भारतीय वन्यजीव संस्थान
Wildlife Institute of India

SUGGESTED MEASURES TO MITIGATE

ELEPHANT & OTHER WILDLIFE TRAIN COLLISIONS ON VULNERABLE RAILWAY STRETCHES IN *India*

MARCH 2025

TR No./2025/02.

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To minimize the risk of collisions between elephants and trains, the Ministry of Environment, Forest and Climate Change and the Ministry of Railways in India have jointly undertaken several measures. These include the construction of underpasses and overpasses for safe elephant passage, setting up of signage boards to warn locomotive drivers, and speed regulations in elephant corridors. Further, efforts have also been made to sensitize train drivers and railway staff about elephant movements and using technology to track and predict elephant movements near railway tracks. These collaborative efforts aim to safeguard elephant populations while ensuring the smooth operation of railway services, and are part of a comprehensive strategy to reduce train-elephant collisions.

By implementing early warning systems like DAS, underpasses, overpasses, level crossings and installing barriers at vulnerable points along railway tracks, the Ministry of Environment, Forest and Climate Change and the Ministry of Railways aim to create a safer environment for elephants while maintaining efficient rail operations.

The collaboration between the Ministry of Environment, Forest and Climate Change and the Ministry of Railways underscores the importance of inter-departmental cooperation in wildlife conservation. By aligning their efforts, these ministries are working towards a sustainable solution to mitigate the risk of elephant-train collisions.

A combination of technological innovations, such as the use of thermal imaging cameras and automated alert systems, & traditional methods, like patrolling and community involvement, are being employed by the Ministry of Environment, Forest and Climate Change and the Ministry of Railways to protect elephants from train accidents.

Editors

Dr. Bilal Habib
Scientist F & NO Tiger Cell

Shri Ramesh K. Pandey
IG, (PT & E), MoEFCC

Dr. Parag Nigam
Scientist G & NO Elephant Cell

Core Coordination Team

Dr. Bilal Habib
Scientist F & NO Tiger Cell, WII

Dr. Akanksha Saxena
Project Scientist, WII

Lead Surveyor(s) (WII & PE, MoEFCC)

Andhra Pradesh	Dr. Lakshminarayanan
Arunachal Pradesh	Dr. Akanksha Saxena
Assam	Dr. Akanksha Saxena
Jharkhand	Dr. Zehidul Hussain
Karnataka	Dr. Sudip Banerjee
Kerala	Dr. Lakshminarayanan
Madhya Pradesh	Dr. Aakriti Singh Ms. Maitreyee Bhave
Maharashtra	Dr. Akanksha Saxena
Nagaland	Dr. Akanksha Saxena
Odisha	Dr. Dharmendra Kumar Gupta Mr. Aditya Bisht
Tamil Nadu	Dr. Shivam Shrotriya
Uttar Pradesh	Dr. Shaheer Khan
Uttarakhand	Dr. Indranil Mondal Dr. Akanksha Saxena
West Bengal	Dr. Dharmendra Kumar Gupta Mr. Aditya Bisht

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Shri Bhupender Yadav
Hon'ble Minister, Environment, Forest and Climate Change, Govt. of India

Shri Kirtivardhan Singh
Hon'ble Minister of State, Environment, Forest and Climate Change, Govt. of India

Shri Ashwini Vaishnaw
Hon'ble Minister, Ministry of Railways, Govt. of India

Shri V. Somana
Hon'ble Minister of State, Ministry of Railways, Govt. of India

Shri Ranveet Singh
Hon'ble Minister of State, Ministry of Railways, Govt. of India

Ministry of Environment, Forest and Climate Change, Govt. of India

Shri Tanmay Kumar
Secretary, MoEF&CC

Ms. Leena Nandan
Former Secretary, MoEF&CC

Shri Sushil Kumar Awasthi
Director General of Forest & Special Secretary, MoEF&CC

Shri Jitendra Kumar
Former Director General of Forest & Special Secretary, MoEF&CC

Shri C. P. Goyal
Former Director General of Forest & Special Secretary, MoEF&CC

Dr. G. S. Bharadwaj
ADG, (PT & E), MoEF&CC

Dr. S. P. Yadav
Former ADG, (PT & E), MoEF&CC

Shri Ramesh K. Pandey
IGF (PT & E), MoEF&CC

Dr. Dheeraj Mittal
AIGF, (PT & E), MoEF&CC

Dr. Dharmendra Gupta
Scientist F, Regional Officer, Chandigarh

Dr. K. Muthamizh Selvan
Scientist E, RO Chandigarh

Dr. Rajendra Kumar
Scientist D, (PT & E), MoEF&CC

Dr. Aju Mathew George
Scientist C (PT & E), MoEF&CC

Shri Gaurav Sirola
Consultant B (Policy), (PT & E), MoEF&CC

Principal Chief Conservators of Forests (Wildlife) of all surveyed states

Ministry of Railways, Govt. of India

Ms. Jaya Varma Sinha
Chairman & Chief Executive Officer, Railway Board

Shri Anil Kumar Lahoti
Former, Chairman & Chief Executive Officer, Railway Board

Shri Vinay Kumar Tripathi
Former, Chairman & Chief Executive Officer, Railway Board

Shri Anil Kumar Khandelwal
Member Infrastructure

Shri N. C. Karmali
ED (Coord.)/Gati Shakti

Shri Anil Kumar Khandelwal
Member Infrastructure

Shri Kamlesh Gosai
ED/Gati Shakti (Traffic)

Shri Dhananjaya Singh
ED/GS(Civil)-II

General Managers and Divisional Railway Managers of Various Railway Zones

Wildlife Institute of India

Sh. Virendra R. Tiwari
Director

Dr. Ruchi Badola
Dean, FWS, WII

Dr. S. Sathyakumar
Scientist G/Registrar, WII

Dr. Bivash Pandav
Scientist G/Research Coordinator

Dr. Parag Nigam
Scientist G & NO Elephant Cell

Dr. Anukul Nath
Scientist C & ANO Elephant Cell

Dr. Lakshminarayanan
Project Scientist

Sh. Udhayaraj A. D.
GIS Expert

Executive Summary

The Indian Railways serves as a vital transportation lifeline for the country, facilitating the movement of people and goods nationwide. However, its extensive network has also contributed to major threats to Asian elephants and other wildlife in certain regions. Additionally, railway infrastructure can act as a barrier, restricting wildlife movement and leading to habitat fragmentation. To address the issue of wildlife fatalities resulting from train collisions, the Ministry of Environment Forest and Climate Change, in collaboration with the Wildlife Institute of India (WII) and the Ministry of Railways, had initially identified 110 sensitive railway stretches across the elephant distribution range in India, with 17 additional sensitive stretches identified in two Indian tiger range states. Across these identified stretches, a comprehensive joint survey was executed by a team of Project Elephant officers, Ministry of Environment, Forest and Climate Change (MoEF&CC) representatives, Wildlife Institute of India (WII) experts, Ministry of Railways officials, and State Forest Departments, focused on assessing critical railway stretches where elephant and wildlife-train collisions are prevalent. The team evaluated site-specific conditions and proposed targeted permanent mitigation measures tailored to the unique characteristics of each location.

After an exhaustive survey of the 127 railway stretches (110 in elephant range and 17 in two tiger range states) spanning 3452.4 km, 77 railway stretches spanning 1965.2 km across 14 states were recommended for mitigation measures based on the intensity of use by elephants, tigers, and other wildlife in the region. The proposed mitigation measures for these 77 stretches include 503 ramps and level crossings, 72 bridge extensions and modifications, 39 fencing, barricading, or trenching structures, 4 exit ramps, 65 new underpasses, and 22 overpasses—totalling 705 structures. The details of these measures and their implementation are monitored through an online dashboard (Elephant Railway Portal) developed for this purpose.

These recommendations were discussed with the officials of the Ministry of Railways and relevant State Forest Departments for implementation. Additionally, an online railway portal has been established by WII to facilitate the monitoring and assessment of these mitigation strategies. The portal provides access to detailed survey findings and finalized reports, enabling ongoing evaluation and refinement of collision prevention measures. Currently, the joint survey reports for 14 states- Andhra Pradesh, Arunachal Pradesh, Assam, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Nagaland, Odisha, Tamil Nadu, Uttar Pradesh, Uttarakhand and West Bengal- have been finalized.

Various mitigation measures to reduce wildlife-train collisions were recommended among the 12 elephant range and 2 tiger range states. These include installation of DAS-based IDS, sign boards, rescheduling of goods trains to avoid peak wildlife activity times, clearing of vegetation on either side of railway tracks, restriction of garbage disposal and regular cleaning of tracks, formation of joint teams of railways and forest personnel for joint coordination, information sharing and sensitisation, and documentation of incidences of wildlife mortality.

ANDHRA PRADESH

Railway stretches identified for mitigation: 5
Bridge expansion: 1
Other measures: maintenance of existing drainage structures, signages and caution orders

ASSAM

Railway stretches identified for mitigation: 7
Level crossings with ramps: 131
Bridge modifications: 9
Fencing at 1 site | Underpass: 1
Other measures: landscaping, light and sound barriers.

KARNATAKA

Railway stretches identified for mitigation: 5
Level crossings with ramps: 23
Fencing at 1 site
Underpasses: 8 | Overpasses: 9
Other measures: light and sound barriers.

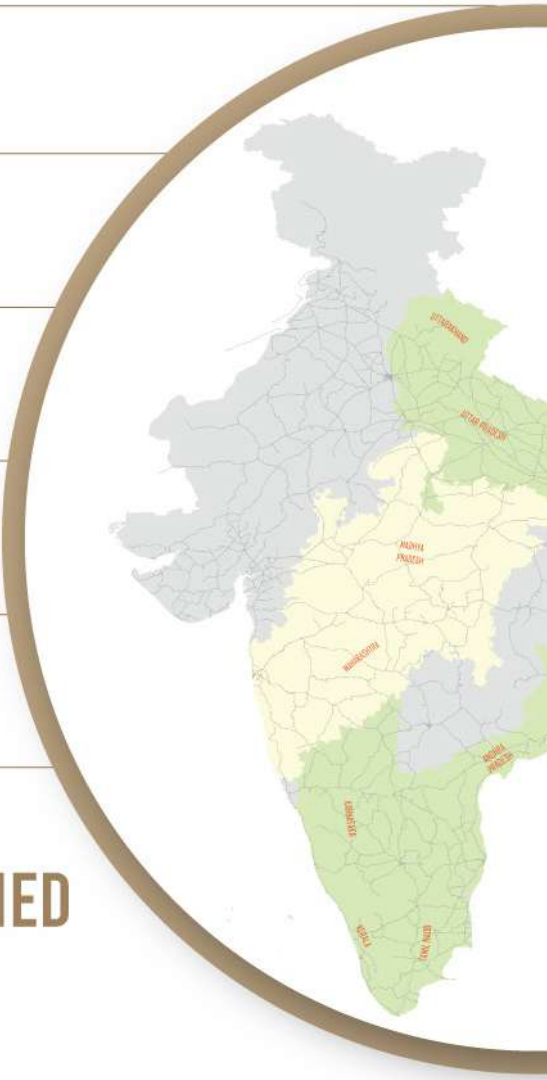
14 STATES

127 STRETCHES IDENTIFIED FOR SURVEY

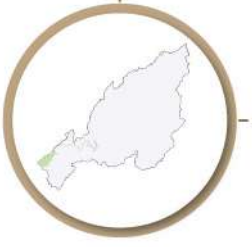
77 STRETCHES IDENTIFIED FOR MITIGATION

72 BRIDGE EXPANSIONS/ MODIFICATIONS

04 EXIT RAMPS



3452.4 KM IDENTIFIED FOR SURVEY



NAGALAND

Railway stretches identified for mitigation: 1
Underpass: 1

TAMIL NADU

Railway stretches identified for mitigation: 4
Level crossings with ramps: 4
Fencing at 4 sites
Other measures: light and sound barriers.

UTTARAKHAND

Railway stretches identified for mitigation: 7
Level crossings with ramps: 57
Fencing at 3 sites
Underpasses: 9 | Overpass: 4
Other measures: landscaping, light and sound barriers.

MAHARASHTRA

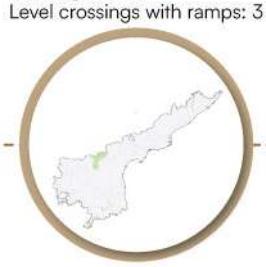
Railway stretches identified for mitigation: 8
Level crossings with ramps: 125
Bridge expansion: 51
Fencing: 4 | Exit ramps: 4
Underpasses: 9 | Overpass: 1
Other measures: landscaping, maintenance of existing drainage structures.

MADHYA PRADESH

Railway stretches identified for mitigation: 3
Level crossings with ramps: 8

ARUNACHAL PRADESH

Railway stretches identified for mitigation: 2
Level crossings with ramps: 3

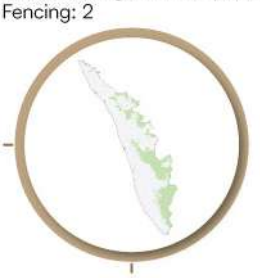


JHARKHAND

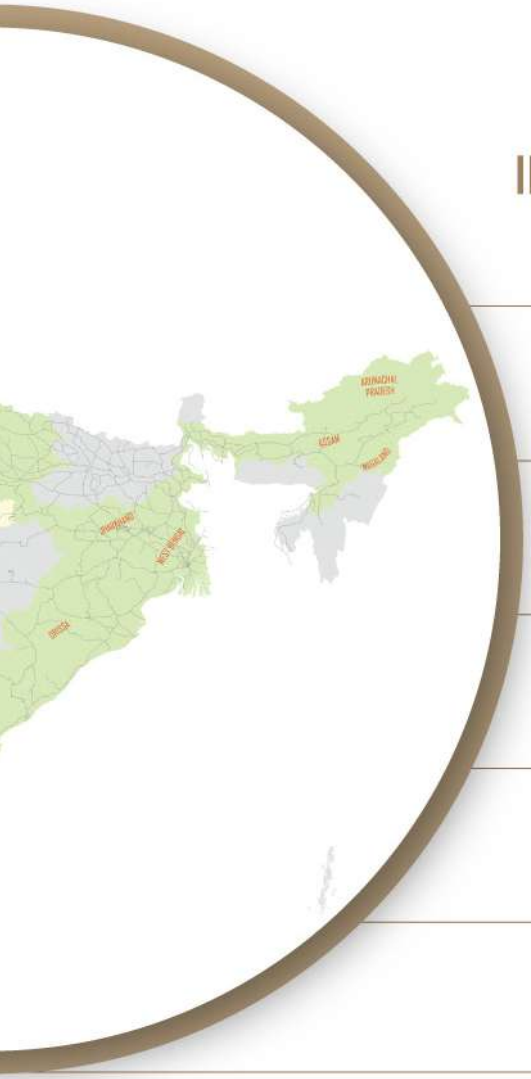
Railway stretches identified for mitigation: 12
Level crossings with ramps: 10
Bridge modifications: 5
Fencing at 20 sites
Underpasses: 29 | Overpasses: 5
Other measures: landscaping, light and sound barriers.

KERALA

Railway stretches identified for mitigation: 3
Level crossings with ramps: 2
Fencing: 2



1965.2 KM
IDENTIFIED FOR MITIGATION



NEW UNDERPASSES	65
NEW OVERPASSES	22
SITES OF FENCING & BARRICADING	39
LEVEL CROSSINGS WITH RAMPS	503
TOTAL MITIGATION STRUCTURES	705

ODISHA

Railway stretches identified for mitigation: 9
Level crossings with ramps: 33
Fencing at 4 sites
Underpasses: 5 | Overpasses: 2

UTTAR PRADESH

Railway stretches identified for mitigation: 6
Level crossings with ramps: 92
Bridge expansion: 6
Other measures: maintenance of existing drainage structures

WEST BENGAL

Railway stretches identified for mitigation: 5
Level crossings with ramps: 15
Underpasses: 3 | Overpasses: 1
Other measures: landscaping.

CONTENTS

01. Introduction

The railway network of India is a vital component of the transportation system, and transports people and goods across the nation. In the year 2022-23, the railways transported 6396 million people[1] and freight load of 1512 MT[2] . Thus, the role of the railways in social and economic development of the country cannot be overstated.

However, vast lengths of the railway network pass through sensitive wildlife habitats and corridors, leading to adverse impacts on wildlife (Silva Lucas et al., 2017). Railway tracks pose a physical barrier to animal movement, impeding movement between and within habitats. Railway operations also involve discharge of gaseous, liquid and solid pollutants into the natural environment, making such areas less suitable for wildlife. However, mortality of wild animals due to collisions with trains remains the most adverse impact. For example, between 2009-10 and 2020-21, 186 elephants have died in train accidents. Thousands of cases of wildlife mortality among mammals, and smaller fauna such as birds, amphibians and reptiles go undetected and unrecorded.

To minimise the risk of fatal collisions between trains and Asian elephants and other wildlife prevalent in many regions of the country, a monumental endeavour has been initiated jointly by the Ministries of Railways and Environment, Forest and Climate Change. Recognising the impacts that railway operations are exerting on wildlife, a list of 110 railway stretches totalling roughly 2455 km in 12 elephant range states prone to elephant-train collisions was prepared by the Project Elephant of the MoEF&CC requiring urgent mitigation measures. Additionally, 17 sensitive railway stretches in 2 tiger range states were also considered for the exercise.

Subsequently, joint surveys of these stretches were carried out as a collaborative exercise with representatives of the Indian Railways and concerned state forest department, facilitated by representatives of the Wildlife Institute of India and Project Elephant. Extensive field visits and on-site deliberations were held during these joint surveys regarding the status of use of the railway lines by wildlife, history of wildlife accidents and possible solutions to mitigate this based on site-suitability and other factors.

The mitigation reports for these states have been finalised and uploaded on a virtual dashboard for monitoring implementation of the mitigation measures hosted by WII, containing detailed mitigation measures proposed for the stretches. These measures range from crossing structures such as under and overpasses, level crossings and ramps for ease of movement of wildlife across the tracks, and installation of Distributed Acoustic System based Intrusion Detection Systems on all tracks for early detection of wildlife near tracks. Formation of joint teams of railway and forest frontline staff, fencing to reduce conflict with humans near railway tracks, and landscaping measures have also been suggested. By aligning their efforts, both ministries are working together towards a sustainable solution to mitigate the impacts of railway operations on wildlife.

[1] *Ministry of Railways. Indian Railways Passenger Traffic [Data set]. Dataful.* https://dataful.in/datasets/1197

[2] https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1913114

02. Survey methodology

Between December 2023 and December 2025, joint surveys of the identified stretches in the 12 elephant range and 2 tiger range states was carried out. The surveys involved local representatives of the respective state Forest Departments and Indian Railways, coordinated by representatives of the Wildlife Institute of India and Project Elephant (MoEF&CC). During the survey, the survey team inspected the railway track, particularly sites vulnerable to wildlife mortality and areas where frequent wildlife crossings were observed, based on information from the Forest Department. The survey team relied on information such as previous incidences of elephant/wild animal mortality, wildlife movement trails intersecting railway tracks, GPS coordinates and chainages (km) of these sites from concerned officials. The team then suggested mitigation measures based on multiple factors including width of crossing zone, track height of the railway line, presence of drainage structure and human infrastructure (and consequent potential for conflict) in that segment.

03. State-wise mitigation measures on railway lines to reduce wildlife-train collisions

Arunachal Pradesh

A. Elephant Range States

3.1. ARUNACHAL PRADESH

Introduction

The Asian elephant (*Elephas maximus*) distribution in the north-eastern states of India is spread over the states of Assam, Nagaland, Arunachal Pradesh, Tripura, Mizoram and Meghalaya. However, most of this population is concentrated in Assam, with continuous distribution in Arunachal Pradesh and Nagaland. The following description relates to elephant distribution in this semi-contiguous population spread across the states of Assam, Arunachal Pradesh and Nagaland, as it pertains to the purpose of this survey.

The wilderness of the north-east consisting of several states supports a wide variety of biodiversity and is home to several important protected areas, including the Kaziranga and Manas National Parks, both being UNESCO World Natural Heritage Sites.

The elephant distribution in and around Assam is spread out over four distinct populations (Project Elephant, 2023), and is contiguous with some neighbouring states as well. Apart from the four major populations, few isolated habitats also exist that support some elephants.

- The population on the north bank of the Brahmaputra extends from northern West Bengal through the Himalayan foothills and Duars covering southern Bhutan, northern Assam and Arunachal Pradesh along the Brahmaputra River, and part of the flood plains of the Brahmaputra and Lohit River in eastern Assam.

Three populations exist on the southern bank of the Brahmaputra – the eastern, central and western areas.

- The eastern population is spread over lower Dibang Valley and Lohit, Changlang and Tirap districts in Arunachal Pradesh, Tinsukia, Dibrugarh, Sibsagar, Charaideo, Jorhat and Golaghat districts in Assam; and Mon, Tuensang, Mokokchung and Wokha districts in Nagaland.

- The central range extends from Kaziranga National Park across the Karbi plateau, parts of the central Brahmaputra plains, and the basin of the Diyung Rivers to the foot of the Meghalaya plateau in Assam and Meghalaya.

- The western range extends from near Guwahati through the foothills of the Meghalaya plateau including Kamrup, Goalpara districts in Assam, and Rhi-Bhoi, West Khasi Hills, East Garo Hills, West Garo Hills, Southwest Garo Hills and South Garo Hills in Meghalaya.

The corridors connecting the north-eastern elephant populations spread across these states are also coming under threat from the operational railway tracks in the region. Consequently, these railway lines are a threat to the connectivity amongst these elephant range states that are already under pressure from other anthropogenic activities.

Based on a meeting on 17th August 2022, the Hon'ble Minister of Railways, Government of India, instructed the Ministry of Environment, Forest and Climate Change (MoEF&CC) to provide at least 100 locations of existing railway segments across sensitive elephant and tiger landscapes in the country for construction of permanent mitigation measures in view of

wildlife-train collisions (Proceedings under Ministry of Railways letter No. 2022/CE-IV/Elephant Pass dated 30th September 2022). Consequently, details of sensitive stretches for constructing permanent and temporary mitigation measures were provided by the MoEF&CC (vide OM F.No. 12-1/2019-PE (Part-I), dated 30th August 2022).

A total of 24 priority railway segments were identified in the region, including 5 in Arunachal Pradesh. The railway lines in Nagaland and Arunachal Pradesh states lay on the border with Assam.

Field Survey

A representative of the Wildlife Institute of India, local representatives of the Forest Department and Indian Railways (NFR) conducted a joint field survey of the identified priority railway stretches in the states of Assam, Arunachal Pradesh and Nagaland (Fig. 3.1.1) during 19th – 27th March 2024. During the survey, the survey team inspected the railway track, particularly sites vulnerable to elephant mortality and areas where frequent elephant crossings were observed, based on information from the Forest Department. We relied on information such as previous incidences of elephant/wild animal mortality, elephant movement trails intersecting railway tracks, GPS coordinates and chainages (km) of these sites from concerned officials. We then suggested mitigation measures based on multiple factors including width of crossing zone, track height of the railway line, presence of drainage structure and human infrastructure (and consequent potential for conflict) in that segment.

On consultation with field forest and railway officials, it was observed that some railway lines had not been constructed yet, were not operational, or did not lie in elephant areas. These were not inspected. Further, we inspected additional railway stretches that were highlighted by forest officials as vulnerable to elephant-mortality or as a barrier to their movement in the area.

* The objective of the field survey was to minimise elephant-train collisions either by constructing underpasses and overpasses wherever possible, by reducing the time taken by elephants to cross the railway tracks by easing movement across the track through construction of ramps and level crossings, and by implementation of technology for early detection and warning systems.

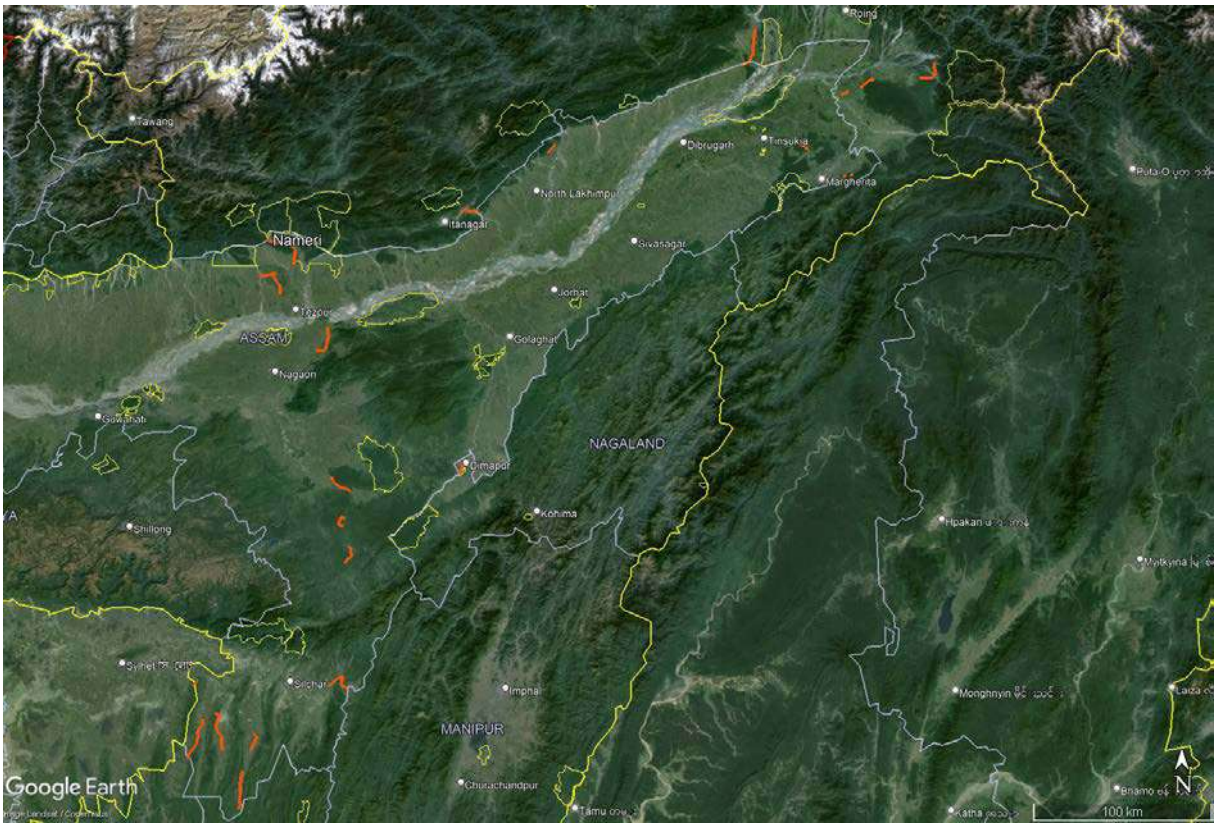


Figure 3.1.1: Identified priority railway line stretches (orange lines) for field survey in the states of Assam, and bordering Nagaland and Arunachal Pradesh, with respect to the protected areas (yellow polygons).

Site-Specific Findings & Mitigation Measures

Jonai to Pasighat railway line near the Poba Reserve Forest, Arunachal Pradesh- Assam border

Survey date: 21st March 2024

The Poba Reserve Forest is spread across Arunachal Pradesh (East Siang district) and Assam (Dhemaji district), with the National Highway 515 passing through it acting as the state boundary. Poba RF, recently upgraded to Wildlife Sanctuary status, is rich in flora and fauna. It forms part of an important elephant corridor, connecting the hills of Arunachal to the north, the D'Ering (Memorial) Wildlife Sanctuary and Dibru-Saikhowa National Park to the south and east via confluence of rivers Siang, Dibang and Lohit (Fig. 3.1.3). It is often called the last remaining rain forest of Assam, with a rich repository of wild edible plants. The forest is under immense pressure from anthropogenic activities.

Observations:

- The Jonai to Pasighat railway line is currently under construction (Fig. 3.1.2).
- Though the railway line does not pass through the Reserve Forest, Forest Department officials have reported elephant movement between the northern part of the Forest and foothills of Arunachal Pradesh. Three such crossing points intersecting the railway line were reported (Fig. 3.1.4).
- The land use adjacent to the railway line is mostly agriculture and few human settlements interspersed with natural vegetation and small streams.

Figure 3.1.2: The Jonai to Pasighat railway line is currently under construction, and passes near the northern boundary of the Poba Reserve Forest bordering Assam and Arunachal Pradesh.

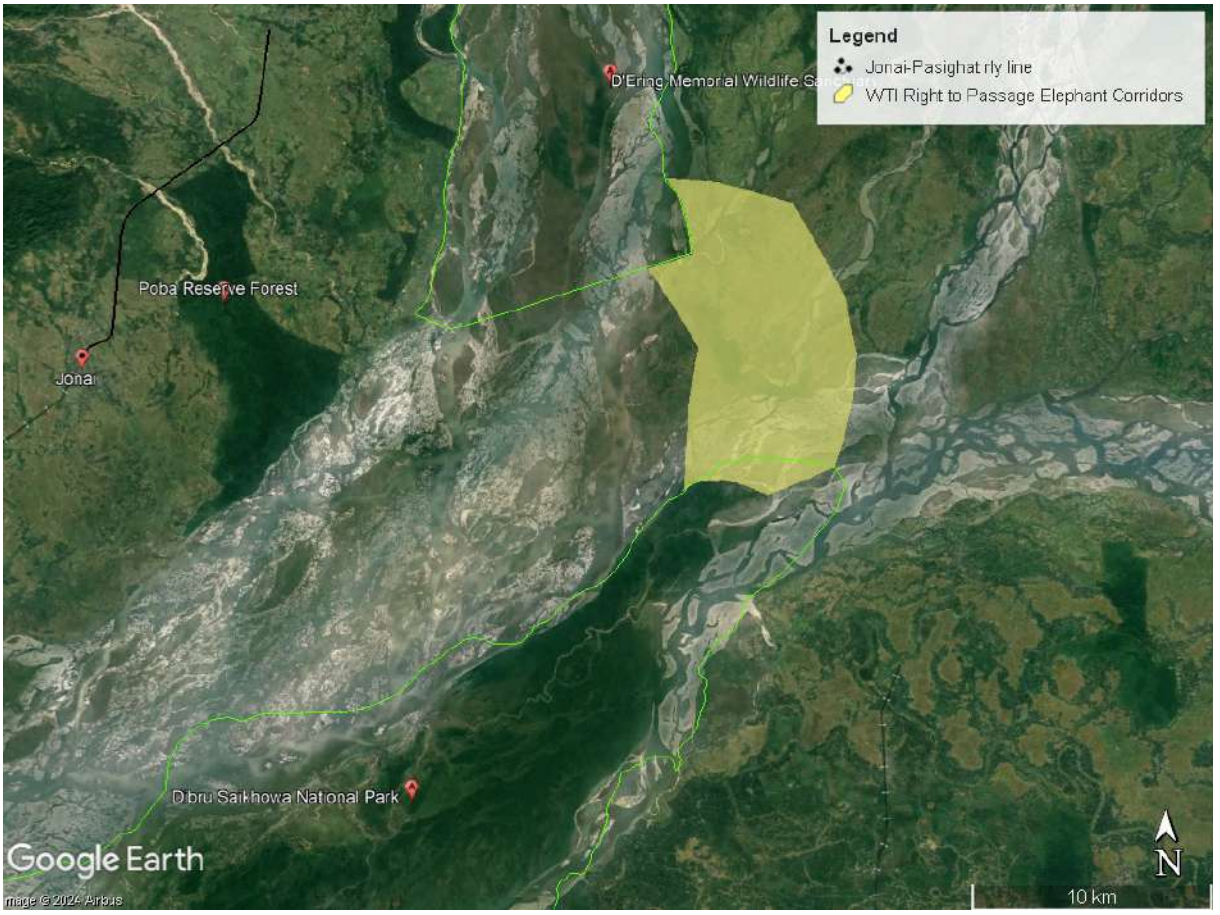


Figure 3.1.3: Location where occasional elephant crossing is reported to occur.

Recommendations:

- Ramps with level crossings to facilitate elephant movement across the railway track are recommended across the three crossing points identified on field.

- WII guidelines on design specifications for mitigation measures (Appendix I) may be referred to for structural details of the ramps and level crossings. The mid-point GPS locations of the crossing zones are shown in Table 3.1.1 and Figure 3.1.5.

Table 3.1.1: Mid-point GPS locations of three elephant crossing zones identified along the under-construction Jonai-Pasighat railway line near Poba Reserve Forest, Assam and Arunachal Pradesh.

S.No.	Crossing points	Mid-point GPS
1.	Poba 1	27° 54.541'N 95° 16.311'E
2.	Poba 2	27° 54.033'N 95° 15.500'E
3.	Poba 3	27° 53.884'N 95° 15.287'E

Figure 3.1.4: The Jonai-Pasighat railway line alignment currently under construction aligned north of the Poba Reserve Forest in Assam and Arunachal Pradesh. Yellow pins represent reported elephant crossing points across the railway line.

Figure 3.1.5: Proposed/under construction bridges (white arrows) on the Jonai-Pasighat railway line, and elephant crossing zones (yellow pins) as indicated by Forest Department personnel. Ramps and level crossings for elephant movement are to be constructed at each of the three crossing points.

Harmuti-Gumto-Naharlagun railway line passing through the Durpong-Doimukh at Khundakuwa elephant corridor

Survey date: 21st March 2024

The Durpong-Doimukh at Khundakuwa corridor connects the Durpong Reserve Forest to the south-west with the Doimukh Reserve Forest to the north-east. The corridor is intersected by the National Highway 415 connecting Banderdawa to Itanagar, the Doimukh-Harmuti road, the Harmuti-Gumto-Naharlagun railway line and multiple human settlements and agricultural fields (Fig. 3.1.6).

Observations:

- The corridor connecting the two reserve forests is intersected by multiple roads, a railway line, stone crusher sites, human settlements and agricultural land. Some of the human settlements were reported to be encroachments, such as those on the nalas used by elephants for movement. Walls and human activities such as burning of fire in these areas to repel elephant movement have been reported.

- The railway line was established in 2014, and the train traffic is currently low (4 trains daily). No elephant accidents have been reported on the stretch yet.

- Reduced use of the corridor was reported in 2017. According to forest officials, movement has been infrequent in recent years too, except for paddy-harvesting season. However, it is improbable that elephants have been able to cross the corridor completely.

Recommendations:

- The railway line is soon to be electrified. All electrical infrastructure should be proofed so as to avoid incidences of wildlife electrocution.

- Drainage structures on the railway line are to be kept free of human encroachments.

NOTE:

The railway line in the Namsai region of Arunachal Pradesh was reported to be under planning. Consequently, it is recommended that assessment of probable impacts and mitigation planning be conducted as soon as the planning process is completed.

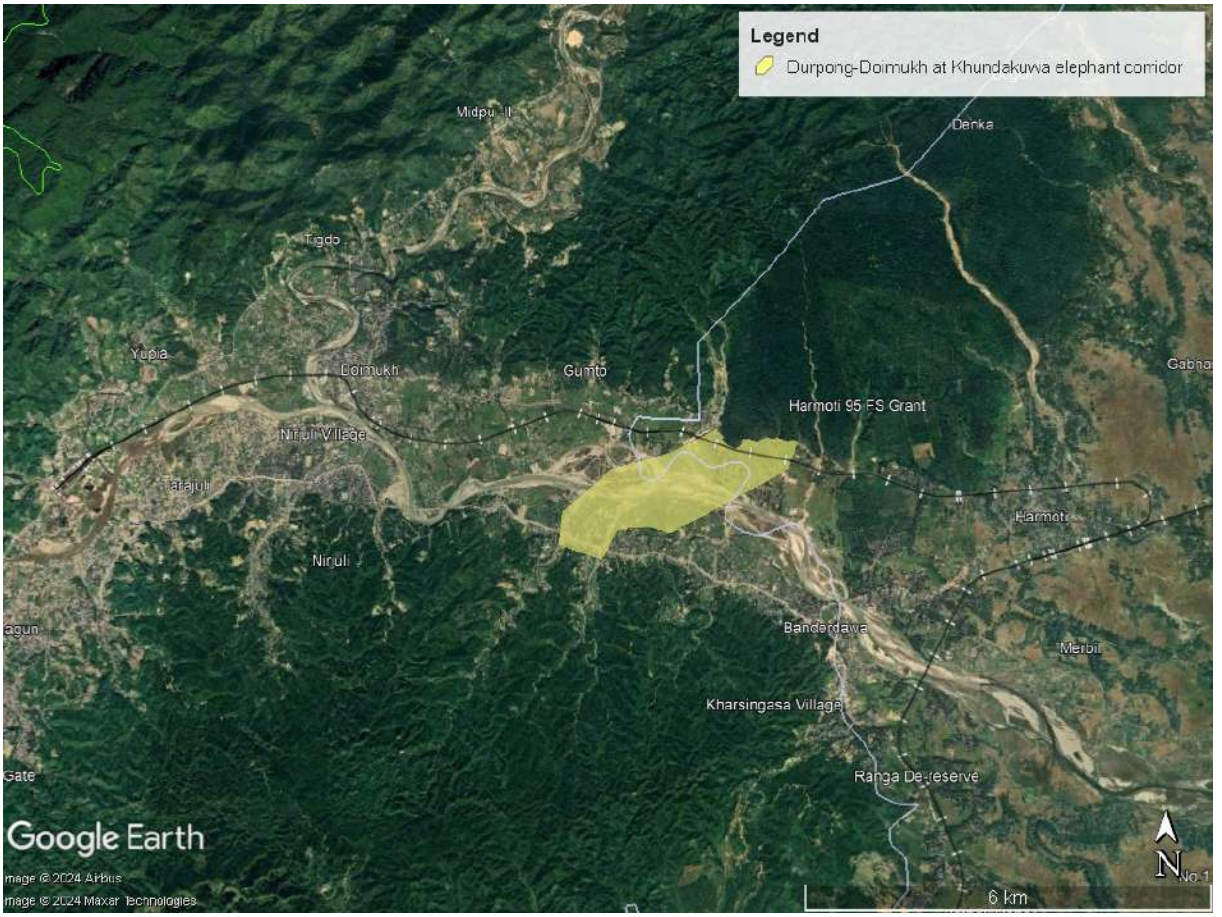


Figure 3.1.6: Location of the Harmuti-Gumto-Naharlagun railway line, and other anthropogenic infrastructure and land uses, intersecting the Durpong-Doimukh elephant corridor (Project Elephant, 2023).

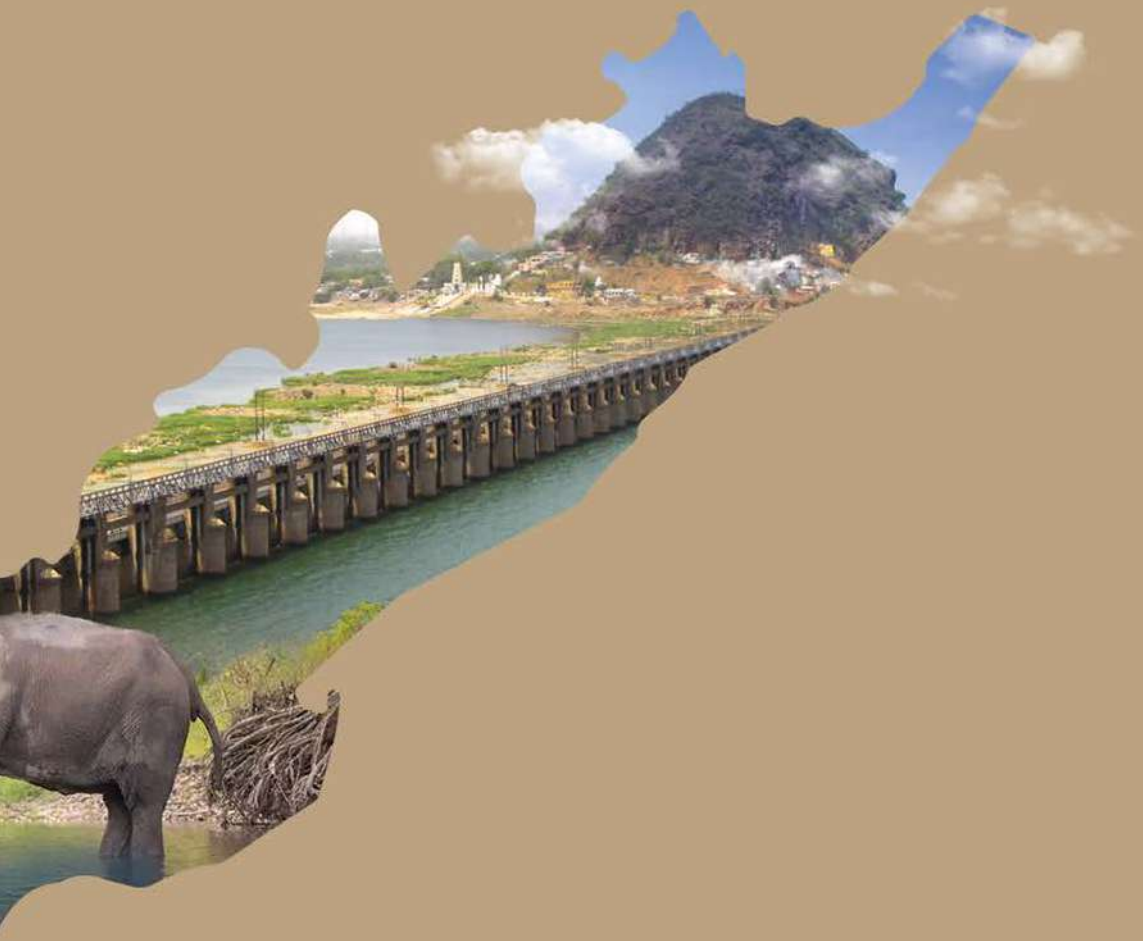
List of Arunachal Pradesh Forest Department and Indian Railways officials consulted during the survey

State Forest Departments

Sri Hano Moda *DFO, Pasighat*
Sri T. T. Toppu *DFO, Itanagar*
Sri T. Dupit *RFO, Doimukh Range*
Sri Opang Jamoh *RO, Ruksin Range*
Sri Adiram Natung *Forester/Beat Officer, Gumto*

Indian Railways

Sri A. K. Kushwaha *Northeast Frontier Railway*
Sri Vivek Bajaj *DEN 1, Tinsukia Division*
Sri Lakshman Singh *DEN 1, Lumding Division*
DEN 3, Lumding Division
Sri Arvind Kumar *DEN 3, Rangia Division*
Sri Abhishek Choudhary *XEN, Pasighat*
Sri Vishnu Kumar *ADEN Dimapur*
Sri Dibyajyoti Dutta *ADEN 3, Lumding Division*
Sri Gautam Saikia *SSE/P.Way/I.C/MRG*
Sri Biman Doley *SSE, Works, Pasighat SPTR*
Sri Deep Das *SSE/P.WAY/NLP/east*
Sri Ratan Majumder *SSE/P.Way/H/LMG (Sc)*
Sri Jayanta Rajbongshi *SSE/PWay/INE/BBU-BJL*
Sri Dizen Medhi *SSE/PWay/RPAN*
Sri Lima Sungba *AO, SSE/P.Way/DMV*
Sri Dharvesh Pal Singh *Jr. Engr./PWay, Naharlagun*
Sri Himanshu Bisht *JE/P.Way/JRBM*
Sri Mintu Choudhury *Trolley Man, Balipara-Bhalukpong*
Sri Bijay Boro *TRM I /BBU*



Andhra Pradesh

3.2. ANDHRA PRADESH

Introduction

India has four major regional elephant populations, namely the north-west, north-east, east-central and the southern. A few Indian states comprise more than one regional elephant population. Andhra Pradesh, which did not have elephants for nearly 200 years, presently harbors a small group of elephants from both the east-central and southern regional elephant populations occurring in two discrete regions of the state.

Elephants in Southern Andhra Pradesh

The south Andhra Pradesh elephant population comprises elephants that have extended their range from the neighboring Karnataka and Tamil Nadu into Chitoor and Tirupathi districts since the 1980s. Here, elephants from Bannerghatta National Park of Karnataka, and the Hosur and Dharamapuri Forest Divisions initially dispersed into Kuppam and Palamner Forest Ranges of Chittoor Forest Division. These two Ranges were subsequently notified as Koundinya Wildlife Sanctuary. A splinter herd moved further northeast and colonized Sri Venkateswara National Park and Wildlife Sanctuary. A much larger area around Koundinya Wildlife Sanctuary was notified as Rayala Elephant Reserve. The population that initially dispersed into southern Andhra Pradesh was subsequently augmented by sporadic dispersals from both Tamil Nadu and Karnataka during the last two decades.

