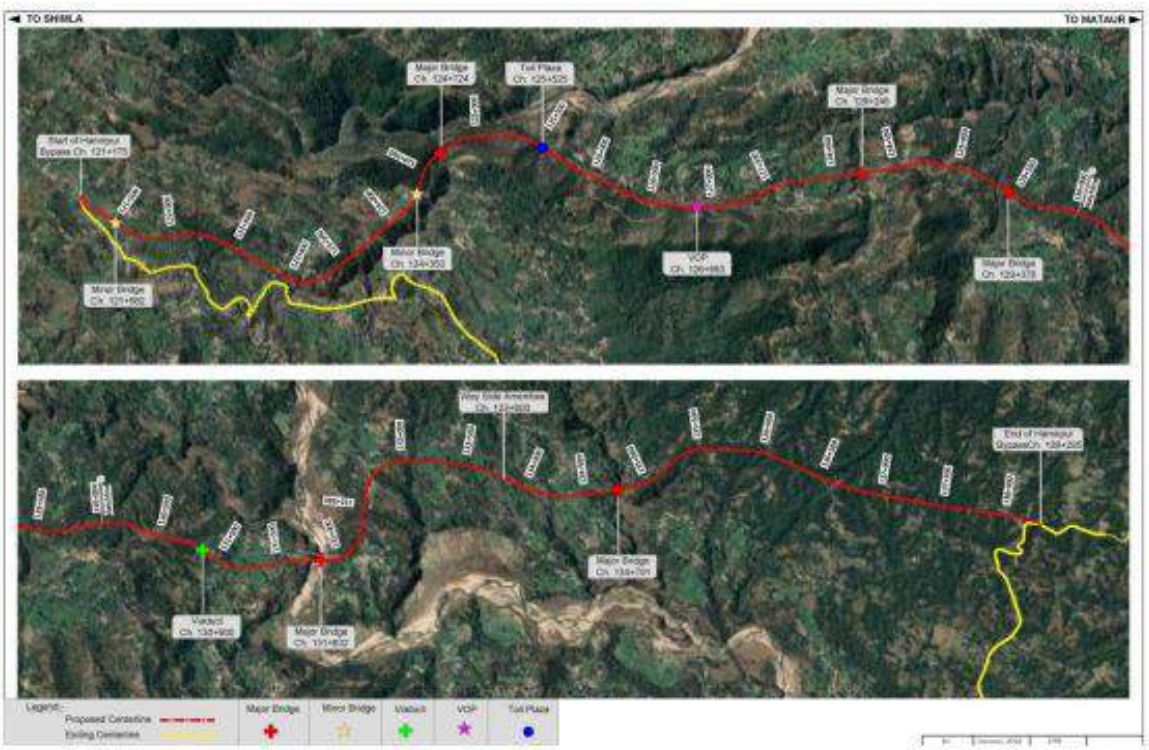
Map of HP

Map of Hamirpur District

Annexure 9



Location of Project



Key Plan Showing the Salient Characteristics of the Package

Annexure 9

Contents

PREFACE

This Soil & Moisture Conservation Plan has been prepared to fulfill the requirement of the Ministry of Environment, Forest and Climate Change; Govt. of India policy vide which the State Governments are required to submit Soil & Moisture Conservation Plan (SMCP) along with detailed cost of its implementation into the account of CAMPA along with the Stage I compliance.

This document should be cited as:

Soil & Moisture Conservation Plan for diversion of 12.8537 ha of forest land in favour of NHAI for the construction on New 2 lane with paved shoulder of Hamirpur bypass of NH-88 (New 103 & 3) (Design Chainage Kms. 121+175) to kms. 138-295), (design length 17.20 kms) in the State of Himachal Pradesh within the jurisdiction of Hamirpur Forest Division, Distt. Hamirpur, Himachal Pradesh. (Online proposal no-FP/HP/Road/151932/2022)

Himachal Pradesh, being one of the Himalayan states, is crucially important for the water regime of the entire country as most of the important rivers originate and get recharged in the Himalayas only. However, of late, a host of developmental activities, particularly road construction, have taken a heavy toll on the fragile Himalayan eco-system resulting in the drying up of many smaller rivulets, springs and by large scale soil erosion. The conservation of soil & moisture has gained much importance in the recent past. Soil provides the nutrients essential for plant growth, animal life, and millions of microorganisms. Sometimes during stage of development/construction of projects such as roads, soil becomes unhealthy, unstable, or polluted and the life cycle stops. Soil conservation focuses on keeping soils healthy through a combination of positive interventions, practices and techniques. While writing this Soil & Moisture Conservation Plan (SMCP), significant emphasis has been given on identifying the factors that may potentially lead to soil moisture depletion in the existing soil/ground conditions during road construction. This plan incorporates specific mitigation measures to effectively address and alleviate the impacts associated with these factors.

The project area has steep to moderate slopes, the soil fragile and soil movement common. Though the area receives plentiful precipitation in the form of rain, yet most of it goes away as surface run off into vast multitude of khads, streams and nallas that drains the entire area into river system comprising Beas.

CHAPTER 1

GENERAL DESCRIPTION OF AREA

Project area of the proposed road in this Package traverses in the district of Hamirpur a in the state of Himachal Pradesh. The project road which commences near Dravsai village in Hamirpur Tehsil at km 121+175 and ends at km 138+295 near Bhalun village in Nadaun Tehsil of Hamirpur district in the State of Himachal Pradesh. The length of the road is 17.120 Km. This road falls in Hamirpur Forest Division.

Details of District involved

SN	Name of District	Forest Land (ha)	Non-Forest Land (ha)
1	Hamirpur	12.8587	50.6327
	Total	**12.8587**	**50.6327**

Details of Forest Division involved

SN	Name of Forest Division	Forest Land (ha)	Non-Forest Land (ha)
1	Hamirpur	12.8587	50.6327
	Total	**12.8587**	**50.6327**

Villages and habitation within the project area

SN	Name of Village	Forest Area (ha)	Non-Forest Area (ha)
1	Dravsai (45/14)	0	1.1606
2	Sai Brahmana (45/21)	0	1.7039
3	Sai Ugialla (45/20)	0	0.0471
4	Lahad (46/30)	0	7.583
5	Jasor (46/14)	1.5445	0.0279

SN	Name of Village	Forest Area (ha)	Non-Forest Area (ha)
6	Masyana (37/17)	6.1419	1.1059
7	Payadkad (37/10)	0	0.0855
8	Bahdla (37/3)	0.0342	2.3942
9	D. P. F. Chak Bajuri (37/13)	0.4722	0
10	Kaswar (37/13)	0.0192	2.0334
11	Ghanotla (37/15)	0	3.6057
12	Khagal (37/14)	0.0174	5.3665
13	Kamlah (37/7)	0	3.6884
14	Baleta Khurd (37/22)	0	2.2458
15	Baleta Kalan (37/29)	0	2.1628
16	Dumpsite - Lahar	0	0.984
17	Dumpsite - Ghanotla	0	1.7002
18	Dumpsite - Khagal	0	1.8462
19	Dumpsite - Baleta Kalan	0	0.1051
20	Sanahi Kalan (26/10)	0	0.7488
21	Kohlwin (26/8)	0	1.546
22	Atialu (26/12)	0	1.9955
23	Telkad (26/4)	0	1.6026
24	Bharyal (26/1)	0.2506	0.2698

SN	Name of Village	Forest Area (ha)	Non-Forest Area (ha)
25	Badwana (26/23)	0	2.4812
26	DPF Kunna (25/27)	2.5528	0.1091
27	Kunna (25/27)	0	0.0571
28	Ralian-Di-Bahal (25/49)	0.447	0
29	Syalan-Di-Bahal (25/35)	0.0461	0.1304
30	D.P.F. Loharkad (20/21)	0.2895	0
31	Loharkad (20/21)	0.6251	1.5473
32	Dangri (20/18)	0.3367	1.6896
33	Chilbahal (20/10)	0	0.5326
34	Bhalun (20/23)	0.0765	0.0765
	Total	**12.8587**	**50.6327**

Component wise breakup

SN	Component	Forest Land (ha)	Non-Forest Land (ha)
1	Bypass Road	12.4782	43.7631
2	Bridges	0.3498	0.7896
3	VOP	0.0257	0
4	Wayside Amenities	0	1.4445
5	Disposal of excess earth	0	4.6355
	Total	**12.8587**	**50.6327**

Hamirpur District-Physical Features

Area & Location

Hamirpur, one of the twelve districts of beautiful state Himachal Pradesh, lies in the middle of the state. The district occupies an area of 1,118 km².The most literate district and well connected by roads from all sides, shares its geographical boundaries with Bilaspur, Mandi, Kangra and Una districts. District is situated between 76°17'50" to 76°43'42" east longitudes and 31°24'48" to 31°53'35" north latitudes. Tract is hilly, covered by Shivalik Range. The elevation varies from 400 meters to 1100 meters. Boundary of Hamirpur Forest Division is co-terminus with geographical boundary of Hamirpur District. The forests do not form a continuous and compact belt but are scattered throughout the division.

Configuration of the ground

It varies from almost flat land bordering Beas River to the broken and precipitous slopes in higher reaches.

Altitude

The altitude varies from 570 m above MSL to 1150 above MSL.

Ridges and watersheds

The main hill ranges of the district are known as Jakh Dhar & Sola Singhi Dhar. The Jakhdhar runs in continuation of Kali Dhar range in the Kangra district. It enters in Hamirpur district near Nadaun and transverses it into southeastern direction. The town of Hamirpur lies to the east of this range where the country is undulating but in the north and north east bare and rugged hills, deep ravines with precipitous sides transform the landscape into what has been described as an agitated sea suddenly arrested and fixed stones. The Chabutra hills have the same dip and strike as in the Jakh Dhar and are continued beyond the Beas to what is known as the Changar, a mass of rugged and broken hills. The Sola Singhi Dhar is the longest range of the tract and is known under various names such as Chintpurni and Jaswan Dhar in Una and by Sola Singhi in Hamirpur. Thus Dhar enters Hamirpur to the east of Tappa Daruhi and traverses it in a south-easterly direction more or less parallel to the Jakh Dhar and terminated on the Satluj. Hamirpur district is bounded in the north by river Beas which separates it from Kangra

district. In the east Bakar and Seer Khads separate it from Mandi district. In the south, It is bounded by Bilaspur district and in the west by Una district.

Rivers and streams

Hamirpur is watered by many big and small rivers. Among the big rivers we have Beas and Sutlej. River Beas runs through the northern edge of the district. Kunah Khad, Bakar Khad and Man Khad are some of the perennial streams that run northward to mingle into Beas. In the south we have, Sukkar Khad and Mundkhar Khad draining into Seer Khad, which in its turn drains into River Sutlej. The streams like Kunah Khad, Shukar Khad, Man Khad, Seer Khad and Pung Khad etc have highly variable supply of water, maximum in the months of Monsoon when all of these are in spade and minimum in the months of May and June. The streams like Kunah, Pung and Seer are more or less perennial because the catchment of these streams is less degraded as compared to Mann or other streams. Mann Khad runs all along the length of the district starting near Barsar and ending up in Nadaun.

Geology and Rock

The geological formation is represented by the Shiwalik beds of the sub Himalayan Series. The Jakh Dhar has been formed by an up throw on north-east side. This is known as Gumbar fault. It is composed of alternating strata of a blue, softish sand stone and red clay. The sand stone dips at an angle of about 20º to the north-east and is generally expose in sheets where the soil has been washed away due to evenness of the slop. The south-western slope of the ridge is for sharper and usually descends by a series of precipitous sandstone scarps between which the clay strata outcrops. The Sola Singhi ridge is an upthrow between two faults. The undulating land between two ridges is composed of gravels, possibly of post Shiwalik time, or pebbly sandstone of the higher Shiwalik beds. The sandstone belt is fertile and supports good chil forest.