Elephants in Northern Andhra Pradesh

Unlike the southern districts of Andhra Pradesh, where elephant colonization dates back to the 1980s, elephant immigration in the northern districts of the state was relatively recent. During the year 2017, a herd of elephants from southern Odisha comprising the east-central regional elephant population extended its range into the patchy forested habitats of Vizianagaram district. Subsequently, more elephants from Odisha moved into Srikakulam district. Presently, there are about 11 elephants occurring in the whole of northern Andhra Pradesh primarily in Parvathipuram Manyam and Srikakulam districts. Solitary bulls reportedly move back and forth along the Odisha-Andhra Pradesh interstate boundary.

In the districts of both southern and northern Andhra Pradesh, where elephants occur, till date no rail-related elephant collision has been reported. However, there are high-traffic railway lines in the State that elephants regularly cross. Thus, there is a perpetual risk of rail-elephant collisions necessitating timely identification of critical stretches to adequately and appropriately mitigate the potential effects thereof. In an attempt to preempt elephant deaths due to rail collisions, which is also a matter of safety concern for rail operation, vide Office Memorandum 12-1/2019-PE (Part-I) dated 30th August 2022 of the MoEFCC, Government of India, a joint survey of vulnerable railway stretches with potential elephant-rail collisions involving the field officials from the Railways and the Forest Department was envisaged. As per the said correspondence, five stretches of Railway lines in the whole of Andhra Pradesh were indicated to be sensitive as far as elephants are concerned (Appendix-1). Joint site visits were carried out during August 2024 in all sensitive stretches across the state to validate the importance of the identified stretches and deliberate on the mitigation plans thereof.

Field Survey

The site visits to the railway stretches identified as those vulnerable for rail-elephant collisions were carried out during 22/08/2024 to 27/08/2024 involving a joint team of the Railways, Forest Department and a representative from the Project Elephant nominated through letter reference F. No. 12-1/2019-PE (Part-I) dated 20th August 2024 addressed to the Chief Wildlife Warden, Government of Andhra Pradesh. During the site visits to the vulnerable stretches, the latest details pertaining to elephant use of the area were obtained from the Forest Department. Additionally, details such as intensity and nature of rail traffic, track characteristics, including that of curvature and gradient, sanctioned speed, and mitigation measures currently in place to minimize collision risks were recorded. Wherever possible, during the site visits, the entire stretch of the tracks was covered either on foot or Railway trolleys, as appropriate. The Railway stretches with potential elephant crossings, which were visited during the site surveys, have been provided in Table 3.2.1.

* The objective of the field survey was to minimise elephant-train collisions either by constructing underpasses and overpasses wherever possible, by reducing the time taken by elephants to cross the railway tracks by easing movement across the track through construction of ramps and level crossings, and by implementation of technology for early detection and warning systems.

Table 3.2.1: Sensitive Railway stretches with potential elephant crossings

S.No	Stretch	Forest Division	District
1	Parvathipuram	Parvathipuram Forest Division	Parvathipuram Manyam
2	Renigunta to Balepalli (*via* Mamandur)	Tirupathi Forest Division and Sri Venkateswara WLS	Tirupathi
3	Tirupathi to Pakala	Tirupathi Forest Division	Tirupathi
4	Damalacheruvu to Mangalampet	Tirupathi Forest Division	Tirupathi
5	Mallanur to Pachur	Koundinya Wildlife Sanctuary	Chittoor
6	Mallanur to Pachur	Koundinya Wildlife Sanctuary	Chittoor
7	Gudupalli to Bisanattam	Kuppam Range, Chittoor Forest Division	Chittoor

Site-Specific Findings & Mitigation Measures

Parvathipuram railway stretch (Northern Andhra Pradesh)

Since the year 2018, elephants have sporadically crossed the Railway lines in the stretch between Parvathipuram and Kuneru Railway stations, spanning nearly 20 km. Within this section, c. 9.0 km stretch between Railway OHE Mast No. 379-34 (GPS: 18.846037°/ 83.457734°) is particularly sensitive with regard to recent elephant movements.

Table 3.2.2: Salient Features of the Railway Stretch in Parvathipuram Manyam

Railway Zone and Division = East Coast Railway (ECoR), Vishakapatnam Division (VSKP)
District = Parvathipuram Manyam
Track = Triple. Broad Gauge. Energized.
Sanctioned Speed in the Stretch = 110 km/hour
Number of trains operating per day = c. 90 (together in both the directions)
Nature of traffic = both freight and passenger
Mitigation measures currently in place to prevent train-elephant collisions = a. Intensive round the clock monitoring by the Forest Department team by involving about 25 trackers (temporary staff) b. The tracking is both manual and use of drones c. The Forest Department has identified the critical stretch of the Railway line and communicated the same to the Railway department. d. Whenever elephant movement is observed, speed restriction is temporarily imposed. e. A few sensitive stretches have been identified to erect signage to alert loco pilots.

OBSERVATIONS

- The elephant movement in northern Andhra Pradesh is relatively recent and continues to be fluid. In the past (5 years ago), elephant movement was reported in and around Ichchapuram Railway station (in Srikakulam district) in the Vishakapatnam – Khurda Road Railway section of the Howrah-Chennai main line. However, elephant movement has not been observed in this area during the last five years. Thus, in the present, the Ichchapuram section of the Vishakapatnam- Khurda Road in the Howrah-Chennai main line doesn't assume importance from the perspective of elephant-related mitigation.

- Currently, there are two different herds of elephants occurring in northern Andhra Pradesh. A herd of 4 elephants occurs around Pathapatnam in Srikakulam district. Another herd of 7 elephants occurs in Parvathipuram Manyam. Elephant movement around Parvathipuram Manyam entails crisscrossing Railway lines necessitating mitigation plans to preempt rail-related elephant collisions.

- In addition to this herd, a bull elephant periodically joins the herd. This bull, which was implicated with high conflicts with local people, has reportedly moved into Odisha recently.

- Elephant movement in Parvathipuram Manyam commenced during the year 2018. Here, the elephants occur in Artham and Konavalasu Reserved Forests and frequently cross the Parvathipuram-Rayagada Railway section frequently (Figure-3.2.1).

- The total span of the stretch vulnerable for elephants is c. 9.0 km.

- The Railway stretch between OHE Mast 379/34 (GPS: 18.846037°/ 83.457734°) and Parvathipuram Railway Station (GPS: 18.769821°/83.427106°) is sensitive with respect to recent elephant movements. This stretch spans around 9.0 km in total. Within this stretch, the smaller stretch (stretch-1 in Figure-3.1.1) of around 2.75 km spanning OHE Mast 379/34 and Artham Level Crossing (18.822037°/ 83.451418°) is particularly sensitive, as elephant movement has predominantly occurred in that stretch.

Figure-3.2.1: Railway stretch in Parvathipuram Manyam of the East Coast Railway used by elephants frequently

RECOMMENDATIONS

- Elephant movement in northern Andhra Pradesh remains fluid, and less than 15 elephants use/occur in the landscape. These elephants currently predominantly occur in man-modified mosaic landscapes with high interspersion of human settlements, agricultural areas, and forest patches. Given these, envisaging permanent mitigation plans in the Railway stretches is not necessary. Nevertheless, the risk of a rail-elephant collision is high, and thus, provisional plans are necessary to minimize the threat.

- The Railway should demarcate the indicated stretch as a sensitive location with respect to elephants and (i) include the same in the caution order so that the loco-pilots are aware of the potential risk and, (ii) erect signage in the identified stretches, particularly in the regular crossing locations, to further reinforce caution for the loco-pilots and local Railway staff. The main crossing locations have already been identified by the Forest Range Officer, Parvathipuram and communicated to the ADEN, PWAY of the Railways (letter copy enclosed as Appendix-2).

- The Railway Department can extend financial support to the Forest Department by deploying an exclusive vehicle (four-wheeler) for monitoring elephant movement and paying monthly wages for four temporary watchers to reinforce the current monitoring team of the Forest Department.

Joint Survey of the Parvathipuram Railway Stretch on 23/08/2024

Renigunta to Balepalle via Mamamdur) in Tirupathi (Southern Andhra Pradesh)

In southern Andhra Pradesh, while a large fraction of elephants occurs in Koundinya Wildlife Sanctuary, a splinter group of around 30-40 elephants occurs in Sri Venkateswara National Park and Wildlife Sanctuary. Human-elephant conflict is reportedly minimal, as elephants occur in a large and connected forested complex with minimal human influence. The National Highway between Tirupathi and Kadapa (NH-716) and the Railway line connecting Tirupathi and Kadapa bisect through the otherwise intact forest and pass along the eastern boundary of the sanctuary. The vehicular and rail traffic on both the National Highway and the Railway Stretch is high, creating a barrier effect. From the standpoint of elephants, the Railway stretch from Renigunta.

The Railway stretch that is critical from the standpoint of elephants is from Balapalle (BLPE) to Railway OHE Mast No. 149/3 (GPS: 13.703052/79.488677) through Mamanduru (MRM) Railway Station. The total span of the sensitive stretch is about 16.5 km.

OBSERVATIONS

- The stretch between Anjaneyapuram forest barrier and Railway OHE Mast No. 143/3 (GPS: 13.703052°/ 79.488677°) and Balepalle Railway Station (BLPE) via Mamanduru Railway Station (MRM) is sensitive for wildlife crossings.
- The total length of the sensitive stretch is c. 16.5 km
- Presently, elephants occur mostly along the west of the Railway track, primarily within Sri Venkateswara NP & WLS.
- Elephants come close to the Railway line and both the staff of the Forest Department and the Railway Department have seen them on numerous occasions. However, elephants only sporadically cross the Railway tracks.

- The vehicular traffic on the National Highway passing along the Railway line is high throughout the day and increases, particularly during the night. This bumper-to-bumper traffic during the night is possibly deterring elephants from regularly crossing the Railway lines.

- The area is rich in wildlife in general. Large mammals like chital (*Axis axis*), sambar (*Rusa unicolor*) and leopard (*Panthera pardus*) regularly cross the Railway line and the National Highway effectively using the forests on either side of the linear artifacts. A few incidences of road kill of these animals were reported too.

Table-3.2.3: Salient Features of the Railway Stretch between Balepalle (BLPE) to Mamanduru (MRM)

Railway Zone and Division = South Central Railway (SCR), Guntakkal Division (GTL)
District = Annamaiah and Tirupathi Divisions
Track = Double. Broad Gauge. Energized.
Sanctioned Speed in the Stretch = 110 km/hour
Number of trains operating per day = c. >70 (together in both the directions)
Nature of traffic = both freight and passenger
Mitigation measures currently in place to prevent train-elephant collisions = a. A few sensitive stretches where elephants can potentially cross have been identified by the Forest Department to erect signage to alert loco pilots.

Figure 3.2.2: Railway stretch in Renigunta Junction Railway station and Balepalle Railway Station in the South-Central Railway, which passes through important wildlife area in southern Andhra Pradesh

RECOMMENDATIONS

- Presently, there are no structural mitigation plans to address potential threats to elephants. Whenever, elephants occur in areas close to the Railway lines, the Forest Department monitoring teams inform the Railway staff requesting cautious train operation. Since the Railway lines and the National Highway pass through an otherwise intact and wildlife rich area, a comprehensive mitigation plan that address the potential threats of the physical infrastructure on wildlife assumes a priority in the landscape. Standalone plans for either the Railway or the Highway are not appropriate given that both of these establishments already seem to have a strong barrier effect on elephants occurring in Sri Venkateswara NP & WLS.

- A comprehensive wildlife mitigation plan to facilitate unhindered animal movement in both the Railway tracks and the National Highway is required.

- As a stopgap arrangement, a permanent caution order indicating potential elephant crossing in the Railway stretch between Anjaneyapuram and Balepalle Railway station seems pertinent.

- The Forest Department can also identify vulnerable points within the stretch where signage can be erected to further reinforce cautious train movement in the stretch.

- In the entire stretch, Distributed Acoustic Sensing (DAS) early warning system should be implemented for timely elephant detections.

Table 3.2.4: Specific structural mitigation measures suggested in addition to aforementioned recommendations

S.No	Chainage	Suggested Mitigation	Latitude	Longitude
1	153/4	The existing bridge over Tada Kaluva stream should be further widened and bed kept free for wildlife movement. Minimum height of 8m from the bed of the stream should be maintained.	13.77488	79.42448
2	153/0	The existing bridge over Tummuru river is about 50 m wide. Minimal height of 8m from the river bed is to be maintained to facilitate elephant movement.	13.77290	79.42685
3	150/29	The existing bridge over jungle stream narrow. Minimal height of 8m from the river bed is to be maintained to facilitate elephant movement.	13.75635	79.44657
4	150/2	The existing bridge over Mamandur river is about 50 m wide. Minimal height of 8m from the river bed is to be maintained to facilitate elephant movement.	13.75044	79.45355

Joint Survey of the Balepalle-Mamanduru Railway Stretch on 24/08/2024

Tirupathi to Pakala (Southern Andhra Pradesh)

Pakala Railway Junction (PAK) is located 41.9 km southwest of Tirupathi. A single energized Railway line passes parallel along the Chittoor-Tirupathi National Highway for most part. In a few stretches, the Railway line passes along the boundary of the forests.

Table3.2.5: Salient Features of the Railway Stretch between Tirupathi (TPTY) to Pakala (MRM)

Railway Zone and Division = South Central Railway (SCR), Guntakkal Division (GTL)
District = Chittoor and Tirupathi Districts
Track = Single. Broad Gauge. Energized.
Sanctioned Speed in the Stretch = 110 km/hour
Number of trains operating per day = c. 40 (together in both the directions)

Figure 3.2.3: Railway stretch in between Tirupathi Railway Station to Pakala Junction Railway Station in Tirupathi and Chittoor Districts

OBSERVATIONS

- The stretch of the Railway track spanning c. 32km from Tirupathi (TPTY) to Pakala Junction (PAK) passes along the forest boundary in some sections. In particular, the section in the vicinity of Sri Venkateswara Zoological Park (Tirupathi zoo) to Panapakkam Railway Station passes close to the forest boundary.

- The Tirupathi-Pakala Railway track also runs parallel to Tirupathi – Chittoor National Highway for most part.

- Elephant occurrence in the forests located alongside the Railway track is sporadic. No recent movements were observed. Further, elephants seldom crossed the Railway track as well as the National Highway located alongside the track. This was suggested during a recent joint surveys by the Railways and the Forest Department (-2).

- Elephants crossing the Tirupathi-Pakala Railway track is not desirable as (i) there is a risk of elephants entering urban limits of Tirupathi city and (ii) no substantial viable habitats are available for elephants if they cross the Railway line and move towards forests in the southwest. These forest patches never had elephant presence in the past and thus novel movements can only perpetuate human-elephant conflicts.

RECOMMENDATIONS

- There is no elephant movement across the Railway track in the present and thus, the stretch between Tirupathi to Pakala Railway Junction need no mitigation plan to facilitate elephant movement.

- Rather, it would be pertinent to limit even sporadic elephant movement in vulnerable locations through Railway barricades along such stretches so that human-elephant conflict is not perpetuated in new areas of the landscape.

Joint Survey of the Tirupathi-Pakala Junction Railway Stretch on 25/08/2024

Damalchervu to Mangalampet railway stretch in the Pakala junction–Piler section (Southern Andhra Pradesh)

The Rayala – Venkateswara Elephant Corridor is a vital link between Koundinya Wildlife Sanctuary and Venkateshwara National Park and Wildlife Sanctuary in Southern Andhra Pradesh. The Railway track between Damalcheruvu (DCU) and Mangalampeta (MPT) cuts through the Rayala – Venkateswara Elephant Corridor (Project Elephant, 2023). Thus, mitigating the potential effects of the Railway track on elephants assumes critical importance.

Table 3.2.6: Salient Features of the Railway Stretch between Balepalle (BLPE) to Mamanduru (MRM)

Railway Zone and Division = South Central Railway (SCR), Guntakkal Division (GTL)
District = Chittoor District
Track = Single. Broad Gauge. Energized.
Sanctioned Speed in the Stretch = 110 km/hour (however, there are many 5 degree curves in the section where permanent speed restriction at 75 km/hour in the interest of train safety is in place)
Number of trains operating per day = 4
Nature of traffic = only passenger trains

OBSERVATIONS

- The Damalcheruvu (DCU, GPS: 13.478567°/ 79.056458°) to Railway Mast No: 206/9 (GPS: 13.583214°/ 79.084424°) passing through the Mangalampeta (MPT) and Vallivedu (VLV) Railway stations cut across the Rayala-Venkateswara elephant corridor. This is a vital elephant corridor in southern Andhra Pradesh that elephants have to use to move between Koundinya Wildlife Sanctuary in the west to Sri Venkateswara NP and WLS in the east. Most of the elephant movement between the two Protected Areas occurs through the revenue lands. Any disruption in this corridor can lead to isolation of elephants in Sri Venkatesara NP & WLS.

- The total length of the sensitive stretch of Railway track is around 13.0 km passing through Mangalampeta (MPT) and Vallivedu (VLV) sections.

- Elephant movement across the Damalcheruvu and Mangalampeta Railway Stations is reportedly seasonal and occurs mostly during the summer months. Nevertheless, there is occasional movement of bulls/ group of bull elephants in the area.

RECOMMENDATIONS

- Presently, the train traffic in the section is low at just 4 trains per day. Further, the track between Managalampeta and Damalcheruvu via Vallivedu has many 5 degree curves where permanent speed restriction of 75 km/hour is in place. Therefore, due to low traffic and speed limitations, the probability of elephant-train collisions in this single-line section is presently low.

- However, any upgradation of the track, including that of doubling and concomitant increase in the frequency of train services need to be adequately mitigated so that elephant movement in the corridor is not affected.

- Presently, there are multiple locations in the 13.0 km stretch that are actively used by elephants.

- Monitoring elephant movement in and around the vicinity of the Railway track to understand patterns of habitat-use and seasonality of movement would be essential so that impediments for elephant movement, in the present and in future can be predicted and adequately mitigated.

- In the entire stretch, Distributed Acoustic Sensing (DAS) early warning system should be implemented for timely elephant detections.

Figure 3.2.4: Railway stretch in Damalcheruvu (DCU) and Mangalampeta (MPT) cuts through the vital Rayala-Venkateswara elephant corridor

Table 3.2.7: Specific structural mitigation measures suggested in addition to aforementioned recommendations

S.No	Chainage	Suggested Mitigation	Latitude	Longitude
1	219/9	The existing bridge over Mangalampeta River is about 100m wide. The river bed kept free for wildlife movement. Minimum height of 8m from the bed of the stream should be maintained.	13.48431	79.05363

Joint Survey of the Damalacheruvu-Mangalampeta Railway Stretch on 25/08/2024

Kuppam to Mallanur and interstate boundary with Tamil Nadu (Southern Andhra Pradesh)

Kuppam taluk in Chittoor District is located in the tri-junction of Andhra Pradesh, Tamil Nadu and Karnataka. There is forest connectivity across the three states in the trijunction area, where considerable elephant movement is observed all through the year. Elephants moving from Tamil Nadu and Karnataka will have to cross the busy Bengaluru – Chennai railway tracks to reach Koundinya Wildlife Sanctuary in Andhra Pradesh. Lately, the frequency of elephant movement has substantially increased. Although no rail-related elephant deaths were ever reported, considering regular elephant movement, it is high-time to embark on a comprehensive mitigation plan given that rail traffic in this busy section has been increasing with numerous high speed trains like Vande Bharat and Shadabdi plying frequently.

Table 3.2.8: Salient Features of the Railway Stretch between Kuppam (KPN) to Mullanur (MAR) and up to Tamil Nadu border

Railway Zone and Division = South Western Railway (SWR), Bengaluru Division (SBC)
District = Chittoor District
Track = Double. Broad Gauge. Energized.
Sanctioned Speed in the Stretch = 110 km/hour. However, the sanctioned section speed would be increased soon.
Number of trains operating per day = c. 90
Nature of traffic = both passenger and freight including high-speed trains like Shadabdi and Vande Bharat

OBSERVATIONS

- There has been an increased frequency in elephant movement observed between Kuppam (KPN) to Mulanur (MAR) and beyond, till the Tamil Nadu-Andhra Pradesh interstate boundary. Elephants from Koundinya WLS moving into Tamil Nadu and Karnataka and vice-versa have to compulsorily cross the Bangalore-Chennai railway line.
- The total span of the sensitive stretch is c. 16.5 km
- To manager the gradient, the two Railway tracks (up line and down line) bifurcate into two from Mulanur (MAR) Railway Station to Tamil Nadu-Andhra Pradesh interstate boundary and beyond.
- Elephants cross the Railway track in multiple locations between Kuppam (KPN) and Mulanur (MAR). There is no forest cover between Kuppam (KPN) and Mulanur (MAR) and all the identified elephant crossing locations occur outside forests. This is a cause for concern, as specific locations for mitigation measures can be challenging to device.
- The stretch between Mulanur (MAR) and the interstate boundary is more frequently used by elephants in comparison to the Kuppam (KPN) to Mulanur (MAR) section. Here, elephants cross both the up and down lines located at variable distance from each other, further compounding the challenge.

Figure 3.2.5: Railway stretch in Kuppam (KPN) and the Tamil Nadu – Andhra Pradesh interstate boundary

RECOMMENDATIONS

- Intensive monitoring of elephant movement through active interstate coordination between Karnataka, Tamil Nadu and Andhra Pradesh is critically needed in the area to minimize the risk of train-elephant collisions. Using a data-driven approach, generating a long-term perspective on planning safe movement of elephants across high-speed railway corridor would be critical for the landscape.

- Since the entire stretch of Railway track that elephants cross between Kuppam and the interstate boundary passes through non-forest areas and with highly fluid elephant movement, no permanent mitigation structures to facilitate elephant crossings can be planned.

- Ideally, elephant movement should be funneled through Kothur RF in Tamil Nadu where permanent structures to facilitate elephant movement can be designed. However, this is challenging as elephants use a long stretch of non-forest areas to cross the Railway lines.

- It is pertinent to identify all crossing locations between Kuppam and Mulanur extending up to Tamil Nadu – Andhra Pradesh interstate boundary and create hotspots of elephant crossing where the Railways can erect signage alerting the loco-pilots about imminent elephant crossings.

- Permanent caution orders between Kuppam and Tamil Nadu-Andhra Pradesh boundary and beyond into Tamil Nadu state can be issued by demarcating the stretch as vulnerable for elephant crossings. This is particularly important as a high number of loco pilots would be involved in train operations in the stretch, and in the absence of permanent caution orders, the train operating crew may not be aware of potential elephant movement.

Joint Survey of the Mulanur-Kuppam Railway Stretch on 25/08/2024

Gudupalli-Bisanattam near Kuppam (Southern Andhra Pradesh)

In the intersection of Tamil Nadu, Karnataka and Andhra Pradesh, considerable elephant movement has been observed during the last decade between Kuppam (KPN) and Bisanattam (BSM) Railway stations. The Bisanattam (BSM) Railway station is located in Karnataka, along the interstate border with Andhra Pradesh and the boundary line passes next to the Railway station. Elephant movements have particularly increased between Gudupalli (GDP) and Bisanattam Railway Stations during the last few years. Thus, mitigating the impacts related to potential rail-elephant collisions is imperative in this stretch.

Table 3.2.9: Salient Features of the Railway Stretch between Kuppam (KPN) to Bisanattam (BSM) via Gudupalli (GDP) and up to Tamil Nadu border

Railway Zone and Division = South Western Railway (SWR), Bengaluru Division (SBC)
District = Chittoor District
Track = Double. Broad Gauge. Energized.
Sanctioned Speed in the Stretch = 110 km/hour. However, the sanctioned section speed would be increased soon.
Number of trains operating per day = c. 90
Nature of traffic = both passenger and freight including high-speed trains like Shadabdi and Vande Bharat

OBSERVATIONS

- While the movement between Kuppam (KPN) and Mulanur (MAR) has been observed for many decades since the 1980s, elephants moving between Kuppam (KPN) and Bisanattam (BSM) is relatively recent.

- Lately, elephant movement has particularly increased in the stretch between Gudupalli (GDP) and Bisanattam (BSM). The span of this stretch is around 5.2 km

- There is sparse forest cover between Gudupalli (GDP) and Bisanattam (BSM) and hence, elephants crossing the Railway track are not limited to a small stretch of forests near Bisanattam Railway station. This presents a major challenge as elephant movements between Gudupalli and Bisanattam could occur anywhere.

RECOMMENDATIONS

- Intensive monitoring of elephant movement through active interstate coordination between Karnataka, Tamil Nadu and Andhra Pradesh is critically needed in the area to minimize the risk of train-elephant collisions. Using a data-driven approach, generating a long-term perspective on planning safe movement of elephants across high-speed railway corridors would be critical for the landscape.

- Because of fluid elephant movement and sparse forest cover, permanent mitigation measures in the Railway stretch between Gudupalli and Bisanattam are not appropriate in the present.

- It is pertinent to identify all crossing locations between Gudupalli and Bisanattam extending up to Karnataka – Andhra Pradesh interstate boundary and create hotspots of elephant crossing where the Railways can erect signage alerting the loco-pilots about imminent elephant crossings.

- Permanent caution orders between Gudupalli and Bisanattam and beyond into Karnataka state can be issued by demarcating the stretch as vulnerable for elephant crossings. This is particularly important as a high number of loco pilots would be involved in train operations in the stretch, and in the absence of permanent caution orders, the train operating crew may not be aware of potential elephant movement.

Figure 3.2.6: Railway stretch in Kuppam (KPN) and the Tamil Nadu – Andhra Pradesh interstate boundary

Summary

1. For elephants, there is one vulnerable stretch in northern Andhra Pradesh and 5 vulnerable stretches in southern Andhra Pradesh.

S.No	Stretch	District	Railway	Distance (approximate)
1	Parvathipuram Manyam	Parvathipuram	ECoR	9.0 km
2	Renigunta to Balepalle via Mamanduru	Tirupathi	SCR	16.5 km
3*	Tirupathi to Pakala	Tirupathi and Chittoor	SCR	0 km
4	Damalcheruvu to Mangalampeta	Chittoor	SCR	13.0 km
5	Kuppam to Mulanur, until TN-AP boundary	Chittoor	SWR	16.0 km
6	Gudupalli to Bisanattam, until KA-AP boundary	Chittoor	SWR	5.2 km
	Total			59.7 km

* This section is found to be not important for elephants

For elephants, the total span of the sensitive stretches in Andhra Pradesh is around 59.7 km. Of this, 9 km is in the ECoR, 29.5 km is in the SCR, and 21.2 km is in the SWR.

2. The Ichchapuram section of the Vishakapatnam- Khurda Road in the Howrah-Chennai main line is not important from the perspective of elephant crossings, as no elephant movement has been observed in the stretch for the last five years.

3. In Parvathipuram Manyam, a small herd of elephants regularly crosses the Parvathipuram to Kuneru Railway stations (in ECoR) in a 9.0 kilometer stretch. Here, elephants are vulnerable to train collisions, and hence, joint monitoring of elephants to enforce caution orders assumes a priority. Here, it is essential to augment the Forest Department monitoring team with additional human resources and a vehicle with the support of Railways. Additionally, the stretch should be included in the permanent caution order.

4. In the Renigunta (RU) to Balepalle (BLPE) stretch on the Tirupathi – Kadapa section of the SCR, 16.5 km stretch from Anjaneyapuram forest barrier to Balepalle Railway Station is sensitive for the movement of elephants and other wildlife. The area is particularly rich in wildlife, and therefore, a holistic long-term wildlife mitigation plan that simultaneously addresses the potential impacts of both the Railway alignment and the National Highway (NH 716) (which is slated for upgradation) is critically required. The combination of the Railway alignment and NH-716 can bisect the habitat with long-term ramifications for wildlife.

5. The Tirupathi (TPTY) to Pakala Junction (PAK) stretch is not important from the standpoint of elephant movement. No recent movements were observed, and facilitating elephant movement is not desirable as such movements could only perpetuate human-elephant conflicts.

6. The 13.0 km stretch between Damalacheruvu (DCL) and Mangalampeta (MPT) cuts through the vital Rayala – Venkateswara Elephant Corridor. Being a single-line track with very low train traffic (just 4 trains a day), this stretch presently poses no major impediment for elephant movement. However, it is important to erect signages in vulnerable locations and include the stretch in the permanent caution order.

7. In the stretch between Kuppam and TN-AP Interstate boundary via Mulanur (MAR) there is frequent elephant movement. Most of the movement is outside the forests and therefore, inherently challenging to manage. A permanent caution order is required in the stretch indicating elephant movement and wherever appropriate, signage can be erected to further alert the loco pilots. Through mutual coordination between Tamil Nadu, Andhra Pradesh and Karnataka Forest Departments, it is critical a generate a long-term perspective on elephant movement in the landscape.

8. In the stretch between Gudupalli (GDP) and Bisanattam (BSM) there is frequent elephant movement. Most of the movement is outside the forests and therefore inherently challenging to manage. Permanent caution order is required in the stretch indicating elephant movement and wherever appropriate, signage can be erected to further alert the loco pilots. Through mutual coordination between Tamil Nadu, Andhra Pradesh and Karnataka Forest Departments, it is critical to generate a long-term perspective on elephant movement in the landscape.

9. General guidelines issued by the Wildlife Institute of India to mitigate railway-related threats to elephants and other wildlife, as appropriate, may be taken up in all the identified vulnerable stretches in Andhra Pradesh.

List of Andhra Pradesh Forest Department and Indian Railways officials consulted during the survey

Parvathipuram Manyam Stretch, East-Coast Railway (ECoR)

Ms. Prasuna, *AFS, DFO, Pavathipuram*
Shri. K. Manikantesh, *FRO, Elephant Monitoring, Parvathipuram*
Shri. S.K. Mohanty, *SSE/P.WAY/PVT, ECoR*
Shri. S. Nagendra, *TM/III/PVP, ECoR*
Shri. Hari, *Range Forest Staff*
Shri. Chandru, *Elephant Tracker, Kallikota village*

Renigunta to Balapalle Section, South-Central Railway (SCR)

Shri. Sathish, *AFS, DFO, Tirupathi*
Shri. Mohamadullah, *ADEN/Razampet/SCR*
Shri. Srinivas Rao, *Deputy DFO, Tirupathi*
Shri. Rakesh Kalva, *Consultant, Andhra Pradesh Forest Department*
Shri. Ghouse Khareem, *Deputy Forest Range Officer, Mamandur*
Shri. Jyoti Prakash, *Forest Guard, Mamandur*
Shri. Guruvaiyya, *Forest Watcher, Mamandur*
Shri. Ravi Babu, *Temporary Watcher, Mamandur*
Shri. Kilesh, *TM/P.Way/ Renigunta*
Shri. R. Murali, *TM/P.Way/ Renigunta*
Shri. Mathew, *TM/P.Way/ Renigunta*
Shri. Saikat Mondol, *TM/P.Way/ Renigunta*
Shri. Om Kumar, *TM/P.Way/ Renigunta*

Tirupathi to Pakala Section, South-Central Railway (SCR)

Ms. Madhavi, *FRO, Panapakkam*
Shri. Chinna Babu, *DRO, Panapakkam*
Ms. Anitha, *Forest Guard, Mugulipattu*
Shri. Hari Babu, *Trolley Man, Permanent Way, SCR*
Shri. Rakesh Kalva, *Consultant, Andhra Pradesh Forest Department*

Damalacheruvu to Managalampeta Section, South-Central Railway (SCR)

Ms. Madhavi, *FRO, Panapakkam*
Shri. Chinna Babu, *DRO, Panapakkam*
Shri. Venkateswara Rao, *SSE/P/KCI (Kalikiri)*
Ms. K. Bharathi, *Section Officer/PWAY/DCL*
Ms. J. Geetha, *Forest Guard, Damalcheruvu*

Kuppam to Mulanur and Kuppam to Bisanattam Sections, South-Western Railway (SWR)

Shri. Jayashankar, *FRO, Kuppam*
Shri. Pulliah, *Deputy FRO, Kuppam*
Shri. Amarnath, *SSE/P/KPN*
Shri. Rahman, *Forest Guard, Kuppam*
Shri. Tirumalai, *TM/P/KPN*

Assam

3.3. ASSAM

Introduction

The Asian elephant (*Elephas maximus*) distribution in the north-eastern states of India is spread over the states of Assam, Nagaland, Arunachal Pradesh, Tripura, Mizoram and Meghalaya. However, most of this population is concentrated in Assam, with continuous distribution in Arunachal Pradesh and Nagaland. The following description relates to elephant distribution in this semi-contiguous population spread across the states of Assam, Arunachal Pradesh and Nagaland, as it pertains to the purpose of this survey.

The wilderness of the north-east consisting of several states supports a wide variety of biodiversity and is home to several important protected areas, including the Kaziranga and Manas National Parks, both being UNESCO World Natural Heritage Sites. Despite being the second-largest state by area in the north-eastern region, and the largest in terms of human population, Assam is home to rare and endangered wild animals including the greater one-horned rhinoceros, hoolock gibbon, golden langur, and a wide range of birds and reptiles. Significantly, Assam is home to around 56% of Asian elephants found in north-eastern India[1], and is an important landscape for conservation of wild elephants in the country.

The state is divided into three regions – the Brahmaputra valley, the Barak valley and hills of North Cachar and Karbi Anglong. The elephant distribution in and around Assam is spread out over four distinct populations (Project Elephant, 2023), and is contiguous with some neighbouring states as well. Apart from the four major populations, few isolated habitats also exist that support some elephants.

- The population on the north bank of the Brahmaputra extends from northern West Bengal through the Himalayan foothills and Duars covering southern Bhutan, northern Assam and Arunachal Pradesh along the Brahmaputra River, and part of the flood plains of the Brahmaputra and Lohit River in eastern Assam.

Three populations exist on the southern bank of the Brahmaputra – the eastern, central and western areas.

- The eastern population is spread over lower Dibang Valley and Lohit, Changlang and Tirap districts in Arunachal Pradesh, Tinsukia, Dibrugarh, Sibsagar, Charaideo, Jorhat and Golaghat districts in Assam; and Mon, Tuensang, Mokokchung and Wokha districts in Nagaland.

- The central range extends from Kaziranga National Park across the Karbi plateau, parts of the central Brahmaputra plains, and the basin of the Diyung Rivers to the foot of the Meghalaya plateau in Assam and Meghalaya.

- The western range extends from near Guwahati through the foothills of the Meghalaya plateau including Kamrup, Goalpara districts in Assam, and Rhi-Bhoi, West Khasi Hills, East Garo Hills, West Garo Hills, Southwest Garo Hills and South Garo Hills in Meghalaya.

Assam has a fast-growing economy, and the potential for further growth. Important urban centres in Assam include Guwahati, Silchar and Dibrugarh, that are densely populated. The state is rich in petroleum and natural gas deposits, and other minerals such as coal and limestone.

[1] *https://moef.gov.in/moef/division/forest-divisions-2/project-elephant-pe/introduction/index.html*

Other major economic activities of the state include tourism, agriculture, and oil and tea production. Assam has the largest railway network in the north-east region, with about 2435 km of railway lines[2] connecting it to the rest of the country, and providing access to other north-eastern states.

Despite being the most connected state in the north-east in terms of the railway network, railway operations in Assam account for the highest impacts on biodiversity in terms of elephant mortality. The vast railway network often intersects wildlife habitats, and movement pathways of wild elephants that occur outside the purview of protected areas. Consequently, train hits account for the second-highest cause of non-natural elephant mortality in the state, with reports indicating deaths of 115 elephants between 1990 and 2018[3] , and at least 33 elephants between January 2017 and March 2023[4] . Further, the Northeast Frontier Railway (NFR) zone accounted for the highest number of elephant deaths in the period 2014-2022 (65 deaths)[5] . Consequently, while all new railway line construction projects passing through habitats and corridors of elephants and other wildlife must take mitigative actions, it is pertinent that measures to retrofit existing railway lines to mitigate the impacts of railway lines on elephants are taken proactively.

Based on a meeting on 17th August 2022, the Hon'ble Minister of Railways, Government of India, instructed the Ministry of Environment, Forest and Climate Change (MoEF&CC) to provide at least 100 locations of existing railway segments across sensitive elephant and tiger landscapes in the country for construction of permanent mitigation measures in view of wildlife-train collisions (Proceedings under Ministry of Railways letter No. 2022/CE-IV/Elephant Pass dated 30th September 2022). Consequently, details of sensitive stretches for constructing permanent and temporary mitigation measures were provided by the MoEF&CC (vide OM F.No. 12-1/2019-PE (Part-I), dated 30th August 2022).

A total of 18 priority railway segments were identified and surveyed in Assam. The stretches were surveyed by joint teams consisting of State Forest Department, Indian Railways and WII representatives.

Field Survey

A representative of the Wildlife Institute of India, local representatives of the Forest Department and Indian Railways (NFR) conducted a joint field survey of the identified priority railway stretches in the states of Assam, Arunachal Pradesh and Nagaland (Fig. 3.3.1) during 19th – 27th March 2024. During the survey, the survey team inspected the railway track, particularly sites vulnerable to elephant mortality and areas where frequent elephant crossings were observed, based on information from the Forest Department. We relied on information such as previous incidences of elephant/wild animal mortality, elephant movement trails intersecting railway tracks, GPS coordinates and chainages (km) of these sites from concerned officials. We then suggested mitigation measures based on multiple factors including width of crossing zone, track height of the railway line, presence of drainage structure and human infrastructure (and consequent potential for conflict) in that segment.

[2] *https://industries.assam.gov.in/portlet-sub-innerpage/transportation*
[3] *https://www.deccanherald.com/india/assam-third-elephant-injured-in-train-hit-dies-1153132.html*
[4] *https://theprint.in/ground-reports/in-assam-trains-prey-on-elephants-but-hathi-mitras-ai-have-been-defeating-them-for-4-yrs/1656636/*
[5] *https://www.news18.com/news/india/more-than-130-elephants-killed-on-railway-tracks-since-2014-most-in-northeast-frontier-zone-7095799.html*

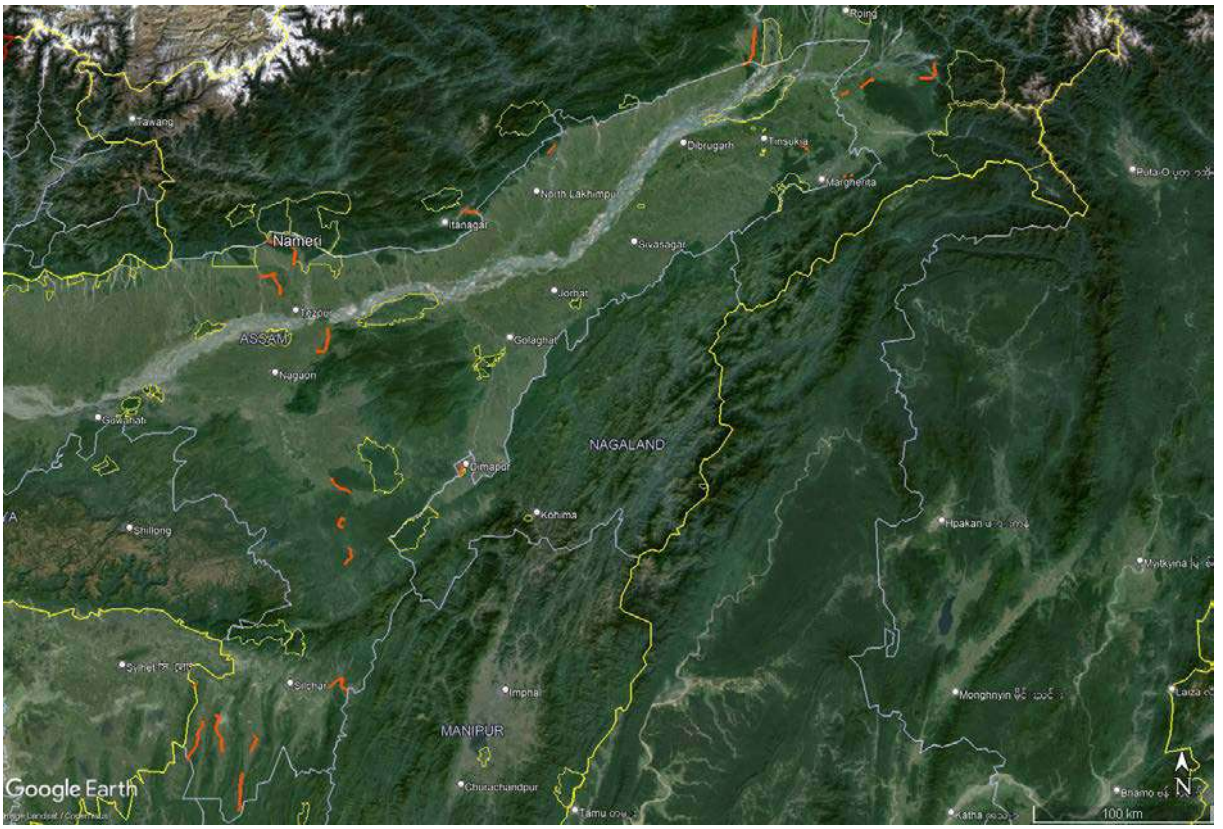


Figure 3.3.1: Identified priority railway line stretches (orange lines) for field survey in the states of Assam, and bordering Nagaland and Arunachal Pradesh, with respect to the protected areas (yellow polygons).

On consultation with field forest and railway officials, it was observed that some railway lines had not been constructed yet, were not operational, or did not lie in elephant areas. These were not inspected. Further, we inspected additional railway stretches that were highlighted by forest officials as vulnerable to elephant-mortality or as a barrier to their movement in the area. The site specific mitigation details are provided in the following sections.

* The objective of the field survey was to minimise elephant-train collisions either by constructing underpasses and overpasses wherever possible, by reducing the time taken by elephants to cross the railway tracks by easing movement across the track through construction of ramps and level crossings, and by implementation of technology for early detection and warning systems.

Table 3.3.1: Details of railway line stretches vulnerable to elephant-train collisions in the state of Assam surveyed during 19th – 27th March 2024.

S.No.	Railway lines surveyed	Length
1.	Tingrai-Bogapani-Digboi-Golai Gaon railway line passing through the Bogapani corridor, Digboi Forest Division, Assam	6.7
2.	Railway line passing though the Dulung Forest Reserve, Lakhimpur Forest Division, Assam	7.0
3.	Harmuti-Gumto-Naharlagun railway line passing through the Durpong-Doimukh at Khundakuwa elephant corridor	10.9
4.	Chariduar-Bhalukpong railway line passing through Balipara Reserve Forest (buffer of Nameri Tiger Reserve) and surrounding forests in Sonitpur Forest Division, Assam	25.0
5.	Railway lines near Rangapara (Rangapara to Misamari, and Rangapara to Bindukuri) in Sonitpur Forest Division, Assam	9.6, 14.4
6.	Silghat Town – Puranigudam railway stretch near Kaziranga National Park, Nagaon Forest Division, Assam	4.6, 2.11, 10.2, 5.3
7.	Lumding – Habaipur railway line passing near the Lumding Reserve Forest (part of Dhansiri-Lungding Elephant Reserve), Nagaon South Forest Division	14.2

Site-Specific Findings & Mitigation Measures

Tingrai-Bogapani-Digboi-Golai Gaon Railway line passing through the Bogapani Corridor, Digboi Forest Division

Survey date: 20th March 2024

The railway line, coming from Tinsukia, passes through Tingrai, Bogapani and Digboi railway stations. As per forest officials, the railway line passes through two important elephant movement corridors adjacent to the Dihing Patkai National Park (Fig. 3.3.2). The Bogapani corridor, connecting the Upper Dihing East and Upper Dihing West Blocks, is regularly used by elephants to cross the railway track. Nine elephants died on the railway track between 2001 and 2015.

The Golai corridor is heavily degraded, and elephant movement has been blocked owing to multiple human infrastructure in the area, including IOCL infrastructure. This corridor is heavily degraded as per field observations and information from the Forest Department, and requires urgent restoration measures.

The Tingrai-Bogapani-Digboi-Golai Gaon railway line intersects the Bogapani corridor connecting the Lakhipather and Digboi ranges between the Upper Dihing East and Upper Dihing West Forest Blocks respectively. The National Highway 315 (previously 38) also runs parallel to the railway line along the corridor (Fig. 3.3.3).

Observations:

- The land use types immediately adjacent to the highway and railway line are forests, agriculture and tea gardens.
- According to information provided by the Forest Department, the Bogapani Forest Village also falls within the corridor, making it vulnerable to human-elephant conflict.
- Movement of elephant herds (size 5 – 100 elephants per herd) across these corridors through the railway line and highway have been reported to be of seasonal nature, particularly between the months of October and February, that coincides with the paddy-harvesting season. Occasional use by lone elephants has also been reported in the corridor.
- Though development of human infrastructure along the road and railway line, and the traffic on the road and railway line, have led to a decrease in the intensity of use of the corridor by elephants, the animals still use the corridor to move between the two important habitat patches.
- Owing to the co-occurrence of forest villages along elephant movement corridors, conflict incidences such as house damage and human casualties have occurred in the area.