Soil

The composition of the vegetation is determined by the depth of soil and the softness of rocks permitting penetration of roots. The sandstone formations in most parts become soft during

rains and permits penetration of roots thus becoming suitable for good chil forests. Along the river Beas and other khads, riverine gravels predominate which support scrub forests.

Climate

Hamirpur district falls in sub-humid sub-tropical zone. The winter prevails from November to March, spring in April and May, summer from June to September and transition season from October to November. The minimum temperature in the winter goes to 4°C and rises to maximum 38°C in summer. The damage by frost is confined to mainly December-January.

Rainfall

There are two seasons of rainfall during the year, one from December to March, associated with the passage of western disturbances and the other which is the main one, extending from mid June till middle of September, caused by the south west monsoons. Some rain is also received in the post monsoon month of October. A major portion of precipitation (74%) is received during monsoon period from June to September. July and August are the wettest months. Main drought periods are from May to June and October to mid December. Drought in May and June is generally acute. The annual rainfall and average for 30 years (1994-2023) in Hamirpur District are depicted in Fig. 2. The maximum rainfall (1728.20mm) occurred in 1997, followed by 1569.90 mm occurring in 2006. The minimum rainfall (817.20 mm) occurred in 2017, and the second-lowest year (843.2 mm) occurred in 2018. The average annual rainfall for the 30-year period is 1274.45 mm.

Temperature

It is not a typical "Hilly & Chilly" type of climate in district Hamirpur, as it is closer to the plains. During winter, the climate is cold but pleasant. During summer the temperature is hot and temperature does sometimes cross the 44 degree Celsius mark in summers.

Demography

According to the 2011 census, Hamirpur district has a population of 454,768. The district has a population density of 407 inhabitants per square kilometre (1,050/sq. mts). Its population growth rate over the decade 2001–2011 was 10.19%. Hamirpur has a sex ratio of 1095 females for every 1000 males, and an average literacy rate of 84.53%. The district comprises 4 sub-divisions: Hamirpur, Barsar, Nadaun and Bhoranj. Hamirpur sub-division consists of 2 tehsils; viz. Hamirpur and Sujanpur. Barsar, Nadaun and Bhoranj sub-divisions comprise only one tehsil as Barsar, Nadaun and Bhoranj respectively. There are five Vidhan Sabha constituencies in the district; namely Barsar, Hamirpur, Sujanpur, Nadaun and Bhoranj.

Occupational profile of the villages

About 92% population of this district lives in the Rural areas and most of them are agriculturist. People are also employed in government service. Many people also work in industries in the adjoining areas of state of Punjab.

Geology of the landslide in Project Area

The project road is passing through hilly and undulating terrain of Hamirpur andKangra Districts which are high intensity earthquake zones and hence are liableto suffer landslides, especially during monsoons.

CHAPTER 2

PROJECT DESCRIPTION

Project Proponent

National Highways Authority of India (NHAI) is an autonomous agency of the Government of India. It is responsible for the network of National Highways across the country. NHAI is reimagining the movement of both passenger and goods through its smart mobility mission under the Bharatmala Pariyojana. It aims at provision and maintenance of national highways network to meet user expectations in the most timebound and cost-effective manner within the strategic policy framework and envisioned to bring connectivity, inclusivity, and prosperity to the people in the country.

Justification for locating the Project In forest area

The project road is construction of new 2-lane with paved shoulders of Hamirpur Bypass of NH-88 (New NH-103) in the State of Himachal Pradesh. The project road starts from design chainage at Km 121+175 and ends at design chainage Km 138+295. The length of the project road is 17.120 Km. The Hamirpur Bypass is a Green field alignment which is proposed to be 2 lane with Paved Shoulder which commences near Dravsai village in Hamirpur Tehsil at km 121+175 and ends at km 138+295 near Bhalun village in Nadaun Tehsil of Hamirpur district in the State of Himachal Pradesh.

The proposal involves construction 3 Major bridges, 5 Minor bridges. 1 Viaduct, 9 Bus Shelters and a Wayside Amenity. No tunnels have been proposed on this route. The proposed road passes through forest and non-forest areas. Forests are located along the road in scattered patches on either side of the road. The alignment has been finalized keeping in view the forest areas. Also, the project road is located in hilly/rolling terrain and an alternative option to the road is limited. Construction of the Hamirpur Bypass involves bare minimum diversion of forest land.

Project details

Stage I approval for forest for diversion proposal for construction on New 2 lane with paved shoulder of Hamirpur bypass of NH-88 (New 103 & 3) (Design Chainage Kms. 121+175) to kms. 138-295), (design length 17.20 kms) was obtained by NHAI vide MOEF & CC, Shimla letter dated 03.08.2023 for the following purpose:

The Project Road is proposed to bypass the congested location of Hamirpur town. The bypass is 2 lane with Paved Shoulder which commences near Dravsai village in Hamirpur Tehsil at km 121+175 and ends at km 138+295 near Bhalun village in Nadaun Tehsil of Hamirpur district.