Figure 3.3.2: Location of the Bogapani and Golai corridors (Project Elephant, 2023) intersected by the railway line and National Highway 315 near Dihing Patkai National Park, Digboi, Assam.

Figure 3.3.3: The National Highway 315 (right) runs parallel to the Tingrai-Bogapani-Digboi-Golai Gaon railway line (left) that passes through the Bogapani corridor near Dihing Patkai National Park, Digboi Forest Division, Assam.

Recommendations:

- Four frequently used trails intersecting the railway line by elephants were observed on field. A series of ramps and level crossings are suggested for the railway line at these points in the corridor, considering the flat terrain of the track bed. The width of the ramps should be at least 30 m, and that of level crossing should be at least 50 m (details in Table 3.3.2).

- Upgradation of NH 315 that runs parallel to the railway line had been proposed, for which the Forest Department had submitted a proposal to incorporate animal underpasses (flyover for vehicular traffic). However, the highway upgradation did not materialise. It is, thereby, recommended that in the event of upgradation of NH 315, a flyover or animal underpass measuring 500 m in length and 6 m in height is to be made to ease animal movement across the highway. The span of the flyover would cover the three elephant trails (Bogapani 1, 2, & 3), and funnel elephant movement on Bogapani 4 towards the opening. The construction of this flyover in the event of upgradation of the highway is vital to maintain connectivity of the Bogapani corridor. Start and end point GPS locations of the highway underpass are given below:

  Start: 27° 25.484'N, 95° 36.587'E;
  End: 27° 25.214'N, 95° 36.613'E

- Encroachment between the highway and the railway line should be removed on priority.

Table 3.3.2: Mid-point GPS locations for construction of ramps on frequently used trails across the railway line.

S.No.	Crossing points	Mid-point GPS
1.	Bogapani 1	27° 25.436'N 95° 36.564'E
2.	Bogapani 2	27° 25.380'N 95° 36.572'E
3.	Bogapani 3	27° 25.291'N 95° 36.583'E
4.	Bogapani 4	27° 25.208'N 95° 36.591'N

Railway line passing though the Dulung Forest Reserve, Lakhimpur Forest Division, Assam

Survey date: 21st March 2024

The Dulung Forest Reserve is an important habitat for elephants in Northern Assam, and provides connectivity with several adjacent habitats in the region, particularly with elephant habitat in the Himalaya to the north. It is rich in both flora and fauna, and is known for being home to the endemic *Mesua assamica* or Sia nahor tree. The RF is part of the important Dulung-Subansiri elephant corridor that facilitates east-west movement of elephants across the Subansiri river.

A ~7 km stretch of railway line passes along the south-eastern boundary, and through the Forest Reserve (Fig. 3.3.4). Regular elephant mortality has been observed on the railway track. More recently, a female elephant was killed in an accident on the track in early March this year.

Observations:

- A 6.7 km (approx.) stretch of railway track passes through the forest reserve (Fig. 3.3.5).
- Use of the railway track by elephants was reported and observed to be uniform across the entire stretch of the track passing through the forest. The primary reason for elephant movement across the track is possibly daily access to resources on either side, since no corridor exists beyond the forest reserve to the south-east.
- Further, many accident sites and sites of probable crossing or use were found near bridges built on drainages, with elephant signs found under the bridges as well.
- A 1.4 km (approx.) stretch of the railway track runs parallel to the National Highway 15. Considerable number of human settlements exist on either side of the railway track in this stretch, and between the railway track and the highway. Elephant movement across the track in this segment can potentially lead to incidents of conflict.

Recommendations:

- All major bridges on the railway track within the forest are to be expanded to facilitate elephant and wildlife movement underneath (with the exception of bridges number 670 and 671). The expansion in width may be done by constructing additional spans on either side of the existing bridges. Further the bridges should be made suitable for movement by discouraging any human disturbance underneath. Details of the bridges to be modified are given in Table 3.3.3.
- Ramps with level crossings for easy movement of elephants across the track should be built every 1 km, as per WII's guidelines (General Guidelines for Suggesting Mitigation Measures on Existing Railway Tracks through Elephant Habitat in India), except for the 950 m stretch as shown in Fig. 3.3.6.
- Similarly, escape ramps (same design as level crossings and ramps) on either side of all railway bridges along the entire stretch are to be provided.
- The railway line segment running parallel to NH 15 (approximately between 327/3-4 to 325/9) is to be fenced off from the forest reserve side (Fig. 3.3.6), to discourage elephant movement towards human habitation.

Figure 3.3.4: Location of the Dulung Forest Reserve, Assam, and railway line with respect to elephant corridors in the area (Project Elephant, 2023).

Figure 3.3.5: The railway track passing through the Dulung Forest Reserve, Assam.

Table 3.3.3: Details of existing railway bridges to be expanded to facilitate elephant and movement in the Dulung Forest Reserve, Assam.

S.No.	Bridge No.	Present dimensions (m)	Total length (m)	Recommended dimensions
1.	664	5 x 6.10	36.55	6 x 6.10
2.	665	2 x 3.05 + 3 x 6.10	29.03	4 x 6.10
3.	666	2 x 3.05 + 4 x 6.10	36.34	6 x 6.10
4.	667	2 x 3.05 + 3 x 6.10	29.03	4 x 6.10
5.	669	5 x 6.10	169.41	No increase required
6.	672	3 x 6.10	21.93	4 x 6.10
7.	673	3 x 6.10	21.93	4 x 6.10
8.	674	6 x 12.20	72.06	No increase required

Figure 3.3.6: Approximately 950 m of the railway track (in red) where construction of ramps is not required, and where fencing is to be done to discourage elephant movement into human settlement south-east of Dulung Forest Reserve.

Harmuti-Gumto-Naharlagun railway line passing through the Durpong-Doimukh at Khundakuwa elephant corridor

Survey date: 21st March 2024

The Durpong-Doimukh at Khundakuwa corridor connects the Durpong Reserve Forest to the south-west with the Doimukh Reserve Forest to the north-east. The corridor is intersected by the National Highway 415 connecting Banderdawa to Itanagar, the Doimukh-Harmuti road, the Harmuti-Gumto-Naharlagun railway line and multiple human settlements and agricultural fields (Fig. 3.3.7).

Observations:

- The corridor connecting the two reserve forests is intersected by multiple roads, a railway line, stone crusher sites, human settlements and agricultural land. Some of the human settlements were reported to be encroachments, such as those on the nalas used by elephants for movement. Walls and human activities such as burning of fire in these areas to repel elephant movement have been reported.

- The railway line was established in 2014, and the train traffic is currently low (4 trains daily). No elephant accidents have been reported on the stretch yet.

- Reduced use of the corridor was reported in 2017. According to forest officials, movement has been infrequent in recent years too, except for paddy-harvesting season. However, it is improbable that elephants have been able to cross the corridor completely.

Recommendations:

- The railway line is soon to be electrified. All electrical infrastructure should be proofed so as to avoid incidences of wildlife electrocution.

- Drainage structures on the railway line are to be kept free of human encroachments.

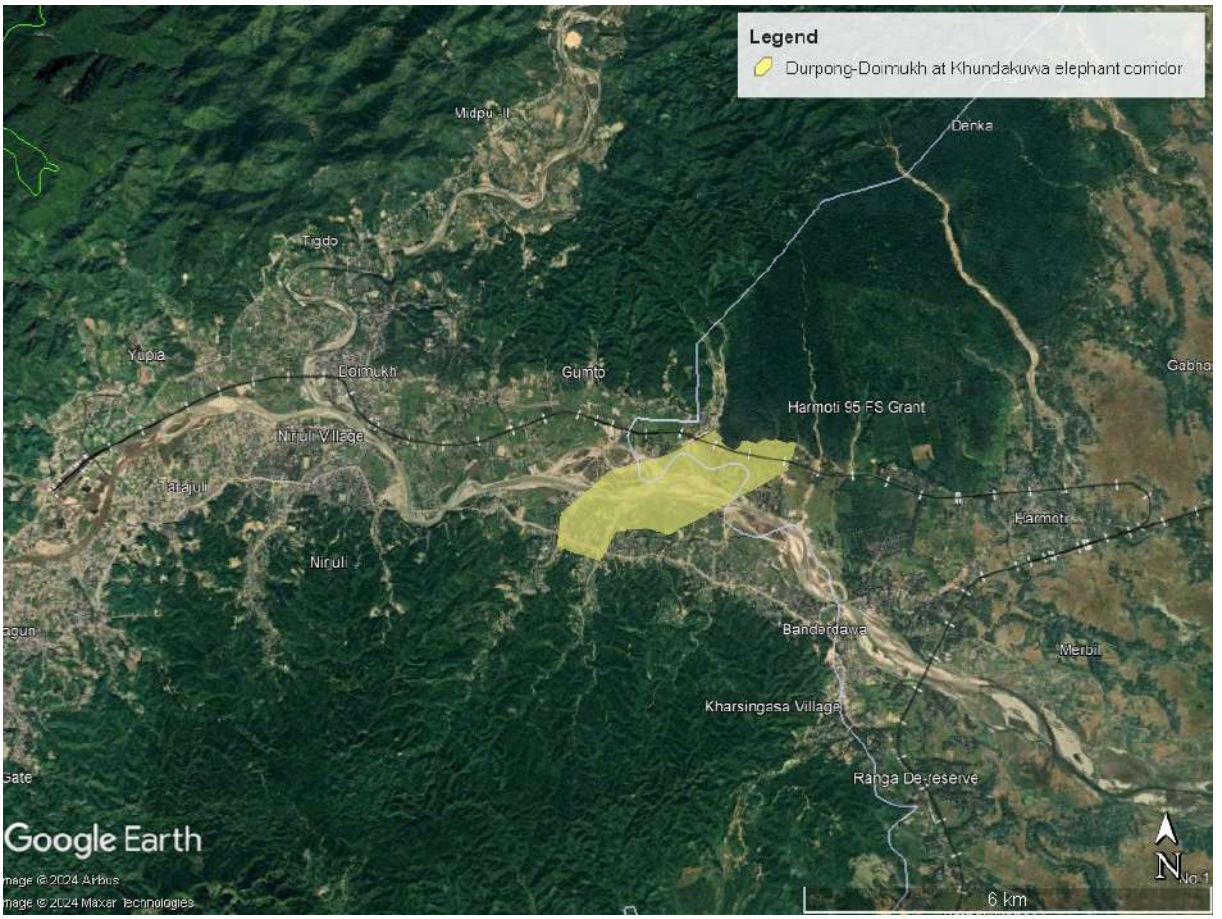


Figure 3.3.7: Location of the Harmuti-Gumto-Naharlagun railway line, and other anthropogenic infrastructure and land uses, intersecting the Durpong-Doimukh elephant corridor (Project Elephant, 2023).

Chariduar-Bhalukpong railway line passing through Balipara Reserve Forest (buffer of Nameri Tiger Reserve) and surrounding forests in Sonitpur Forest Division

Survey date: 22nd March 2024

Nameri Tiger Reserve is an important large protected area in the region, bordering Arunachal to the north and contiguous with the Pakke Tiger Reserve in Arunachal Pradesh. Both tiger reserves form one of the largest blocks of semi-evergreen and evergreen forests in Northeast India. The Nameri National Park, Sonai-Rupai Wildlife Sanctuary, and Naduar and Balipara Reserve Forests together make up the Nameri Tiger Reserve. The tiger reserve is home to a wide variety of charismatic fauna, including tiger, elephant, goral, marbled cat, Asiatic wild dog, and leopard.

The Sonitpur Forest Division, once known to be one of the greenest districts of Assam, has faced intense forest conversion in the past 20 years, including the Balipara Reserve Forest. Extensive loss of natural vegetation has been indicated to be the cause of rampant human-elephant conflict in the region (Kushwaha & Hazarika, 2004; Mahato *et al.*, 2021). Further, the 25 km (approx.) railway line from Charduar to Bhalukpong stations intersects the connectivity between the Nameri Tiger Reserve and the Balipara Reserve Forest which is part of the Nameri- Sonai Rupai Arimora (NSA) elephant corridor (Fig. 3.3.8), at different points.

Observations:

- The railway track passes through a mix of agricultural fields, human habitation and narrow forested sections at different segments (Fig. 3.3.9). Non-forested tracts are regularly used by elephants for movement.

- According to railway personnel, the railway line currently has low traffic, with 2 trains plying on the track daily, in addition to few goods trains. No elephant mortality has been recorded on the tracks till date.

- Eight main crossing points were highlighted by the Forest Department personnel on field (Table 3.3.4, Fig. 3.3.10).

- The track height is low as compared to adjacent terrain, with an average height of 1.5 – 2 m.

- In many places, ROBs and level crossings for villages are being used by elephants to cross over (Fig. 3.3.11), often from the reserve forests towards villages on towards Balipara Reserve Forest, that could potentially lead to conflict.

- The railway stretches going through the narrow and forested corridors near Kalabil (Ch. 15/2 – 15/6), and near Gamani Ban Gaon (Ch. 22/0 – 22/4) (corridors 7 and 8 in Fig. 3.3.10) have walls on both sides for at least 400 m each (Fig. 3.3.12). Multiple elephant signs were recorded in both stretches. Railway personnel have also reported seeing deer in the Kalabil stretch. This could potentially lead to elephants and other animals getting trapped in the event of a train passing through the stretch, without an escape route present.

Figure 3.3.8: The Chariduar-Bhalukpong railway line intersecting the corridor between Nameri Tiger Reserve and Balipara Reserve Forest, Sonitpur Forest Division, Assam.

Figure 3.3.9: The Chariduar-Bhalukpong railway line near the Nameri Tiger Reserve and Balipara Reserve Forest, Assam, passes through a mix of land uses, including agricultural fields and human habitations, also used by elephants for movement.

Table 3.3.4: Characteristics of major elephant crossing corridors visited on the Chariduar-Bhalukpong railway line between the Nameri Tiger Reserve and Balipara Reserve Forest, Assam.

S.no.	Crossing points	Characteristics
1.	1, 2, 3, 4, 5, & 8	Forest on one side and human habitation on the other.
2.	3 & 4	Elephant crossing across level crossing meant for vehicles and humans.
3.	6	Elephant crossing across the non-functional Gamani railway station.
4.	7 & 8	Railway track is cut into slightly elevated terrain, thus has walls on both sides of the tracks.
5.	6 & 7	Forests on either side of the track.

Figure 3.3.10: Locations of the eight major elephant crossing corridors visited on the Chariduar-Bhalukpong railway line between the Nameri Tiger Reserve and Balipara Reserve Forest, Assam.

Recommendations:

Almost the entire stretch of the railway line seems to be regularly used by elephants. Specific measures are recommended for stretches highlighted as major corridors by forest department personnel.

- Escape ramps and level crossings are to be provided every 1 km in consultation with the forest department along the entire stretch.
- Railway stretches where low-voltage live wires have been put up by villagers for repelling elephants from agricultural fields should not overlap with those delineated for construction of ramps.
- Considering the possibility of the railway line to get electrified in the future, all electrical infrastructure should be properly insulated and proofed so as to avoid incidences of wildlife electrocution. Adequate measures to ensure this should be taken.
- For the two railway segments near Kalabil (Ch. 15/2 – 15/6), and that near Gamani Ban Gaon (Ch. 22/0 – 22/4), smooth ramps/exits for elephants are to be provided at every 100 m by breaking the walls in the two highlighted stretches (corridors 7 and 8 in Fig. 10). The design of the exit ramp can be similar to those constructed on canals in Odisha (Fig. 3.3.14).
- Specific actions to be taken at select points have been detailed in Table 3.3.5 below.

Figure 3.3.11: Level crossing BB/7 (Ch. 10/2) is used by elephants to cross over towards villages.

Figure 3.3.12: Concrete walls along two sections of the railway line Kalabil (Ch. 15/2 – 15/6), and that near Gamani Ban Gaon (Ch. 22/0 – 22/4) could cause elephants and other wild animals from getting stuck in the rail corridor. Multiple animal signs were found here.

Figure 3.3.13: Low-voltage live-wire fencing used by villagers against crop-depradation by elephants along the Charduar-Bhalukpong railway line.

Table 3.3.5: Specific mitigation measures to be taken on select points of the Chariduar – Bhalukpong railway line, between Nameri Tiger Reserve and Balipara Reserve Forest, Assam.

S.No.	Chainage	GPS location	Remarks	Measures recommended
I.	9/5	26° 53.294'N 92° 47.910'E	Crossing BB/6 is used by elephants for crossing.	Four level crossings and ramps, two beside each of the level crossings are to be made. Barriers to dissuade elephants from using the existing level crossings are to be constructed.
II.	10/2	26° 53.672'N 92° 47.983'E	Crossing BB/7 is used by elephants for crossing into village.	
III.	14/6 - 14/7	26° 56.013'N 92° 48.415'E	Elephant signs and trails seen on both sides of the bridge.	Present slab bridge of 2 x 20 m dimension may be expanded to include two dry spans of 5 m on either side for elephant movement.

Figure 3.3.14: Ramps/exits similar to these built on canals, to facilitate escape of wild animals in the event of approaching trains in the walled sections Kalabil (Ch. 15/2 – 15/6), and that near Gamani Ban Gaon (Ch. 22/0 – 22/4) should be provided [Picture courtesy: Jagyandatt Pati]

Railway lines near Rangapara (Rangapara to Misamari, and Rangapara to Bindukuri) in Sonitpur Forest Division, Assam

Survey date: 22nd March 2024

The area surveyed in the Sonitpur forest division and district lies between the Nameri National Park and Sonai-Rupai Reserve Forest and Wildlife Sanctuary. These PAs and adjacent forest patches provide refuges for wild elephants. The land use in the district is mostly tea plantations (18.8%), with few human settlements and forest patches (3%), with tea gardens also being used as refugia by elephants (Wilson *et al.*, 2015; Fig. 3.3.15). The intervening forest patches are reportedly small (<0.5 km^2), but also serve as refuge areas (Wilson *et al.*, 2015).

The forests of the Sonitpur Forest Division have, in the past few decades, witnessed extensive loss of vegetation cover (Mahato *et al.,* 2021) owing to multiple reasons. The district also has amongst the highest rates of human-elephant conflict in the state. The conflict is

mostly seasonal in nature, commonly crop damage and property damage (Wilson *et al.*, 2015). This is also the season when most elephant-train collisions occur.

We surveyed the two major railway lines cutting through the region - Rangapara North Junction to Misamari (East-West), and Rangapara North Junction to Bindukuri station (North-South). Even with low elephant density and train traffic (10-20 average daily trains) on these tracks, the area accounts for high collision rates (Ahmed & Saikia, 2022) because of gregarious and seasonal movement of elephants in the region. A herd of 5 elephants was killed in December 2017 near a level crossing[6] , pointing to the need for retro-fitting railway infrastructure in this region to facilitate elephant movement. During the survey, additional sites of concern as flagged by the local forest department staff were also inspected (Fig. 3.3.16).

Figure 3.3.15: Tea plantations along the railway lines in Chariduar Forest Range are regularly used by elephants for movement.

Observations:

- The railway tracks surveyed were almost at ground level (<1 m) for most of the length.
- There is regular movement of elephant herds between railway gates number 66 to number 69.
- Rail gates or level crossings, especially those near tea plantations and agricultural areas, are regularly used by elephants for crossing the railway tracks. These are also points where elephant mortality has occurred in the past, as elephants would get trapped in the barriers along the rail line on both sides of the level crossings (Fig. 3.3.17).
- Most of the elephant movement in large herds occurs during the winter months of November – March. This movement has a direct bearing on the probability of elephant-train collisions as well as human-elephant conflict.

[6]*https://scroll.in/latest/861004/assam-speeding-train-kills-five-elephants-crossing-tracks-to-find-food*

Recommendations:

- Level crossings are to be provided every 1 km all along the vulnerable segments of the two railway stretches (Fig. 3.3.18) to facilitate quick movement of elephants across the tracks, as indicated in Table 3.3.6. More level crossings may be constructed if needed.

- Level crossings for vehicles, such as those where elephant mortality has occurred in the past, are to be manned and monitored vigilantly. Early warning elephant detection systems are vital for this landscape, and the Railways should implement the DAS system here on priority basis.

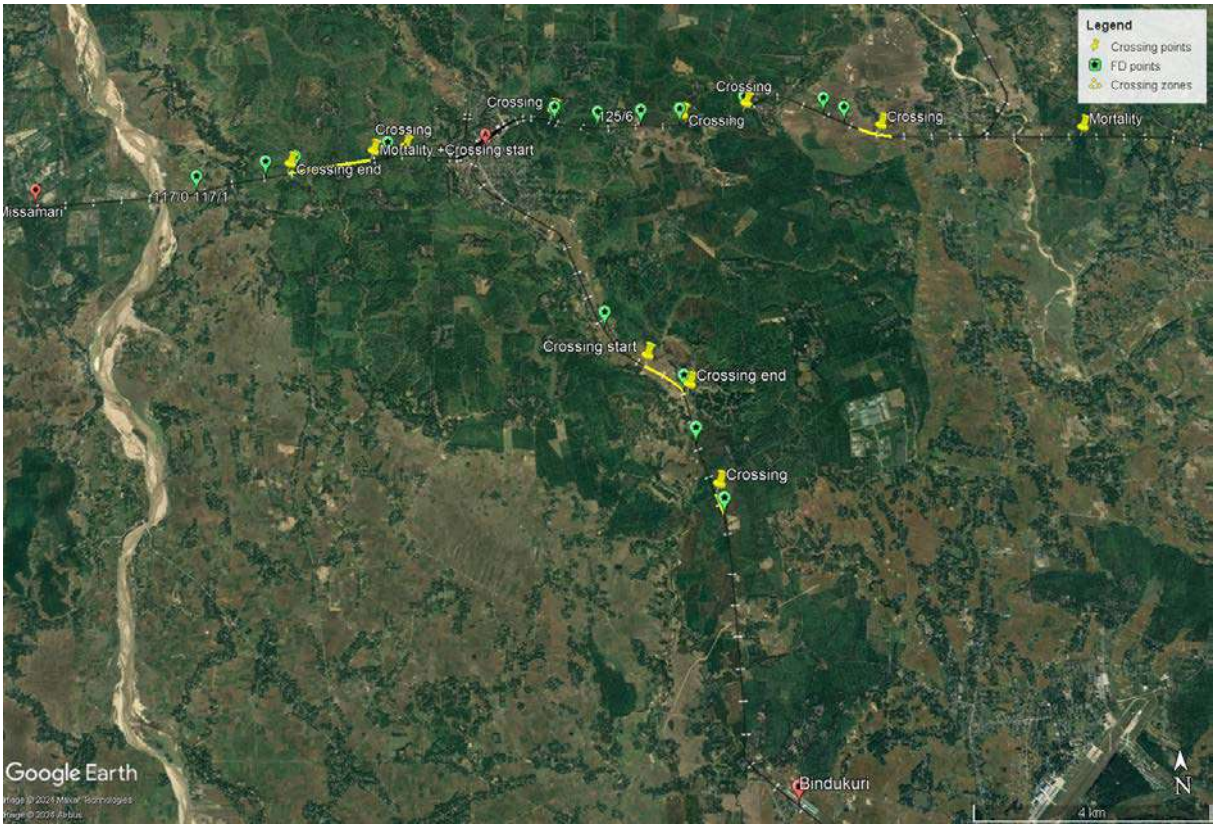


Figure 3.3.16: Extent of the two railway lines (Rangapara Jn. – Misamari (East-West) and Rangapara Jn. – Bindukuri (North-South)) surveyed in Chariduar Range, Sonitpur Forest Division. Yellow pins/lines denote crossing points/zones noted on field as reported by Forest Department staff, green pins denote additional points of concern flagged by the Forest Department.

Figure 3.3.17: Barriers along the railway level crossing that led to the trapping of a herd of elephants leading to the mortality of 5 after colliding with a train near Bamgaon tea estate.

Table 3.3.6: Details of railway stretches in Chariduar Range, Sonitpur Forest Division, where construction of ramps for easing elephant movement has been suggested.

Stretch ID	Start GPS	End GPS	Length (m)	Number of elephant level crossings (minimum)
		Bamgaon – Rangapara Jn. – Misamari		
1	26° 49.066'N 92° 48.396'E	26° 49.105'N 92° 47.367'E	1700	2
2	26° 49.167'N 92° 46.005'E	26° 49.661'N 92° 44.689'E	2400	3
3	26° 49.580'N 92° 44.184'E	26° 49.472'N 92° 43.999'E	375	1
4	26° 49.427'N 92° 43.568'E	26° 49.561'N 92° 41.547'E	3400	4
5	26° 49.124'N 92° 40.472'E	26° 48.789'N 92° 37.237'E	5400	6
		Rangapara Jn. – Bindukuri		
6	26° 47.199'N 92° 42.270'E	26° 44.397'N 92° 43.584'E	6000	7

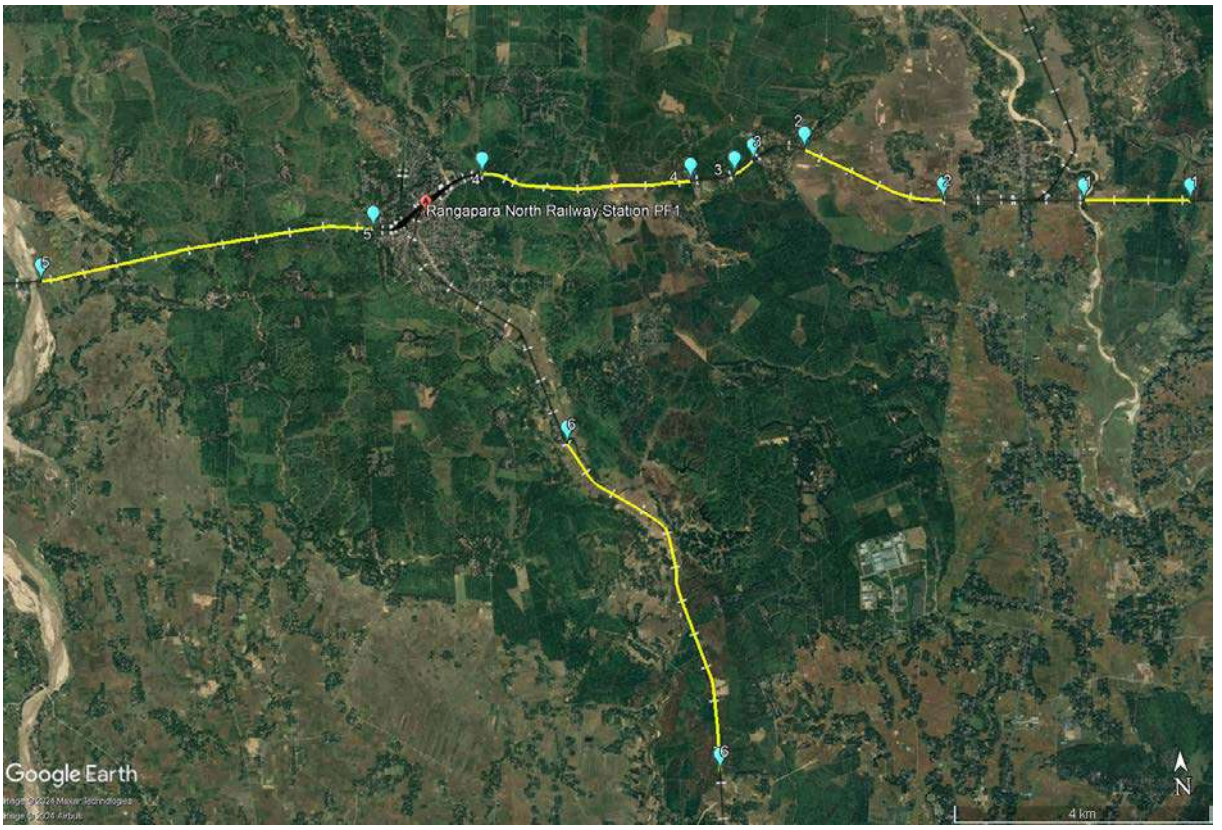


Figure 3.3.18: Representation of the stretches susceptible to elephant-train collisions (in yellow) on the railway stretches in Chariduar Range, Sonitpur Forest Division, where construction of ramps has been recommended to ease elephant movement.

Silghat Town – Puranigudam railway stretch near Kaziranga National Park, Nagaon Forest Division, Assam

Survey date: 23rd March 2024

The railway line between the Silghat town, that lies in the southern bank of the Brahmaputra River, until the Puranigudam railway station near Nagaon city passes mostly through agricultural fields, tea plantations and some forest patches, specifically on the stretch near Kaziranga NP (Bagser Reserve Forest). Elephant herds traveling between adjacent habitat and resource patches such as the Brahmaputra bank, Kamakhya Reserve Forest, Bagser Reserve Forest, Kaziranga NP, Karbi Anglong hills, North Diju Reserve Forest, Salona Forest Range, and intervening refuges often come across the railway track. Few incidences of elephant mortality have been recorded on the railway tracks in the region, potentially inhibiting west-east elephant movement.

As indicated by the Forest Department, there are four vulnerable stretches of the railway line totalling 24.5 km (Fig. 3.3.19). These four stretches were surveyed during the visit

Observations:

i. Silghat (59/9) to Jakhalabanda station

- Elephant herds traveling between Brahmaputra and Kamakhya Reserve Forest cross this track, moving through tea plantations.
- The land use on either side of the track on this stretch is tea plantations to the north and agricultural lands to the south, with intermittent human settlements and vegetation (Figs. 3.3.20 and 3.3.21).
- The track is not high as compared to the adjacent terrain (~1 m).
- A case of elephant mortality involving a tusker occurred on this stretch.

ii. Jakhalabanda (50/1) to Salona (48/0):

- Elephant herds moving between the Bagser Reserve Forest to the east towards the west (and *vice versa*) come across this railway stretch (Fig. 3.3.22).
- A tusker was hit by a train on this stretch in 2021, moving between tea plantation on one side and agricultural fields on the other.

iii. Ch. 45/0 to Amoni (34/8):

- This railway stretch intersects the elephant movement pathway between the Karbi Anglong hills, Reka Pahar, North Diju Reserve Forest, Salona range, and adjacent tea plantations and agricultural fields (Figs. 3.3.23 and 3.3.24).
- The track is relatively flat as compared to adjacent terrain.
- Regular movement of deer species, wild pig, tiger and leopard was reported to occur across the railway track inside the North Diju Reserve Forest.

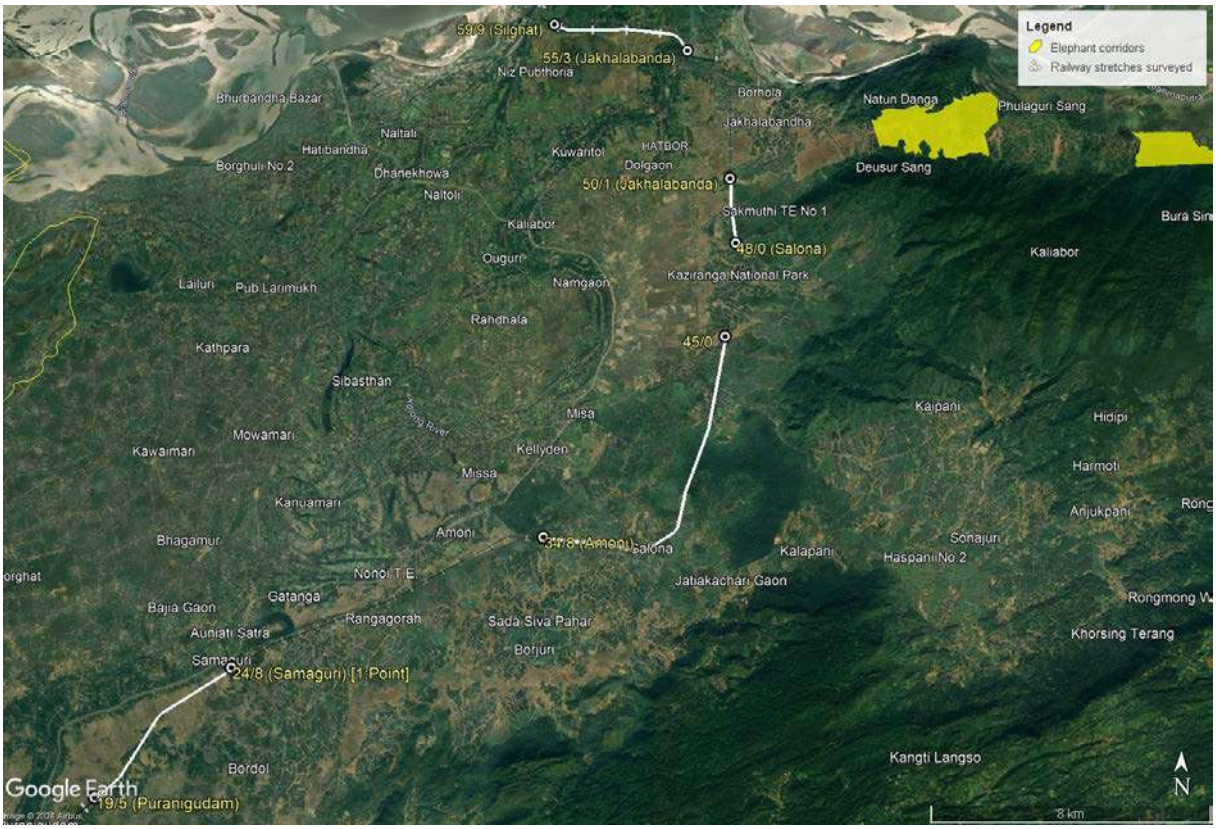


Figure 3.3.19: Four priority vulnerable railway stretches (white lines) next to Kaziranga National Park in the Nagaon Forest Division, Assam, visited during the survey.

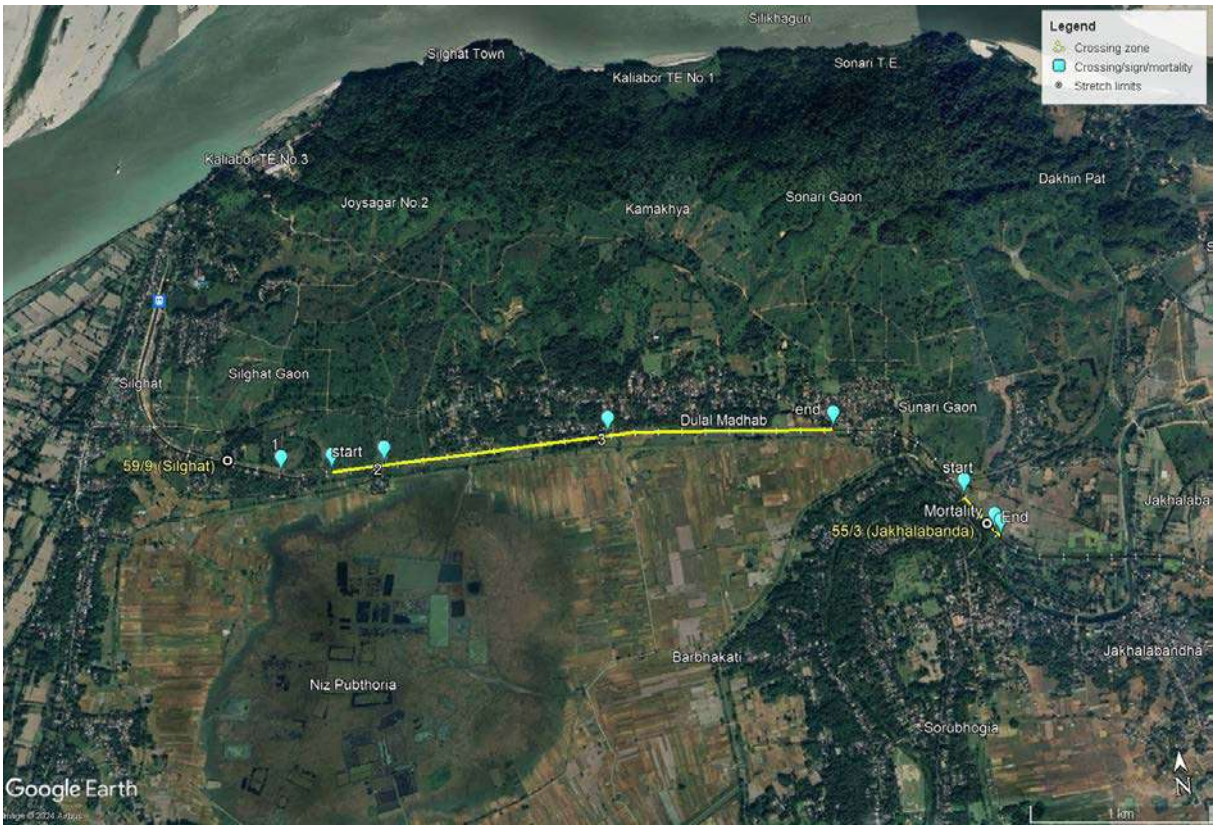


Figure 3.3.20: Elephant crossing zones delineated based on past reports of crossing/mortality and signs observed during the survey along the Silghat (59/9) to Jakhalabanda station section.

Figure 3.3.21: Tea plantations adjacent to the Silghat (59/9) to Jakhalabanda station railway segment where elephant movement was reported to occur.

iv. Samaguri (24/8) to Puranigudam (19/5):

- The land use adjacent to the track along this segment is mostly agricultural fields interspersed with human settlements and few small private forest patches (Fig. 3.3.25).
- It was reported that a herd of 6-7 elephants are resident in this area.
- It was also reported that elephant movement across the railway track in the region is regular and uniform, with no fixed spatial movement pattern or specific crossing zones (Fig. 3.3.26).
- The track height is about 1 m throughout the stretch.

Recommendations:

- The points/structures listed in Table 3.3.7 below may be converted to a crossing structure of 30 m width and maximum possible height.

Table 3.3.7: Chainage and GPS locations of sites/existing drainage structures that should be converted to crossing structures for elephants considering height of the track and high probability of elephant movement.

S.no.	Chainage	GPS location	Stretch	Existing structure	Proposed structure
1.	49/3	26° 32.741'N 92° 59.481'E	Jakhalabanda (50/1) to Salona (48/0)	Pipe culvert	Underpass of 30 m width
2.	44/1 - 44/2	26° 29.981'N 92° 59.325'E	Ch. 45/0 to Amoni (34/8)	Nil	Underpass of 30 m width

Figure 3.3.22: Elephant crossing zones delineated based on past reports of crossing/mortality and signs observed during the survey along the Jakhalabanda (50/1) to Salona (48/0) section.

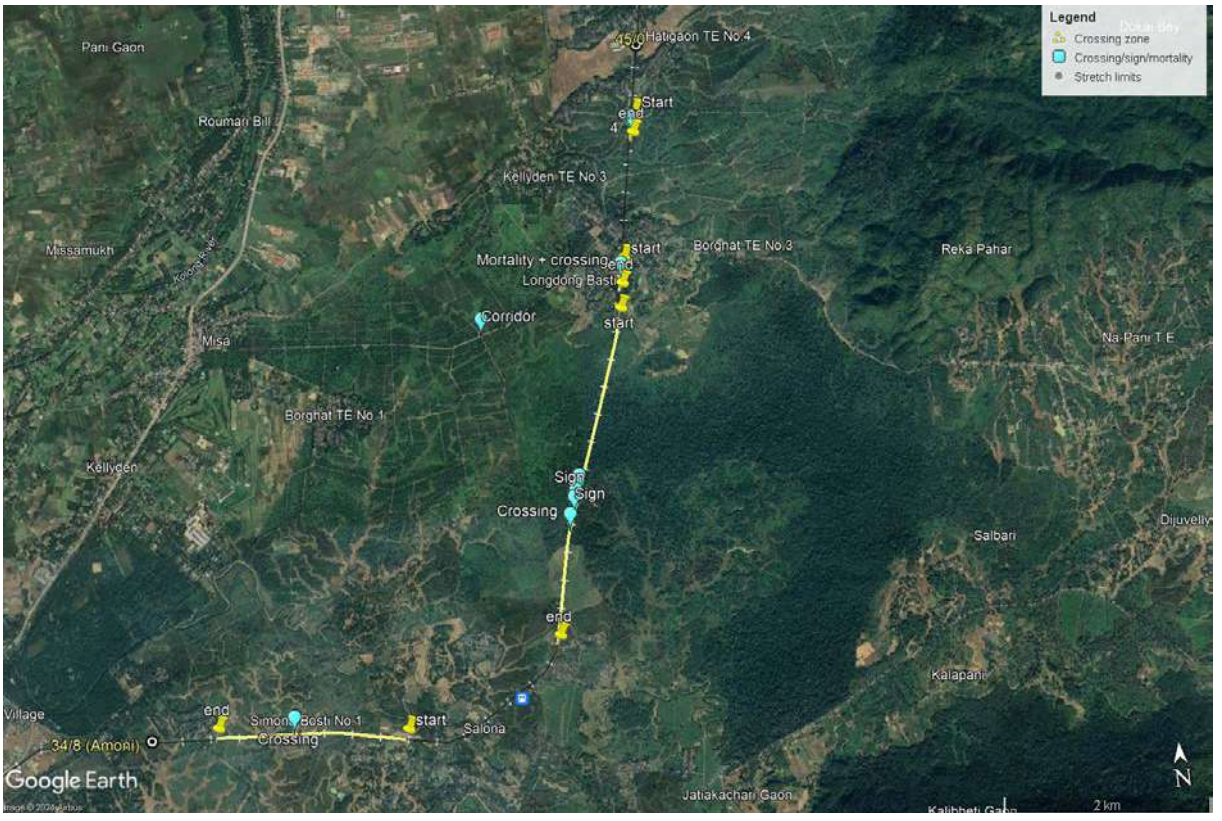


Figure 3.3.23: Elephant crossing zones delineated based on past reports of crossing/mortality and signs observed during the survey along the Ch. 45/0 to Amoni (34/8) section.

Figure 3.3.24: Tea plantations along the Ch. 45/0 to Amoni (34/8) railway section where elephant movement was reported to occur.

Figure 3.3.26: Agricultural fields adjacent to the Samaguri (24/8) to Puranigudam (19/5) railway section where regular elephant movement was reported to occur. Elephant hoof marks can be seen in the fields next to the railway line.

- Ramps with level crossings for ease of elephant movement across the railway track are to be constructed at every 1 km for the following vulnerable stretches (Table 3.3.8). The exact location of the ramps may be decided in coordination with the local Forest Department.

- The entire length of stretches Jakhalabanda to Salona (50/1 to 48/0) and Samaguri to Puranigudam (24/8 to 19/5) have been marked as sensitive.

Figure 3.3.25: Elephant crossing zones delineated based on past reports of crossing/mortality and signs observed during the survey along the Samaguri (24/8) to Puranigudam (19/5) section.

Table 3.3.8: Railway stretches with high probabilities of elephant movement where level crossings and ramps for elephants are recommended.

S.no.	Start GPS	End GPS	Length (m)	Number of elephant level crossings (minimum)
		Silghat (59/9) to Jakhalabanda station		
1.	26°35.858'N 92° 56.379'E	26° 35.835'N 92° 58.130'E	2900	3
2.	26°35.586'N 92° 58.550'E	26° 35.452'N 92° 58.656'E	300	1
		Jakhalabanda (50/1) to Salona (48/0)		
3.	26°33.190'N 92° 59.470'E	26° 32.053'N 92° 59.592'E	2100	3
		Ch. 45/0 to Amoni (34/8)		
4.	26°30.038'N 92° 59.336'E	26° 29.932'N 92° 59.316'E	200	1
5.	26°29.276'N 92° 59.189'E	26° 29.143'N 92° 59.165'E	250	1
6.	26°29.014'N 92° 59.141'E	26° 27.344'N 92° 58.602'E	3200	7
7.	26°26.938'N 92° 57.670'E	26° 27.038'N 92° 56.568'E	1845	2
		Samaguri (24/8) to Puranigudam (19/5)		
8.	26°24.872'N 92° 50.808'E	26° 22.855'N 92° 48.637'E	5300	6

Lumding – Habaipur railway line passing near the Lumding Reserve Forest (part of Dhansiri-Lungding Elephant Reserve), Nagaon South Forest Division

Survey date: 24th March 2024

The Lumding Elephant Reserve is one of the five elephant reserves of Assam, and is a connecting link between the Marat-Longri Wildlife Sanctuary to the east and the Langting Mupa Reserve Forest in the west. Elephant movement between central and southern Karbi Anglong, forests of North Cachar Hills, Nagaon and west Karbi Anglong occurs through Lumding ER (Singh *et al.*, 2010). The forest is also home to other important fauna such as tiger, clouded leopard, western hoolock gibbon, gaur, barking deer and sambar. The 14.2 km Lumding-Habaipur railway line circumvents the south-western boundary of the ER (Fig. 3.3.27), and has been an elephant mortality hotspot in the past (Ahmed & Saikia, 2022).

Observations:

- The DAS-based (Distributed Acoustic Sensing) Intrusion Detection System (IDS) is currently operational along the Habaipur-Lumsakhan-Patharkhola-Lumding section, and is being actively monitored.
- Caution orders (speed reduction measures) for day and night time are implemented at identified sensitive stretches.
- According to railway personnel, no recent incidents of elephant-train collision have occurred on the segment, except for the mortality of a female elephant and calf in 2021.

Figure 3.3.27: The Lumding-Habaipur railway line passing near the Lumding Reserve Forest (part of the Dhansiri-Lungding Elephant Reserve, Nagaon South Forest Division, Assam.

- The forest department, railways and local people jointly patrol the sensitive stretches, and alert the station masters and train loco pilot.

- The railway track has forests on both sides for about 5.3 km (from Lumding to Pagla Nadi railway bridge), and the rest of the track has forest on one side and human settlement and agricultural fields on the other (Pagla Nadi railway bridge to Habaipur).

- Elephant herds crossing over to villages from the forest often become involved in conflict with humans and crop-raiding incidences.

- According to field observations and information from forest department personnel, the use of the railway track by elephants is more or less uniform across the stretch (Fig. 3.3.28). Well-defined trails indicate regular crossing zones of elephants (Fig. 3.3.29).

Recommendations:

- The railway track height is for most part not higher than 4 m. The railway line is triple-tracked till Patharkhola railway station, beyond which it is double-tracked.

- The DAS-based IDS set-up should be continued, and monitoring and effectiveness evaluation done regularly.

- The structure at ch. 184/2 (6 x 5.5 m) should be expanded by openings of 10 m on either side. Use of the crossing by humans should be discouraged. (GPS location: 25° 46.257', 93° 06.868').

- Ramps and level crossings are to be constructed at the identified crossing locations/zones, and locations of past collisions in the forested section (Table 3.3.9 below). Additional ramps may be constructed where necessary, in consultation with the forest department.

- In the non-forested section (Pagla Nadi railway bridge to Habaipur), ramps and level crossings are to be constructed in identified locations of elephant crossings (Table 3.3.10 below). Additional ramps and level crossings may be constructed, keeping in mind the potential for conflict with adjacent villages.

- To discourage the use of the ramps and level crossings for elephants by humans, especially in the railway stretches next to villages, barriers that cannot be navigated by two- and four-wheelers, but can be crossed by elephants, must be installed.

- Level crossings are to be constructed over the space between the tracks (Fig. 3.3.30).

- Smoothening, slope stabilisation and revegetation (with grassy/herbaceous vegetation) of the slopes on either side of the railway track (Fig. 3.3.31) in most segments (e.g., between ch. 174/4 – 174/1) should be done.

Figure 3.3.28: Elephant crossing points, crossing zones, past mortality locations, and locations of elephant signs observed during the survey along the Lumding-Habaipur railway line near Lumding Reserve Forest, Assam.

Table 3.3.9: GPS locations and chainage of crossing locations/zones and past elephant train collisions on the forested stretch (Lumding to Pagla Nadi railway bridge) of the Lumding-Habaipur railway line.

S.no.	GPS location	Approximate chainage
1.	25° 46.105'N 93° 7.319'E	185/0
2.	25° 46.114'N 93° 07.268'E	
3.	25° 46.859'N 93° 05.194'E	Between 181/0 - 181/1
4.	25° 46.959'N 93° 04.842'E	Between 180/4 - 180/5

Figure 3.3.29: A well-defined elephant trail across a crossing zone on the Lumding-Habaipur railway line.

Figure 3.3.30: The space between parallel tracks should also be covered with the level crossing material recommended at elephant crossing sites.

Table 3.3.10: GPS locations and chainage of crossing locations/zones and past elephant train collisions on the non-forested stretch (Pagla Nadi railway bridge to Habaipur) of the Lumding-Habaipur railway line.

S.no.	GPS location	Approximate chainage
1.	25° 47.127'N 93° 04.189'E	Between 179/3 - 179/4
2.	25° 47.408'N 93° 03.354'E	-
3.	25° 47.517'N 93° 03.077'E	177/3
4.	25° 48.199'N 93° 02.441'E	175/7
5.	25° 48.570'N 93° 02.108'E	174/8
6.	25° 48.990'N 93° 01.620'E	173/7
7.	25° 50.672'N 93° 00.510'E	170/0
8.	25° 51.064'N 92° 59.917'E	168/8
9.	25° 51.176'N 92° 59.827'E	168/5
10.	25° 51.412'N 92° 59.679'E	168/0
11.	25° 51.484'N 92° 59.627'E	-
12.	25° 51.825'N 92° 59.420'E	167/1
	One ramp at a suitable place within crossing zones	
13.	Between 25° 47.266'N, 93° 03.814'E and 25° 47.306'N, 93° 03.715'E	Between 178/5 - 178/7
14.	Between 25° 48.720'N, 93° 01.916'E and 25° 48.815'N, 93° 01.763'E	Between 174/4 - 174/1
15.	Between 25° 49.458'N, 93° 01.365'E and 25° 50.040'N, 93° 01.048'E	Between 172/8 - 171/5

Figure 3.3.31: Slope stabilisation of embankments and slopes should be done through revegetation using herbaceous (grassy) vegetation.

NOTE:

A. The following railway stretches were surveyed, but it was reported by forest and railway representatives that no elephant movement or mortality has occurred in these stretches in the past.

- Hatikali to Dibolong (Surveyed on 25th March 2024)
- Langting to Dihaku (Surveyed on 25th March 2024)
- Jiribam to Sribar stations (Surveyed on 26th March 2024)

B. The following railway tracks were not surveyed since prior communication with the Forest Department officials revealed no requirement of a survey or mitigation measures.

- Near Ledo (Tinsukia) and Bargolai stations
- From Lekhapani towards Nagaland border
- Lalpahar Gaon to Tipong Colliery
- Assam-Mizoram border (Bairabi) to Alaicherra
- Rongpur to Chandrapur
- Dullabcherra to Duhalia
- Maishasan to Karimganj

C. Survey of the Kathaltali to Patharkandi stations (near Logai forest, Karimganj Forest Division) could not be conducted, and may be taken up at a later date, since forest department officials informed us of recent elephant movement in the nearby forests.

List of Assam Forest Department and Indian Railways officials consulted during the survey

State Forest Departments

Sri Sandeep Kumar *Principal Chief Conservator of Forests, Wildlife & Chief Wildlife Warden, Assam*
Smt. Jayashree Naiding *Divisional Forest Officer, Guwahati (Wildlife)*
Sri T.C. Ranjith Ram, *IFS Divisional Forest Officer, Digboi Division*
Sri Ashok Chaudhury *DFO Lakhimpur Forest Division, Assam*
Sri Piraisoodan *DFO, Western Assam (Wildlife)*
Sri Suhas Kadam *DFO, Nagaon (Territorial*)
Sri Vijay Palve *DFO, Cachar Forest Division*
Sri Champak Deka *ACF, Hojai/DFO (IC) Nagaon South Division*
Sri Mazumdar *RFO, Jakhalabanda*
Sri Gobin Gogoi *RFO, Lekhapani Range, Digboi*
Sri Raju Saikia *RFO, Amaribari Range*
Sri Mukut Rabha *RFO, Jonai Range, Assam*
Sri A Motin *RFO, Dulung Forest Reserve*
Sri Burgohain *RFO, Lumding*
Sri Depolala Langthasa *RFO, Hathikali Range*
Range Officer, *Lanka Range, Lumding*
Sri Hirai Kamneume *Deputy Ranger, Hatikhali*
Sri Biraj Barman *RO, Chariduar*
Sri Rowel Rongphar *RO, Lakhipur, Cachar*
Sri. Prasanto Boruah *Junior Assistant, Digboi DFO Office*
Sri Kulendra Bhuyan *Beat Officer, Jakhalabanda*
Sri Md. Nurul Ishlam *CL, Jakhalabanda*
Sri Naba Samua *Forest Guard, Jakhalabanda*
Sri Manmohan Das *Forest Guard, Pathalipam Beat Dulung Forest Reserve, Assam*
Sri Prasant Baruah *Forest staff Dulung Forest Reserve Assam*
Sri Deejyoti Baishya *Forester I, Jirighat Range*
Sri Zia Ur Rahman *Forest Guard, Chariduar Range*
Sri Dibakar Basumatary *Forest Staff, Amaribari Range*
Sri Biren Rabha *Forest Guard, Amaribari Range*
Smt Rita Das *Forest Guard, Amaribari Range*
Sri Jagdish Sarania *Forest Guard, Lumding*
Sri Bipin Saikia *Forest Guard, Lanka Range*

Indian Railways (NFR)

Sri A. K. Kushwaha *Northeast Frontier Railway*
Sri Vivek Bajaj *DEN 1, Tinsukia Division*
Sri Lakshman Singh *DEN 1, Lumding Division*
DEN 3, Lumding Division
Sri Arvind Kumar *DEN 3, Rangia Division*
Sri Abhishek Choudhary *XEN, Pasighat*
Sri Dibyajyoti Dutta *ADEN 3, Lumding Division*
Sri Gautam Saikia *SSE/P.Way/I.C/MRG*
Sri Biman Doley *SSE, Works, Pasighat SPTR*
Sri Deep Das *SSE/P.WAY/NLP/east*
Sri Ratan Majumder *SSE/P.Way/H/LMG (Sc)*
Sri Jayanta Rajbongshi *SSE/PWay/INE/BBU-BJL*
Sri Dizen Medhi *SSE/PWay/RPAN*
Sri Lima Sungba *AO, SSE/P.Way/DMV*
Sri Dharvesh Pal Singh *Jr. Engr./PWay Naharlagun*
Sri Himanshu Bisht *JE/P.Way/JRBM*
Sri Mintu Choudhury *Trolley Man Balipara-Bhalukpong*
Sri Bijay Boro *TRM I /BBU*

WWF-India

Ms. Tejaswini Nagesh *(Previously with WWF, India)*

Jharkhand

3.4. JHARKHAND

Introduction

In India, train collisions significantly impact elephants, disrupting their movements and leading to fatal accidents when railway lines intersect elephant habitats. Elephants play a crucial ecological role in maintaining the balance of the ecosystem. Between 2009-2010 and from 2011-2021, 186 elephants were killed on railway tracks (February 2023 | Wildlife Institute of India, an Autonomous Institute of MoEF&CC, Govt. of India (wii.gov.in). Being a long-lived social species, such a loss can heavily impact the entire herd dynamics and an entire generation of the species. To address this issue, the Ministry of Environment, Forest and Climate Change (MoEF&CC) and the Ministry of Railways held a meeting in June 2023 to discuss potential mitigation strategies for railway tracks. The Project Elephant Division of the MoEF&CC and State Forest Departments identified 110 railway segments within elephant reserves and other areas frequented by elephants, aiming to mitigate risks to both humans and elephants.

In Jharkhand, elephants are primarily found in forested regions such as West Singhbhum, Simdega, and Hazaribagh, where they inhabit dense forests and utilize well-established migratory routes. These majestic creatures are vital in maintaining ecological balance and contributing to forest regeneration and biodiversity. However, their movement patterns often intersect with railway tracks, leading to tragic collisions. These accidents frequently occur on railway lines that cut through their habitats, particularly during nocturnal migrations. Despite efforts to impose speed restrictions and implement mitigation measures, collisions remain persistent, resulting in significant elephant fatalities. Recent incidents highlight the urgent need for effective strategies to ensure the safety of both elephants and rail traffic. The report highlights in detail the survey done in the state of Jharkhand. The survey was done between 14/02/2024 and 22/02/2024.

Field Survey

The Wildlife Institute of India and the Forest Department conducted a joint field survey at the identified stretches, accompanied by concerned staff from the Department of Railways, from February 13th to 22nd, 2024. During the survey, records of wildlife presence and topographic features were documented. Sites with reported elephant activity, movement or recorded deaths or injuries were identified as vulnerable to collisions between wildlife and trains. Each of these locations was visited, inspected, and thoroughly deliberated upon. After careful consideration and inspection, mitigation measures were discussed at each of these locations. Mitigation measures such as wildlife level crossings, overpasses, and underpasses were suggested based on the feasibility of construction and criteria like proximity to the nearest forest patch, human settlement, water source, and seasonality of incidents. The entire stretch was surveyed on foot, and findings were confirmed through discussions with forest and railway officials. Details of the identified railway stretch and elephant crossing areas are given in Table 3.4.1 and Figure 3.4.1.

* The objective of the field survey was to minimise elephant-train collisions either by constructing underpasses and overpasses wherever possible, by reducing the time taken by elephants to cross the railway tracks by easing movement across the track through construction of ramps and level crossings, and by implementation of technology for early detection and warning systems.

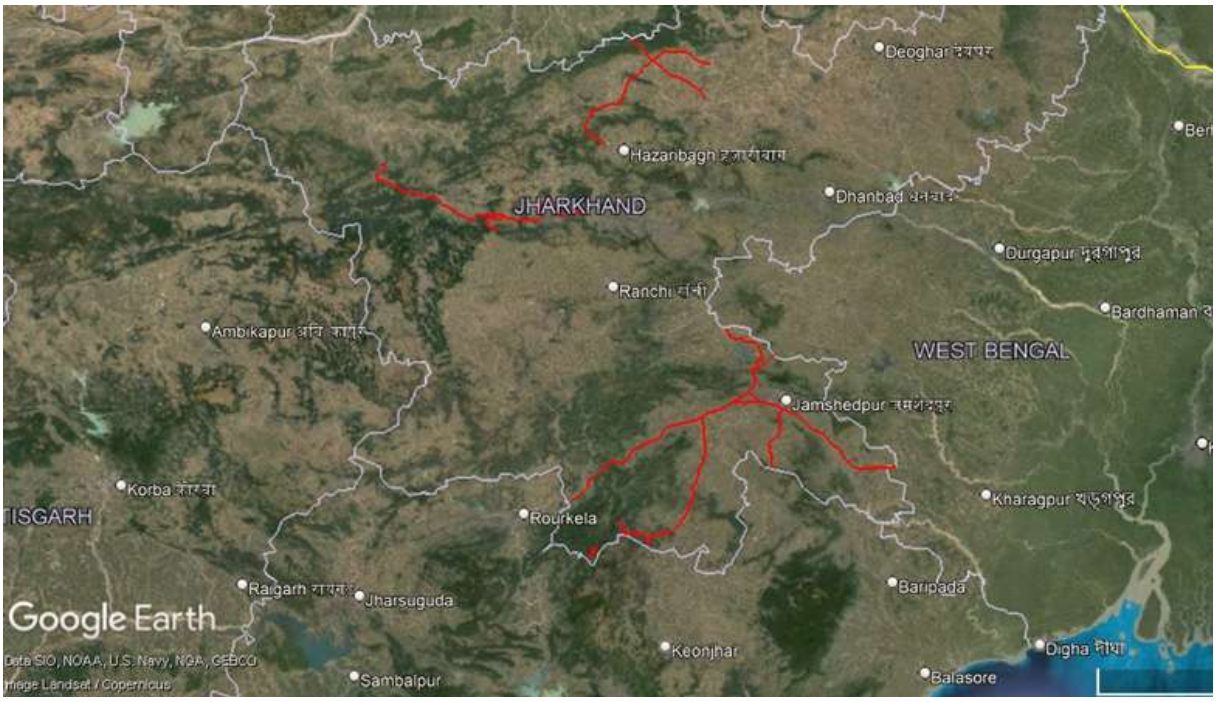


Figure 3.4.1: Surveyed railway lines in the state of Jharkhand railway passing through sensitive elephant habitats as identified by the Project Elephant Division of MoEF&CC and the Wildlife Institute of India

Table 3.4.1: Details of railway stretches passing through sensitive elephant habitats of Jharkhand as identified by the Project Elephant Division of MoEF&CC and the Wildlife Institute of India

No.	Start latitude	Start longitude	End latitude	End longitude	Crossing width (km)
1	22.31392	85.11978	20.02147	86.173276	168
2	22.95802	86.08613	23.12208	85.935675	26.5
3	23.1324	85.92995	22.97963	86.074138	35.4
4	22.84699	86.04174	22.79609	86.091693	8
5	22.48389	86.79471	22.79553	85.958771	111.6
6	22.47983	86.17583	22.76361	86.20827	38.3
7	22.16287	85.4047	22.7235	85.8800523	116.6
8	22.11184	85.52171	22.15275	85.539039	7.4
9	22.16428	85.40576	22.22515	85.385679	9.9
10	22.05147	85.20632	22.10075	85.262603	13.5
11	23.92535	84.14739	23.6514	84.949005	144.4
12	23.60205	84.74013	23.68042	84.754519	22.2
13	23.66204	84.96256	23.74066	85.058223	63.1
14	23.67917	85.06017	23.69973	85.20376	16.2
15	24.01345	85.305	24.41114	85.844082	146.2
16	24.23858	85.815	24.42461	85.547235	40.1
17	24.52947	85.43736	24.42953	85.537659	15.7

Site-Specific Findings & Mitigation Measures

Stretches and mitigation measures suggested in Ranchi Forest Division

Table 3.4.2: Suggested mitigation measures in sensitive elephant crossing zones in the Ranchi Forest Division, Jharkhand

No.	Latitude	Longitude	Mitigation Type*	Remarks
1	23.64871	84.97488	-	Mitigation is not required as the existing structure is well suited for elephant crossing
2	23.65793	85.03000	Rubberized level crossings with Distributed Acoustic Sensing (DAS) early warning system	Elephant movement during monsoon
3	Start loc 23.69427 End loc 23.69224	Start loc 85.11262 End loc 85.11474	Rubberized level crossings with Distributed Acoustic Sensing (DAS) early warning system	There is a primary road running parallel to the track
4	Start loc 23.69617 End loc 23.69760	Start loc 85.18556 End loc 85.19357	Underpass 6.5 m (H) x 30 m (W)	The existing structure is not feasible for elephant crossing, modification of the structure required
5	23.69956	85.20071	Underpass 6.5 m (H) x 30 m (W)	Nearby culvert not feasible for elephant movement

**H = Height, W = Width*

Stretches and mitigation measures suggested in Jamshedpur Forest Division

Table 3.4.3: Suggested mitigation measures in sensitive elephant crossing zones in the Jamshedpur Division

No.	Chainage	Latitude	Longitude	Mitigation Type*	Remarks
1	-	22.48139	86.75927	Rubberized level crossings with Distributed Acoustic Sensing (DAS) early warning system, signage	Elephant crossing from West Bengal to Jharkhand
2	180/01 – 180/13	Start loc 22.48041 End loc 22.48012	Start loc 86.74717 End loc 86.74297	Underpass 6.5 m (H) x 30 m (W)	
3	175/19 - 175/25	Start loc 22.48364 End loc 22.48350	Start loc 86.78967 End loc 86.78763	Barricade/Trench on both sides of the track	This crossing is close to the Kanimuhuri railway station and human settlement on one side
4	178/3	22.48193	86.76634	Underpass 6.5 m (H) x 30 m (W)	The track height gives feasibility for an underpass
5	184/18 - 184/22	22.47771	86.70165	Not feasible	Human settlement & facilitating elephant movement might increase conflict
6	187/23 - 17/29	Start loc 22.47455 End loc 22.47447	Start loc 86.67239 End loc 86.67055	Rubberized level crossings with Distributed Acoustic Sensing (DAS) early warning system, signage	This is a stretch of forest that elephants actively use for movement
7	188/10	22.47858	86.66577	Underpass 6.5 m (H) x 30 m (W)	Necessary barricading the track on either side for elephant movement into the underpass

**H = Height, W = Width*

Figure 3.4.2: Field survey with the forest department and railway officials for suggesting mitigation measures in sensitive elephant crossing zones

Figure 3.4.3: An elephant crossing zone identified for mitigation measure during the field survey

Stretches and mitigation measures suggested in Kolhan Forest Division

Table 3.4.4: Suggested mitigation measures in sensitive elephant crossing zones in the Kolhan Forest division

No.	Latitude	Longitude	Mitigation Type*	Remarks
1	22.61076	85.54562	Existing minor bridge	Barricading in a funnel shape of 500m on each side of the existing structure. Elephant crossing from Lotapahar, Kolhan forest division to Lonjo, Porahat Forest division
2	22.50757	85.32440	Overpass	Barricading from the Mahadeosal Railway Station to the start point of the overpass
3	22.49071	85.30433	Underpass 6.5 m (H) x 30 m (W)	Elephant movement from Raibera, Kolhan Division to Polaburu-Amjaharan forest. Additionally, the area below the Karo bridge should be barricaded on each side
4	22.43629	85.24181	Underpass 6.5 m (H) x 30 m (W)	The existing underpass should be stretched from 363/32 to 363/27. Funneling and habitat enrichment are suggested on both sides to route elephant movement through the underpass
5	22.42141	85.21741	Underpass 6.5 m (H) x 30 m (W)	Barricading on both sides of the railway track from the underpass openings

**H = Height, W = Width*

Stretches and mitigation measures suggested in Saranda Forest Division

Table 3.4.5: Suggested mitigation measures in sensitive elephant crossing zones in the Saranda Forest division

No.	Chainage	Latitude	Longitude	Mitigation Type*	Remarks
1	376/11A	22.35308	85.17491	Level crossing, Rubberized level crossings with Distributed Acoustic Sensing (DAS) early warning system, signage	The level of the railway track is the same as the ground level, speed limit, signages
2	380/25A	22.33125	85.14146	Underpass 6.5 m (H) x 30 m (W)	Underpass opening should be barricaded along the railway track to make elephant use of the structure
3	378/25A - 378/21A	22.33999	85.15836	Underpass 6.5 m (H) x 30 m (W)	Funnel-shaped barricading on either side of the railway track up to 1000 m from the underpass

**H = Height, W = Width*

Stretches and mitigation measures suggested in Hazaribagh Forest Division (West)

Table 3.4.6: Suggested mitigation measures in sensitive elephant crossing zones in the Hazaribagh Forest division

No.	Chainage	Latitude	Longitude	Mitigation Type*	Remarks
1	86/9 - 86/10	22.35308	85.17491	Underpass 6.5 m (H) x 30 m (W)	Funnel-shaped barricading on either side of the railway track from the underpass
2	91/17 - 99/18	22.33125	85.14146	Underpass 6.5 m (H) x 30 m (W	
3	-	22.33999	85.15836	Existing Bridge	Funnel-shaped barricading on either side of the railway track up to 1000 m from the underpass
4	94/11 - 94/16	23.87203	85.33463	Existing overpass	The bridge can facilitate elephant movement. However, barricading the existing crossing along the railway track is required with modification of area under the bridge for smooth elephant movement
5	97/8 - 97/9	23.86885	85.35922	Underpass 6.5 m (H) x 30 m (W)	
6	364/7 - 363/23	24.29331	85.76437	Existing Bridge	This existing bridge can facilitate elephant movement. However, area close the bridge on either side it flat and elephant use these flat surfaces to cross railway track. It should be noted to construct barrier to prevent elephant crossing along the track and make use of the area under the bridge
7	-	24.28372	85.78254	Overpass	It should be noted that the railway concrete boundary along the railway track should not obstruct elephant movement

**H = Height, W = Width*

Stretches and mitigation measures suggested in Saraikela Forest Division

Table 3.4.7: Suggested mitigation measures in sensitive elephant crossing zones in the Saraikela Forest Division

No.	Chainage	Latitude	Longi-tude	Mitigation Type*	Remarks
1	295/4	23.00077	86.10413	Rubberized level crossings with Distributed Acoustic Sensing (DAS) early warning system	Flat area with forest on one side and dam on the other side
2	289/11 - 289/8	Start loc 22.97355 End loc 22.97302	Start loc 86.08498 End loc 86.08716	Leveling of slope both side of the track with signage	Existing small culvert, underpass not feasible due to track height. Modification of slope angle to the track
3	289/15	22.97407	86.03040	Overpass	
4	290/7 - 290/8	22.97649	86.07639	Underpass 6.5 m (H) x 30 m (W)	Modification of existing structure can be done with height clear-ance of 6 m. However, details aspect of water logging related during monsoon due to the structure should be explored
5	292/15 - 292/16	22.99277	86.0336	Rubberized level crossings with Distributed Acoustic Sensing (DAS) early warning system/ signage/slope modification	The surface is flat with elephant using the Chandil dam area for usage.
6	292/15 - 293/3	22.99349	86.0569	Underpass 6.5 m (H) x 30 m (W)	The existing structure should be modified for elephant movement
7	385/S29 - 386/S5	Start loc 22.89043 End loc 22.88789	Start loc 86.06996 End loc 86.06969	Underpass 6.5 m (H) x 30 m (W)	The track is well above the ground and area feasible for underpass for elephant movement
8	394/S18	22.83194	86.01914	Underpass 6.5 m (H) x 30 m (W)	The track is well above the ground and area feasible for underpass for elephant movement
9	286/26 - 286/30	Start loc 22.75017 End loc 22.75056	Start loc 85.5296 End loc 85.85406	Rubberized level crossings with Distributed Acoustic Sensing (DAS) early warning system/ signage/slope modification	Flat surface on either side of the track
10	289/2 - 289/06	22.74510	85.83740	Underpass 6.5 m (H) x 30 m (W)	Triple line crossing and dung found during survey suggesting elephant movement
11	293/25A - 293/29	22.72427	85.79537	Rubberized level crossings with Distributed Acoustic Sensing (DAS) early warning system/ slope modification	Flat surface area with either side agricultural fields

**H = Height, W = Width*

Stretches and mitigation measures suggested in Chaibasa Forest Division

Table 3.4.8: Suggested mitigation measures in sensitive elephant crossing zones in Chaibasa Forest division

No.	Chainage	Latitude	Longitude	Mitigation Type*	Remarks
1	363/8 - 363/10	22.16753	85.62347	Underpass 6 m (H) x 30 m (W)	Barricading either side of the railway track to facilitate elephant movement through the under-pass
2	342/33A - 342/35A	22.30663	85.73813	Underpass 6 m (H) x 30 m (W)	Barricading either side of the railway track up to 800 - 1000 m from the underpass opening
3	337/9A - 337/11A	22.35255	85.75596	Underpass 6 m (H) x 30 m (W)	Barricading either side of the railway track starting from Talaburu Railway Station to the underpass opening
4	300/31	22.65528	5.80769	Underpass 6 m (H) x 30 m (W)	Barricading either side of the railway track is necessary from the underpass opening

**H = Height, W = Width*

Figure 3.4.4: Existing mitigation measures need modification like barricading from the side of the overpass along the along railway track and placement of light/sound barriers

Figure 3.4.5: Existing major bridge which requires landscape modification like habitat restoration, plantation and water availability for elephant movement under bridge

Figure 3.4.6: Existing culverts need structural modifications for elephant underpass

Stretches and mitigation measures suggested in Ramgarh Forest Division

Table 3.4.9: Suggested mitigation measures in sensitive elephant crossing zones in Ramgarh Forest division

No.	Chainage	Latitude	Longitude	Mitigation Type*	Remarks
1	377/23 - 378/1	23.48888	85.74108	Underpass 6 m (H) x 30 m (W)	Barricading either side of the railway track up to 1000 m is necessary from the underpass opening
2	374/7 - 374/6	23.50365	85.76817	Underpass 6 m (H) x 30 m (W)	Barricading either side of the railway track to facilitate elephant movement through the mitigation structure

**H = Height, W = Width*

Stretches and mitigation measures suggested in Bokaro Forest Division

Table 3.4.10: Suggested mitigation measures in sensitive elephant crossing zones in Bokaro Forest division

No.	Chainage	Latitude	Longitude	Mitigation Type*	Remarks
1	67/9 - 67/10	23.79192	85.65295	Existing major bridge	Habitat restoration and modification is suggested along the structure to enhance elephant movement
2	71/9 - 71/27	23.76775	85.63661	Underpass 6 m (H) x 30 m (W)	Barricading either side of the railway track to facilitate elephant movement through the mitigation structure

**H = Height, W = Width*

Stretches and mitigation measures suggested in Hazaribagh Forest Division **(East)**

Table 3.4.11: Suggested mitigation measures in sensitive elephant crossing zones in Hazaribagh Forest Division (East)

No.	Chainage	Latitude	Longitude	Mitigation Type*	Remarks
1	350/10	24.20410	85.85416	Underpass 6 m (H) x 30 m (W)	The mitigation structure should facilitate elephant movement and the existing barricading wall along the railway track should make a funnel effect
2	338/19	24.12636	85.91884	Underpass 6 m (H) x 30 m (W)	

**H = Height, W = Width*

Stretches and mitigation measures suggested in Koderma Forest Division

Table 3.4.12: Suggested mitigation measures in sensitive elephant crossing zones in Koderma Forest Division

No.	Chainage	Latitude	Longitude	Mitigation Type*	Remarks
1	364/20 – 364/22	24.29437	85.7599	Existing major bridge	The existing wall barricade along the railway track will help elephants cross under the bridge
2	368/6 – 368/7	24.31360	85.73202	Underpass 6 m (H) x 30 m (W)	
3	380/28 – 381/1	24.35969	85.61779	Overpass	
4	11/23 – 11/27	24.46315	85.62157	Underpass 6 m (H) x 30 m (W)	Barricading existing elephant crossing paths and funnelling their movement towards the underpass for crossing
5	12/13 – 12/15	24.35415	85.46854	Rubberised level crossings with Distributed Acoustic Sensing (DAS) early warning system and slope modification	

**H = Height, W = Width*

Stretches and mitigation measures suggested in Latehar Forest Division

Table 3.4.13: Suggested mitigation measures in sensitive elephant crossing zones in the Latehar Forest Division

No.	Chainage	Latitude	Longitude	Mitigation Type*	Remarks
1	21/5A – 21/5B	23.82480	84.81904	Overpass	There is a metal road running parallel to the railway track. Therefore, the mitigation structure should be on the railway track and the road
2		23.83486	84.83588	Existing major bridge	The existing structure acts as an underpass for elephant movement. Any debris or construction material should be cleared to give open passage for elephant movement
3		23.83756	84.84064	Existing major bridge	The existing structure acts as an underpass for elephant movement. Any debris or construction material should be cleared to give open passage for elephant movement
4		23.84661	84.87263	Existing major bridge	The existing structure acts as an underpass for elephant movement. Any debris or construction material should be cleared to give open passage for elephant movement
5	02/06	23.68023	84.77234		
6	180/27	23.67278	84.78252	Existing major bridge	The existing structure acts as an underpass for elephant movement. Any debris or construction material should be cleared to give open passage for elephant movement
7	174/24 – 174/22	23.65508	84.83620	Underpass 6 m (H) x 30 m (W)	Barricading existing elephant crossing paths and funnelling their movement towards the underpass for crossing
8	23.65815	84.86662		Underpass 6 m (H) x 30 m (W)	
9	167/21 – 167/19	23.65854	84.90145	Underpass 6 m (H) x 30 m (W)	

**H = Height, W = Width*

List of Jharkhand Forest Department and Indian Railways officials consulted during the survey

Jharkhand Forest Department Staff:

Latehar Forest Division
Alok Tigga, *Sub-beat Officer, Chandwa Range*
Sumit Kumar Gupta, *Sub-beat Officer, Chandwa Range*
Sunil Kachhap, *Sub-beat Officer, Chandwa Range*

Jamshedpur Forest Division
Kalyan Prasad Mahto, *IC Forest, Chakulia Range Office*
Anup Kumar Bera, *Sub-beat Officer, Chakulia Range Office*
Biplab Kumar, *Sub-beat Officer, Chakulia Range Office*
Hazaribagh Forest Division

Vidya Bhushan, *Forester-In-Charge*
Anshu Kumar, *Forester-In-Charge, Bagodar Range*
Deb Chand Mahato, *Sub-beat Officer*
Prabhat K. Lakra, *Sub-beat Officer*

Saraikela Forest Division
Rana Pratap, *Forester, Chandil Range*
D.N. Tudu, *Forester-In-Charge*
Saraikela Range
Amit Kumar Patnayak, *Forest Guard, Kharsawan Range*

Koderma Forest Division
Ravinder Kumar, *RFO, Domchach Range*
Rahul Kumar, *Sub-beat Officer, Gajhandi Range*
Hiraman Oraon, *Sub-beat Officer, Koderma Range*
Abhimanyu Kumar, *Sub-beat Officer, Domchach Range*
Ram Babu Kumar, *Gajhandi Range*
Saranda-Kolhan Forest Division
Ram Nandan Ram, *RFO, Koina-Manoharpur Range*
Shanar Bhagat, *RFO, Saitbar Range*

Chaibasa Forest Division
Jitendra Prasad Singh, *RFO, Noamundi Range*
Richard Mathew Soren, *Sub-beat Officer, Chaibasa Range*
Ekka Bablu Lakra, *Sub-beat Officer, Chaibasa Range*

Ramgarh Forest Division
Shailender Kumar, *Sub-beat Officer, Mandu Range*
Nilesh Chandra Poddar, *Sub-beat Officer, Mandu Range*
Bokaro Forest Division
Dheeraj Kumar, *Sub-beat Officer, Tenughat Range*

Indian Railways:

Sunil Kumar, *Assistant Operation Manager (Control), Kharagpur Division, SE Railway*
Rahul Kumar, *JE/P.Way/DVM, Kharagpur Division, SE Railway*
Subodh Kumar Singh, *Chief Divisional Transportation Inspector, Ghatsila, Kharagpur Division, SE Railway*
J. C. Das, *OC, RPF, Ghatsila, Kharagpur Division, SE Railway*
B. Pashwan, *Senior Section Engineer/P.Way, Muri, S.E. Railway*
R.K. Singh, *Senior Section Engineer/Works, Sini – KKP, S.E. Railway*
Kamlesh K. Singh, *ADEN/West/CKP, S.E. Railway*
K. Shrinivas, *SSE/Workline/CKP, S.E. Railway*
Ranjeet Singh, *Senior Section Engineer (Works), Chaibasa-Chakradharpur Division, S.E. Railway*
Giridhar Kumar, *SSE (Special), S.E. Railway*
Dilip Kumar, *Assistant Divisional Engineer, Dhanbad Division, S.E. Railway*

Karnataka

3.5. KARNATAKA

Introduction

Among the anthropogenic causes leading to human-elephant conflict, train collision has been a matter of serious concern for the past several years. Between 2009-2010 and from 2011-2021, 186 elephants were killed on railway tracks[1], and 80 elephant deaths were reported in a five-year span (between 2018-2023)[2]. Being a long-lived social species, such a loss can heavily impact the entire herd dynamics and an entire generation of the species. The ecological importance of the species in maintaining the ecosystem balance is undeniably of the highest magnitude. It is a prudent responsibility to stop such loss. With that aim the Ministry of Environment, Forest and Climate Change (MoEF&CC) and Ministry of Railways met on June 2023 to deliberate upon the mitigation measures to be adopted on the railway track to minimize such incidents of train-elephant collision.

Project Elephant Division of MoEFCC, India and the Wildlife Institute of India, Dehradun had identified 110 railway stretches passing through sensitive elephant habitats of India with the objective to implement effective mitigation measures to minimize wildlife-train collision. In this regard Ministry of Railways and MoEF&CC planned to conduct joint surveys on these 110 stretches across 13 states. Technical representatives from the Wildlife Institute of India and Project Elephant Division along with state forest officers and senior railway personnel visited these stretches to suggest and evaluate feasibility of wildlife-specific mitigation measures.

With 6395 elephants[3] (21% of India's elephant population in 2023), 2 elephant reserves[4] (spanning more than 15,000 km^2) and 7 elephant corridors[5], the state of Karnataka plays a significant role in India's elephant conservation. However, rapid linear infrastructure development, such as roads and railway, and agricultural practices in the state has severely fragmented the forested habitats. Elephant herds are forced to venture out of the forest in search of forage. Such long-distance movement entails crossing roads and railways which inadvertently puts the species to a life-threatening scenario. This report highlights in detail the survey done in the state of Karnataka. The survey was done between 26/02/2024 and 06/03/2024. Five vulnerable stretches spanning four districts were identified in the state (Table 3.5.1). Each stretch was thoroughly inspected by the joint technical team of WII-Forest Department-Railways and collective decision was taken on construction of wildlife mitigation structures at sensitive locations.

Table 3.5.1: Details of railway stretches passing through sensitive elephant habitats of Karnataka as identified by the Project Elephant Division of MoEF&CC and the Wildlife Institute of India.

Stretch	Width (km)	Between stations	District
1	24.9	Ambewadi – Alnavar	Uttar Kannada
2	42.7	Londa – Khanapura – Desur	Belgaum
3	86	Tinaighat – Londa – Nagargali	Uttara Kannada - Belgaum
4	100	Shimoga – Kumsi – Anandapura - Talaguppa	Shimoga
5	131.5	Subrahmanya Road – Sakleshpura – Ballupet	Hassan

1 186 elephants killed on railway tracks in over 10 years: MoEFCC - The Hindu
2 Mongabay.com
3 Number of elephants in Karnataka has gone up by 346 - The Hindu
4 wiienvis.nic.in/Database/eri_8226.aspx
5 Press Information Bureau (pib.gov.in)

Field Survey

Concerned staffs from the Department of Forest and Indian Railways for each of the identified stretches were informed in advance about the locations through which a stretch passes. Accordingly, the survey date, time, start-end locations and other logistics were arranged. The inspection team comprised of Range Forest Officer, Assistant Divisional Engineer of Railways and WII representative. Motorised trolley was used which was a convenient and faster mode for surveying the stretches (Figure 3.5.1). The trolley allowed swift and careful inspection of each of the sensitive locations. Locations with report of elephant movement or previous/current records of elephant mortality/injury were considered sensitive to wildlife-train collision. All such locations were visited and upon inspection and thorough deliberation mitigation measures such as wildlife level-crossings, overpass and underpass were suggested. Apart from feasibility of constructing the mitigation structures, the suggestions were also based on criteria such as distance to the nearest forest patch, distance to the nearest human settlement, distance to water source and seasonality of incidences. For each location chainage number and geo-coordinates were recorded (using GPS). Data on past records of wildlife-rail collision was collected from the Forest Department offices. Data on type and dimension of existing structures near the sensitive locations (if any) were recorded. The structures were inspected for any animal usage based on indirect signs, such as footprint.

Figure 3.5.1: Field survey conducted by WII representative in collaboration with Indian Railways and Karnataka State Forest Department officials in sensitive railway line stretches in the state.

* The objective of the field survey was to minimise elephant-train collisions either by constructing underpasses and overpasses wherever possible, by reducing the time taken by elephants to cross the railway tracks by easing movement across the track through construction of ramps and level crossings, and by implementation of technology for early detection and warning systems.

Site-Specific Findings & Mitigation Measures

Ambewadi – Alnavar

25 km of this stretch, between Ambewadi – Alnavar, was surveyed in presence of Range officers of three forest ranges, viz. Dandeli, Barchi and Haliyal and Railway Section Engineers on 27/02/2024. The stretch falls within an active elephant and gaur corridor. From Dandeli towards Kalyanpura, the right side of the stretch has dense contiguous forest (Figure 3.5.2). The left side of the stretch however has patchy forest with few villages and human settlements (Figure 3.5.2). Illicit felling and logging by the villagers are a major problem the forest department faces here. This stretch is currently used for transportation of goods to a paper mill located at Ambewadi.

Table 3.5.2: Suggested mitigation measures and their dimensions for the Ambewadi – Alnavara railway stretch

S. No.	Chainage	Suggested mitigation structure	Dimension (meters)	Latitude	Longitude
1	25/700	Level Crossing*	50	15.2746	74.6216
2	22/500	Level Crossing*	50	15.2906	74.6431
3	21/500	Level Crossing*	50	15.2924	74.6529
4	17/100	Level Crossing*	50	15.3226	74.6676
5	14/100	Level Crossing*	50	15.3420	74.6605
6	5/200	Level Crossing*	50	15.4031	74.7002

** Rubberized level crossings with Ramps and Distributed Acoustic Sensing (DAS) early warning system*

Londa – Khanapura – Desur

The survey in this stretch was done between Khanapura station and Londa station on 29/02/2024. This section of the stretch passes through forested habitats majorly. As reported by the forest and the railway staff, the section between Khanapura and Desur has minimal to zero movement of elephant or gaur. The forested habitat through which the railway passes between Khanapura and Londa is interspersed with occasional agricultural fields creating a patchy forest network (Figure 3.5.3). This section is heavily used by gaur with several reports of deaths and injury repeatedly in certain locations (Figure 3.5.4 & Table 3.5.4). The movement is primarily during night when animals cross from the forest habitats towards agricultural fields in search of food and water and falls victim to the fast-moving trains. In addition to implementation of all the suggested measures, controlling the speed is crucial for minimizing such fatal accidents. During the survey itself an adult gaur was found dead hit by train in the preceding night at chainage 575/8 (Figure 3.5.5).

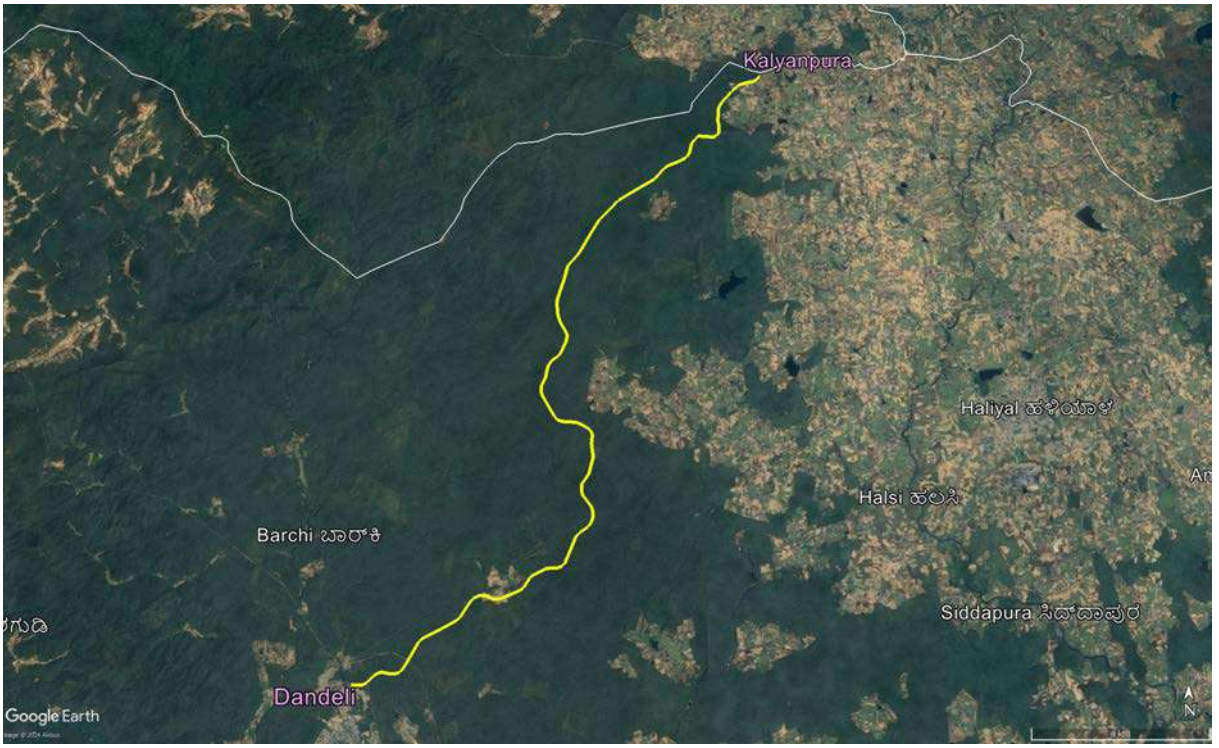


Figure 3.5.2: Map showing stretch of railway line surveyed between Ambewadi – Alnavar, Karnataka

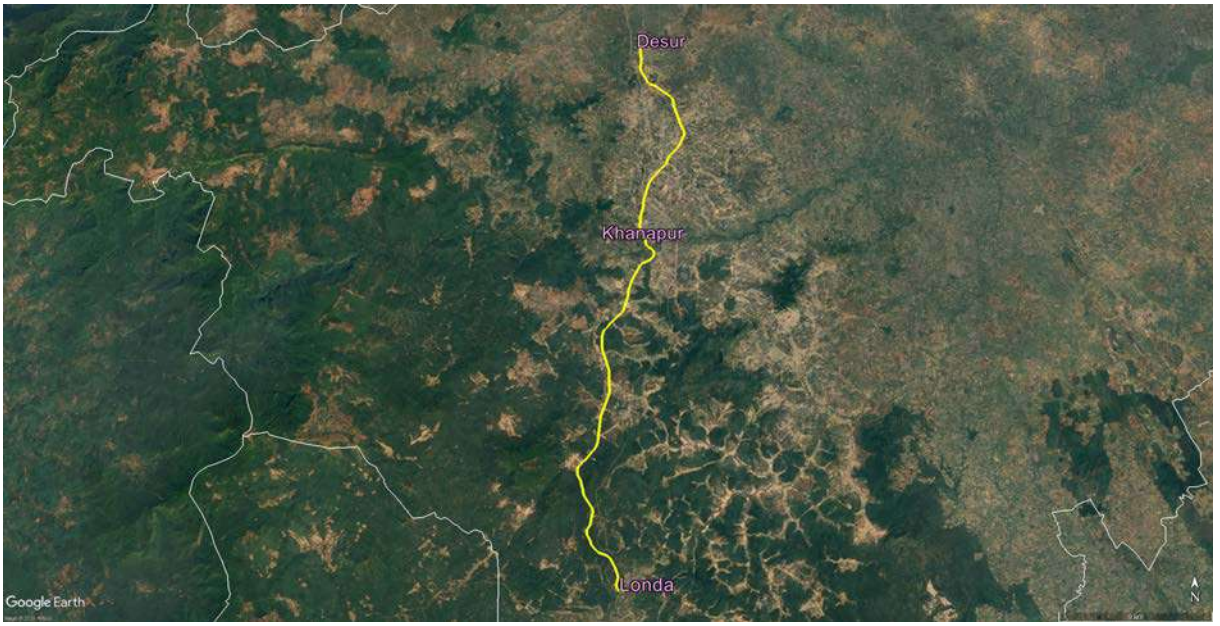


Figure 3.5.3: Map showing the railway stretch between Londa and Desur, Karnataka.