	Particulars	Details
i)	**Proposal No.**	FP/HP/Road/151932/2022
ii)	**Name of Project for which Forest Land is required**	Construction on New 2 lane with paved shoulder of Hamirpur bypass of NH-88 (New 103 & 3) (Design Chainage Kms. 121+175) to kms. 138-295), (design length 17.20 kms) in the State of Himachal Pradesh within the jurisdiction of Hamirpur Forest Division, Distt. Hamirpur, Himachal Pradesh.
iii)	**Short narrative of the proposal and Project/scheme for which the forest land is required**	The Hamirpur Bypass is is proposed to bypass the congested location of Hamirpur town. The bypass is 2 lane with Paved Shoulder which commences near Dravsai village in Hamirpur Tehsil at km 121+175 and ends at km 138+295 near Bhalun village in Nadaun Tehsil of Hamirpur district
iv)	**State**	Himachal Pradesh
v)	**Category of the Proposal**	Road
vi)	**Shape of forest land proposed to be diverted**	Linear
vii)	**Area of forest land proposed for diversion (in ha.)**	12.8537
ix)	**Non-forest land required for**	63.4864

	Particulars	Details
	this project (in ha.)	
x)	**Total period for which the forest land is proposed to be diverted (in years)**	99
xi)	**District/Forest Division**	Hamirpur
xii)	**Seismic Zone**	V
xiii)	**Major/Minor Bridges**	5/2
xiv)	**Flyover**	0
xv)	**Bypass**	Hamirpur Bypass (Length = 17.120 Km)
xvi)	**New Toll Plaza**	
xvii)	**Way side Amenity**	At Km 133+800
xviii)	**Bus Shelter**	09 nos.
xix)	**Design Speed (Plain & Rolling)**	80/60/kmph
xx	**Carriage Way**	2 Lane (lane width 7.0 meters)
xxi	**Proposed RoW**	60 m (except interchange and wayside amenities)

Project impacts and requirement of soil & moisture conservation plan by GoI

It's a well-known fact that roads impact the environment, forests and wildlife and other natural resources directly as well as indirectly bringing their degradation and depletion. It also includes noise & water pollution, habitat destruction/disturbance and degradation of local air quality; and the wider environmental effects of transport such as habitat fragmentation, ecosystem degradation, and climate change from vehicle emissions.

Undoubtedly, it is well-established that any hill cutting activity can potentially trigger varying degrees of instability. Therefore, it is essential for the Soil & Moisture Conservation Plan to

outline mitigative measures along with a comprehensive implementation program aimed at mitigating potential instability risks.

Consequently, undertaking Road projects such as this, obtaining forest clearances have been made mandatory by MoEF& CC, Government of India.

As per recommendations made in the Forest Advisory Committee meeting held in MoEF & CC GoI on 9-12-22, it was decided that

- In respect of linear projects, the stipulated norms of 2% and 0.5% towards the cost of Wildlife Management Plan and Soil and Moisture Conservation Plan respectively, as provided in the Ministry's guidelines dated 7.06.2022, proportionate to the extent of forest land involved instead of total project cost or actual cost of implementation of such Plans, whichever is more, should be charged from the user agency

- The provisions of Wildlife Management Plan or Soil Moisture Conservation Plan shall be 11-91/2012-FC(Pt.) I/36495/2022 approved by the competent authority in the State and accordingly, the deficit amount, if any, from the money already realized from to the tune of 2% and/or 0.5% of project cost proportionate to the extent of forest land involved, shall be paid by the user agency, and the same shall be deposited in to the CAMPA account.

- Guidelines dated 7.06.2022 may be modified by the Ministry to the extent as indicated above in respect of linear projects.

- **Since the total cost of the project is 715.25 cr and the total area involved is 63.4864 ha (12.8537 ha-Forest Land and 50.6327 ha-Non Forest Land), as per above stipulations cost of Wildlife Management Plan works out to be 0.411 Cr.**

CHAPTER 3

SOIL & MOISTURE CONSERVATION PLAN

The preservation of soil and water resources holds immense significance as an integral objective of forest management in hilly regions. The extensive loss of vegetative cover caused by human interference and developmental endeavors, such as road construction, accelerates soil erosion. These sudden transformations have far-reaching consequences on agriculture, wildlife, and local forests. Therefore, a Soil & Moisture Conservation Plan for road construction, especially in hilly areas like the project site, becomes indispensable for several compelling reasons:

Erosion Vulnerability:

Hilly areas are often characterized by steep slopes, fragile soils, and high rainfall. These conditions make them highly susceptible to soil erosion. Road construction activities, such as excavation, cutting slopes, and land clearing, can significantly increase erosion rates if adequate soil conservation measures are not implemented.

Ecological Sensitivity:

Hilly areas are home to diverse ecosystems, including forests, grasslands, and wildlife habitats. Uncontrolled erosion during road construction can lead to the loss of topsoil, which is rich in organic matter and essential nutrients. This loss can adversely impact vegetation growth, soil fertility, and overall ecological balance in the region.

Water Resource Protection:

Hilly areas often have numerous streams, rivers, and water bodies. Erosion from road construction can result in sedimentation of these water bodies, leading to reduced water quality and aquatic habitat degradation. Effective soil conservation measures are necessary to prevent sediment runoff and protect water resources from contamination.

Landslide Prevention:

Road construction activities can destabilize slopes, increasing the risk of landslides. Erosion weakens the stability of hillsides, and if not properly addressed, it can lead to slope failures, road damage, and potential loss of lives and infrastructure. Implementing soil conservation measures is essential to minimize erosion and maintain slope stability.

Sustainable Development:

Hilly areas often have limited land availability, and the construction of roads is crucial for connectivity, socio-economic development, and tourism. However, these activities must be carried out sustainably to minimize their negative impacts on the environment. Incorporating a soil conservation plan ensures the long-term viability of the road infrastructure while preserving the ecological integrity of the hilly regions.

To address these concerns, a soil conservation plan for road construction should include measures such as erosion control techniques, proper drainage systems, re-vegetation strategies, and slope stabilization methods. The plan should be tailored to the specific characteristics of the site, considering factors such as slope steepness, soil type, rainfall intensity, and the presence of sensitive ecosystems or protected areas.

Additionally, close coordination between road construction agencies, environmental authorities, and local communities is crucial to ensure the effective implementation and monitoring of the soil conservation plan. Regular inspections, proper maintenance, and adaptive management practices should be incorporated to address any potential erosion issues that may arise during or after construction.

By prioritizing soil conservation in road construction projects in hilly areas, sustainable development goals can be achieved while safeguarding the environment, conserving natural resources, and maintaining the ecological balance of these fragile ecosystems.