Figure 3.5.4: Mortality locations of gaur (red circles) on the railway track between Londa and Khanapur, Karnataka (2014-2024)

Table 3.5.3: Suggested mitigation measures and their dimensions for the Khanapura – Desur railway stretch, Karnataka

S. No.	Chainage	Suggested mitigation structure	Dimension (meters)	Latitude	Longitude
1	578/0-577/9	Level Crossing*	50	15.5866	74.4818
2	578/1-578/2	Underpass	6(H) x 20(W)	15.5874	74.4827
3	577/9-577/2	Retaining Wall#		15.5874	74.4827
4	576/0-576/1	RCC Box	6(H) x 15(W)	15.5707	74.4781
5	575/0-575/1	Level Crossing*	50		
6	571/9	RCC Box	6(H) x 15(W)	15.5345	74.4770
7	571/1	Level Crossing*	50	15.5272	74.4762
8	569/9	Level Crossing*	50	15.5176	74.4732
9	568/23	Overpass	30	15.5056	74.4648
10	567/1-567/0	Level Crossing*	50	15.4954	74.4682
11	565/0-564/9	Underpass	6(H) x 20(W)	15.4781	74.472
12	563/7	Underpass	6(H) x 20(W)	15.4677	74.4737

** Rubberized level crossings with Ramps and Distributed Acoustic Sensing (DAS) early warning system*
 # Retaining wall should be provided with ramps on both sides for facilitating wildlife movement;
H = Height, W = Width

Figure 3.5.5: An adult gaur found dead because of collision with a train on the Londa-Khanapura-Desur railway line, Karnataka, during the joint survey.

Table 3.5.4: Records of animal mortality due to collision with trains in the Londa – Khanapura railway stretch between 2014 and 2024. [Source: Range Forest Office, Londa.]

Sl No	Year	FOC No	FIR No/ WLOR No	Date	Time	Details of wild Animal	Location	GPS Reading		Chinage No
1	2013-14			22-02-2014		Indian Gaur	Watra Fs No: 71	15.46427	74.47787	563/300
2	2015-16			29-02-2016		Indian Gaur-2 Nos	Akrali Fs No: 79/A	1)15.45457 2)15.45473	1)74.44832. 2)74.44827	7/250
3				02-03-2016		Indian Gaur	Akrali Fs No: 79/A	15.45613	74.42748	7/200
4				19-03-2016		Indian Gaur	Kirawale Fs No: 62	15.51288	74.46896	567/00
5	2016-17			27-09-2016		Indian Gaur	Kirawale Fs No: 62	15.47766	74.2452	554/900
6				12-01-2017		Indian Gaur	Kirawale Fs No: 62	15.51074	74.46673	568/100
7				01-03-2017		Indian Gaur	Kirawale Fs No: 62	15.31087	74.28423	570/100
8	2017-18			07-04-2017		Indian Gaur	Akrali Fs No: 78, 79	15.45630	74.43698	7/400
9				12-12-2017		Wild Dog	Kirawale Fs No: 62	15.51437	74.47014	571/100
10				28-12-2017		Indian Gaur	Kirawale Fs No: 62	15.29782	74.2808	568/100
11				28-12-2017		Indian Gaur	Kirawale Fs No: 62	15.31341	74.27744	567/200
12				13-07-2017		Bear	Kirawale Fs No: 62	15.29580	74.27040	569/300
13				07-01-2018		Indian Gaur	Gunji Fs No: 62	15.54820	74.48148	573/400
14	2018-19			23-08-2018		Indian Gaur	Akrali Fs No: 78, 79	15.45690	74.43329	7/700
15				19-12-2018		Indian Gaur	Akrali Fs No: 78, 79	15.45690	74.43329	7/700
16				25-03-2019		Indian Gaur	Railway	15.45610	74.43842	7/000
17	2019-20	05/2019-20	01/2019-20	18-05-2019	4.00 pm	Indian Gaur	Akrali Fs No: 121	15.44495	74.47002	3/300
18		23/2019-20	01/2019-20	24-02-2020	Night	Indian Gaur	Kirawale Fs No: 62/A	15.50499	74.69960	567/8
19		24/2019-20	02/2019-20	06-03-2020	Night	Indian Gaur	Goshe Fs No: 58	15.47005	74.51240	556/3
20		25/2019-20	03/2019-20	16-03-2020	Night	Indian Gaur	Tivoli Fs No: 16	15.32070	74.28370	576/6
21	2020-21	04/2020-21	02/2020-21	11-06-2020	Night	Indian Gaur	Kumrutwadi Fs No: 59	15.32070	74.28370	572/0
22		05/2020-21	01/2020-21	25-07-2020	3.20 pm	Sambar	Akrali Fs No: 78, 79	15.456191	74.442348	6/800
23		08/2020-21	01/2020-21	03-12-2020	5:00 AM	Bison	Shindoli BK Fs No: 34	15.47470	74.53233	553/4
24		13/2020-21	01/2020-21	29-12-2020	10.30 am	Indian Gaur	Goshe kh Fs No: 41	15.32070	74.28370	555/7
25		15/2020-21	02/2020-21	08-01-2021	9.10 am	Indian Gaur	Potoli Fs No: 37	15.475461	74.526525	554/2
26		16/2020-21	02/2020-21	19-01-2021	3.40 pm	Indian Gaur	Akrali Fs No: 78	15.456645	74.433832	7/700
27		18/2020-21	03/2020-21	02-02-2021	4.10 pm	Bison	Akrali Fs No: 78	15.456776	74.427617	8/500
28		19/2020-21	19/2020-21	13-02-2021	6.00 am	Indian Gaur	Watra Fs No: 71	15.494591	74.46850	567/0
29		20/2020-21	01/2020-21	21-02-2021	3.00 am	Bison	Tivoli Fs No: 16			577/1
30		23/2020-21	03/2020-21	07-03-2021	10.30 pm	Indian Gaur	Kirawale Fs No: 62/A	15.49633	74.46812	567/2
31	2021-22	04/2021-22	04/2021-22	08-06-2021	3.40 pm	Indian Gaur	Akrali Fs No: 79	15.45459	74.44456	6/500
32				09-04-2021		Indian Gaur	Tvoli Fs No: 16	15.57156	74.47778	576/100
33		07/2021-22	01/2021-22	11-08-2021	Night	Indian Gaur	Londa Fs No: : 51	15.45273	74.48794	563/3
34		08/2021-22	02/2021-22	22-08-2021	Night	Bison	Tvoli Fs No: 27	15.56316	74.48083	575/1
35		10/2021-22	01/2021-22	24-09-2021	Night	Bison	Goshe BK Fs No: 18			555/2
36		12/2021-22	02/2021-22	27-10-2021	Night	Sambar	Gunji Fs No: : 35	15.52736	74.47522	571/2
37		14/2021-22	02/2021-22	20-11-2021	4.20 pm	Indian Gaur	Watra Fs No: 71	15.477399	74.471401	564/9
38		14/A/2022-23	01/2022-23	27-01-2022	Night	Bison	Mohishet Fs No : 10	15.467567	74.474018	563/700-800
39				15-02-2022	-	Indian Gaur	Londa Fs No: : 18	15.46212	74.50799	557/200
40				17-02-2022	-	Indian Gaur	Shindoli Fs No: 32	15.474627	74.529839	553/700
41				14-04-2022	-	Indian Gaur	Potoli Fs No: 37	15.47471	74.52704	554/1
42	2022-23	18/2022-23	2/2022-23	10-01-2023	4.30 am	Bison	Tivoli Sy No: 56	15.569308	74.47874	575/800
43				01-02-2023	-	Indian Gaur	Potoli R S No: 40	15.47559	74.81354	555/7
44	2023-24			07-01-2024	-	Indian Gaur	Goshe kh Fs No: 58	15.468996	74.511554	556/4
45		19/2023-24	19/2023-24	21-02-2024	-	Indian Gaur	Tivoli R S No: 52	15.5726	74.4889	575/8
46		20/2023-24	20/2023-24	22-02-2024	-	Indian Gaur	Gavegali R S No: 26	15.4533	74.429	9/0
47		22/2023-24	22/2023-24	28-02-2024	-	Indian Gaur	Dokegali Fs No: 32	15.5863	74.4819	578/0
48	2024-25	01/2024-25	01/2024-25	07-04-2024	-	Indian Gaur	Mohishet Fs No : 10	15.44849	74.49162	562/300
49		02/2024-25	02/2024-25	09-04-2024	Night	Indian Gaur - 2 Nos	Akrali Fs No: 78	15.456129	74.442702	6/800
50		03/2024-25	03/2024-25	13-04-2024	-	Indian Gaur	Akrali Fs No: 78	15.456134	74.442622	6/800
51		04/2024-25	04/2024-25	05-05-2024	-	Indian Gaur	Shivathan Sy No: 56	15.459307	74.542418	551/7
52		05/2024-25	05/2024-25	13-05-2024	-	Indian Gaur	Tivoli Fs No: 16	15.57276	74.47749	576/3
53		06/2024-25	06/2024-25	03-06-2024		Indian Gaur	Goshe KH	15.464559	74.509209	556/9

In this stretch the section between Tinaighat – Londa – Nagargali was surveyed on 29/02/2024 and 02/03/2024. The section passes through forested habitat interspersed by agricultural field and human settlements. Movement of gaur is frequent across the railway track of this section. Low forage availability in the fragmented forest and scarce water availability in dry season probably forces the animal to venture into agricultural fields. Such movements render the species vulnerable to train collision (Figure 3.5.6 and 3.5.7).

The section between Castlerock and Tinaighat which falls under the buffer of Kali Tiger Reserve was systematically surveyed and chainage-wise appropriate mitigation measures were suggested by WII during an earlier project "Cumulative Environmental Impact Assessment on wildlife habitat and ecological values due to proposed doubling of railway track from Tinaighat to Kulem in the northern Western Ghats". The technical details of these mitigation measures can be found in the report "Mitigation measures for the doubling of railway track between Tinaighat (Karnataka) and Goa". The stretch is separately considered for doubling and mitigation by Indian Railways.

Table 3.5.5: Suggested mitigation measures and their dimensions for the Tinaighat – Londa – Nagargali railway stretch

S. No.	Chainage	Suggested mitigation structure	Dimension (meters)	Latitude	Longitude
1	8/400	Level Crossing*	50	15.4535	74.42427
2	556/3	Level Crossing*	50	15.4697	74.51228
3	555/7	Level Crossing*	50	15.4755	74.8135
4	554/2	Underpass	4(H)*20(W)	15.4753	74.5257
5	550/5-550/6	Level Crossing*	50	15.4518	74.5435
6	548/4-548/5	Level Crossing*	50	15.4458	74.5614
7	545/1-545/2	Underpass	5(H)*20(W)	15.449	74.5873
8	542/3	Level Crossing*	50	15.4308	74.6003

** Rubberized level crossings with Ramps and Distributed Acoustic Sensing (DAS) early warning system*

Figure 3.5.6: Map showing the railway stretch between Castlerock – Tinaighat – Londa – Nagargali, Karnataka

Figure 3.5.7: Map showing mortality locations of gaur (red circle) on the Tinaighat – Londa – Nagargali railway stretch, Karnataka.

Shimoga – Kumsi – Anandapura – Talaguppa

This stretch was surveyed on 05/03/2024. The major span of this stretch passes through human habitation with no forest (Figure 3.5.8). The area adjacent to the railway track is predominately of Arecanut plantations. Only about 10 km of the total 100 km stretch passes through forest on one side, where there has been very infrequent report of elephant movement. Railway track ends at the Talaguppa.

Table 3.5.6: Suggested mitigation measures and their dimensions for the Khanapura – Desur railway stretch, Karnataka.

S. No.	Chainage	Suggested mitigation structure	Dimension (meters)	Latitude	Longitude
1	92/2	Overpass	30	13.9874	75.3433
2	92/0	Level Crossing*	50	15.5874	74.4827

** Rubberized level crossings with Ramps and Distributed Acoustic Sensing (DAS) early warning system*

Balupete – Sakleshpura – Subrahmanya Road

This stretch was surveyed on 07/03/2024. Half of the stretch passes through extensive coffee plantations before it enters the Ghat section with dense forest and hilly terrain (Figure 3.5.9). The section between Ballupet and Sakleshpura could be extensively surveyed with the motorised trolley. Several locations of the section had active elephant movement as was evident from presence of dung as well from report of forest and railway staff. For the rest of the stretch, section between Sakleshpura till Yedakumari could only be surveyed due to absence of motorised trolley. The motorised trolley was not permitted to run between Sakleshpura and Subrahmanya Road due to technical difficulties on the day of survey. Hence, only those elephant crossing points were visited, between Sakleshpura and Kadagaravalli, which could only be accessed through the vehicular road passing parallel to the rail track.

N.B: Assessment of the section between Kadagaravalli and Subrahmanya Road which passes through the critical Ghat section will require 3/4 days of prior planning, as on-foot survey seems to be the only option of surveying the stretch. The stretch however has several elephant crossing points and requires a thorough inspection for finalising the mitigation measures.

Table 3.5.7: Suggested mitigation measures and their dimensions for the Ballupet – Sakleshpura – Kadagaravalli railway stretch, Karnataka.

S. No.	Chainage	Suggested mitigation structure	Dimension (meters)	Latitude	Longitude
1	28/100-28/200	Level Crossing*	50	12.95611	75.87834
2	29/100-29/200	Overpass	50	12.9595	75.86961
3	34/600-34/700	Overpass	30		
4	35/200-35/300	Level Crossing*	50		
5	35/900-36/000	Overpass	50	12.9611	75.8176
6	44/300-44/300	Level Crossing*	50	12.9403	75.7596
7	54/600-54/700	Level Crossing*	50	12.8637	75.7242
8	54/350	Railway Under Bridge	6(H) x 30(W)	12.8655	75.7262
9	54/200-54/300	Overpass	50	12.8664	75.7269
10	56/400-56/500	Overpass	50	12.8553	75.7116
11	58/300-58/400	Overpass	30	12.8413	75.7055
12	58/400-58/500	Level Crossing*	50	12.8413	75.7037
13	58/600-58/700	Overpass	30	12.8416	75.7021

** Rubberized level crossings with Ramps and Distributed Acoustic Sensing (DAS) early warning system*

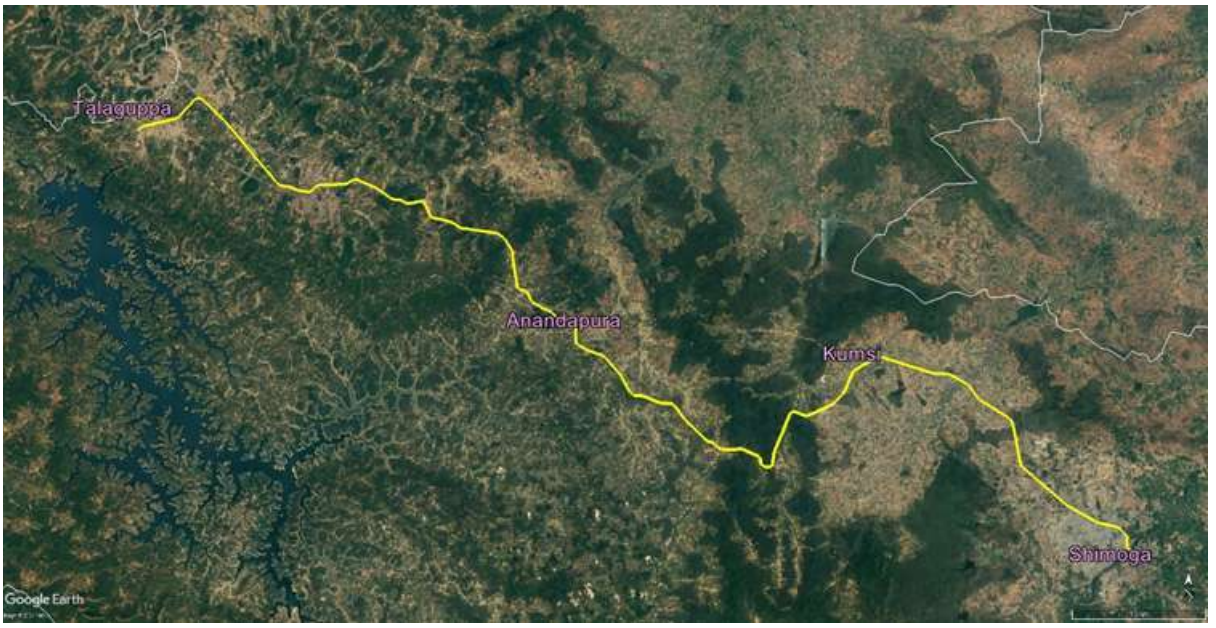


Figure 3.5.8: Map showing the railway stretch between Shimoga – Kumsi – Anandapura – Talaguppa, Karnataka.

Figure 3.5.9: Map showing the railway stretch between Ballupet – Sakleshpura – Subrahmanya Road, Karnataka.

List of Karnataka Forest Department and Indian Railways officials consulted during the survey

Karnataka Forest Department Staff:

1. Mr Nilesh Shinde, *Deputy Conservator of Forest and Director Kali Tiger Reserve, Dandeli*
2. Mahantesh Patel, *RFO, Kulgi*
3. Y P TEJ, *RFO*, *Londa*
4. Mahesh Marenavar, *RFO, Bhimgad*
5. B.L.Dinesh, *DRFO, Sakleshpura*
6. Mr.Venugopal, *DyRFO, Sakleshpura*
7. Lokesh K.N., *DRFO*
8. Arun Hampiholi, *DRFO*
9. Manikanta Vaidya, *DRFO*
10. Somashekar Naik, *DRFO*
11. Akandappa Horkiri, *BFO*

Indian Railways:

12. Ajit Astekal, *SSE / PWAY / LONDA*
13. Mr Chandregowda, *PM / SSE*
14. Mayank Raj, *JE / WORKS / BGM*
15. Chetan M.P., *JE / WORKS / DWR*
16. Mahesh Vaddar, *JE / PWAY / DWR*

Kerala

3.6. KERALA

Introduction

Kerala harbors over 2300 elephants (Kerala Forest Department 2023), which are predominantly distributed in the hilly tracts of the Western Ghats. The elephant habitats in Kerala span across Karnataka and Tamil Nadu involving substantial interstate movement of elephants, which could periodically inflate elephant numbers within the state. During the last few decades, Western Ghats region as a whole has seen rapid infrastructural development, including that of the upgrading of the Railway and road network, among other physical infrastructure. Within Kerala, there are Railway stretches that cut through elephant habitats posing a risk of rail-elephant collisions. Mitigating the potential risks for elephants in those stretches assumes importance.

In an attempt to preempt elephant deaths due to collisions with trains, which is also a matter of safety concern for train operations, vide Office Memorandum 12-1/2019-PE (Part-I) dated 30th August 2022 of the MoEFCC, Government of India, a joint survey of vulnerable railway stretches with potential elephant-rail collisions involving the field officials from the Railways and the Forest Department was envisaged. Apropos the said correspondence, three different stretches of the Railway lines in the whole of Kerala were indicated to have potential elephant movement (Appendix-1). Joint site visits involving the officials from both the Railway Department and Kerala Forest Department were made during September 2024 in all those sensitive stretches.

Field Survey

The site visits to the railway stretches identified as those vulnerable for rail-elephant collisions were carried out during 07/09/2024 to 11/09/2024 involving a joint team of the Railways, Forest Department and a representative from the Project Elephant nominated through letter reference F.No.12-1/2019-PE (Part-I) dated 20th August 2024 addressed to the Chief Wildlife Warden, Government of Kerala. During the site visits to the vulnerable stretches, details pertaining to elephant use of the area were obtained from the Forest Department. Additionally, details such as intensity and nature of rail traffic, track characteristics, including that of curvature and gradient, sanctioned speed, and mitigation measures currently in place to minimize collision risks were recorded. Wherever possible, during the site visits, the entire stretch of the tracks was covered either on foot or Railway trolleys, as appropriate. The Railway stretches with potential elephant crossings, which were visited during the site surveys, have been provided in Table 3.6. 1.

* The objective of the field survey was to minimise elephant-train collisions either by constructing underpasses and overpasses wherever possible, by reducing the time taken by elephants to cross the railway tracks by easing movement across the track through construction of ramps and level crossings, and by implementation of technology for early detection and warning systems.

Table 3.6.1: Sensitive Railway stretches with potential elephant crossings

S.No	Stretch	Forest Division	Railway Division	District
1	Palakkad-Kanjikodu a. Kottekad – Kanjikodu b. Kanjikodu to Walayar (Track-A) c. Kanjikodu to Walayar (Track-B)	Palakkad	Palakkad (PGT)	Palakkad
2	Mullurcara to Wadakkancherry	Thrissur	Thiruvananthapuram (TVM)	Thrissur
3	Edamann to Ariyankavu	Thenmala FD and Shendurney Wildlife Sanctuary	Madurai (MDU)	Kollam

Site-Specific Findings & Mitigation Measures

Palakkad (PGT) to Walayar (WRA) on the Palakkad (PGT) - Podanur (PDR) railway section

OVERVIEW

The Palakkad (PGT) to Podanur (PDR) near Coimbatore (CBE) is one of the most sensitive Railway stretches in India with respect to elephant deaths. The "Palakkad gap" is a natural gap in the otherwise continuous 1600 km stretch of the Western Ghats mountains. The "Palakkad gap" this acts as a main gateway for entering Kerala, and consequently, major transportation infrastructure connecting the state with Tamil Nadu and most Indian states passes through the gap.

ALIGNMENT OF TRACKS A (DOWN) AND B (UP) IN THE SECTION

The Railway infrastructure connecting Palakkad (PGT) in Kerala with Podanur (PDR) a suburban locality in Coimbatore city located in Tamil Nadu, was established in 1861. This "down" track "A" spans 48.26 km from PGT to PDR cutting through forests in a few stretches. The ruling gradient in line A is 1 in 62, falling towards Palakkad (c~100 m a.s.l) from Coimbatore (c~450m a.s.l). The said gradient predisposes haulage-related constraints, particularly for the freight-laden trains. Thus, during 1974, the "up" line "B" was commissioned for traffic. The track "B" passes further in the forests in a few stretches so as to achieve a ruling gradient of 1 in 100, which is reportedly conducive for freight traffic as well. Thus, in the present there are two railway tracks in the PGT-PDR section, which are located alongside each other in most of the stretch, but for certain sections where they are spatially apart. The total span of the tracks between PGT and PDR is 48.26 km for track A and 52.56 km for track B.

MITIGATION MEASURES TAKEN UP IN THE VULNERABLE STRETCHES BETWEEN PGT AND PDR:

i. Permanent speed restrictions (PSR) in select vulnerable stretches between PGT and PDR has been in place. In those select stretches, the permanent speed restriction of 65 km/hour and 45 km/hour has been enforced by the Railways.

ii. Adherence to speed restrictions by the loco pilots has been periodically monitored.

Table 3.6.2: Salient Features of the Railway Stretch between Palakkad (PGT) and Walayar (WRA), till the interstate boundary with Tamil Nadu

Railway Zone and Division = Southern Railway, Palakkad (PGT) Division
District = Palakkad
Track = Double. Broad Gauge. Energized.
Sanctioned Speed in the Stretch = in the stretches identified vulnerable for elephants there are permanent speed restrictions (PSR).
65 km/hr during day and 45 km/hr during night applicable in 18.84 km of track A and 27.5km of track B in the entire PGT-PDR stretch.
Number of trains operating per day = c. 90 (together in both the directions)
Nature of traffic = Mixed. Both freight and passenger

iii. Vegetation around the Railway tracks is periodically cleared for 10-15km on both sides to improve visibility of the animals to the loco pilots.

iv. In select crucial stretches of the tracks, underpasses, which animals might use, have been built.

v. In select vulnerable stretches, physical modification, including that of earth cuttings and provisioning of ramps, have been taken up to facilitate elephant movement.

vi. There is active interdepartmental coordination between the Railways and the State Forest Departments. There is joint patrolling and sharing of information between both departments.

vii. Barricading certain stretches to prevent elephants from coming on the tracks has been taken up.

viii. To further reinforce vigilance among the loco pilots operating trains in the section, signage in appropriate vulnerable points has been erected. Additionally, in the vulnerable points, solar lights have been provided so that elephants can be detected by the loco pilots from far.

ix. The Intelligent Detection System (IDS) aimed at tracking elephant locations near the Railway lines is being installed in a few vulnerable sections on an experimental basis.

OBSERVATIONS

1. The entire stretch between Palakkad Railway Junction (PGT) and the interstate boundary between Tamil Nadu and Kerala near Walayar has numerous elephant crossing locations. Such locations occur within forests and outside as well. Some of the locations are sporadically used, while a few of them are used intensively.

2. In the stretch between Kottekad Railway Station (KTKD) and Kanjikodu Railway Station (KJKD) and till Railway Mast No. 520/15 (GPS:10.801063°/76.760322°), the tracks A & B are together. Elephants frequently cross both tracks in the stretch (Figure 3.6.1).

3. From Railway OHE Mast 520/15 (GPS:10.801063°/76.760322°) located near Kanjikode Railway Station (KJKD) to the Kerala-Tamil Nadu interstate boundary, the Track A and Track B are spaced apart. Both the tracks briefly converge near Walayar Railway Station (WRA) before spacing apart again (Figure 3.6.2).

4. From Kanjikode Railway Station (KJKD) to the interstate boundary beyond Walayar (WRA), track B passes mostly along the forest boundary and cuts through the forests in multiple locations. Thus, frequent crossings of elephants in Track B are inevitable.

5. The total stretch of Railway tracks between PGT and WRA sensitive for elephants is as follows:

S.No	Stretch	Distance (approximate)
i	Kottekadu (KTKD) to Kanjikode (KJKD) until track A & B diversion	7.8 km
ii	Kanjikode (KJKD) to Walayar (WRA) and until Kerala-Tamil Nadu border in Track A	11.5 km
iii	Kanjikode (KJKD) to Walayar (WRA) and till Kerala-Tamil Nadu border in Track A	14.1 km
	TOTAL	33.4 km

Figure 3.6.1: The stretch of Railway line between Kottekad (KTKU) and Kanjokode (KJKD) and up to Railway OHE Mast 520/15

RECOMMENDATIONS

i. There are Orders and Directions issued by the Hon'ble Courts pertaining to this sensitive stretch of Railway tracks. Additionally, the State Forest Departments of Kerala and Tamil Nadu in coordination with the Southern Railways have implemented myriad measures to minimize the risk of elephants being run over by trains. Thus, the recommendations suggested in this report should be read along with the Orders of the Hon'ble Courts and the existing mutual arrangements agreed upon by the State Forest Departments and the Southern Railway administration.

ii. The Railway tracks passing through Palakkad and Podanur near Coimbatore city pass through

the Reserved Forests of Coimbatore Forest Division in Tamil Nadu and Palakkad Forest Division in Kerala. These two Forest Divisions are part of the greater Brahmagiri-Nilgiris-Eastern Ghats elephant landscape (~12,000 km^2), which supports the largest population of Asian elephants in the world. Thus, effective mitigation of the threats posed by the Railway infrastructure assumes a priority in the landscape.

iii. Given that Track B that cuts through the forests is relatively more vulnerable to wildlife crossings and concomitant runover threats, commissioning this Railway track along with Track A would be the most preferred long-term solution towards the problem of rail-related elephant deaths. Since the PGT-PDR Railway line serves as a lifeline for passenger and goods traffic in the southern region, particularly for the state of Kerala, shifting Track B and taking it parallel along with Track A can augur long-term benefits for both train operation and elephant conservation. The Railways may closely examine the latest engineering options to address issues related to gradient ruling, which was the primary reason to commission track B inside the forest. Shifting track B and taking it along with track A has multiple potential benefits for the Railways as well.

a. Firstly, by securely barricading the northern portion of the Railway tracks to prevent elephants from entering on the tracks, operational speed can be optimized.
b. Track B entails an additional travel distance of 4.3 km, which can be cut down to accrue long-term mileage benefits of the reduced distance.
c. Accidental collisions with elephants and other wildlife can be considerably minimized so as to enhance rail safety.

iv. Until a policy decision to effectively mitigate rail-related threats to elephants, while at the same time improving efficiency in train operations by shifting track B along with track A is deliberated and modalities worked out, interim interventions by the State Forest Departments of Kerala and Tamil Nadu and the Southern Railways aimed at reducing train-related elephant deaths should earnestly continue.

v. In the entire stretch, Distributed Acoustic Sensing (DAS) early warning system should be implemented for timely elephant detections.

Figure 3.6.2: The stretch of Railway line between Kanjikode Railway Station (KJKD) and the Kerala-Tamil Nadu interstate boundary through Walayar Railway Station (WRA)

Joint Survey of the Palakkad (PGT) to Walayar (WRA) Railway Stretch

An important stretch of forests near Kottekad (KTKD) Railway Station that elephants regularly cross

Clearance of vegetation (vista clearance) along the Railway line for about 10 meters as seen in Track B of the Kanjikode (KJKD) – Walayar (WRA) section

Signage (indicating elephant movement and with an instruction to whistle) and barriers along track B in the PGT-PDR section

Elephant use of the forests in Machad Forest Range in Thrissur Forest Division located along the east of the Railway alignment is relatively recent and commenced during the year 2021 when Kuthiran tunnel was commissioned in the NH 544 (Salem-Kochi Highway) in the Peechi-Vazhini Wildlife Sanctuary.

Prior to the construction of the tunnel, the NH 544 marked the westernmost limit of elephant distribution in the Anamalai-Parambikulam-Nelliyampathy elephant landscape, which encompasses Peechi-Vazhini Wildlife Sanctuary located in Thrissur district. Over the years, it is plausible that NH 544 acted as a barrier for elephant movement. Nevertheless, after the old road alignment was decommissioned and traffic diverted via Kuthiran tunnel, the barrier effect of NH 544 was offset, and elephants started moving further west extending their range into Machad Forest Range. In the present, < 20 elephants have started using the forest areas and surrounding human-use areas located along the west of the Kuthiran tunnel. Although elephants come close to the Mullurkara – Wadakkancheri Railway tracks, they have never crossed the alignment.

Table 3.6.3: Salient Features of the Railway Stretch between Mullurkara (MUC) to Wadakkancheri (WKI)

Railway Zone and Division = Southern Railway (SR), Thiruvananthapuram Division (TVC)
District = Thrissur
Track = Double. Broad Gauge. Energized.
Sanctioned Speed in the Stretch = 65 km/hour due to curve and ruling gradient
Number of trains operating per day = ~ 60-90
Nature of traffic = Mixed. Both freight and passenger

OBSERVATIONS AND RECOMMENDATIONS

1. In the Shoranur (SRR) to Thrissur (TCR) Railway section, a short stretch of 1.8 km spanning Agamala Railway Over bridge (GPS: 10.687591°/ 76.267660°) to Uttaralikavu Bagavathi Amman Temple (GPS: 10.672854°/ 76.264273°) is vulnerable for elephant crossings.

2. As per the observations made by both the Railway and Forest Department field staff, the elephants have come up to the eastern side of the Railway track, but have never crossed the Railway line yet.

3. Elephant use of the forests in Machad Forest Range in Thrissur Forest Division located along the east of the Railway alignment is relatively recent and commenced during the year 2021 when Kuthiran tunnel was commissioned in NH 544.

4. The 1.8 km stretch of Railway tracks between Agamala Railway Over Bridge and Uttaralikkavu Bhagavathi Amman Temple skirts through a narrow passage between rocky escarp and thus, elephants can enter the tracks only in a few point locations.

5. The forest cover along the western side of the Railway line is relatively less, patchy, and interspersed with dense human-use areas. Thus, by crossing the Railway tracks, elephants do not gain considerable viable habitats. Therefore, at this juncture, it is pertinent to limit elephant

movement strictly along the eastern side of the Railway line. This is relatively easy to accomplish as escarp along the tracks preclude elephant movement already in most of the section. In permeable stretches that are properly identified and communicated by the Forest Department, the Railways can erect permanent barriers covering the eastern margin of the Railway tracks.

6. In the entire stretch, Distributed Acoustic Sensing (DAS) early warning system should be implemented for timely elephant detections.

Figure 3.6.3: Railway stretch in Akamala Railway Over Bridge and Uttaralikkavu Bhagavathi Temple in the Mullurkara (MUC) – Wadakkancheri (WKI) railway stretch

Joint Survey of the Mullurkara (MUC) to Wadakanchery (WKI) stretch between Agamala Railway Over Bridge and Uttaralikkavu Bhagavathi Amman Temple Railway in the Shoranur (SRR) to Thrissur (TCR) Railway section

The Railway tracks skirt through steep escarp on both sides of the track. As such elephants can cross the section in only a few locations

Edamann (EDN) to Ariyankavu (AYU) stretch of the Kolam (QLN) - Tenkasi (TSI) Railway station

The Railway line connecting the town of Punalur (PUU) in Kerala with the town of Tenkasi (TSI) in Tamil Nadu passes through the "Ariyankavu pass" or the "Shengottah gap". The "Ariyankavu pass" is a narrow valley in an otherwise contiguous mountainous stretch in the southern portion of the Western Ghats. The Ariyankavu pass separates the Periyar landscape in the north from the Agasthiyamalai landscape in the south. Periyar and Agasthiyamalai are two major biodiversity-rich landscape units within southern Western Ghats. Because of major infrastructure developments including those of the Railways and the National Highway and associated developments along the Ariyankavu pass, the north-south movement of elephants and other large mammals was hindered and remains tenuous except in a few locations close to Tenmala. While north-south movement of elephants across Ariyankavu pass crossing the NH 744 and the Punalur (PUU) – Tenkasi (TSI) Railway line is limited to areas around Tenmala (TEN) and Ariyankavu (AYV) railway stations, possibility of elephants coming to the Railway track lies in the entire 28.4 km stretch from Edamann Railway Station (EDN) to Kottavasal near the Tamil Nadu – Kerala interstate boundary.

OBSERVATIONS AND RECOMMENDATIONS

1. Only passenger trains are operated in the Punalur (PUU) to Tenkasi (TSI) stretch. There is no freight traffic. The traffic in this section is presently less, with less than 10 trains plying every day.

2. The permanent speed restriction (PSR) of 30 km/hr is enforced on the entire section from Edamann (EDN) to Shengottah (SCT) due to (i) curves (ii) gradient (iii) threat of rocks falling on the track, and (iv) wildlife movement.

3. The total stretch of the Railway line from Edamann (EDN) to Ariyankavu (AYV) and until Tamil Nadu – Kerala interstate boundary is around 28.4 km. There is possibility of elephants

crossing the Railway track in this entire stretch. A permanent speed restriction of 30 km/hr is being enforced in the entire section.

4. Due to low train traffic and permanent speed restriction of 30 km/hr applicable for the entire section, the probability of elephants being run over by trains is relatively low.

5. The north-south movement of elephants across the Railway line is crucial, as such movements connect Periyar and Agasthiyamalai elephant populations. Elephant movement between these two landscapes is critical to ensure long-term genetic and demographic via bility of the populations. Therefore, ensuring permeability across the Railway track assumes paramount importance, particularly in the stretch between Tenmala (TEN) and Ariyankavu (AYV) and till the Kerala-Tamil Nadu interstate boundary at Kottavasal.

6. In the entire stretch, Distributed Acoustic Sensing (DAS) early warning system should be implemented for timely elephant detections.

Table 3.6.4: Salient Features of the Railway Stretch between Edamann (EDN) to Ariyankavu (AYV) and up to Tamil Nadu – Kerala interstate border at Kottavasal

Railway Zone and Division = Southern Railway, Madurai Division
District = Kollam District
Track = Single. Broad Gauge. Energized.
Sanctioned Speed in the Stretch = 30 km/hour. Permanent speed restriction due to curves, gradient, and risk of earth caving in.
Number of trains operating per day = 8-10
Nature of traffic = Only passenger trains

Table 3.6.5: Specific structural mitigation measures suggested in addition to aforementioned recommendations

S.No	Chainage	Suggested Mitigation	Latitude	Longitude
1	695/05	Level Crossing – 100 meters (critical elephant crossing area)	8.96500	77.07840
2	693/42	Level Crossing – 50 meters. The level crossing should be made just before the newly built tunnel. Elephants are currently crossing the railway line above the tunnel. The proposed 50m level crossing will further facilitate elephant crossing.	8.961376	77.08582
3		The underside of the famous 13-arch bridge should be kept disturbance free.	8.966990	77.090449

Figure 3.6.4: The stretch of Railway line between Edamann (EDN) and Ariyankavu Railway station (AYV) in the Punalur (PUU) – Tenkasi (TSI) section of the southern Railway.

Joint survey of the Punalur (PUU) – Ariyankavu (AYV) stretch in Tenmala Forest Division

The Railway line is juxtaposed NH 744 in the entire stretch between Punalur and Tenkasi. Being mountainous, elephants cross the Railway line and the road only in a few locations

Summary

1. From the standpoint train-related threats to wild elephants, there are three major Railway stretches in Kerala that assume importance in the present. The details are as follows:

S.No	Stretch	District	Railway	Distance (approx.)
1	Kottekad (KTKU) to Kanjikode (KJKD), till track A & B diversion	Palakkad	SR	7.8 km
	Kanjikode (KJKD) to Walayar (WRA) interstate border – Track A			11.5 km
	Kanjikode (KJKD) to Walayar (WRA) interstate border – Track B			14.1 km
2	Akamala rail over bridge [GPS: 10.687591°/76.267660°] near Mullurkara (MUC) to Uttaralikkavu Temple [GPS: 10.672854°/ 76.264273°] on the way to Wadakkanchery (WKI)	Thrissur	SR	1.8 km
3	Edamann Railway Station (EDN) to Ariyankavu Railway Station (AYV) and till Kerala-Tamil Nadu interstate boundary	Kollam	SR	28.4 km
	Total			c. 63.6 km

Of the total 63.6 km of sensitive Railway stretches in Kerala, 33.4 km stretch is in Palakkad district, 1.8 km of stretch is in Thrissur district, and 28.4 km stretch falls in the Kollam district. The entire 63.6 km stretch occurs in the Southern Railways and encompasses three Railway Divisions namely Palakkad (PGT), Thiruvananthapuram (TVM) and Madurai (MDU). The aforementioned Railway stretches administratively fall in the Palakkad, Thrissur and Tenmala Forest Divisions of the Kerala Forest Department.

2. Among the three identified Railway stretches, the Akamala-Uttaralikavu temple stretch falling in the Thrissur District lies in the vicinity of Peechi-Vazhini Wildlife Sanctuary, while the Edamann-Ariyankavu stretch falling in the Kollam District lies in the vicinity of Shendurney Wildlife Sanctuary.

3. The Palakkad (PGT) – Podanur (PDR) stretch connecting the cities of Palakkad and Coimbatore is one of the most sensitive Railway stretches in India with respect to elephant mortalities caused by the trains. In this stretch, the Railway tracks passing between Kottekad Railway Station (KTKD) to Walayar (WRA) and until Tamil Nadu border occurs within Kerala and is highly sensitive to elephant movements. In the stretch between KTKD and WRA, the "up" and "down" tracks termed Track B and Track A respectively, are spaced apart from each other to manage the train haulage issues resulting from the ruling gradient of 1/62 in Track B. Track B has a relatively more imprint on the forest than Track A as it skirts through the forest besides bisecting it in multiple locations. Thus, Track B is more prone to wildlife run over by trains. Following the interventions by the Hon'ble Courts and further to the joint efforts taken by Kerala and Tamil Nadu Forest Departments along with the Southern Railways, numerous measures to prevent elephant runovers in the tracks have been taken up in the sensitive stretches between PGT and PDR. These short-term measures are critical and should continue earnestly. In the long-term, given the strategic importance of the Railway tracks to south India in general and Kerala in particular, it is pertinent to shift Track B and take it along with Track A by circumventing engineering constraints posed by the ruling gradient falling towards PGT from PDR. Taking Track A and Track B parallel to each other could augur long-term benefits for both wildlife conservation and the Railways. Since there are no considerable wildlife habitats available to the south of Track A, it is pertinent to take Track A and Track B together and get the entire section barricaded towards the forests (and other vulnerable locations) located in the northern side of the track. This can help in minimizing wildlife collision risks besides optimizing train safety and speed. It will also cut down the total distance from PGT to PDR by about 4.3 km, which can accrue mileage-related benefits in the long-term.

4. The 1.8 km Railway stretch spanning Akamala Railway Overbridge to Uttaralikavu Bhagavathi Amman Temple located between Mullurkara (MUC) and Wadakkancheri (WKI) Railway stations in Thrissur district can potentially be crossed by elephants in a few locations. However, in the recent known history, elephants have never crossed the Railway track. The Forests here are an extension of the Anamalai-Parambikulam-Nelliyampathi elephant landscape that extends till Peechi-Vazhini Wildlife Sanctuary. In the present, the MUC-WKI Railway track marks the westernmost elephant distribution of this large elephant landscape. Since the habitat available along the western side of the Railway track is insignificant for elephants, it is pertinent to limit elephant distribution to the east of the Railway track. This will also address issues related to human-elephant conflict, which is emerging in the area. Thus, in the 1.8 km stretch of the said Railway track, strong barriers, as appropriate, can be built to prevent elephants from entering the track. Kerala Forest Department can plan the total span and vulnerable spots along the Railway track that can be barricaded so that the Railways can provide resources for effecting the same.

5. The 28.4 km stretch of Railways between Edamann (EDN) and Ariyankavu (AYV) Railway stations in Tenmala Forest Division passes between Periyar and Agasthiyamalai landscapes, which are inherently biodiversity rich. Movement across these two landscapes is important for elephants and other large mammals to ensure long-term genetic and demographic viability of the populations. While sporadic elephant occurrence on the Railway track is reported in the

entire stretch, elephant movements are relatively frequent in the Tenmala (TEN) to Ariyankavu (AYV) stretch, particularly near the MSL village. Elephants frequently cross the Railway line near MSL village. Presently, less than 10 trains operate in this single-line every day. There is no freight traffic. There is a permanent speed restriction of 30 km/hr for the entire Edamann (EDN) to Ariyankavu (AYV) section owing to the ruling gradient, curves, rockfall risks, and numerous bridges. Thus, the probability of elephant runover by trains is low in the present. However, since elephant movement along the tracks is already tenuous and could easily be severed, any civil work or upgradation of the tracks/railway network should closely consider wildlife movement. Any mitigation structures planned in the National Highway or the Railway Line should be taken up together.

6. General guidelines issued by the Wildlife Institute of India to mitigate railway-related threats to elephants and other wildlife, as appropriate, may be taken up in all the identified vulnerable stretches in Andhra Pradesh.

List of Kerala Forest Department and Indian Railways officials consulted during the survey

PGT-WRA stretch in Palakkad (PGT Division)

Shri. Vijayananthan, *IFS, CCF, Palakkad Circle, Kerala Forest Department*
Shri. Thomas, *SFS, DFO, Palakkad Forest Division, Kerala Forest Department*
Shri. Anshul Bharti, *IRTS, DEN/P/PGT, Southern Railway*
Shri. Bibhash Paswan, *ADEN/P/PGT, Southern Railway*
Shri. Muhammed Ali Jinna, *Range Forest Officer, Palakkad, Kerala Forest Department*
Shri. Vinesh, *SSE/PWAY/PGT, Southern Railway*
Shri. Sunil Phillip, *Section Forest Officer, Palakkad, Kerala Forest Department*
Shri. Marudan, *Section Forest Officer, Puducherry South, Kerala Forest Department*
Shri. Arun, *Beat Forest Officer, Puducherry South, Kerala Forest Department*
Shri. Joseph, *Section Forest Officer, Puducherry North, Kerala Forest Department*
Shri. Siju, *Beat Forest Officer, Puducherry South, Kerala Forest Department*
Shri. Rajesh Andhadhi, *Beat Forest Officer, Puducherry South, Kerala Forest Department*
Dr. N. Lakshminarayanan, *Elephant Cell, Wildlife Institute of India*

MUC-WKI stretch in Thrissur (TVM Division)

Shri. Ravi Meena, *IFS, DFO, Thrissur, Kerala Forest Department*
Shri. Anand, *Range Forest Officer, Machad, Kerala Forest Department*
Shri. Ludish, *Range Forest Officer, Wadakkancherry, Kerala Forest Department*
Shri. Vinod, *Deputy Range Forest Officer, Vazhini, Kerala Forest Department*
Shri. Nobin, *Forester, Atthor Section, Kerala Forest Department*
Shri. Vimal, *SSE/PWAY/PCR, Southern Railway*
Shri. Bijesh, *TM/II/MUC, Southern Railway*
Dr. Lakshminarayanan, *Elephant Cell, WII & Project Elephant, MoEF&CC*

EDN-AYV stretch in Kollam (MDU Division)

Shri. Shannawaz, *SFS, DFO, Thenmala, Kerala Forest Department*
Shri. C. Selvaraj, *Range Forest Officer, Tenmala, Kerala Forest Department*
Shri. Sanoj, *Range Forest Officer, Ariyankavu, Kerala Forest Department*
Shri. K. Babu, *Section Forest Officer, Tenmala, Kerala Forest Department*
Ms. S. Aashna, *Best Forest Officer, Tenmala, Kerala Forest Department*
Ms. C. Arya, *Best Forest Officer, Ariyankavu, Kerala Forest Department*
Shri. B. Mariyappan, *Forest Watcher, Tenmala, Kerala Forest Department*
Shri. Ravi Chandran, *Forest Watcher, Ariyankavu, Kerala Forest Department*
Shri. Jayakumar, *Station Master, Edamann, Southern Railway*
Shri. Achu, *TM/III/TEN, Southern Railway*
Dr. Lakshminarayanan, *Elephant Cell, WII & Project Elephant, MoEF&CC*

Nagaland

3.7. NAGALAND

Introduction

The Asian elephant (*Elephas maximus*) distribution in the north-eastern states of India is spread over the states of Assam, Nagaland, Arunachal Pradesh, Tripura, Mizoram and Meghalaya. However, most of this population is concentrated in Assam, with continuous distribution in Arunachal Pradesh and Nagaland. The following description relates to elephant distribution in this semi-contiguous population spread across the states of Assam, Arunachal Pradesh and Nagaland, as it pertains to the purpose of this survey.

The wilderness of the north-east consisting of several states supports a wide variety of biodiversity and is home to several important protected areas, including the Kaziranga and Manas National Parks, both being UNESCO World Natural Heritage Sites.

The elephant distribution in and around Assam is spread out over four distinct populations (Project Elephant, 2023), and is contiguous with some neighbouring states as well. Apart from the four major populations, few isolated habitats also exist that support some elephants.

- The population on the north bank of the Brahmaputra extends from northern West Bengal through the Himalayan foothills and Duars covering southern Bhutan, northern Assam and Arunachal Pradesh along the Brahmaputra River, and part of the flood plains of the Brahmaputra and Lohit River in eastern Assam.

Three populations exist on the southern bank of the Brahmaputra – the eastern, central and western areas.

- The eastern population is spread over lower Dibang Valley and Lohit, Changlang and Tirap districts in Arunachal Pradesh, Tinsukia, Dibrugarh, Sibsagar, Charaideo, Jorhat and Golaghat districts in Assam; and Mon, Tuensang, Mokokchung and Wokha districts in Nagaland.

- The central range extends from Kaziranga National Park across the Karbi plateau, parts of the central Brahmaputra plains, and the basin of the Diyung Rivers to the foot of the Meghalaya plateau in Assam and Meghalaya.

- The western range extends from near Guwahati through the foothills of the Meghalaya plateau including Kamrup, Goalpara districts in Assam, and Rhi-Bhoi, West Khasi Hills, East Garo Hills, West Garo Hills, Southwest Garo Hills and South Garo Hills in Meghalaya.

The corridors connecting the north-eastern elephant populations spread across these states are also coming under threat from the operational railway tracks in the region. Consequently, these railway lines are a threat to the connectivity amongst these elephant range states that are already under pressure from other anthropogenic activities.

Based on a meeting on 17th August 2022, the Hon'ble Minister of Railways, Government of India, instructed the Ministry of Environment, Forest and Climate Change (MoEF&CC) to provide at least 100 locations of existing railway segments across sensitive elephant and tiger landscapes in the country for construction of permanent mitigation measures in view of wildlife-train collisions (Proceedings under Ministry of Railways letter No. 2022/CE-IV/Elephant Pass dated 30th September 2022). Consequently, details of sensitive stretches for constructing permanent and temporary mitigation measures were provided by the MoEF&CC (vide OM F.No. 12-1/2019-PE (Part-I), dated 30th August 2022).

A total of 24 priority railway segments were identified in the region, including one in Nagaland. The railway lines in Nagaland and Arunachal Pradesh states lay on the border with Assam.

Field Survey

A representative of the Wildlife Institute of India, local representatives of the Forest Department and Indian Railways (NFR) conducted a joint field survey of the identified priority railway stretches in the states of Assam, Arunachal Pradesh and Nagaland (Fig. 3.7.1) during 19th – 27th March 2024. During the survey, the survey team inspected the railway track, particularly sites vulnerable to elephant mortality and areas where frequent elephant crossings were observed, based on information from the Forest Department. We relied on information such as previous incidences of elephant/wild animal mortality, elephant movement trails intersecting railway tracks, GPS coordinates and chainages (km) of these sites from concerned officials. We then suggested mitigation measures based on multiple factors including width of crossing zone, track height of the railway line, presence of drainage structure and human infrastructure (and consequent potential for conflict) in that segment.

On consultation with field forest and railway officials, it was observed that some railway lines had not been constructed yet, were not operational, or did not lie in elephant areas. These were not inspected. Further, we inspected additional railway stretches that were highlighted by forest officials as vulnerable to elephant-mortality or as a barrier to their movement in the area.

* The objective of the field survey was to minimise elephant-train collisions either by constructing underpasses and overpasses wherever possible, by reducing the time taken by elephants to cross the railway tracks by easing movement across the track through construction of ramps and level crossings, and by implementation of technology for early detection and warning systems.

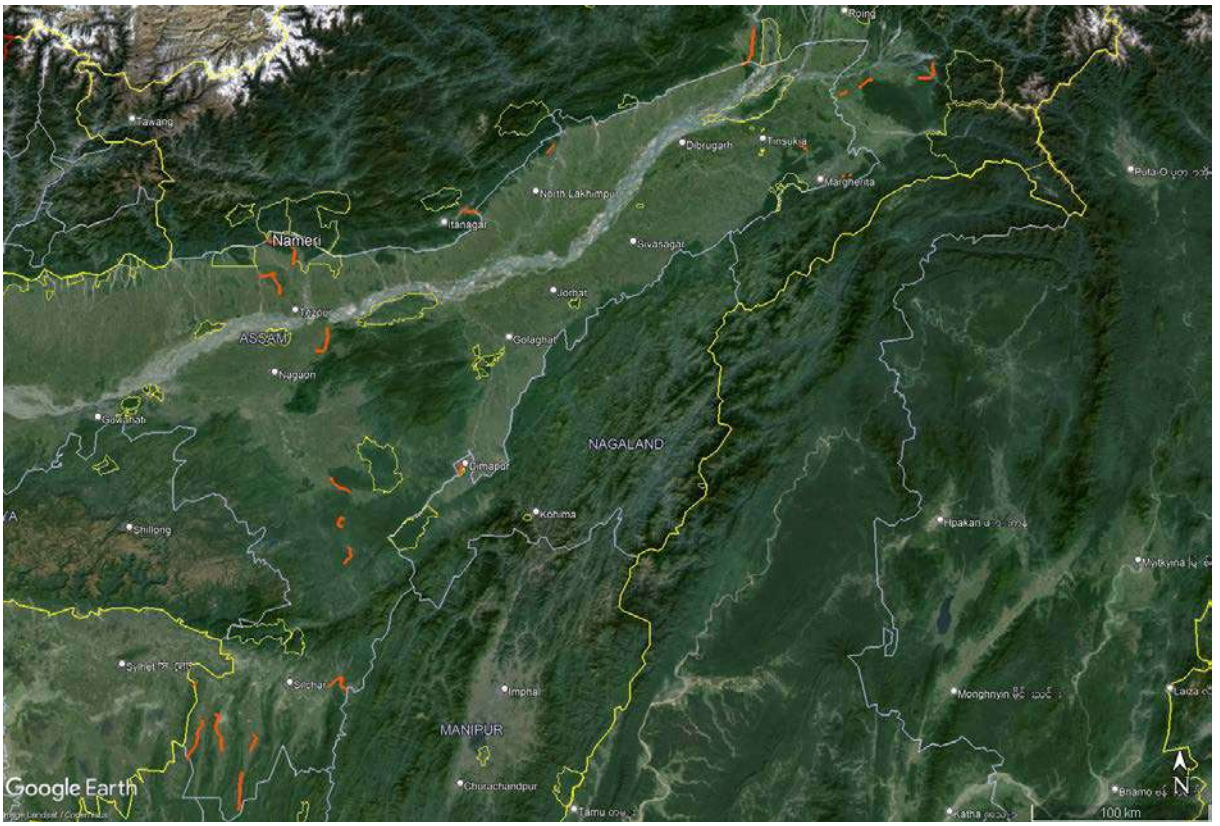


Figure 3.7.1: Identified priority railway line stretches (orange lines) for field survey in the states of Assam, and bordering Nagaland and Arunachal Pradesh, with respect to the protected areas (yellow polygons).

Site-Specific Findings & Mitigation Measures

Railway line near Rangapahar and Dimapur, Nagaland

Survey date: 24th March 2024

Infrequent elephant movement has been reported near this stretch. It constitutes the southern Brahmaputra elephant population moving between Dhansiri-Intanki region, covering parts of Karbi Anglong in Assam and Peren districts in Nagaland.

Observations:

- According to forest department personnel, movement of a herd of 20-30 elephants has been occasionally (once/twice a year) reported in the area from Dhansiri forest range (territorial).
- No elephant-train accidents have been reported from the railway stretch yet.
- The main crossing point is near where the Dhansiri river flows near the railway line (Fig. 3.7.2) (approximate chainage 251/0-241/2).

Figure 3.7.2: Location where occasional elephant crossing is reported to occur.

Recommendation:

- An elephant crossing structure measuring 30 m wide with maximum possible height is to be constructed at the crossing site (25° 50.773'N, 93° 41.186'E).

List of Nagaland Forest Department and Indian Railways officials consulted during the survey

State Forest Department

Sri Thokaho *Dimapur, Nagaland Forest Department*
Sri T. Setsali *Forest Guard, Dimapur*
Sri Pongli *Forest Guard, Dimapur*

Indian Railways

Sri A. K. Kushwaha *Northeast Frontier Railway*
Sri Vivek Bajaj *DEN 1, Tinsukia Division*
Sri Lakshman Singh *DEN 1, Lumding Division*
DEN 3, Lumding Division
Sri Arvind Kumar *DEN 3, Rangia Division*
Sri Abhishek Choudhary *XEN, Pasighat*
Sri Vishnu Kumar *ADEN Dimapur*
Sri Dibyajyoti Dutta *ADEN 3, Lumding Division*
Sri Gautam Saikia *SSE/P.Way/I.C/MRG*
Sri Biman Doley *SSE, Works, Pasighat SPTR*
Sri Deep Das *SSE/P.WAY/NLP/east*
Sri Ratan Majumder *SSE/P.Way/H/LMG (Sc)*
Sri Jayanta Rajbongshi *SSE/PWay/INE/BBU-BJL*
Sri Dizen Medhi *SSE/PWay/RPAN*
Sri Lima Sungba *AO, SSE/P.Way/DMV*
Sri Dharvesh Pal Singh *Jr. Engr./PWay, Naharlagun*
Sri Himanshu Bisht *JE/P.Way/JRBM*
Sri Mintu Choudhury *Trolley Man, Balipara-Bhalukpong*
Sri Bijay Boro *TRM I/BBU*

Odisha

3.8. ODISHA

Introduction

Odisha is one of the top five priority landscapes for wild elephant conservation in India with vast tracts of contiguous forests. Despite threats to elephant conservation such as habitat loss, conflict with humans, electrocution and linear infrastructure, the substantial forest cover of the state and relatively well-connected corridors offer protection and hope for conservation. Despite severe pressures on habitat from mining, roads, anthropogenic pressures, etc Orissa is fortunate to still have relatively good connectivity of tiger and elephant habitats in a north-southerly direction throughout the length of the state. The two single largest intact elephant populations, numbering between 400-500 elephants each in the Mahanadi Elephant Reserve in central Orissa (based around Satkosia Tiger Reserve) and Mayurbhanj Elephant Reserve in north Orissa (based around Similipal Tiger Reserve) have been isolated from each other only very recently in history. However, these rich forests and corridors are being intersected by linear infrastructure, including railway lines, leading to incidences of train-elephant collisions. Based on a meeting on 17th August 2022, the Hon'ble Minister of Railways, Government of India, instructed the Ministry of Environment, Forest and Climate Change (MoEF&CC) to provide at least 100 locations of existing railway segments across sensitive elephant and tiger landscapes in the country for construction of permanent mitigation measures in view of wildlife-train collisions (Proceedings under Ministry of Railways letter No. 2022/CE-IV/Elephant Pass dated 30th September 2022). Consequently, details of sensitive stretches for constructing permanent and temporary mitigation measures were provided by the MoEF&CC (vide OM F.No. 12-1/2019-PE (Part-I), dated 30th August 2022).

Field Survey

Joint surveys of the critical stretches of the railway lines passing through the elephant habitats in Odisha for suggesting mitigation measures were conducted during 13-17th February, 2024 jointly by the officers/officials of Project Elephant, MoEF&CC, Ministry of Railways and Odisha Forest Department.

The surveys were conducted in the critical stretches of Angul, Athamalik, Baripada, Bonai, Dhenkanal, Rairakhol, Rairangpur, Sambalpur, Keonjhar (Territorial and Wildlife Divisions), with an objective to identify specific elephant crossing zones to suggest site-specific mitigation measures based on the location and the extent of these crossing zones to mitigate train-elephant collisions.

As part of the joint surveys, meetings were held between the officers/officials of the MoEF&CC, Odisha Forest Department and South Eastern Railways and East Coast Railways to deliberate on different structural mitigation measures in the identified critical elephant zones intersected by railway tracks such as level crossings, creation of ramps, wildlife underpasses, wildlife overpasses, efficacy of Intrusion Detection System (IDS) using Distributed Acoustic Sensing (DAS) System.

The joint survey team visited the critical stretches of railway tracks which were identified by the Forest Department for implementing the mitigation measures.

* The objective of the field survey was to minimise elephant-train collisions either by constructing underpasses and overpasses wherever possible, by reducing the time taken by elephants to cross the railway tracks by easing movement across the track through construction of ramps and level crossings, and by implementation of technology for early detection and warning systems.

Dhenkanal

Date of survey: 13th February, 2024

Locations Surveyed:

- OHE Mast No. 471/8-471/10
- OHE Mast No. 472/24-472/26
- OHE Mast No. 474/7-474/11

Observations:

- The critical elephant crossings fall under the Budhapaka Salegaon Railway Project.
- The elephants frequently cross the railway tracks to move between the different habitats in Dhenkanal.
- As per the discussion held with the local Forest Department staffs, it was informed that the elephant movement is being affected (reduced) due to coarse ballast used on the railway tracks.
- On request of Forest Department, the Indian Railways issues caution order to restrict the speed of the trains.
- Drains have been constructed by along the railway tracks which act as barriers for the easy movement of the elephants, especially young ones/calves.
- The railway lines are being doubled *i.e.* from two lines to four lines. This will impact the movement of elephants in future.
- Due to the flat terrain, there was no provision for construction of underpass or overpass for elephants.

Recommendations:

- Since, the railway tracks are on the ground level, construction of ramps at these stretches would help the elephants in crossing the railway tracks more quickly and smoothly. It is recommended for construction of level crossings and ramps as per Wildlife Institute of India's guidelines by using suitable material (soil/cement/rubberised pads etc.) that flattens towards the top of the track, and allow for smooth and quick movement for the elephants in OHE Mast Nos. 471/8-471/10, 472/24-472/26 and 474/7-474/11.
- Considering the future scenario of doubling the existing railway tracks, the possibility of construction of permanent mitigation measures such as elevated railway tracks, overpasses and underpasses for elephants and other wildlife must be explored.
- The existing ramps around the railway tracks should be levelled with the surrounding terrain by smoothening out the slope.
- Installation of signages and boards about elephant crossings throughout the elephant passing stretches.
- Regular pruning of bushes (upto 30 meters) on both sides of the track for clear visibility to the drivers and the elephants.
- Frequent honking by the train engine when passing through critical stretches especially when elephant or wildlife movement near the railway tracks has been reported or observed.
- The open drains along the railway tracks must be covered with suitable material.

Figure 3.8.1: Field survey conducted by Project Elephant (MoEF&CC) representatives in collaboration with Indian Railways and State Forest Department officials in sensitive railway line stretches in Dhenkanal, Odisha.

Date of survey: 13th February, 2024

Locations Surveyed:

- OHE Mast No. 131/119- 131/131
- OHE Mast No. 128/26-128/25
- OHE Mast No. 121/3-122/4
- OHE Mast No. 120/6-120/5
- OHE Mast No. 106/3-106/4

Observations:

- The elephants cross the railway track to move between the two habitats in Angul and Athamallik. In Angul, tusker movement is very frequent between the forest blocks of Katada RF, Para RF, and Anshulia RF which are separated by the National Highway and Railway line.
- The death of a Tusker elephant due to a train hit was reported in April 2023 near OHE Mast No. 131/119- 131/131.
- As per the discussion held with the local Forest Department staff, it was informed that the elephant movement is being affected (reduced) due to coarse ballast used on the railway tracks. Edge features along the railway lines have made the movement of the elephants across the track slow and forced the elephants to move along the track. Box-shaped drains on the side of the track prevent their exit.
- At many locations, the railway tracks are in parallel with National Highway 55. The elephants have to cross the railway tracks and then the National Highway to move between the two habitats.
- The National Highway Authority of India (NHAI) has proposed for construction of an overpass for elephants near the OHE Mast No. 121/3-122/4.
- Due to the flat terrain in Angul Division, there has been no construction of underpasses or overpasses for elephants.

Recommendations:

- Construction of level crossings and ramps as per Wildlife Institute of India's (WII) guidelines by using suitable material (soil/cement/rubberized pads etc.) that flattens towards the top of the track, and allows for smooth and quick movement for the elephants in OHE Mast Nos. 131/119- 131/131, 128/26-128/25, 121/3-122/4, 120/6-120/5 and 106/3-106/4.
- Such ramps should be leveled with the surrounding terrain by smoothening out the slope.
- The Indian Railway could fence the Gumti near the railway crossing and OHE Mast No. 106/3-106/4 to avoid any conflict with the elephants.
- Installation of signages and boards about elephant crossings throughout the elephant passing stretches.
- Regular pruning of bushes (up to 30 meters) on both sides of the track for clear visibility to the drivers and the elephants.
- At night hours, joint patrolling by at least one team for each division should be done with the forest department. The railway needs to provide sufficient staff for better coordination and communication in these stretches of Angul and Athmallik Forest Division.

- Frequent honking by the train engine when passing through critical stretches especially when elephant or wildlife movement near the railway tracks has been reported or observed.
- No barriers should be erected along the crossing points by Railways without the completion of the overpass/underpass at above mentioned critical locations/ elephant passing zones.
- The open drains along the railway tracks must be completely covered with suitable material.

Figure 3.8.2: Field survey conducted by Project Elephant (MoEF&CC) representatives in collaboration with Indian Railways and State Forest Department officials in sensitive railway line stretches in Angul and Athamalik, Odisha.

Date of survey: 14th February, 2024

Locations Surveyed:

- OHE Mast No. 81/12-81/16 at Patakhaman in Rairakhol range.
- OHE Mast No. 81/3-81/4 at Patakhaman in Rairakhol range.
- OHE Mast No. 80/16-80/20 at Patakhaman in Rairakhol range.
- OHE Mast No. 73/30-73/26 at Angarpada in Rairakhol range.
- OHE Mast No. 68/17-68/14 at Kuhi in Badbahal range.
- OHE Mast No. 52/8-52/11 near Landakhot-mochibahal reserve forest in Badmal.
- OHE Mast No. 49/7-49/3 at Lamketa in Badmal range.

Observations:

- Regular elephantmovement is reported in the above mentioned locations.
- The railway tracks is frequently used by all categories of trains including goods and express trains as it is the main line which connects Sambalpur district with Angul district.
- Death of a Tusker elephant due to train hit was reported in April, 2023 near OHE Mast No. 73/30-73/26 at Angarpada in Rairakhol range.
- At present there are two railway tracks (up & down line). It was informed by the Railway officers that there is a planning of laying two more railway lines.
- Suitable height on both sides of the railway line near OHE Mast Nos. 81/12-81/16 is available which could be utilized for construction of overpass for elephants.
- Drains have been constructed along the railway tracks which act as barriers for the easy movement of the elephants, especially young ones/calves.

Recommendations:

- Since suitable height is available on both sides of the railway tracks near OHE Mast No. 81, it is proposed for construction of an elephant overpass as per Wildlife Institute of India's guidelines near OHE Mast No. 81/12-81/16.
- A ramp to be constructed near OHE Mast No. 80/16-80/20 and 73/30-73/26 as per WII's guidelines by using suitable material (soil/cement/river stones) that flattens towards the top of the track, and allow for smooth and quick movement of the elephants. The ramp should be levelled with the surrounding terrain by smoothening out the slope.
- Soft rubber pads as per WII guidelines should be laid down over the stones lying on railway track to make the crossing of railway track easier for elephants.
- Due to suitable height below the railway tracks at OHE Mast Nos. 68/17-68/14, 52/8-52/11 and 49/7-49/3, under-passes could be constructed as per the WII's guidelines for easy passage of the elephants.
- Installation of signages and boards about elephant crossings throughout the elephant passing stretches.
- Regular pruning of bushes (upto 30 meters) on both sides of the track for clear visibility to the drivers and the elephants.

- Frequent honking by the train engine when passing through critical stretches especially when elephant or wildlife movement near the railway tracks has been reported or observed.
- No barriers should be erected along the crossing points by Indian Railways without the completion of elephant overpass/underpass at above mentioned critical locations/elephant passing zones.
- The open drains along the railway tracks must be covered with suitable material.

Figure 3.8.3: Field survey conducted by Project Elephant (MoEF&CC) representatives in collaboration with Indian Railways and State Forest Department officials in sensitive railway line stretches in Raidakhol, Odisha.

Date of survey: 14-15th February, 2024

Locations Surveyed:

- OHE Mast No. 17/27-17/29
- OHE Mast No. 24/30-24/34
- OHE Mast No. 24/37-24/41
- OHE Mast No. 29/33-29/32
- OHE Mast No. 40/9-40/11
- OHE Mast No. 31/44-31/49
- OHE Mast No. 30/27-30/29

Observations:

- Regular elephant movement is reported in the above mentioned locations.
- Death of two elephants due to train hit was reported about 2.5 years ago near OHE Mast No. 17/27-17/29.
- The railway tracks is frequently used by all categories of trains including goods and express trains as it is the main line which connects Sambalpur district with Angul district.
- At present there are two railway tracks (up & down line). It was informed by the Railway officers that there is a planning of laying two more railway lines.
- Thick vegetation was found near OHE Mast No. 24/30-24/41 which needs to be cleared.

Recommendations:

- A ramp to be constructed near OHE Mast No. 17/27-17/29, 24/30-24/34 and 24/37-24/41as per WII's guidelines by using suitable material (soil/cement/river stones) that flattens towards the top of the track, and allow for smooth and quick movement of the elephants.
- The ramp should be levelled with the surrounding terrain by smoothening out the slope.
- Rubber pads as per WII guidelines should be laid down over the stone blast lying on railway track to make the crossing of railway track easier for elephants.
- Due to suitable height below the railway tracks at OHE Mast Nos. 31/44-31/49 and 30/20- 30/24, under-passes could be constructed as per the WII's guidelines for easy passage of the elephants.
- Intrusion Detection System (IDS) using Distributed Acoustic Sensing (DAS) System could be installed near OHE Mast No. 29/33-29/32.
- Installation of signages and boards about elephant crossings throughout the elephant passing stretches.
- Regular pruning of bushes (upto 30 meters) on both sides of the track for clear visibility to the drivers and the elephants.
- Frequent honking by the train engine when passing through critical stretches especially when elephant or wildlife movement near the railway tracks has been reported or observed.
- No barriers should be erected along the crossing points by Railways without the completion of overpass/underpass at above mentioned critical locations/elephant passing zones.
- The open drains along the railway tracks must be covered with suitable material.

Figure 3.8.4: Field survey conducted by Project Elephant (MoEF&CC) representatives in collaboration with Indian Railways and State Forest Department officials in sensitive railway line stretches in Sambalpur, Odisha.

Date of survey: 15th February, 2024

Locations Surveyed:

- OHE Mast No. 462/7-462/9
- OHE Mast No. 461/6-461/7

Observations:

- The critical elephant crossings fall under the Barswen forest range.
- The elephants frequently cross the railway tracks to move between the different habitats in Bonai.
- On request of Forest Department, Indian Railway issues caution order to restrict the speed of the trains.
- Due to the flat terrain, there was no provision for construction of underpass or overpass for elephants.

Recommendations:

- Construction of level crossings and ramps as per Wildlife Institute of India's guidelines by using suitable material (soil/ cement/rubberised pads etc.) that flattens towards the top of the track, and allow for smooth and quick movement for the elephants in OHE Mast Nos. 462/7-462/9 and 461/6-461/7.
- The existing ramps around the railway tracks should be levelled with the surrounding terrain by smoothening out the slope.
- Installation of signages and boards about elephant crossings throughout the elephant passing stretches.
- Regular pruning of bushes (upto 30 meters) on both sides of the track for clear visibility to the drivers and the elephants.
- Frequent honking by the train engine when passing through critical stretches especially when elephant or wildlife movement near the railway tracks has been reported or observed.
- The open drains along the railway tracks must be covered with suitable material

Figure 3.8.5: Field survey conducted by Project Elephant (MoEF&CC) representatives in collaboration with Indian Railways and State Forest Department officials in sensitive railway line stretches in Bonai, Odisha.

Date of survey: 16th February, 2024

Locations Surveyed:

- OHE Mast No. 405/7-405/2 in South East Railways
- OHE Mast No. 414/3-414/2 in South East Railways
- OHE Mast No. 16/15-16/18 in East Coast Railways
- OHE Mast No. 33/31-33/37 in East Coast Railways
- OHE Mast No. 33/37-33/41 in East Coast Railways
- OHE Mast No. 33/41-33/45 in East Coast Railways
- OHE Mast No. 36/21-36/25 in East Coast Railways
- OHE Mast No. 67/3-67/7 in East Coast Railways
- OHE Mast No. 67/7-67/9 in East Coast Railways
- OHE Mast No. 67/9-67/11 in East Coast Railways

Observations:

- Elephant movement is reported in the above mentioned locations.
- The railway tracks are frequently used by all categories of trains including goods and express trains. It lies in between two divisions of the Railways i.e. South Eastern Railways and East Coast Railways.
- The Forest department has installed solar fences on both sides of the railway tracks near OHE Mast No. 405/51 to prevent the elephants entering the track.
- Death of three elephants due to train hit was reported in year 2022.
- Suitable height on both sides of the railway line near OHE Mast Nos. 405/7-405/2 is available which could be utilized for construction of overpass for elephants. NHAI has also proposed an over pass for elephants near OHE Mast Nos. 405 in South East Railways.
- Drains have been constructed along the railway tracks which act as barriers for the easy movement of the elephants near OHE Mast No. 415/6 to 16/9, 16/14 to 16/18 and 79/18 to 79/20 especially young ones/calves.

Recommendations:

- Since suitable height is available on both sides of the railway tracks near OHE Mast No. 405, it is recommended for construction of an elephant overpass as per Wildlife Institute of India's guidelines near OHE Mast No. 405/7-405/2 which falls under the jurisdictionof South East Railways.
- A ramp to be constructed near OHE Mast No. 16/15- 16/18, OHE Mast No. 36/21-36/25 and 33/37-33/41 along with fencing at 33/31-33/37 and 33/41-33/45 (under east Coast Railways) to guide/route the elephants towards OHE Mast No. 33/37-33/41 as per WII's guidelines by using suitable material (soil/cement/river stones) that flattens towards the top of the track, and allow for smooth and quick movement of the elephants. The ramp should be levelled with the surrounding terrain by smoothening out the slope.
- The feasibility of construction of elevated railway tracks, elephant overpasses and underpasses in future while doubling the railway tracks in future must be carried out by the Ministry of Railways with the support of State Forest Department.

- Soft rubber pads as per WII guidelines should be laid down over the blast stones lying on railway track in the above mentioned critical stretches to make the crossing of railway track easier for elephants.
- A ramp to be constructed on OHE Mast No. 67/7-67/9 along with fencing at 67/3-67/7 and 67/9-67/11 to guide/route the elephants towards OHE Mast No. 67/7-67/9 as per WII's guidelines by using suitable material (soil/cement/river stones) that flattens towards the top of the track, and allow for smooth and quick movement of the elephants. The ramp should be levelled with the surrounding terrain by smoothening out the slope.
- Installation and regular maintenance of signages and boards about elephant crossings throughout the elephant passing stretches.
- Regular pruning of bushes (upto 30 meters) on both sides of the track for clear visibility to the drivers and the elephants.
- Frequent honking/ blowing long horn as well as sharp look out by the loco pilots when passing through critical stretches especially when elephant or wildlife movement near the railway tracks has been reported or observed.
- The open drains along the railway tracks must be covered with suitable material at OHE Mast No. 415/6 to 16/9,16/14 to 16/18 and 79/18 to79/20.

Figure 3.8. 6: Field survey conducted by Project Elephant (MoEF&CC) representatives in collaboration with Indian Railways and State Forest Department officials in sensitive railway line stretches in Keonjhar, Odisha.

Date of survey: 16th February, 2024

Locations Surveyed:

- OHE Mast No. 126/2-126/4
- OHE Mast No. 126/7-126/9
- OHE Mast No. 126/27-126/29
- OHE Mast No. 132/46-132/48
- OHE Mast No. 135/39-135/41
- OHE Mast No. 136/16-136/18
- OHE Mast No. 138/19-138/21
- OHE Mast No. 139/2-139/6
- OHE Mast No. 140/44-140/48
- OHE Mast No. 141/13 – 141/17

Observations:

- Elephant movement is reported in the above mentioned locations.
- The railway tracks are frequently used by all categories of trains including goods and express trains.
- Death of one tusker due to train hit was reported in year 2022 near OHE Mast No. 135/41- 135/39 and three numbers of female elephants had been succumbed to death due to train hit during the year 2023 near OHE Mast No. 141/13 to 141/17.
- Drains have been constructed along the railway tracks which act as barriers for the easy movement of the elephants, especially young ones/calves.
- At most of the identified critical stretches, the railway tracks are on the ground level.
- There are some blind curves on the railway tracks which are prone to elephant-train hits.

Recommendations:

- Since, most of the identified critical stretches of the railway tracks are on the ground level, suitable height below the railway tracks/ above the railway tracks is not available for construction of under pass/ overpasses for elephants. Hence, as a short term measure, construction of ramps at these stretches would help the elephants in crossing the railway tracks more quickly and smoothly. It is recommended to develop the ramps near OHE Mast No. 126/2 - 126/4, 126/7 - 126/9, 126/27 - 126/29, 132/46 - 132/48, 135/41 - 135/39, 136/16 - 136/18, 138/21 - 138/19, 139/4 - 139/2, 140/44 - 140/48 and 141/13 – 141/17 along with fencing on both sides of OHE Mast No. 140/44 - 140/48 and from 141/13 – 141/17 to guide/route the elephants as per WII's guidelines by using suitable material (soil/cement/ river stones) that flattens towards the top of the track, and allow for smooth and quick movement of the elephants. The ramp should be levelled with the surrounding terrain by smoothening out the slope.

- The feasibility of construction of elevated railway tracks, overpasses and underpasses in future while doubling the railway tracks in future must be carried out by the Ministry of Railways with the support of State Forest Department.
- Installation of Intrusion Detection System (IDS) near OHE Mast No. 132/46-132/48.
- Soft rubber pads as per WII guidelines should be laid down over the blast stones lying on railway track in the above mentioned critical stretches to make the crossing of railway track easier for elephants.
- Installation and regular maintenance of signages and boards about elephant crossings throughout the elephant passing stretches.
- Regular pruning of bushes (upto 30 meters) on both sides of the track for clear visibility to the drivers and the elephants.
- Frequent honking/ blowing long horn as well as sharp look out by the Loco Pilots by the train engine when passing through critical stretches especially when elephant or wildlife movement near the railway tracks has been reported or observed.
- The open drains along the railway tracks must be covered with suitable material.

Figure 3.8.7: Field survey conducted by Project Elephant (MoEF&CC) representatives in collaboration with Indian Railways and State Forest Department officials in sensitive railway line stretches in Keonjhar (wildlife division), Odisha.

Date of survey: 18th February, 2024

Locations Surveyed:

- OHE Mast No. RB 15/7-10

Observations:

- The railway tracks are frequently used by Express trains and Goods trains.
- Caution order for speed restriction is issued by Railways on request of Forest Department.
- Permanent speed restriction of 40 Km/h is implemented for trains near OHE Mast No. 336/01- 337/01.
- It was informed by the railway officers that there is a planning of doubling the railway line in future.
- Coordination between Railways and Forest Department personnel is playing a significant role in safe crossing of elephants across the railway track.

Recommendations:

- Since, all the identified critical stretches of the railway tracks are on the ground level, construction of ramps at these stretches would help the elephants in crossing the railway tracks more quickly and smoothly. It is recommended to develop the ramps near OHE Mast No. 336/27-336/28, 327/11-327/13 and 287/09-287/06 as per WII's guidelines by using suitable material (soil/cement/river stones) that flattens towards the top of the track, and allow for smooth and quick movement of the elephants. The ramp should be levelled with the surrounding terrain by smoothening out the slope.
- The feasibility of construction of elevated railway tracks, overpasses and underpasses in future while doubling the railway tracks in future must be carried out by the Ministry of Railways with the support of State Forest Department.
- The ramps must be constructed at critical stretches as per WII's guidelines by using suitable material (soil/cement/river stones etc.) that flattens towards the top of the track, and allow for smooth and quick movement for the elephants.
- Regular pruning of bushes (30 Meter) on both sides of the track for clear visibility of the drivers and the elephants.
- Installation of more signages and boards about animal crossings throughout the elephant passing stretches.

Figure 3.8. 8: Field survey conducted by Project Elephant (MoEF&CC) representatives in collaboration with Indian Railways and State Forest Department officials in sensitive railway line stretches in Rairangpur, Odisha.

Date of survey: 17th February, 2024

Locations Surveyed:

- OHE Mast No. RB 15/7-10

Observations:

- The railway line is connecting Rupsa-Bangriposi and used by two daily express trains and one weekly superfast train. The railway tracks are surrounded by paddy fields on both sides.
- Elephant herds frequently crosses the railway lines, especially during the paddy season.
- Due to clear visibility, no incident of elephant train hit has been reported in the area.
- Coordination between Railways and Forest Department personnel is playing a significant role in safe crossing of elephants across the railway track.

Recommendations:

- Since, the railway track is on the ground level, construction of ramp at this stretch would help the elephants in crossing the railway tracks more quickly and smoothly. It is recommended to develop the ramp near OHE Mast No. RB 15/7-10 as per WII's guidelines by using suitable material (soil/cement/river stones) that flattens towards the top of the track, and allow for smooth and quick movement of the elephants. The ramp should be levelled with the surrounding terrain by smoothening out the slope.
- Installation of signages and boards about animal crossings throughout the elephant passing stretches.

Figure 3.8. 9: Field survey conducted by Project Elephant (MoEF&CC) representatives in collaboration with Indian Railways and State Forest Department officials in sensitive railway line stretches in Baripada, Odisha.

List of Odisha Forest Department and Indian Railways officials consulted during the survey

Odisha State Forest Department:

1. Shri Vikas Tyagi, *Divisional Forest Officer (DFO) Angul, DFO Dhenkanal (additional charge)*
2. Ms. Shyama Bharti, *Assistant conservator of Forests, Dhenkanal Forest Division*
3. Shri Vivek Kumar, *IFS, Divisional Forest Officer, Angul (Territorial) Forest Division*
4. Shri Madhab Chandra Nayak, *Range officer, Jarapada Forest Range, Angul (T) Forest Division*
5. Shri Arabinda Mohanty, *DFO, Raidakhol*
6. Shri Harishankar Nayak, *Assistant Conservator of Forest (ACF), Sambalpur*
7. Shri Manoj, *Assistant Conservator of Forest (ACF), Sambalpur*
8. Shri Sushant Kumar Jena, *Assistant Conservator of Forest, Bonai*
9. Shri Nabin Chandra Pradhan, *Range Officer, Bonai*
10. Shri Dhanraj Hanumant Dhamdhere, *DFO, Keonjhar*
11. Shri Ashok Das, *Assistant Conservator of Forest, Keonjhar*
12. Sri Abhay Kumar Dalai, *DFO, Keonjhar Wildlife Division, Anandapur*
13. Sri Umakanta Dash, *Asst. Conservator of Forests, I/C of Deogaon Wildlife Range*
14. Miss Priyadarshini Sahoo, *Range Officer, Brahmanipal Wildlife Range, Daitari*
15. DFO, Baripada
16. Shri Arun Kumar Biswal, *Assistant Conservator of Forest, Baripada*

Indian Railways :

17. Shri Prasann Kumar Behera, *Section Officer, East Coast Railways.*
18. Shri Pupun Sahu, *Junior Engineer, East Coast Railways*
19. Shri Vasudev Behera, *Senior Section Engineer (Works), East Coast Railways*
20. Shri Deepak, *Senior Section Engineer*
21. Shri Devender Nayak, *Assistant Divisional Engineer (ADEN), Sambalpur*
22. Mr. D. S. Rout, *SSE, South Eastern Railways*
23. Mr. B. S. Jamuda, *SSE, South Eastern Railways*
24. Bijay Kuma Bana, *ADEN, East Coast Railways*
25. Bijay Pal Bana, *ADEN, Kendujhargarh, East Coast Railways*

Tamil Nadu

3.9. TAMIL NADU

Introduction

Train collisions pose a significant threat to elephants in India. Elephant movements can be disrupted, and incidents between trains and elephants can occur when railway lines cross through elephant habitats. There is ecological significance of the elephants in preserving the equilibrium of the ecosystem. In order to reduce the number of train-elephant collision events, the Ministry of Environment, Forest and Climate Change (MoEF&CC) and the Ministry of Railways convened a meeting in June 2023 to discuss potential mitigation measures that could be implemented on the railway track. In this regard, the Project Elephant Division of the MoEFCC and State Forest Departments identified 110 railway line segments across elephant reserves and elephant distribution areas outside of elephant reserves, taking into account the risks to both human and elephant lives.

Tamil Nadu, with an estimated about 2,500 elephants (approximately 10% of India's population) as of 2023, plays a vital role in national elephant conservation efforts. The state boasts two elephant reserves encompassing over 12,000 km^2 and several elephant corridors. There were 8 railway stretches identified in the Tamil Nadu state that pass through elephant habitats and are considered important for wildlife movement across the railway lines (Office Memorandum, GOI, MOEF&CC(PE), New Delhi. F.No.12-1/2029-PE (part-1), dated: 30.08.2022) (Table 3.9.1).

Table 3.9.1: The identified stretches of railway lines to survey the elephant collision risk in Tamil Nadu.

Sl No.	Length (km)	Start Latitude	Start Longitude	End Latitude	End Longitude	District
1	3	10.868581	76.83481	10.87713	76.85952	Coimbatore
2	5.3	10.899215	76.90627	10.9003	76.92634	Coimbatore
3	14.4	11.341931	76.79704	11.33747	76.69662	Coimbatore
4	14.8	11.177097	76.96344	11.04576	76.95146	Coimbatore
5	90.3	11.222887	76.96948	11.40675	76.69662	Coimbatore, the Nilgiris
6	9	12.624218	78.39531	12.57676	78.44251	Tirupattur
7	14	12.595113	78.57493	12.68973	78.63589	Tirupattur
8	6.9	12.630446	78.428	12.58328	78.47487	Tirupattur

Field Survey

A joint survey by the WII and Forest department was carried out at the identified stretches from 20th March 2024 to 27th March 2024, where local railway officers joined wherever possible. During the survey, records of the presence of the wildlife and topographic features of such sites were taken. Sites where elephant activity has been reported or where records of elephant deaths or injuries exist were deemed vulnerable to collisions between wildlife and trains. After careful consideration and inspection, mitigation measures were taken at each of these locations. Most of the stretches were walked on foot (Fig. 3.9.1), except the ones where it was ascertained through discussion with the forest and railway officials that the identified railway line stretch does not cross through forest habitat and it was located in the middle of human habitation.

Figure 3.9.1: Field survey along the Connoor – Mettupalayam railway line.

The identified stretches in Tamil Nadu could be grouped into three major clusters- 1) the southern Coimbatore district, 2) The Nilgiris and Mettupalayam Forest range in Coimbatore district, 3) Tirupattur district. While 8 stretches were initially identified, an on-ground visit revealed that a few of the stretches fall completely into human habitation, and there were no reports of elephant movement. The stretch from Coimbatore to Karmadi in Coimbatore district, Vaniyambadi to Jolarpet and Patchur to Mallanuru (eastern track) in Tirupattur district did not have any elephant movement and did not require any mitigation structure. In Coimbatore, two tracks, Ettimadai – Walayar and Madukkarai – Ettimadai, were surveyed. A few stretches on the Mettupalayam to Ooty track in Coimbatore and the Nilgiris districts were overlapping and this was surveyed as a single track from Kallar to Ooty. In Tirupattur district, only one track, Patchur to Mallanuru (western track) passing through Kothur reserve forest, was surveyed.

* The objective of the field survey was to minimise elephant-train collisions either by constructing underpasses and overpasses wherever possible, by reducing the time taken by elephants to cross the railway tracks by easing movement across the track through construction of ramps and level crossings, and by implementation of technology for early detection and warning systems.

Site-Specific Findings & Mitigation Measures

Ettimadai - Walayar

This railway line connects Coimbatore to Palakkad in Kerala and has heavy traffic of over 150 trains per day, including high-speed trains and local passenger trains (Fig. 3.9.2). The 3 km stretch in the Madukkarai forest range close to Walayar station in Kerala is crucial from an elephant conservation perspective. Madukkarai forest area is used by migrating elephants whose ranges are spread largely across Kerala. The railway line in this stretch is looped separately with upward and downward routes (Fig. 3.9.3). The route from Coimbatore to Palakkad crosses (northern track) from the middle of the forest and bisects a crucial migration route used by these elephants. The route from Palakkad to Coimbatore (southern track) has little forest around it but is surrounded by banana and coconut plantations. There have been elephant death reports as recent as 2022, where 3 elephant death incidents occurred on the track.

The Tamil Nadu Forest Department and Railway Department have taken proactive measures to thwart such incidents from happening on this track. The northern track has 2 elephant underpasses and 3 level crossing ramps within a 3 km stretch. The forest department reported regular use of the underpasses and ramps. Apart from the elephant, signs of wild dogs, gaur, sambar, and wild boar were found at the mitigation structures. In addition, an AI-based elephant monitoring system has been installed on both lines (Fig. 3.9.4). A control room is established to monitor the elephant movement close to the railway tracks 24 hr. Any sighting close to the tracks immediately triggers an alarm to the running trains.