This Soil & Moisture Conservation Plan will go a long way in providing effective vegetative cover to the hill slopes and thereby ensuring better conservation of soil and water. Besides

plantations, the areas which require soil conservation measures like engineering works should be identified and steps should be taken to construct the engineering structures as per requirement of the site. Soil and moisture conservation measures together with afforestation programme will check various forms of soil erosion and soil loss. Soil and water conservation measures keep the soil in good condition so as to accept rainfall, to provide good quality rooting environment and to avoid loss of top soil which ultimately will help in good land husbandry by improving ground water regime. This will also be useful for natural flora and fauna.

This plan encompasses the strategic implementation of mitigative measures and interventions proposed by project proponents and forest authorities. Its primary objective is to safeguard soil health, fertility, and productivity while preventing erosion and deterioration.

STRATEGIES

While constructing highways in mountainous regions, soil and moisture conservation plans are crucial to mitigate erosion, maintain slope stability, and minimize environmental impacts. Here are some key considerations for a soil and moisture conservation plan:

Site Assessment:

Conduct a thorough assessment of the project site to identify vulnerable areas prone to erosion, such as steep slopes, areas with shallow soils, or locations near water bodies.

Erosion Control Measures:

Implement erosion control measures, such as:

a) Mulching: Apply organic mulch to exposed soil surfaces to reduce erosion caused by rainfall and wind.
b) Terracing: Construct terraces on steep slopes to minimize surface runoff and soil erosion.
c) Retaining Walls: Build retaining walls to prevent soil movement and retain moisture.

Slope Stabilization:

Implement measures to stabilize slopes and prevent landslides. These may include:

a. Retaining Walls: Construct retaining walls in areas with unstable slopes to prevent soil movement and slope failure.
b. Geosynthetic Reinforcement: Use geosynthetic materials, such as geotextiles or geogrids, to reinforce slopes and increase their stability.
c. Drainage Systems: Install adequate drainage systems, including surface drains and subsurface drains, to manage water runoff and prevent saturation of slopes.

Water Management:

Develop a water management plan to control and treat runoff from the highway construction site. Consider implementing techniques such as:

Contour Plowing: Plow along the contour lines to slow down water flow and promote water infiltration.

a) Construct Water Harvesting Structures: Build check dams, ponds, and reservoirs to capture rainwater and increase groundwater recharge.
b) Use of Permeable Surfaces: Incorporate permeable pavements or gravel in parking areas and driveways to allow water infiltration instead of runoff.

Vegetation Restoration:

Undertake re-vegetation efforts to stabilize soil and enhance moisture retention:

a) Plantation: Conduct tree and vegetation plantation along the road to minimize soil erosion and improve water absorption. Select native grasses, legumes, or other suitable vegetation that are adapted to the local climate, soil conditions, and construction timelines. Native species tend to establish quickly and have better erosion control properties.
b) Grass Seeding: Seed grasses or cover crops on disturbed soil areas to provide temporary soil cover and stabilize slopes.

Sediment Control:

Implement measures to prevent sediment from reaching water bodies:

a) Sediment Barriers: Install sediment barriers, such as silt fences or sediment ponds, to trap and filter sediment-laden runoff.
b) Construction Site Best Practices: Promote best practices, including proper waste management, sediment control during earthwork, and regular site inspections.

Monitoring and Maintenance:

a) Regularly monitor the effectiveness of erosion control and stabilization measures.
b) Conduct inspections after rainfall events to identify and address any erosion or slope stability issues promptly.
c) Ensure regular maintenance of drainage systems to prevent clogging and ensure their proper functioning.

Additionally, it is crucial to involve local communities, government agencies, and contractors in the implementation process. Public awareness campaigns can be conducted to educate stakeholders about the importance of soil and moisture conservation and their role in minimizing the environmental impacts of road construction.

MUCK MANAGEMENT

Introduction

The project envisages construction of new 2 Lane with Paved Shoulder of Hamirpur Bypass of NH-88 (New NH-103), As the project road does not involve any construction of tunnels, the quantity of material generated from construction of project road is not of much concern. As the project road is located in a hilly cum rolling terrain, the excess earth quantity generated from the construction is required to be disposed in a planned manner so that it takes least possible space and is not hazardous to the environment. It is of prime importance that these sites will have to be rehabilitated as soon as the disposal sites arc full,

The muck generation, muck disposal sites, site selection criteria, stabilization measures and adequate disposal and management guidelines have been discussed in the following sections.

Muck Generation

In the proposed project, debris is expected to be generated as an excess earth quantity left after utilization as filling quantity in the construction of bypass road. The component wise debris generation from the project activity is given in as follows:

SN	Component	Roadwork	Quantity in cum
1.	**Quantity of Debris/Muck generated (Cum)**	Rock(10%)	1,09,748
		Soil(90%)	9,87,729
2.	**Quantity of Muck due to swell factor (Cum)**	Rock(5%)	1,15,235
		Soil(5%)	10,37115
3.	**Estimated Quantity of Muck/Debris Proposed to be utilized (Cum)**	Rock(39%)	45,122
		Soil(80%)	8,32963.20
4.	**Balance quantity ol\Muck/Debris (Cum)**	Rock(61%)	70,113
		Soil(20%)	2,04151.80
5.	**Effective Muck to be dumped (Cum) With 15% compaction.**	Rock+Soil	**233125**

Source-DPRStudy

During construction of the various components of the project road, cutting material is generated from both soil and from rock excavation. Total quantity of debris, generated from the project, shall be 10, 97,477 cum which shall amount to 11,52,350 cum with swell factor. Out of the total cutting quantity generated, 8,78,085.20 cum shall be utilized on project work 1eaving 2,33,125 cum of excess earth quantity to be disposed after rolling at designated area earmarked for disposal The debris generated is proposed to be utilized in road activities such as earthwork embankment, sub grade, backfill and pavement layers depending on suitability of the material The designate disposal area shall also he properly protected and stabilized with retaining wall /gabion walls of suitable designed sections.

Muck Disposal Area

Disposal sites with total area of 4,6355 Ha have been designated for disposal of excess earth quantity after utilization in the proposed project. All the disposal sites are located on non-forest land for which agreement has been done with private parties for plot no. 187,295 and 296 for disposal of excess earth generated. The details of disposal sites along with their capacity are given in given as follows:

Details of Disposal Sites

Disposal site No.	Chainage	Village	Plot No.	Total area in Ha.	Capacity of sites in Cum	Volume of debris to be disposed in Cmt
D 1	123+500	Lahar	169/1	0.2226	16,305	**233125**
D 2	123+600	Lahar	168/1	0.7614	78,766	
D 3	128+900	Ghanotla	187/1	0.5662	27,931	
D 4	128+900	Ghanotla	187/3	1.1340	41,168	
D 5	129+850	Khaggal	799/2	0.1175	608	
D 6	130+100	Khaggal	813/4	0.5552	30,285	
D 7	130+180	Khaggal	813/3	0.4478	12,748	
D 8	130+020	Khaggal	807/1	0.0883	2,871	
D 9	130+400	Khaggal	295	0.5753	34,967	
D 10	130+400	Khaggal	296	0.0621	860	
D 11	130+680	Baleta Kalan	190/2	0.1051	608	
				4.6355	**247117**	

It may be seen from the Table above that the capacity of the area earmarked for disposal is 2.47 lakh cum and the volume of excess earth quantity to be disposed of after utilization is 2.33 lakh cum This states that the capacity of the disposal sites exceeds the generated volume. All the disposal area shall be well supported by retaining structures and suitable slope protection measures.

Site Selection Criteria

Based on the geological nature of the rocks and engineering properties of the soil, a part of the muck can be used as construction material. However, the balance requires being suitably disposed. The following points shall be considered and followed as guidelines for finalization of the areas to be used as dumping sites:

- The dumping sites shall be selected as close as possible to the project area to avoid long distance transport of muck.
- The sites sliall be free from active landslides or creep and care has to be taken that the sites do not have a possibility of toe erosion and slope instability.
- Existing slope of the site shall not be preferably more than 30°.
- The dumping sites shall be either at a higher level than the flood level or shall be away from the river course so that the possibility of muck falling into the river is avoided.
- There shall be no active channel or stream flowing through the dumping sites.
- Disposal areas shall be planned downwind of villages and townships in consultation with the forest department.
- Wind direction shall be taken into consideration to avoid the erosion i.e. on wind shadow region.
- These sites shall not be pristine habitats containing endangered /threatened species.
- Dumping site shall be located preferably 500 m from the river/stream/nullah
- Dumping site shall not be located in Protected Areas.

Stabilization of Muck disposal site

The loosely held muck can lead to the rise in SPM levels and sedimentation load. Therefore, it requires stability with appropriate methods to avoid the subsequent ecological problems. The muck disposal involves both engineering and biological measures that depend on the eco-climatic conditions.

Engineering Measures:

The muck shall be disposed offin the area earmarked within the available PROW of Package IV as mentioned in Table 2 above and based on the existing topography and elevation profile suitable length of retaining wall shall be proposed towards the valley side.

The Strip Plan of the Muck disposal area is provided at the end of the report.

Biological Measures:

Vegetation cover plays a very important role in holding the dumped material over a period of time and controls the hydrological and mechanical effects on the soils and slopes. Special efforts will be required to raise vegetation cover of grasses, shrubs and trees. The local grass sodding should be done on the muck when grass seed will be germinating and to add humusto the dumped material.

Soil conservation and quick growing species to be planted to stabilize the slope - *Agave sislana, Berberis aristata, Bauhinia vahilii, Jasminum humile, Rubus ellipticus, Prinsepia utilis, .Justiciaadhatoda, Ipomea carnea, Hypericum oblongifolium, Mimosa himalayana, Salix denticulate, Woodfordiafruticosa, Alnus nepalensis*etc.

Guidelines on Muck disposal Management

- The muck shall be dumped preferably in the form of terraces and slope of dumped muck shall not exceed 35° and preferably shall be kept under 26° or 1:2.
- Fencing shall be done to prevent human/ animal interference
- Dumping shall not obstruct the natural drainage pattern
- Trees shall be retained along the contours wherever feasible so as not to disturb the natural slope.
- Protection walls shall be constructed along the contours prior to dumping
- Before dumping the muck chemical analysis shall be done to identify hazardous material if any. The same shall be managed as per Hazardous and Other Wastes (Management and Trans-boundary Movement) Rules, 2016. In case hazardous materials like radioactive elements, high arsenic or fluoride laden rocks are found they shall not be dumped into the dumping site and handled as per prescribed rules.

- Muck shall be carried in dumper trucks covered with heavy duty tarpaulin properly tied to the vehicles
- Dumping may be avoided during the rainy season, to avoid slipping of muck while dumping
- Top soil shall be stripped wherever feasible to a specified depth of 150 mm and stored m stockpiles of height not exceeding 2 min height and used for landscaping.
- All disposal sites shall be properly landscaped when the disposal gets completed so as to merge it in the natural surroundings.

Restoration Plan

Once the dumpsites are filled, these sites shall be rehabilitated by covering it with 15 com fertile top soil and planting local species of trees and shrubs in consultation with the forest department so that the landscape is in harmony with the surrounding environment.
The afforestation with indigenous plant species of high ecological and economic value which can adapt to local habitat will be undertaken in consultation with the forest department depending upon the canopy cover required. Major tree and shrub species which would be planted are listed in table below:

Botanical Name	Common Name
Azadirachta indica	Neem
Bauhinia variegata	Kachnar
Bauhinia purpurea	Kachnar
Delonix regia	Gulmohar
Quercus leucotrichophora	Banjh Oak
Malotus philippensis	Kumkum
Acacia nilotica	Babool
Terminalia arjun	Arjun
Cassia fistula	Amaltas
Cedrela tuna	Tun
Pinus roxburghi	Chil
Melia Azadirechta	Drek

Terminalia chebula	Herad
Dalbergia sisoo	Indian Rosewood
Ficus roxusburghii	Demur
Alnus neplensis	Black Cedar

Source:DPR

CHAPTER 4

MITIGATION MEASURES

Mitigation should be focused on achieving explicit conservation goals within clear timeframes, to be integrated in the broader ***'green infrastructure development'*** approach. These goals should be informed by the significance of affected biodiversity, priority of conservation goals and the values of natural systems to the affected communities.