While the existing structures are sufficient in number, the level crossing ramps have an unsuitable design (Fig. 3.9.5). The railway track is above ground, and ramps are built on either side. The track, however, is filled with ballast, which is known to slow down elephant movement and increase the risk of collision. To ease the elephant crossing, the track should be levelled using modern design and materials such as rubberised filling (Table 3.9.2).

The AI-monitoring system is promising. In the test run from December 2023 to January 2024, 130 alert warnings were generated by the system, out of which 119 incidents involved elephants coming close to the track. The system also alerted about the presence of Indian gaur and leopard. Currently, the warning is generated when animals are within 20m of the track. This could be improved by widening the alert range to 50 meters so that the train loco pilot has ample time to react. The AI system could be replicated at other sites in India with a high risk of elephant-train collision.

Figure 3.9.2: Surveyed railway lines in the southern part of Coimbatore district. Marked railway lines are – 1- Ettimadai – Walayar, 2- Madukkarai – Ettimadai, 3- Coimbatore – Karamadai

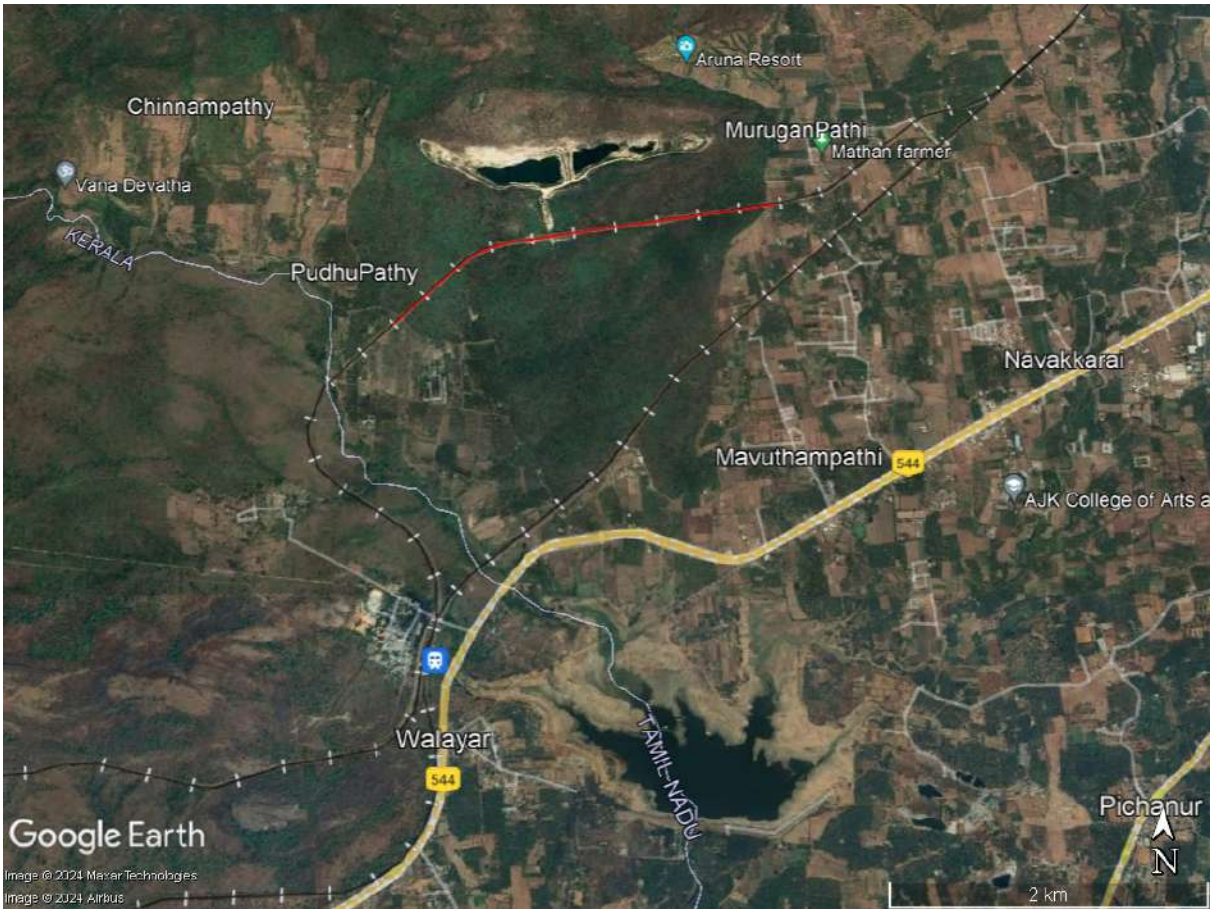


Figure 3.9.3: Ettimadai – Walayar railway track. The northern track is a crucial elephant corridor.

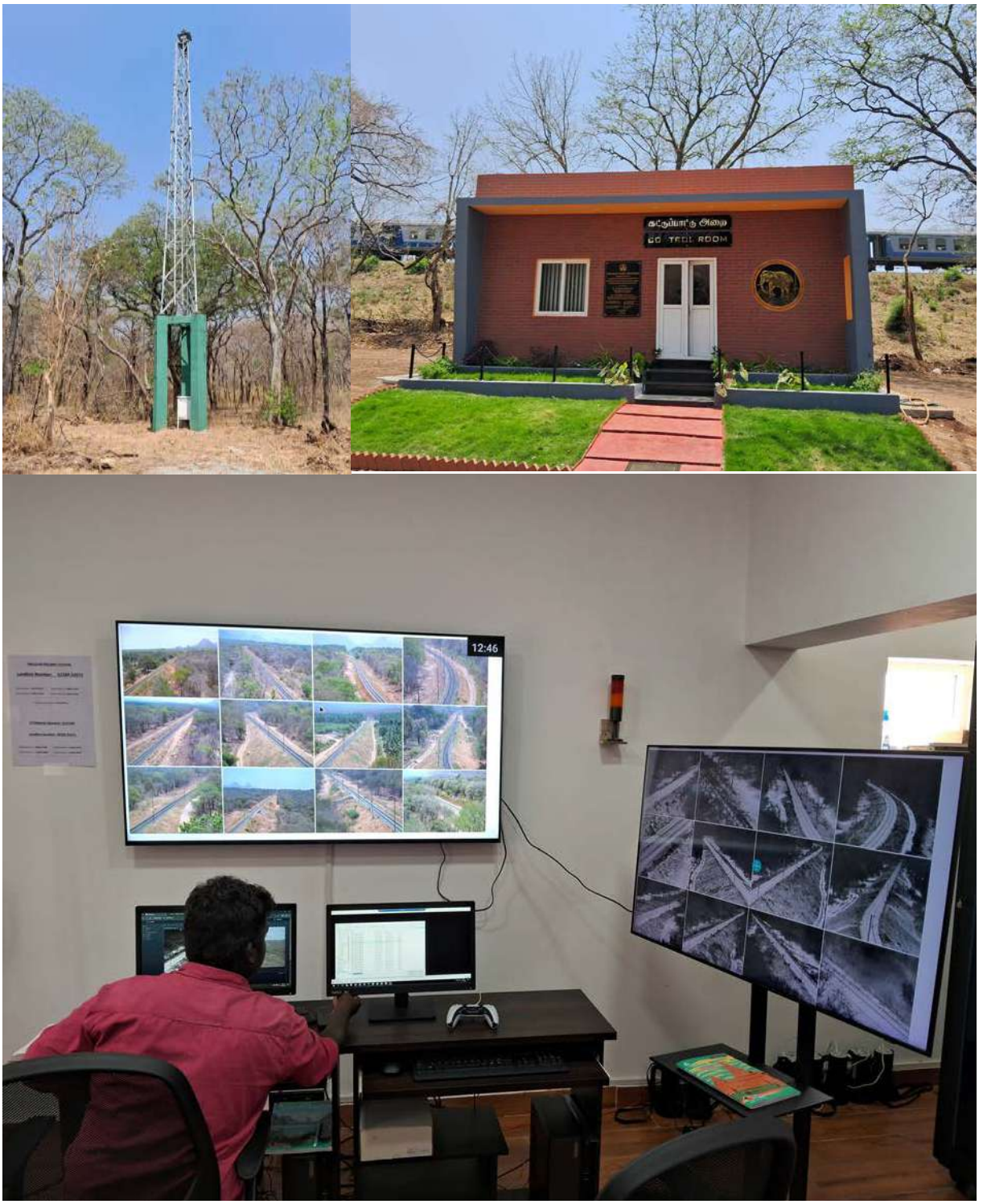


Figure 3.9.4: AI-based elephant monitoring and alert system on railway tracks in Madukkarai Forest Range. Top left- cameras are installed on towers close to the railway line; Top right- the control room; Bottom- Continuous monitoring in action.

Table 3.9.2: Existing mitigation structures on the Ettimadai – Walayar stretch with additional suggestions to upgrade the level crossing

S. No.	Chainage	Existing mitigation structure	Suggestions	Latitude	Longitude
1	505/A500	Underpass (10 m x 18 m)	-	10°52'31.05"N	76°51'8.09"E
2	506/4	Level crossing	Upgradation to rubberised ramp required at the crossing	10°52'27.3"N	76°50'36.1"E
3	506/8	Underpass (10 m x 18 m) under construction	-	10°52'19.8"N	76°50'19.0"E
4	506A/100	Level crossing	Upgradation to rubberised ramp required at the crossing, repairing required	10°52'16.7"N	76°50'16.1"E
5	506 A/9	Level crossing	Upgradation to rubberised ramp required at the crossing, repairing required	10°52'11.7"N	76°50'11.0"E

Figure 3.9.5: Mitigation structures in Madukkarai Forest range. Left – Underpass of 10 x 18 m dimension; the structure requires installation of light and sound barriers on both sides. Right – level crossing ramp, the structure requires upgradation to make a rubberized level crossing on the track.

Madukkarai – Ettimadai

This stretch on the Coimbatore – Palakkad railway line passes along forest area for about 3 km (Fig. 3.9.6). However, the other side of the track is human habitation and agriculture. Elephants often cross for water and crop raiding and come into conflict. There was one report of elephant death on this track.

A metal barrier was installed to deter elephants from crossing the track. The barrier is now broken in several places and currently exists from chainage 498/9 to 498/5 (10°53'50.0"N 76°55'00.9"E) (Fig. 3.9.7). It is suggested that this barrier be repaired and maintained so that elephant movement on the track is minimised. The barrier should start close to chainage 499/7 (10°53'50.0"N 76°55'00.9"E) till chainage 498/5.

Figure 3.9.6: Madukkarai – Ettimadai stretch of the railway line.

Figure 3.9.7: The old broken barriers along the Madukkarai – Ettimadai track used to stop elephants from walking on the track and crossing into the agricultural field (Chainage 498/9).

The Nilgiri Mountain Railway, also known as the Ooty toy train, is a marvel of engineering that scales the steep slopes of the Nilgiri Hills (Fig. 3.9.8). This UNESCO World Heritage Site boasts a unique meter gauge track with a rack railway system. The rack, a toothed rail alongside the regular track, engages with a pinion gear on the locomotive, enabling it to climb gradients as steep as 1 in 25 (4%). This system, along with powerful steam locomotives or modern diesel engines, allows the train to navigate 16 major tunnels, 250 bridges, and 208 curves along its 46-kilometer route from Mettupalayam to Ooty (Fig. 3.9.9).

The major portion of the track is in the mountains, where elephant presence is reported from Kallar towards Ooty (Fig. 3.9.10). The train is carried by a steam engine in the stretch from Connor to Ooty while a diesel engine covers the remaining stretch. The maximum speed of the train is about 30 km per hour, while the average speed is 10 km per hour. Since the speed of the train is quite low and a number of natural underpasses exist in the form of bridges, there is no requirement to build mitigation structures on this track. This is further supported by the lack of elephant-train collision records on this track.

However, railway property damage by elephants is quite common. Therefore, electric fences need to be installed around sensitive stations, particularly Runnymede station (11°19'44.05"N, 76°48'5.01"E) (Fig. 3.9.11). At multiple places, people use old overbridges to cross the track.

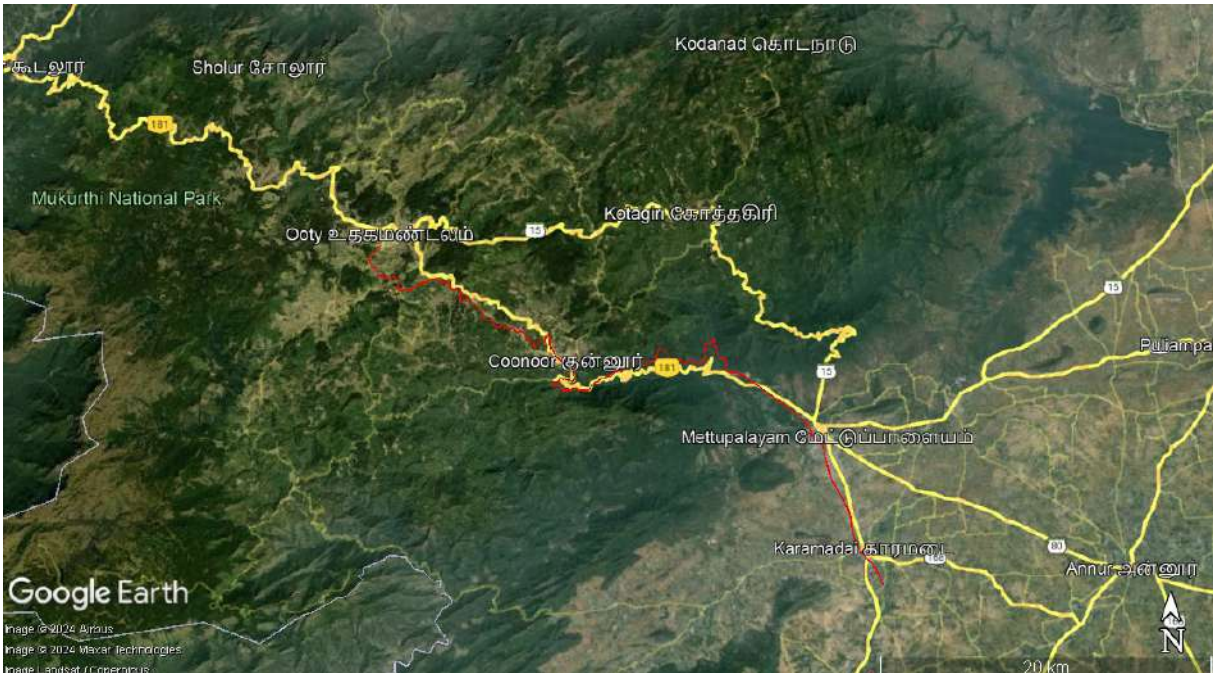


Figure 3.9.8: The Nilgiri Mountain Railway is a narrow-gauge railway line. The elephant habitat starts from Kallar station, about 6 km from Mettupalayam.

Figure 3.9.9. Nilgiri mountain train has 16 major tunnels, 250 bridges, and 208 curves.

Figure 3.9.10: A female elephant with two calves was sighted close to the track on Kallar – Ooty railway line.

Figure 3.9.11: Damage by elephants at Runneymede station on the Kallar – Oory railway line.

These bridges are also used by the local wildlife. There have been incidents of animals falling from the overbridge on the track due to poor maintenance of these structures; for example, an Indian gaur died at bridge no. 41 (11°20'39.23"N, 76°51'14.19"E). These overbridges need to be maintained properly for human and animal safety by providing side railings or light and sound barriers. (Fig. 3.9.12). Elephants are reported to cross the railway track into agriculture near Satchidananda Jothi Nikethan School at bridge 13 (11°19'57.47"N, 76°53'50.26"E). This is a sensitive site for elephant-train collision as well as human-elephant conflict. An electric fence is installed at the site to deter the elephants; however, the fence needs regular repair and maintenance.

Figure 3.9.12: An Indian gaur fell from the overbridge and died at bridge no. 41 (11°20'39.23"N, 76°51'14.19"E).

Patchur – Mallanuru (western track)

This railway line connects Tirupattur in Tamil Nadu to Kuppam in Andhra Pradesh. The western track passes through Kothur Reserve Forest (Fig. 3.9.13). About 110 trains, including passenger and load vehicles, cross this track daily. The fastest trains, e.g., Vande Bharat and Shatabdi, can attain a speed of 90 km per hour.

Elephant movement is not quite frequent in this area as there is no resident population. At times a single herd of 7-8 elephants crossed into Tamil Nadu from Andhra Pradesh and stayed in Kothur and Nandibanda reserve forests. There has been an incident of electrocution of three elephants in farmland, but no incident of elephant-rail collision is reported. For safer movement of this elephant herd, a level crossing is suggested at chainage 232/8 (12°36'2.99"N, 78°24'30.11"E), where both sides of the track have a scrub forest and elephant tracks were observed (Fig. 3.9.14).

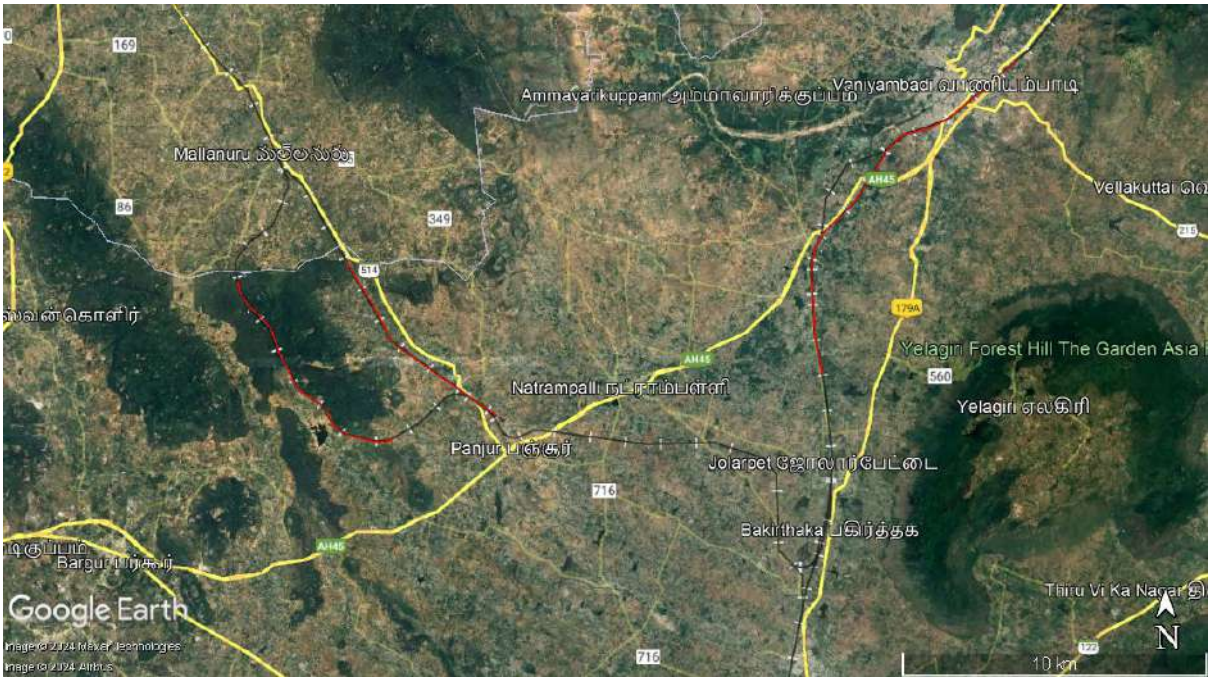


Figure 3.9.13: Surveyed railway lines in Tirupattur district. Marked railway lines are – 1- Patchur – Mallanuru (western track), 2- Patchur – Mallanuru (eastern track), 3- Vaniyambadi – Jolarpet

Figure 3.9.14: Elephant tracks were observed at chainage 232/8 (12°36'2.99"N, 78°24'30.11"E) on Patchur – Mallanuru track.

The entire track is in the middle of the agriculture and human build-up area. Yallagiri is the closest forest area (~4 km.) (Fig. 3.9.13), where a single male elephant resides and has never been seen outside of Yellagiri forest. In one isolated event, 2 male elephants moved into Tirupattur from Andhra Pradesh on 14th May 2023. These elephants were driven away by people and crossed the track a few times. Later, the animals returned to Andhra Pradesh. Given the near absence of elephants and other major wildlife species in the area, this railway line does not require specific mitigation measure.

Photographs depicting the process of construction of elephant underpass on a railway line in Tamil Nadu

Additional Comments

1. Loco pilots and railway officials need to be sensitized about the wildlife collision risk.

2. The train pilots should be trained to record wildlife sightings close to the track and maintain the data. Such data is valuable for suggesting and improving mitigation measures.

3. Indian gaur and Sloth bear are also high-risk species for collisions. Sloth bear scats were observed on bridges on the Nilgiris mountain railway. Railway officers specifically mentioned that sloth bears are often sighed close to the trains.

4. The majority of accidents occur at night and in the twilight. During these hours, extreme caution and strict speed control are required.

5. Garbage disposal by the passengers along the railway tracks is an attractant for wildlife, and collision risk of many of the species increases. Therefore, regular and proper disposal of food waste and garbage inside the train should be endured.

6. The AI-based alert system is a promising solution for replication elsewhere.

7. The mitigation measures infrastructure, such as level crossings, barriers, and electric fences, require regular maintenance and repair. Sustained funding for the maintenance of these constructs is of the utmost importance.

8. Tamil Nadu's major elephant populations are in the Selam, Dharmavar, and Hosur districts. Railway stretches in these districts need to be identified for collision risk assessment.

List of Tamil Nadu Forest Department and Indian Railways officials consulted during the survey

Forest Department

1. Dr V. Naganathan, *Additional PCCF, Conservator of Forests (Wildlife), Tamil Nadu*
2. Mr. N. Jayaraj, *DFO, Coimbatore*
3. Mr. N. Jayaraj, *DFO, Coimbatore*
4. Dr. Naveen Murthy, *Biologist, Coimbatore*
5. Mr. Arun Kumar, *RFO, Madukkarai*
6. Mr. Joseph Stalin, *RFO, Mettupalayam*
7. Mr. S. Gowtham, *DFO, the Nilgiris*
8. Dr. Karthick Sivaraj, *Biologist, the Nilgiris*
9. Mr. M. Mahendran, *DFO, Tirupattur*
10. Mr. Radhakrishnan, *ACF, Tirupattur*

Indian Railways:

11. Mr. Rajsekhar, *JE, Patchur Station*

Uttarakhand

3.10. UTTARAKHAND

Introduction

Based on a meeting on 17th August 2022, the Hon'ble Minister of Railways, Government of India, instructed the Ministry of Environment, Forest and Climate Change (MoEF&CC) to provide at least 100 locations of existing railway segments across sensitive elephant and tiger landscapes in the country for construction of permanent mitigation measures in view of wildlife-train collisions (Proceedings under Ministry of Railways letter No. 2022/CE-IV/Elephant Pass dated 30th September 2022). Consequently, details of sensitive stretches for constructing permanent and temporary mitigation measures were provided by the MoEF&CC (vide OM F.No. 12-1/2019-PE (Part-I), dated 30th August 2022). Further PCCF (WL) and CWLW, Uttarakhand (vide letter 895/698Dehradun, dated 31st October 2022) provided a list of sensitive locations for construction of permanent measures to mitigate wildlife rail collisions in the state.

A. Railway lines near Haldwani

Of the nine priority segments for mitigation on railway lines in Uttarakhand state, two segments both starting at Lalkuan station, were visited during the field survey. There have been regular incidents of wild animal mortality on the tracks recently and in the past. The Lalkuan to Gularbhoj railway line (segment 1 hereafter) connects Kashipur in Uttarakhand to Lalkuan via Sultanpur and Gularbhoj. A 16 km segment of the railway line lies within elephant habitat in the Terai East Forest Division. The Lalkuan to Chhatarpur railway line (Segment 2 hereafter) connects Rampur in Uttar Pradesh to Lalkuan via Bilaspur (UP) and Rudrapur (UK). An 8 km segment of the railway line passes through elephant habitat. Additionally, the railway intersection near the Indian Oil (IOCL) premises was flagged as a potential conflict point where regular elephant movement has been observed (Fig. 3.10.1).

The Terai Arc Landscape supports a sizeable elephant population, that has increasingly come into conflict with humans because of habitat fragmentation. Further the Central Terai Forest Division is also considered a major source of tigers for the Western Terai Arc Landscape. Linear infrastructure such as roads and railway lines have further fragmented elephant movement pathways, leading to elephant mortalities especially through collisions with trains. Elephant and wildlife movement within the Terai Central Forest Division is hampered because of the aforementioned railway lines, leading to several wildlife mortalities in the two sections (Table 3.10.1). Further, the railway line (Haldwani to Kathgodam) and National Highway 109 near the IOCL premises intersect elephant movement pathways between Central Terai and the Gola range (via the Gola River corridor). These human developments, including the Haldwani township, have compromised connectivity within the landscape.

A female elephant was injured after colliding with a train on the eve of Diwali (13th November 2023). The incident necessitated a swift need to take urgent steps to mitigate the railway tracks passing through forested areas in the landscape. Consequently, a team from WII, Forest Department and railways officials visited the railway tracks during 20th and 21st November 2023.

The main objective of the survey was to assess use of habitat near both railway lines by elephants and other wildlife, and subsequently determine locations, types and dimensions of mitigation measures for priority stretches.

B. Railway lines vulnerable to elephant-train collisions in Uttarakhand

A list of railway lines along with proposed mitigation measures appropriate for the sites was shared by the Uttarakhand Forest Department, attached as Appendix 4.

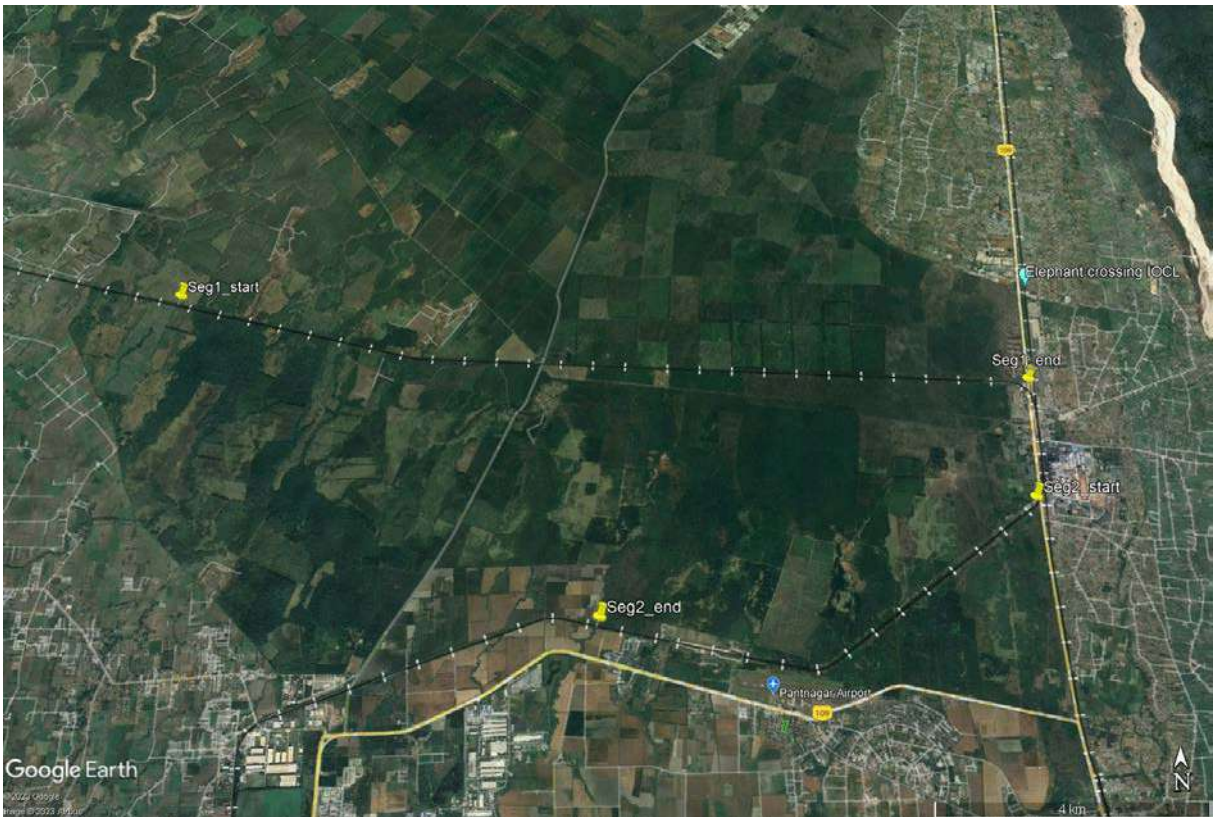


Figure 3.10.1: Railway segments inspected near the Central Terai Forest Division during the field visit.

Table 3.10.1: Mortality of elephants and other wildlife on the Lalkuan to Gularbhoj, and Lalkuan to Chhatarpur railway line passing through forests of the Terai Central Forest Division as reported by the railways and forest department.

S.No.	Date	Chainage/Range	Details
		Lalkuan-Gularbhoj	
1.	18.08.2021	13/2	Female elephant and calf run over
		Lalkuan-Chhatarpur	
2.	17.04.2017	57/8-10	Two elephants dead
3.	11.03.2018	61/1-2	Two elephants dead
4.	27.05.2018	60/3-4	One elephant dead
5.	18.08.2021	13/2	Female elephant and calf run over
6.	20.02.2022	62/1-2	Elephant herd crossing, one dead
7.	18.12.2022	64/08	Elephant calf injury by collision
8.	08.05.2023	63/5-6	Elephant collision
9.	21.09.2023	66/6-7	Elephant injury by collision
		Terai Central Forest Division	
10.	04.12.2002	Tanda	One male elephant
11.	21.10.2010	Tanda	One male elephant
12.	08.09.2021	Tanda	One female elephant
13.	18.12.2022	Tanda	One female elephant
14.	29.11.2022	Rudrapur	One female leopard

Field Survey

Prior to the survey, the Forest Department provided us with locations of 11 points along both railway lines that they considered priority wildlife crossing zones. Thereafter, we walked along both railway lines with Railway officials and Forest Department personnel, and collected data on animal signs on and near the railway tracks, information of previous railway line crossings and use of trails near railway lines by elephants and other wildlife. The GPS coordinates and chainages of these sites were noted down. We also collected records of previous wild animal mortality and wildlife sightings on the railway track from the Department and Railways.

We collated the aforementioned information in the GIS-domain to determine priority high-use railway segments. Mitigation measures were then suggested based on width of crossing zone, track height of the railway line, presence of drainage structure and human infrastructure (potential for conflict) in that segment.

* The objective of the field survey was to minimise elephant-train collisions either by constructing underpasses and overpasses wherever possible, by reducing the time taken by elephants to cross the railway tracks by easing movement across the track through construction of ramps and level crossings, and by implementation of technology for early detection and warning systems.

Site-Specific Findings & Mitigation Measures

Lalkuan to Gularbhoj railway line

The railway track along this segment is relatively flat with regard to the surrounding terrain. Based on the field survey, discussions and data obtained from the Forest Department and Railways, majority of segment 1 was found suitable for wildlife movement, since most of the crossing sites have similar characteristics in terms of track height and adjacent vegetation. Multiple sites of elephants crossing the track were reported by the railways, FD ground staff and observed on field. Two wildlife mortality sites were also reported, that coincided with the priority crossing zones flagged by the FD (Fig. 3.10.2).

Consequently, given the importance of almost entire stretch of segment 1 for wildlife movement, and the relatively flat track, we recommend construction of ramps that would help wild animals, especially elephants, quickly cross the railway track. Ramps are to be constructed on the following ten priority sensitive stretches (Table 3.10.2). These stretches are indicative of the aggregations of signs and sightings of elephants and other wildlife as observed and reported, and ramps may be constructed on other suitable sites along this track as well. **One ramp with rubberised level crossing is to be constructed every 250 m within these segments wherever the maximum slope gradient can be maintained** (Fig. 3.10.3). The width of the crossing should be 25 m (at the top). DAS-based (Distributed Acoustic Sensing) IDS (Intrusion Detection System) should be installed on the railway section on priority to monitor wildlife movement across the railway track to avoid future collisions and deaths. Cable laying for this intrusion system should be done at least 200-250 m away from railway track. i.e. in forest land so that sufficient reaction time is available to disseminate information to train operation staffs.

Table 3.10.2: Approximate start and end GPS coordinates of stretches of the Lalkuan to Gularbhoj railway line segment considered sensitive with respect to presence and movement of elephant and other wildlife.

S. No.	Start GPS	End GPS	Length (m)
1.	29° 4'39.82"N 79°30'23.73"E	29° 4'41.34"N 79°29'57.17"E	700
2.	29° 4'42.78"N 79°29'29.96"E	29° 4'45.89"N 79°28'34.13"E	1500
3.	29° 4'47.22"N 79°28'8.84"E	29° 4'47.75"N 79°27'59.56"E	250
4.	29° 4'48.86"N 79°27'37.94"E	29° 4'48.40"N 79°27'46.34"E	225
5.	29° 4'49.38"N 79°27'29.68"E	29° 4'49.65"N 79°27'23.40"E	170
6.	29° 4'50.41"N 79°27'7.78"E	29° 4'52.36"N 79°26'30.93"E	1000
7.	29° 4'54.97"N 79°25'42.99"E	29° 4'55.71"N 79°25'31.13"E	320
8.	29° 4'56.92"N 79°25'3.64"E	29° 5'8.03"N 79°24'0.74"E	1740
9.	29° 5'9.80"N 79°23'52.94"E	29° 5'20.46"N 79°23'6.43"E	1300
10.	29° 5'26.09"N 79°22'40.76"E	29° 5'39.99"N 79°21'38.39"E	1740

Figure 3.10.2: Representation of wildlife sightings as reported by the Railways (green circles), animal signs recorded during field survey by WII team (green pins), and sensitive animal crossing zones identified by the UK Forest Department (blue pins), on Segment 1 (Lalkuan to Gularbhoj).

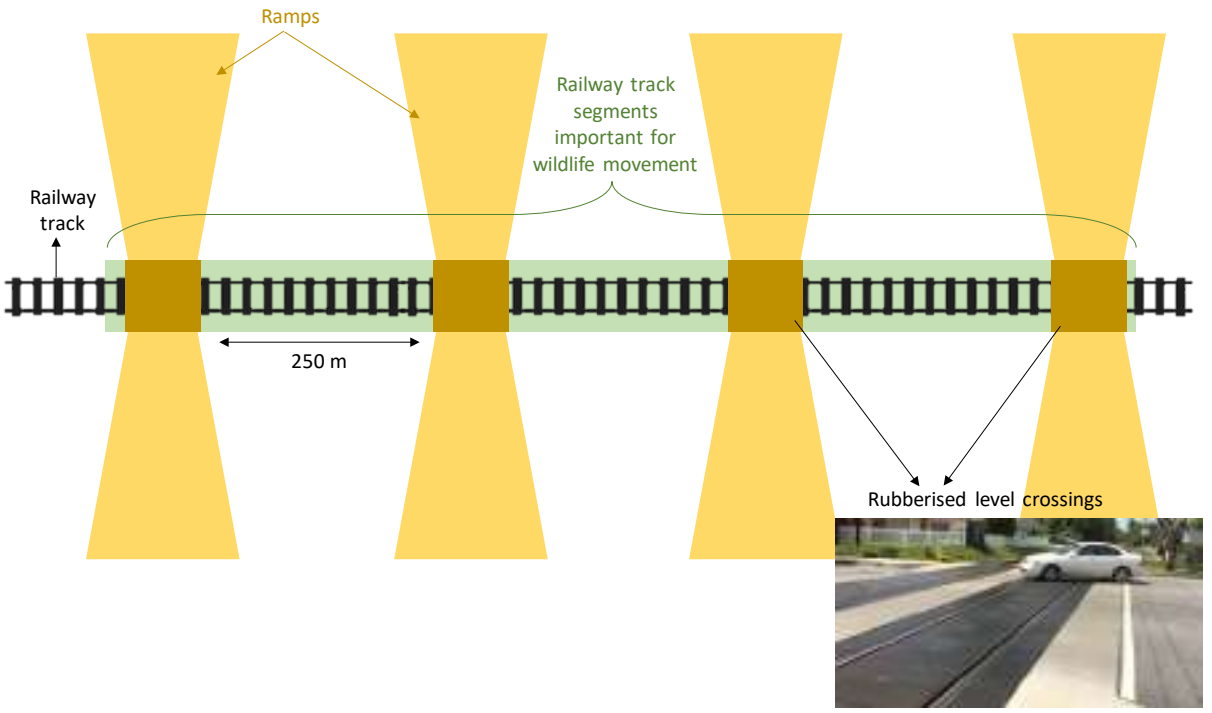


Figure 3.10.3: Diagrammatic representation of layout of ramps, spaced 250 m apart, on identified priority elephant movement stretches on the Lalkuan to Gularbhoj railway segment.

Lalkuan to Chhatarpur

During the field survey, we observed fairly regular elephant movement near and on the railway track, in addition to signs of tigers and leopards. Regular movement was also reported from the section after the curve near chainage 61.00 km (approximate), where the track borders the Pantnagar airport and the G.B. Pant University of Agriculture and Technology (Fig. 3.10.4). Facilitating movement near this segment would elevate conflict of elephants with humans, and it is therefore **suggested to fence the railway track on both sides after the curve (approx. chainage 61.00 km) till the end of the forested segment of the railway track (approx. chainage 57 km).**

Mitigation measures from Lalkuan station till chainage 61.00 km:

The track height varies between 3.25 and 5.5 m in this section, which later decreases to 2 to 3.5 m towards Chhatarpur. Thus, the segment of the railway track where structural mitigation would be beneficial for wildlife and elephants is the segment between Lalkuan station and till chainage 61.00 km (approximate). All drainage structures in this segment should be made suitable for animal movement, most of which are currently waterlogged (Fig. 3.10.5).

Animal underpasses:

Additionally, eight animal underpasses are recommended on the stretch. The underpasses should measure 30 m in width. The height of the underpasses should be 6 m. The height of the underpasses should not be achieved by digging as it would lead to further water logging, rendering the underpasses unusable by wildlife. Further, water logging is to be avoided under these passages by any required means.

The GPS locations of the recommended structures is provided below (Table 3.10.3). Before construction of the structures, the exact locations should be verified and validated on-field in consultation with the Forest Department.

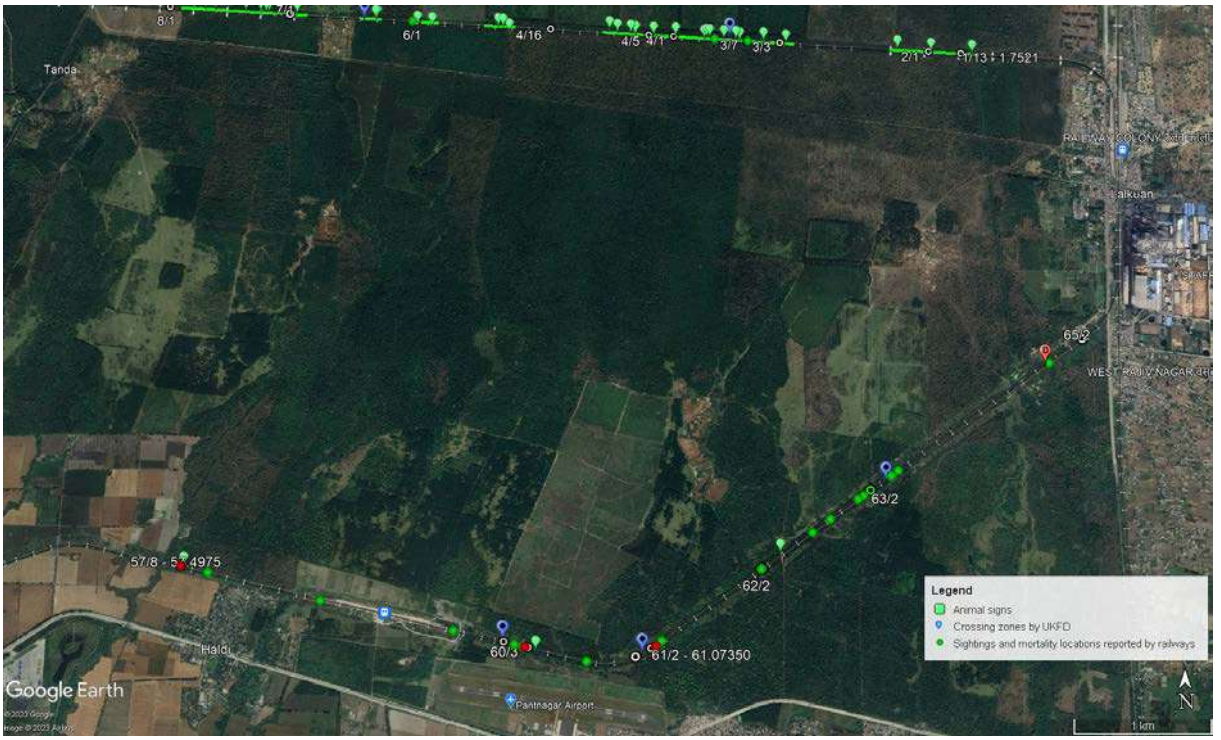


Figure 3.10.4: Representation of wildlife sightings as reported by the Railways (green circles), animal signs recorded during field survey by WII team (green pins), and sensitive animal crossing zones identified by the UK Forest Department (blue pins), on Segment 2 (Lalkuan to Chhatarpur).

Figure 3.10.5: Water logging on both sides of the railway embankment on the Lalkuan-Chhatarpur railway track can make the drainage structures unusable by wildlife.

Clearing land for animal movement:

Presently, water has accumulated on both sides of the railway track on this stretch. This would prevent wildlife from using the existing drainage structures and those proposed (Table 3.10.3). Therefore, it is important to drain this water from both sides to facilitate wildlife movement across the track.

For this purpose, we suggest installation of pipe culverts measuring 1 m in diameter to ensure free flow of water across the railway line. The pipe culverts are to be placed every 300 – 500 m depending on degree of water logging. Waterlogging can also be cleared through mechanical ways or by creating channels to drain water away from the railway embankment. Creation of channels and drains to ensure that water flows during monsoon season, and is not stagnant

Table 3.10.3: Recommended animal underpasses on the railway line segment from Lalkuan station to (approx.) chainage 61.00 km

S. No.	GPS Location (mid-point)
1.	29° 3'19.79"N 79°30'37.36"E
2.	29° 3'9.66"N 79°30'20.77"E
3.	29° 3'1.52"N 79°30'7.33"E
4.	29° 2'50.61"N 79°29'49.34"E
5.	29° 2'44.59"N 79°29'39.48"E
6.	29° 2'32.10"N 79°29'19.07"E
7.	29° 2'27.28"N 79°29'11.29"E
8.	29° 2'14.28"N 79°28'50.00"E

after, can reduce water logging, thus enabling wild animals to use the bridges as crossing structures. Thereafter, the ditches on both sides of the railway track should be filled with soil or other material to prevent further waterlogging. Additionally, suitable native herb and shrubs may be planted to stabilise the soil in these ditches.

Coordination between the Forest Department and Railways would be required to carry out this exercise and to maintain dry passageways for wildlife.

Fencing, and light and sound barriers:

Additionally, light and sound barriers are to be provided along the railway track from Lalkuan to chainage 61.00 km. Elephant-proof fencing should be constructed along the entire track, so that only the crossing structures are used for movement by wildlife.

Further, fencing should be continued towards the entire segment from the curvature (chainage 61.00 km) till the end of the forested segment of the railway track. This would also act as a fence to deter elephant movement across the track towards Pantnagar airport and university. Further, in case future expansion (to double track) or upgradation of the Lalkuan to Chhatarpur railway track is planned, it is recommended to realign the segment from outside the forest (Fig. 3.10.6).