Use of the SMART approach also is recommended to evaluate the likely effectiveness of alternative mitigation strategies or measures: 'SMART' refers to measures that are specific, measurable, achievable, realistic and timely.

A road project that adheres to environmental standards should allocate resources for mitigating the impacts caused by the construction of the road. Mitigative measures should not be limited to the road corridor alone but should encompass technological and ecological enhancements to minimize or prevent ecological disturbances. The focus of mitigation efforts should be on achieving specific conservation goals within well-defined timelines, while integrating them into a broader framework of "green infrastructure development."

Strategies to be followed for undertaking the Mitigation measures

- Avoid or prevent adverse impacts as far as possible by considering spatial or design alternatives. Where impacts are highly significant or could lead to loss of irreplaceable biodiversity or conservation assets, avoidance Is the only real option if development Is to be sustainable;
- Minimise or reduce adverse impacts to 'as low as practicable' levels;
- Restore areas damaged by construction; and
- Remedy or compensate for adverse residual impacts which are unavoidable and cannot be reduced further.

Proposed Mitigation Measures

The Mitigation Measures shall be proposed in two categories:

1. Biological Measures
2. Engineering Measures

Biological Measures

Biological measures play a vital role in mitigating the impacts of road construction in hilly areas. These measures focus on utilizing natural processes and vegetation to protect and restore soil health. Here are some key biological soil conservation measures:

i. **Reforestation and Afforestation:** Planting trees and establishing forests in areas affected by road construction help mitigate soil erosion, stabilize slopes, and enhance biodiversity. Native tree species shall be selected based on their adaptability to the local conditions and their ability to anchor the soil with their root systems. Soil conservation and quick growing species species to be planted to stabilize the slope - *Agave sislana, Berberis aristata, Bauhinia vahlii, Jasminum humile, Rubus ellipticus, Prinsepia utilis, lpomea carnea, Hypericum oblongifolium, Mimosa himalayana, Salix denticulata, Woodfordia fruticosa, Alnus nepalensis etc.*

ii. **Grassland Restoration:** In areas where reforestation is not feasible, restoring native grasslands can be an effective measure. Grasses provide ground cover, reduce erosion, and enhance soil stability. Appropriate grass species that are native to the region is crucial for successful restoration.

iii. **Vegetation Buffer Strips:** Creating vegetation buffer strips along roadways and water bodies can help intercept and slow down runoff, reducing erosion and sedimentation. These strips will consist of a diverse mix of grasses, shrubs, and trees, which act as a natural filter, trapping sediment and absorbing excess moisture.

iv. **Green Belt Development Plan:** The main objective of plantation along the project road and bypasses is:

- To reduce impacts of air and dust pollution
- To provide shade on hot, glaring road surface during summer
- To reduce impact of vehicular noise caused due to movement of vehicles
- To arrest soil erosion at embankment slopes
- Beautification of the project corridor by planting selective ornamental trees
- Prevention of glare from the headlight of incoming vehicles
- To compensate for trees to be felled during construction

As per IRC:SP-21-2009 and "Green Highway (Plantation, Transplantation, Beautification and Maintenance), Policy 2015" of Ministry of Road Transport and Highways, Government of India, one row of avenue plantation has been proposed on either side of the project roads as per availability of space at 3 m spacing between the plants. The Technical specifications for avenue plantation has been followed in accordance with IRC:SP-21-2009.

A total of 10,960 trees are proposed to be planted along the road as avenue plantation as per availability of space. The species suggested for plantation along the road are *Azadirachta indica, Bauhinia purpurea, Acacia nilotica, Cassia fistula, Cedrela toona, Ficus palmata, Melia azedarach, Terminalia arjuna* etc.

v. **Stability of Muck Dumps:** Stabilization of overburden dumps shall be provisioned by providing gabion wall (under engineering measures) on all around the disposal area along with provision of facilitating vegetative growth on slopes. Plantation will be carried out on waste dumps.

vi. **Contour Plowing and Terracing**: Implementing contour plowing and terracing techniques can minimize soil erosion in hilly areas. Contour plowing involves plowing across the slope following the contour lines, creating small ridges that intercept runoff and minimize its velocity. Terracing includes constructing level or gently sloping platforms across the slope to create flat areas for agriculture or other land uses, reducing slope length and erosion potential.

vii. **Mulching and Organic Amendments:** Applying organic mulch, such as straw or wood chips, to bare soil surfaces helps retain moisture, reduce soil temperature fluctuations, and protect against erosion caused by raindrop impact. Organic amendments, such as compost or manure, can improve soil structure, increase water-holding capacity, and enhance nutrient availability.

viii. **Soil Cover Crops:** Planting cover crops, such as legumes or grasses, during non-construction periods can protect the soil from erosion and improve its fertility. Cover crops provide ground cover, prevent runoff, reduce compaction, and add organic matter to the soil when incorporated.

ix. **Erosion Control Mats and Blankets:** Biodegradable erosion control mats or blankets made of natural materials, such as coconut fibers or jute, can be used to stabilize slopes and protect bare soil surfaces. These mats help retain moisture, prevent erosion, and provide a favorable environment for vegetation establishment.

It is important to note that the selection and implementation of biological soil conservation measures should be site-specific, taking into account local soil conditions, climate, vegetation, and conservation goals. Close coordination between road construction agencies, forest authorities and local communities is crucial to ensure the successful implementation and long-term sustainability of these measures.

Engineering Measures

Engineering measures are crucial for mitigating the impacts of road construction in hilly areas in India. These measures involve the use of engineering techniques and structures to stabilize slopes, control erosion, and protect the soil. Here are some key engineering soil conservation measures:

i. **Retaining Walls:** Constructing retaining walls along road cuts and embankments helps prevent slope failure and erosion. Retaining walls will be made of various materials, including concrete, stone, or reinforced earth, and are designed to withstand the pressure exerted by the soil. They will provide structural stability and prevent soil movement.

ii. **Gabion Walls:** Gabion walls are wire mesh containers filled with rocks or other suitable materials. They will be used to stabilize slopes, control erosion, and provide slope protection. Gabion walls will allow water to flow smoothly through while retaining the soil and preventing erosion.

iii. **Terracing:** Terracing involves creating level or gently sloping platforms across slopes to reduce slope length and minimize erosion. Terraces will be constructed using retaining walls, earth berms, or a combination of both. They will help to slow down water runoff, promote infiltration, and prevent erosion.

iv. **Reinforced Soil Slopes:** Reinforced soil slopes involve the use of geosynthetic materials, such as geotextiles and geogrids, to stabilize slopes. These materials are placed within the soil mass to provide additional tensile strength and prevent slope failure. Reinforced soil slopes will be effective in managing erosion and maintaining slope stability.

v. **Drainage Systems:** Proper drainage systems are essential for controlling water runoff and preventing erosion. These systems include surface drains, culverts, and subsurface drains. Surface drains, such as swales or channels, shall collect and divert runoff away from slopes and embankments. Culverts will allow water to pass under the road, reducing the risk of erosion. 53 box culverts and 5 piped culverts have been proposed. Sub-surface drains, such as French drains or perforated pipes to intercept and redirect groundwater flow to maintain slope stability have been proposed.

vi. **Water Catchpits:** Water catchpits on hill side (inlet) of the culverts shall be constructed with all the cross-drainage structures to settle out the suspended solids in storm water. This will also protect the structure from smaller boulders along the water course falling from the hills.

vii. **Rock Toe Protection:** Rock toe protection involves placing a layer of large rocks or riprap at the base of slopes or embankments. This layer acts as a barrier, dissipating the energy of water runoff and protecting the underlying soil from erosion. Rock toe

protection will be particularly effective in areas where concentrated flow or high velocity runoff occurs.

viii. **Soil Bio-engineering:** Soil bioengineering techniques combine engineering principles with the use of living vegetation to stabilize slopes and control erosion. Measures such as brush layers, live crib walls, or soil bioengineering mats utilize vegetation and natural materials to bind soil particles, promote root growth, and this will provide long-term slope stability.

ix. **Soil Erosion Control Blankets:** Erosion control blankets, made of natural or synthetic materials, can be used to protect bare soil surfaces from erosion. They will provide immediate cover, stabilize slopes, promote vegetation establishment, and reduce erosion caused by rainfall impact.

It is important to note that engineering soil conservation measures have been designed and will be implemented by qualified professionals with expertise in slope stability and erosion control. The specific measures employed will depend on site-specific conditions, including slope steepness, soil type, rainfall intensity, and project requirements. Regular inspections, maintenance, and adaptation of these measures will be crucial to ensure their continued effectiveness throughout the construction process and the lifespan of the road infrastructure.

These engineering structures have been proposed in the scope of construction work by the project authority.

Annexure 9

CHAPTER 5

COST ESTIMATE

Abstract of the amount to be spent on the major soil conservation works and to maintain the unhindered flow of water downstream during the road construction **activity by the Project Authority** is as follows:

SN	Item	Amount in (Rs.) CRs
1	Drainage and protection works	47.84
2	Special protection works (Breast/Retaining/Gabion walls, Soil nailing, Stone pitching, Rock protection etc.)	253.78
3	Culverts	25.09
4.	Environmental protection works (Green belt development, Mitigation works etc.	.72
	Total	**327.43**

PROPOSED PHYSICAL AND FINANCIAL OUTLAY UNDER SOIL & MOISTURE CONSERVATION PLAN

for diversion of 12.8537 ha of forest land in favour of NHAI for the construction on New 2 lane with paved shoulder of Hamirpur bypass of NH-88 (New 103 & 3) (Design Chainage Kms. 121+175) to kms. 138-295), (design length 17.20 kms) within the jurisdiction of Hamirpur Forest Division, Distt. Hamirpur, in the State of Himachal Pradesh

. **(to be executed by HP Forest Department)**

(Online Proposal No. FP/HP/Road/151932/2022)

ACTIVITY	1st Year		2nd Year		3rd Year		4th Year		G Total	
	Phy.	Fin. (Rs.)	Phy.	Fin. (Rs.)	Phy.	Fin. (Rs.)	Phy.	Fin. (Rs.)	Phy.	Fin. (Rs.)
i) Bo-engineering interventions for slope stabilization	L/S	100000	L/S	200000	L/S	200000	L/S	200000	L/S	**700000**
ii) Dry Stone Check Dam	10	200000	10	220000	5	120000	5	130000	30	**670000**
iii) Dry Stone Protection Wall	5	200000	5	210000	5	215000	5	225000	20	**850000**
iv) Brushwood Check Dams	10	50000	10	55000	10	60000	10	65000	40	**230000**
v) Dry Stone Terrace Wall	3	60000	3	75000	3	90000	3	105000	12	**330000**
vi) Gabion Check Dam	3	120000	3	135000	3	150000	3	180000	12	**585000**
vii) Gabion Retaining Wall	3	150000	3	180000	3	195000	2	142000	11	**667000**
Total		**880000**	**34**	**1075000**	**29**	**1030000**	**28**	**1047000**	**-**	**4032000**
Add 2% contingency		17600	0	21500	0	20600	0	20940	-	**80640**
Grand Total		**897600**	**34**	**1096500**	**29**	**1050600**	**28**	**1067940**	**-**	**4112640**

Or say **4113000**