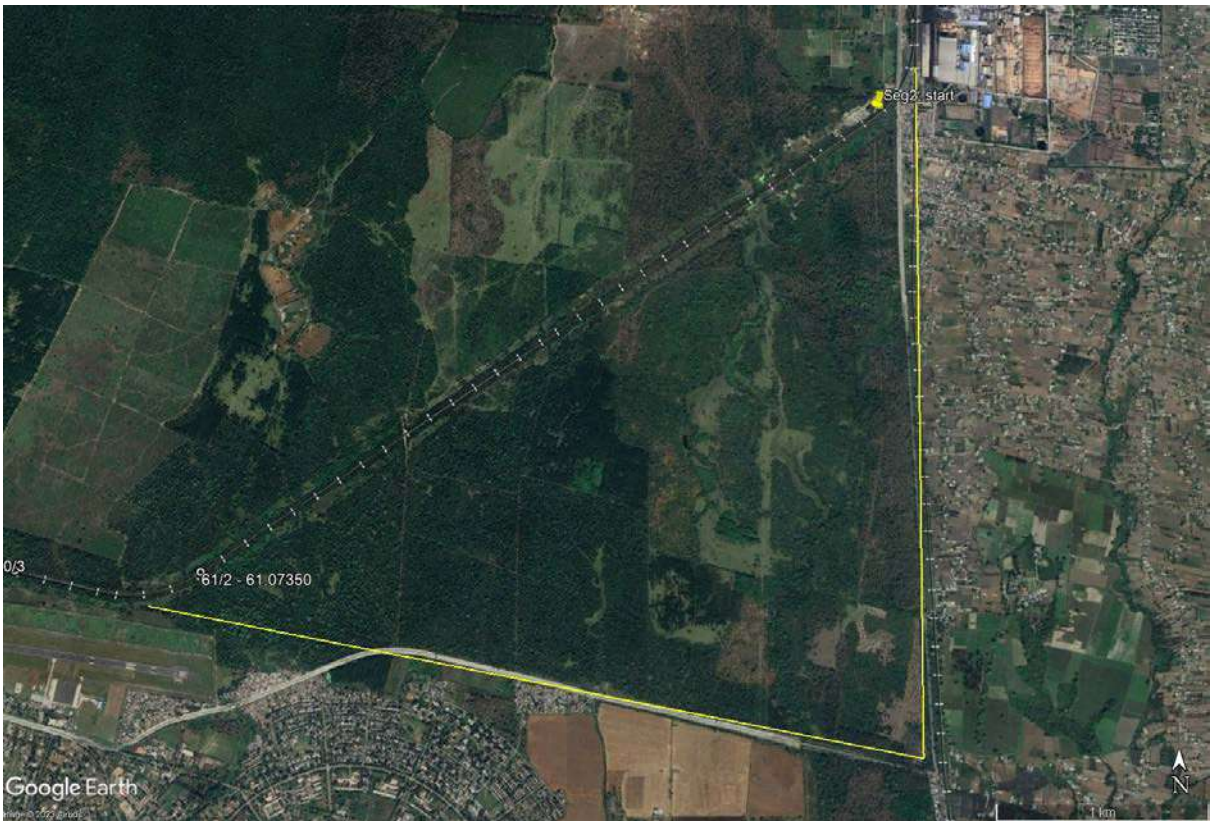


Figure 3.10.6: Suggested realignment of Lalkuan to Chhatarpur railway track in case upgradation or double-tracking is proposed in the future.

Railway crossing near IOCL

A 375 m long overpass is recommended on this stretch to enable elephant movement from the forest on the west towards the small forest patch lying after the IOCL boundary wall, that would connect the East Terai Forest with the forests of the Gola range (Fig. 3.10.7). The overpass may be arch-shaped too. Fencing, preferably made of train track barriers, along the boundaries of the forest on both sides of the overpass should be provided to funnel elephant and wildlife movement towards the overpass. Additional light and sound barriers should be added on both sides of the overpass to encourage wildlife movement on the overpass.

It is further recommended to reclaim the agricultural land lying within the corridor leading to the Gola range (Fig. 3.10.8).

Figure 3.10.7: Suggested location of the wildlife overpass over the NH 109, railway track and IOCL compound (green polygon) and fencing (yellow lines) funnel wildlife movement towards the overpass.

Figure 3.10.8: Indicative area (green polygon) where land reclamation for inclusion in the corridor may be helpful to restore animal movement across the Central Terai Forest Division towards the Gola range via the Gola River.

Mitigation Measures Design Specifications

Ramps

Ramps should be made of compressed soil, and cement wherever feasible. Ramps should be at least 25 m wide at the top, and the slope of the ramps should not be more than 25°. Adequate land may be acquired to ensure that a gradual incline is provided at both ends of the overpass.

The ramps should be maintained regularly to check for erosion and breakage. Ramps should be revegetated using native grass species, and landscaping should be done in such a way so as to make the overpass appear contiguous with the surrounding landscape.

The orientation (direction) of the ramp can be perpendicular or oblique with respect to the railway track considering the land and slope available to flatten the ramp to a navigable slope.

Intrusion Detection System

Use of animal sensors such as Intrusion Detection System (IDS) that is integrated with the communication system of the train that are already in use by several railway divisions (e.g. North East Frontier Railway and East Coast Railway) in elephant landscapes should be explored. The system would provide a long-term viable solution to mitigate incidences of wildlife-train collisions. https://nfr.indianrailways.gov.in/view_detail.jsp?lang=0&dcd=2184&id=0,4,268).

Fencing

The fences to be installed along the railway stretches should be elephant-proof, i.e., resistant to damage by elephants. For this purpose, fences made of used railway tracks (like those used for crash barriers on highways) should be used. The fences should be placed in three vertical rows, and the height of the topmost barrier should be approximately 2-3 m (shoulder height of adult elephant).

Additional Measures to be Implemented

A. Watch towers for patrolling and protection purposes are to be made along the tracks. The locations of the proposed watch towers have been provided below (Table 3.10.4).

B. Regular clearing and pruning of trees and bushes along both railway tracks up to 30 m from the railway track must be undertaken. This would help decrease the possibility of accidents by increasing visibility for both train drivers and wild animals.

C. Two control rooms are to be set up along both the railway tracks – one on the Lalkuan-Gularbhoj segment in Pipalpadav range, and the other on the Lalkuan-Chhatarpur segment at Tanda range. The exact location of the control rooms may be finalised in collaboration with the Forest Department.

D. Additionally, resources such as wireless and communication network, 2-wheelers, manpower, and other equipment for patrolling the railway track and adjacent forest area would be required by the Forest Department. The specifics of these may be finalised in collaboration with the Forest Department.

Table 3.10.4: Locations propose for construction of watch towers along the railway lines.

Range & plot	GPS Location
Tanda Range Gangapurpatiya Plot No. 20	29° 2'57.86" - 79° 29'52.38"
Tanda Range Tanda Plot No. 16	29° 3'5.26"N - 79°30'30.64"E
Pipalpadav Range Pipalpadav Plot No. 17	29° 5'58.75"N - 79°22'8.14"E

List of Uttarakhand Forest Department and Indian Railways officials consulted during the survey

Forest Department

1. Shri Himanshu Bagdi, *DFO, Tarai Central Forest Division, Haldwani*
2. Shri Roopnarayan Gautam, *RFO Tanda*
3. Shri Bhopal Singh Keda, *RFO Rudrapur*

Indian Railways

4. Shri Harish Rartoliya, *Senior DOM, Izzatnagar*
5. Shri Pravesh Kumar, *Senior DST, Izzatnagar*
6. Shri Arun Kumar, *Senior DEN Izzatnagar*
7. Shri Subodh Thapliyal, *ADEN, Kashipur*
8. Shri Vineet Kumar, *Senior DEE, Izzatnagar*

Uttar Pradesh

3.11. UTTAR PRADESH

Introduction

In India, train collisions significantly impact elephants, disrupting their movements and leading to fatal accidents when railway lines intersect elephant habitats. Elephants play a crucial ecological role in maintaining the balance of the ecosystem. Between 2009-2010 and from 2011-2021, 186 elephants were killed on railway tracks (February 2023 | Wildlife Institute of India, an Autonomous Institute of MoEF&CC, Govt. of India (wii.gov.in). Being a long-lived social species, such a loss can heavily impact the entire herd dynamics and an entire generation of the species. To address this issue, the Ministry of Environment, Forest and Climate Change (MoEF&CC) and the Ministry of Railways held a meeting in June 2023 to discuss potential mitigation strategies for railway tracks. The Project Elephant Division of the MoEF&CC and State Forest Departments identified 110 railway segments within elephant reserves and other areas frequented by elephants, aiming to mitigate risks to both humans and elephants.

In Uttar Pradesh, India, a network of railway lines traverses significant forested and protected areas, including the Najibabad Forest Division, Pilibhit Tiger Reserve, Dudhwa Tiger Reserve, and Katarniaghat Wildlife Sanctuary. These regions are recognized for their ecological importance, harboring diverse wildlife, including large mammals such as the Asian elephant (*Elephas maximus*), tiger (*Panthera tigris*), one-horned rhinoceros (*Rhinoceros unicornis*), swamp deer (*Rucervus duvaucelii*), leopards (*Panthera pardus*), and various ungulate species. Apart from these species an endangered species, the hispid hare (*Caprolagus hispidus*) is also found in the grassland areas of the landscape. However, the passage of railway lines through these areas raises concerns over habitat fragmentation, wildlife mortality, and potential human-wildlife conflicts.

The state of Uttar Pradesh is home to several ecologically sensitive landscapes that form part of the Terai Arc Landscape (TAL), a globally important conservation area. This region encompasses dense forests, grasslands, wetlands, and riverine ecosystems, supporting rich biodiversity and serving as a corridor for the movement of wide-ranging species such as elephants and tigers.

The Najibabad Forest Division, located in the foothills of the Shivalik range, provides crucial habitat for elephants and other wildlife. The forests in this division are contiguous with other forested areas, serving as a critical corridor for wildlife movement between the plains and hill regions. Railway lines passing through Najibabad pose significant challenges, particularly for elephants, which require extensive home ranges for foraging and movement.

Pilibhit Tiger Reserve is an important habitat for tigers and elephants. It features a mosaic of grasslands, forests, and wetlands, offering a unique habitat for diverse species. The railway line passing through this reserve not only fragments habitat but also increases the risk of wildlife-vehicle collisions, particularly for wide-ranging species like elephants.

Dudhwa Tiger Reserve, comprising Dudhwa National Park, Kishanpur Wildlife Sanctuary, and Katerniaghat Wildlife Sanctuary, is a biodiversity hotspot in the Terai region. Known for its thriving populations of tigers, elephants, one-horned rhinoceros, swamp deer, and the hispid hare, the reserve is bisected by railway lines, which threaten its ecological integrity. The movement of elephants, in particular, is hindered by these tracks, often leading to fatal encounters. Moreover, the Katarniaghat Wildlife Sanctuary, located near the Indo-Nepal border, is an essential part of the Terai Arc Landscape and supports a range of wildlife species, including elephants. The sanctuary serves as a critical connectivity point between India and Nepal for wildlife movement. Railway infrastructure within this sanctuary exacerbates the challenges of maintaining habitat connectivity and reducing wildlife mortality.

Railway lines in these forested and protected areas have resulted in habitat fragmentation, restricting wildlife movement and access to resources. They also increase the likelihood of wildlife mortality due to collisions with trains, which is a particular concern for large mammals like elephants. These impacts underscore the need for targeted mitigation strategies to reduce the ecological footprint of railway infrastructure and ensure the long-term viability of wildlife populations.

Mitigation measures are vital for minimizing the adverse effects of railway lines on wildlife and their habitats. Strategies such as constructing wildlife overpasses, underpasses, and fencing, combined with the use of warning systems for train operators, have been successful in other parts of India. Implementing such measures in Uttar Pradesh's critical wildlife areas can help reduce wildlife mortality and maintain habitat connectivity.

The railway lines passing through wildlife-rich areas in Uttar Pradesh, including Najibabad Forest Division, Pilibhit Tiger Reserve, Mailani Forest Division, Dudhwa Tiger Reserve, and Katarniaghat Wildlife Sanctuary, represent a significant conservation challenge. These regions are critical for the survival of elephants and other species, and the continued fragmentation of habitats by railway infrastructure threatens the ecological balance. Addressing these issues through comprehensive mitigation measures is crucial for harmonizing development and conservation in these ecologically significant landscapes.

Field Survey

The Wildlife Institute of India and the Forest Department conducted a joint field survey at the identified stretches, accompanied by concerned staff from the Department of Railways, from December 02nd to 08th, 2024 for seven identified railway line stretches (Figure 3.11.1; Table 3.11.1). During the survey, records of wildlife presence and topographic features were documented. Sites with reported elephant activity, movement, or recorded deaths or injuries were identified as vulnerable to collisions between wildlife and trains. Each of these locations was visited, inspected, and thoroughly deliberated upon. After careful consideration and inspection, mitigation measures were discussed at each of these locations. Mitigation measures such as wildlife level crossings found to be more effective considering the flat topography of the Terai Arc landscape were suggested based on the feasibility of construction and criteria like proximity to the nearest forest patch, human settlement, water source, and seasonality of incidents. The entire stretch was surveyed on foot and pull trolley, and findings were confirmed through discussions with forest and railway officials.

* The objective of the field survey was to minimise elephant-train collisions either by constructing underpasses and overpasses wherever possible, by reducing the time taken by elephants to cross the railway tracks by easing movement across the track through construction of ramps and level crossings, and by implementation of technology for early detection and warning systems.

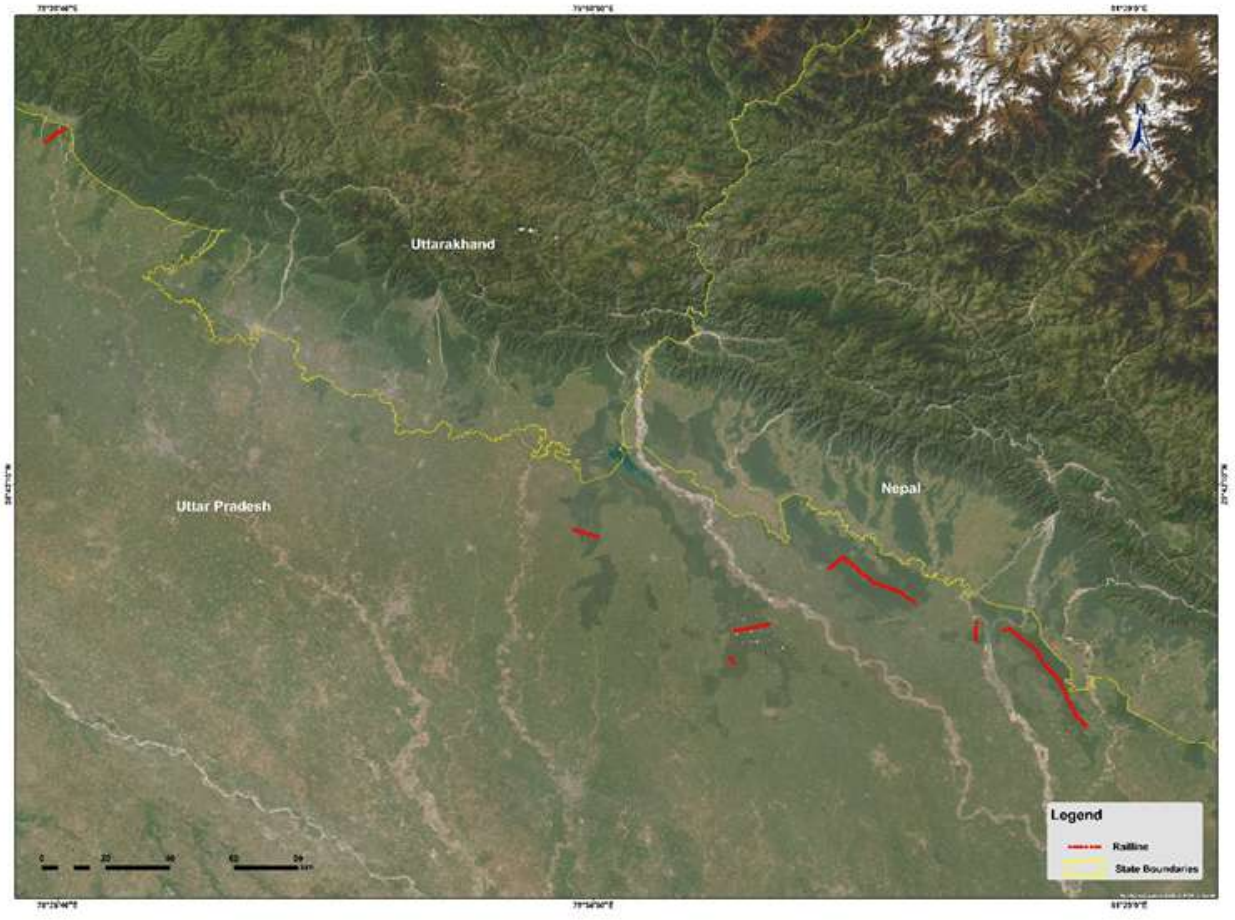


Figure 3.11.1: Surveyed railway lines in the state of Uttar Pradesh railway passing through sensitive elephant habitats as identified by the Project Elephant Division of MoEF&CC and the Wildlife Institute of India

Table 3.11.1: Details of railway stretches passing through sensitive elephant habitats of Uttar Pradesh as identified by the Project Elephant Division of MoEF&CC and the Wildlife Institute of India

S.No.	Latitude Start	Longitude Start	Latitude End	Longitude End	Crossing Width (in km)
1	29.681482	78.441233	29.725375	78.501683	7.68
2	28.591887	79.921699	28.571808	79.995986	7.60
3	28.234934	80.360861	28.209664	80.378987	3.32
4	28.304788	80.373681	28.32703	80.474805	10.27
5	28.47902	80.640288	28.38657	80.885722	30.35
6	28.331572	81.052843	28.274531	81.051794	6.39
7	28.302146	81.128936	28.035254	81.368109	40.78

Site-Specific Findings & Mitigation Measures

Stretches and Mitigation Measures Suggested in Najibabad Forest Division

Table 3.11.2: Stretches and mitigation measures suggested in Najibabad Forest Division from Kotdwar to Najibabad railway station stretch

No	Latitude	Longitude	Chainage	Mitigation Type	Remark
1	29.71806	78.48917		Underpass	Open city waste drainage needs to be covered via pipes and any debris or construction material should be cleared to give open passage for wildlife movement.
2	29.71439	78.48214	19/9	60 m Bridge/ 4 m 90cm height	Existing underpass along the river bed. Elephants and tigers can easily use this structure as an underpass.
3	29.71092	78.47528		300-400 m flat area/ 2-3 ramps could be proposed	High elephant crossing
4	29.71067	78.47475	18/3-4	Underpass	Track height 58 cm/For deer and small-sized wildlife
5	29.69211	78.45261	15/4-5	Ramp and level crossing	Very frequent elephant sightings and crossing
6	29.69044	78.45081		Ramp and level crossing	Ramps near this station as sighting and crossing are frequent.
7	29.68794	78.44808		Ramp and level crossing	Elephant dung found
8	29.68744	78.44758	14/8-9	Ramp and level crossing	Frequent elephant crossing
9	29.81644	78.44294	13/16-17	Ramp and level crossing	Animal movement

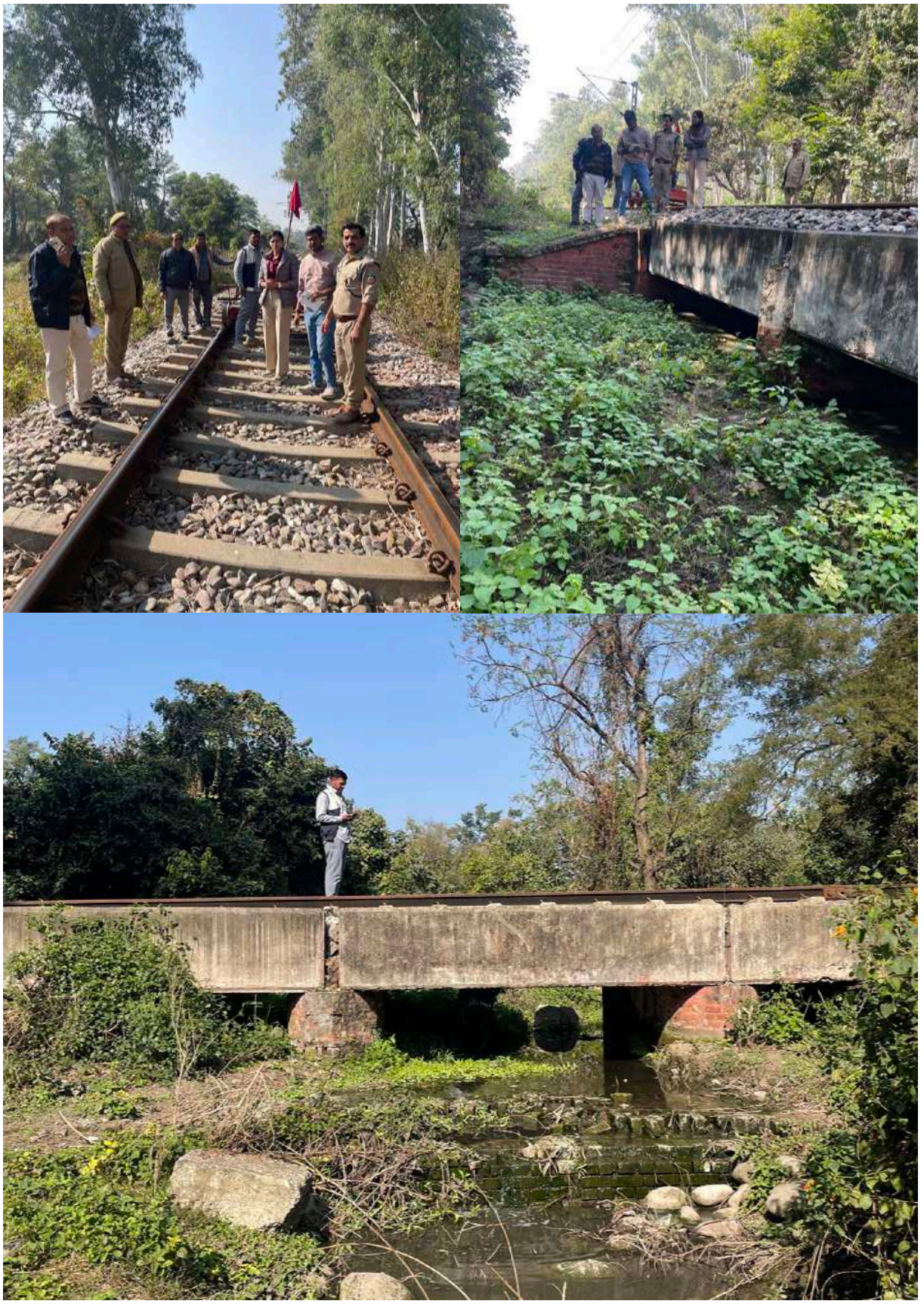


Figure 3.11.2: Field survey with the forest department and railway officials for suggesting mitigation measures in sensitive elephant crossing zones in Najibabad Forest Division from Kotdwar to Najibabad railway station stretch

Table 3.11.3: Stretches and mitigation measures suggested in Mala Range of Pilibhit Tiger Reserve from Sandai to Mala railway station

No	Latitude	Longitude	Chainage	Mitigation Type	Remark
1	28.58663	79.94002		Existing ramp and level crossing	Elephant and Tiger Movement
2	28.58426	79.94887	248/1-2	Existing ramp and level crossing	Elephant and Tiger Movement
3	28.58284	79.95402	247/17	Existing wildlife underpass	Animal Underpass Height-3.8m Width-5m
4	28.58198	79.9513	247/7-8	No mitigation required	Mala River Bridge Height- 10m Width-91.4m
5	28.58102	79.96102		Existing wildlife underpass	Animal Underpass H-3.8m W-5m
6	28.58038	79.96323	246/15-16	Existing ramp and level crossing	Elephant and Tiger Movement
7	28.57893	79.96883		Existing ramp and level crossing	Elephant and Tiger Movement
8	28.5771	79.97511	245/13	Existing wildlife underpass	Animal Underpass Height- 3m Width-10m
9	28.57599	79.97986	245/5	Existing ramp and level crossing	Elephant and Tiger Movement
10	28.57454	79.98453	244/13	Existing wildlife underpass	Animal Underpass Height-3 Width-10m; Water logging issue in underpass and need proper construction to avoid water logging issue.
11	28.57293	79.99121	244/2	Existing ramp and level crossing	Elephant and Tiger Movement
12	28.57293	79.99121	243/12-13	Existing ramp and level crossing	Elephant and Tiger Movement

Figure 3.11.3: Existing underpass for animal crossing in Mala Range of Pilibhit Tiger Reserve from Sandai to Mala railway station

Stretches and Mitigation Measures Suggested from Mailani to Bhira area of Dudhwa Tiger Reserve

Table 3.11.4: Stretches and mitigation measures suggested in the Mailani area of Dudhwa Tiger Reserve from Mailani to Bhira

No	Latitude	Longitude	Chainage	Mitigation Type	Remark
1	28.30297	80.36414		Ramp and level crossing	Frequent elephant crossing
2	28.30297	80.37057	261/5	Ramp and level crossing	Frequent elephant crossing
3	28.30434	80.37117	261/4	Ramp and level crossing	Frequent elephant crossing
4	28.30499	80.30499	261/3	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
5	28.30486	80.37394	261/1-2	Ramp and level crossing	Frequent elephant crossing
6	28.30529	80.37625		The existing bridge needs proper clearance.	Animal crossing; Box Culvert of Height-1.0m Width-1.5m; Existing culvert needs clearance so that animals can easily pass
7	28.30545	80.377		Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
8	28.30608	80.3803	260/5-6	Ramp and level crossing	Frequent elephant crossing
9	28.30698	80.38497	260/1	Ramp and level crossing	Frequent elephant crossing
10	28.30744	80.38718	259/9	Ramp and level crossing	Animal Crossing
11	28.31239	80.41279	257/4	Ramp and level crossing	Animal Crossing
12	28.31301	80.41589	257/1	Ramp and level crossing	Frequent elephant crossing
13	28.3155	80.42911		Ramp and level crossing	This 400m stretch of railway track in the forest that 3.1tigers actively use for movement.
14	28.31898	80.44775	253/9	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
15	28.31968	80.45116		Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
16	28.32156	80.46163	252/5	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
17	28.3241	80.47031	251/6	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.

Stretches and Mitigation Measures Suggested from Mailani to Bankeganj area of Dudhwa Tiger Reserve

For the stretch from Mailani to Bankeganj, a thorough mitigation report has been submitted separately, and the field visit was conducted from 5th – 9th February 2022. After the proposal of the electrification of railway track between Daliganj- Mailani- Kasganj and chainage no. 181,400 to 195,185 and use of the non-forested area of 59.21 ha for other development work related to electrification. Based on this the Mailani to Bankeganj stretch was surveyed, and a mitigating was proposed. The details were attached as Annexure 1 along with the report.

Stretches and Mitigation Measures Suggested in Dudhwa Tiger Reserve

Table 3.11.5: Stretches and mitigation measures suggested in Dudhwa Tiger Reserve from Palia Kalan to Belraya Railway Station

No	Latitude	Longitude	Chainage	Mitigation Type	Remark
1	28.48258	80.64849	226/9	Ramp and level crossing	Frequent elephant and tiger crossing
2	28.48661	80.64849	226/3	Ramp and level crossing	Frequent elephant and tiger crossing
3	28.50181	80.66523	224/0	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
4	28.50879	80.68734	221/4-5	Ramp and level crossing	Frequent tiger and other wildlife crossing
5	28.50879	80.68734	221/1-2	Ramp and level crossing	Frequent tiger and other wildlife crossing
6	28.50728	80.6891	220/8	Ramp and level crossing	Frequent tiger and other wildlife crossing
7	28.50537	80.69135	220/5-6	Ramp and level crossing	Frequent tiger and other wildlife crossing
8	28.50293	80.69425	220/1-2	Ramp and level crossing	Frequent elephant and tiger crossing
9	28.49913	8069869	219/6	Ramp and level crossing	Frequent elephant and tiger crossing
10	28.49533	80.70316	218/8-9	Ramp and level crossing	Frequent tiger and other wildlife crossing
11	28.49292	80.70598	218/5-6	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
12	28.48684	80.71309	217/6-7	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
13	28.48252	80.7182	216/9-217/0	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
14	28.47897	80.72236	216/ 3-4	Ramp and level crossing	Frequent elephant and tiger crossing

15	28.47545	80.72643	215/9	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
16	28.4694	80.73353	214/8	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
17	28.46243	80.74167	213/7-8	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
18	28.4567	80.74818	212/7-8	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
19	28.44235	80.76523	210/5	Ramp and level crossing	Frequent elephant and tiger crossing
20	28.43746	80.77847	209/1	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
21	28.43324	80.79015	207/7	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
22	28.42969	80.79989	206/8-9	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
23	28.42588	80.81033	205/8	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
24	28.42355	80.81686	205/0	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
25	28.42184	80.82167	204/5-6	Ramp and level crossing	Frequent elephant and tiger crossing
26	28.41888	80.8296	203/6-7	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
27	28.41665	80.83562	203/0	Existing bridge	Need proper clearance/ Ensure the inside and outside of the culvert are free of obstacles like dense vegetation or debris.
28	28.41339	80.84408	202/8-9	Existing Ramp Structure/Ramp modification required	Provide sufficient width for large animals to cross comfortably. A minimum width of 4–6 meters is recommended.
29	28.40698	80.85112	201/1	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
30	28.40541	80.85347	200/9	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
31	28.4006	80.85889	200/1	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
32	28.39132	80.87411	198/3	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
33	28.3877	80.88256	197/4	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.

Figure 3.11.4: Field survey with the forest department and railway officials for suggesting mitigation measures in sensitive elephant crossing zones Mailani to Bhira area of Dudhwa Tiger Reserve

Table 3.11.6: Stretches and mitigation measures suggested in Katarniaghat Wildlife Sanctuary from Khairatiya Bandh Road to Mihinpurwa Railway Station

No	Latitude	Longitude	Chainage	Mitigation Type	Remark
1	28.29882	81.05349	174/5	Ramp and level crossing	Frequent elephant and tiger crossing
2	28.32093	81.05527	177/3	Ramp and level crossing	Frequent elephant and tiger crossing
3	28.28242	81.05227	172/1	Ramp and level crossing	Frequent elephant and tiger crossing
4	28.30685	81.13297	160/9	Existing Structure/ Ramp modification required	Existing concrete is present that needs to widen (4-6 m) for easy passage of elephants and tigers.
5	28.29037	81.11845		Ramp and level crossing	Frequent elephant and tiger crossing
6	28.28268	81.11165		Ramp and level crossing	Frequent elephant and tiger crossing
7	28.29362	81.12124		Ramp and level crossing	Frequent elephant and tiger crossing
8	28.28671	81.11517		Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
9	28.28955	81.11767		Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
10	28.29449	81.12202		Ramp and level crossing	Frequent elephant and tiger crossing
11	28.28541	81.11401		Ramp and level crossing	Frequent elephant and tiger crossing
12	28.29102	81.11914		Ramp and level crossing	Frequent elephant and tiger crossing
13	28.29736	81.12462		Ramp and level crossing	Frequent elephant and tiger crossing
14	28.28195	81.11101		Ramp and level crossing	Frequent elephant and tiger crossing
15	28.28277	81.18285	154/2-3	Ramp and level crossing	Frequent elephant and tiger crossing
16	28.27965	81.18285	153/6	Ramp and level crossing	Frequent elephant and tiger crossing
17	28.2756	81.1916	152/8-9	Ramp and level crossing	Frequent elephant and tiger crossing
18	28.26623	81.20309	151/6-7	Ramp and level crossing	Frequent elephant and tiger crossing
19	28.26101	81.20946	150/6-7	Existing Structure/ Ramp modification required	Existing concrete is present that needs to widen (4-6 m) for easy passage of elephants and tigers
20	28.25104	81.2215	149/1	Ramp and level crossing	Frequent elephant and tiger crossing
21	28.23648	81.23038	147/2	Ramp and level crossing	Frequent elephant and tiger crossing

22	28.21101	81.24332	144/2	Ramp and level crossing	Frequent elephant and tiger crossing. The existing structure is blocked by barriers of railways that need to be removed and widened (4-6 m) for easy passage of elephants and other wildlife.
23	28.19063	81.26402		Ramp and level crossing	Frequent elephant and tiger crossing. The existing structure is blocked by barriers of railways that need to be removed and widened (4-6 m) for easy passage of elephants and other wildlife.
24	28.16794	81.28506		Existing Structure/ Ramp modification required	Existing concrete is present that needs to widen (4-6 m) for easy passage of elephants and tigers.
25	28.15802	81.28986	136/6	Ramp and level crossing	Frequent tiger crossing
26	28.14385	81.29671	134/4	Ramp and level crossing	Frequent leopard and tiger crossing
27	28.13766	81.29971	134/1	Ramp and level crossing	Frequent leopard and tiger crossing
28	28.10742	81.31433	130/5	Ramp and level crossing	Frequent leopard and tiger crossing
29	28.09987	81.31792	129/6	Ramp and level crossing	Frequent leopard and tiger crossing
30	28.09842	81.31863	129/4	Ramp and level crossing	Frequent leopard and tiger crossing
31	28.09687	81.31937	129/2	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
32	28.0823	81.32645	127/4	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
33	28.08031	81.3274	127/2	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
34	28.07195	81.33144	126/2	Ramp and level crossing	Frequent leopard and tiger crossing
35	28.06854	81.33324	125/8	Ramp and level crossing	Frequent leopard and tiger crossing
36	28.06138	81.33987	124/7	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.
37	28.05574	81.3452	123/9	Ramp and level crossing	Animal Crossing/ Ensure the crossing is 3-4 m, enough to accommodate multiple animals at once.

Figure 3.11.5: Field survey with the forest department and railway officials for suggesting mitigation measures in sensitive elephant crossing zones in Dudhwa Tiger Reserve and Katarniaghat Wildlife Sanctuary

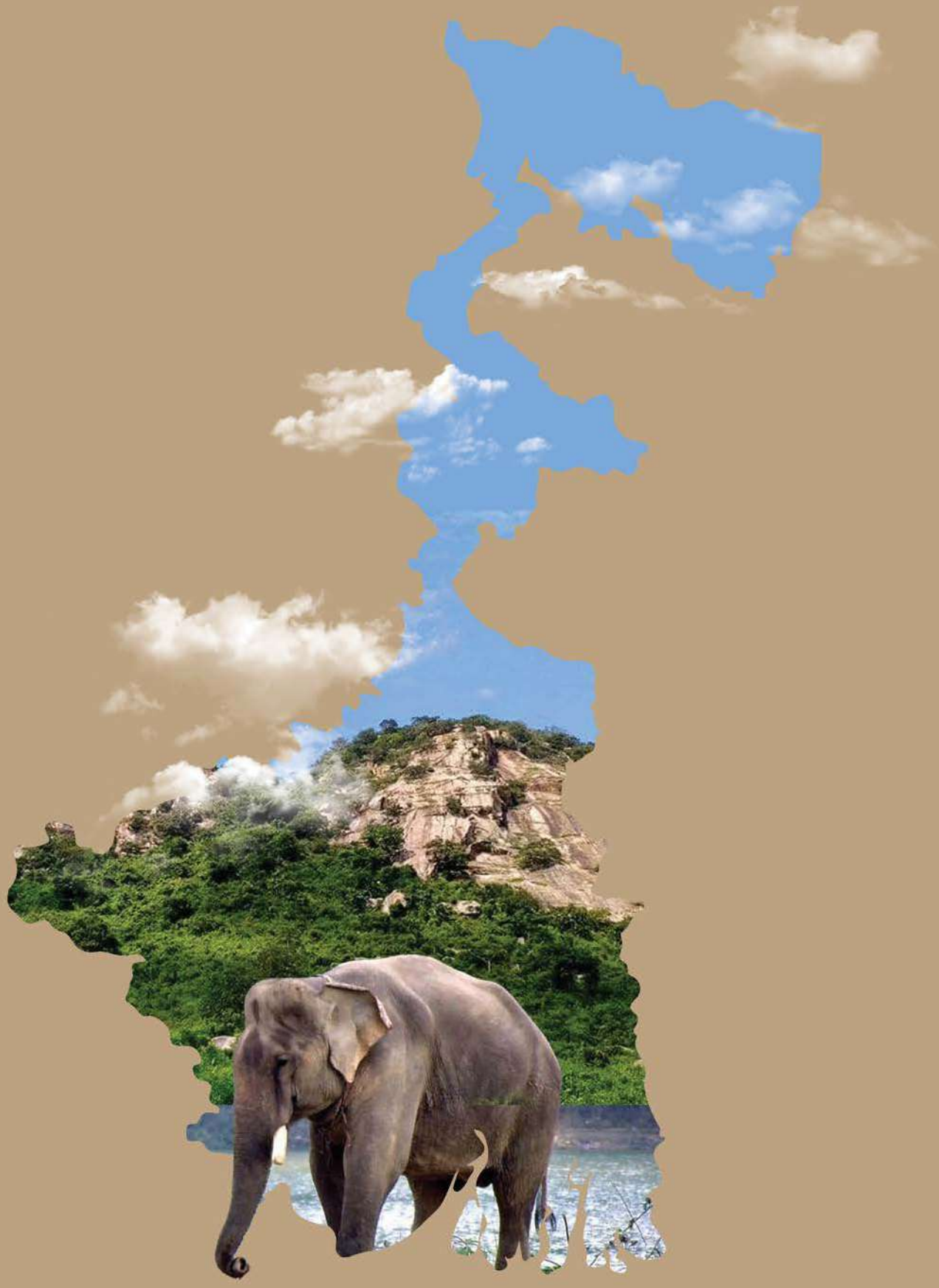
List of Uttar Pradesh Forest Department and Indian Railways officials consulted during the survey

Forest Department Staff

H.V. Girisha, *IFS, Chief Conservator of Forest, Uttar Pradesh Forest Department*
Vandana Phogat, *IFS, Divisional Forest Officer, Najibabad Forest Division*
Manish Singh, *IFS, Divisional Forest Officer, Pilibhit Tiger Reserve*
Sanjay Biswal, *IFS, Divisional Forest Officer, South Kheri Forest Division*
Saureesh Sahai, *IFS, Divisional Forest Officer, North Kheri Forest Division*
Shiva Shankar, *IFS, Divisional Forest Officer, Katarniaghat Wildlife Sanctuary*
Dharmendra Dwivedi, *Wildlife Warden, Dudhwa Tiger Reserve*
Robin Kumar Singh, *Range Forest Officer, Mala Range, Pilibhit Tiger Reserve*
Sajid Hasan, *Range Forest Officer, Mailani Range (Buffer), Dudhwa Tiger Reserve*
Ramesh Chandra Maurya, *Range Forest Officer, Mailani Range, Dudhwa Tiger Reserve*
Ritesh Patel, *Range Forest Officer, Dudhwa Range, Dudhwa Tiger Reserve*
Ashish Goud, *Range Forest Officer, Katarniaghat Range, Katarniaghat Wildlife Sanctuary*
Surendra Kumar Srivastava, *Range Forest Officer, Nishagarah Range, Katarniaghat Wildlife Sanctuary*
Radhe Shyam, *Range Forest Officer, Dharmapuram Range, Katarniaghat Wildlife Sanctuary*
Ratnesh Yadav, *Range Forest Officer, Murtiha Range, Katarniaghat Wildlife Sanctuary*
Ram Bharat Yadav, *Forester, Mala Range, Pilibhit Tiger Reserve*
Leela Dhar, *Forester, Mailani Range, Dudhwa Tiger Reserve*
Avnish Kumar, *Forester, Murtiha Range, Katarniaghat Wildlife Sanctuary*
Anand Lal, *Forester, Kakraha Range, Katarniaghat Wildlife Sanctuary*
Kamla Pal, *Forester, Motipur Range, Katarniaghat Wildlife Sanctuary*
Deepak Kumar, *Beat Guard, Mala Range, Pilibhit Tiger Reserve*
Brijesh Shukla, *Beat Guard, Mailani Range (Buffer), Dudhwa Tiger Reserve*
Shakir Ali, *Beat Guard, Mailani Range (Buffer), Dudhwa Tiger Reserve*
Anurag Kumar, *Beat Guard, Dudhwa Range, Dudhwa Tiger Reserve*

Indian Railways

Raj Kumar Singh, *Divisional Railway Manager, Moradabad, Northern Railways*
Rekha Yadav, *Divisional Railway Manager, Izzatnagar, Northern Eastern Railways*
Aditya Kumar, *Divisional Railway Manager, Lucknow, Northern Eastern Railways*
Mansi Mittal, *Senior Divisional Engineer, Lucknow, Northern Eastern Railways*
Dharmesh Kumar, *Senior Section Engineer, PW, Najibabad, Northern Railways*
Nitin Kumar, *Senior Section Engineer, PW, Palia Kalan, Northern Eastern Railways*
Surendra Kumar, *Assistant Divisional Engineer, Pilibhit*
Nehru Lal Meena, *Senior Section Engineer, Work, Pilibhit*
Netrapal Singh, *Senior Section Engineer, PW-I, Pilibhit*
Somveer Singh, *Trolleyman, Najibabad*
Anil Kumar, *Trollyeman, Najibabad*
Siya Ram, *Trollyeman, Najibabad*
Muneesh Kumar, *Trolleyman, Pilibhit*
Omprakash, *Trolleyman, Pilibhit*
Rakesh Kumar Kashyap, *Trolleyman, Pilibhit*
Suranjan Pal, *Trolleyman, Pilibhit*
Mahendra Pal, *Trolleyman, Pilibhit*
Mahendra, *Trolleyman, Pilibhit*
Vishal, *Trolleyman, Pilibhit*
Tejram, *Trolleyman, Pilibhit*



West Bengal

3.12. WEST BENGAL

Introduction

Northern West Bengal is the westernmost extent of the north-eastern population of Asian elephants, with some elephant herds found in southern West Bengal. The state is home to close to 500 elephants in north, and 194 in south Bengal. In north West Bengal, elephants reside in largely fragmented habitats, and move on an east-west axis along the forest areas on northern West Bengal, Nepal, Bhutan and Assam through a series of corridors distributed across the region. There is also some movement on the north-south axis from the hill slopes of southern Bhutan to the Terai region of northern West Bengal. In south West Bengal, the range expansion of elephants has been noticed from the Dalma Wildlife Sanctuary in the adjoining state of Jharkhand. The elephants have now become residents in these regions and their presence in south West Bengal has led to incidences of human-elephant conflict. In a report that recently mapped elephant corridors in the country, West Bengal emerged as the leader with 26 elephant corridors occurring in the state. Of these, 15 corridors are in the north, and the remaining in south Bengal. Of all threats to elephant conservation in the state, railway-related mortality of elephants has emerged as one of the leading.

Based on a meeting on 17th August 2022, the Hon'ble Minister of Railways, Government of India, instructed the Ministry of Environment, Forest and Climate Change (MoEF&CC) to provide at least 100 locations of existing railway segments across sensitive elephant and tiger landscapes in the country for construction of permanent mitigation measures in view of wildlife-train collisions (Proceedings under Ministry of Railways letter No. 2022/CE-IV/Elephant Pass dated 30th September 2022). Consequently, details of sensitive stretches for constructing permanent and temporary mitigation measures were provided by the MoEF&CC (vide OM F.No. 12-1/2019-PE (Part-I), dated 30th August 2022).

Field Survey

Based on this information, joint surveys of the critical stretches of the railway lines passing through the elephant habitats in West Bengal for suggesting mitigation measures were conducted during 26-31st December, 2023 jointly by the officers/officials of Project Elephant, MoEF&CC, Ministry of Railways and West Bengal Forest Department.

The survey was conducted in the critical stretches of Alipurduar, Jalpaiguri and Darjeeling Districts of North Bengal region and in Jhargram and Paschim Medinipur Districts of South Bengal region with an objective to identify specific elephant crossing zones to suggest site-specific mitigation measures based on the location and the extent of these crossing zones to mitigate train- elephant collisions.

As part of the joint survey, meetings were held between the officers/officials of MoEF&CC and West Bengal Forest Department along with the Sr. Divisional Manager and other senior officials of the North East Frontier Railway (NEFR) to deliberate on different structural mitigation measures in the identified critical elephant zones intersected by railway tracks such as level crossings, creation of ramps, wildlife underpasses, wildlife overpasses, efficacy of Intrusion Detection System (IDS) using Distributed Acoustic Sensing (DAS) System.

The joint team visited the critical stretches of railway tracks which were identified by the Forest Department for implementing the mitigation measures.

* The objective of the field survey was to minimise elephant-train collisions either by constructing underpasses and overpasses wherever possible, by reducing the time taken by elephants to cross the railway tracks by easing movement across the track through construction of ramps and level crossings, and by implementation of technology for early detection and warning systems.

Site-Specific Findings & Mitigation Measures

North Bengal Region: Alipurduar, Jalpaiguri & Darjeeling Districts (I)

Date of survey: 27th December, 2023

Locations:

- Damanpur railway crossing near railway Over Head Equipment (OHE) Mast no. 158 to 162/3.
- Near Modhugajtola railway crossing.
- Rajabhatkhawa-Dima Bridge near OHE Mast no. 153/9 to157/1 (around 5 Km).
- Dabrigate-Madhu Tea Garden, near railway OHE Mast no. 140/2 to 140/8.
- Near Torsa River Bridge near railway OHE Mast no. 128/1 to 130/8.
- Railway crossing near railway OHE Mast no. 122.

Observations:

- The elephants cross the railway tracks to move between the different habitats in Buxa Tiger Reserve and adjoining buffer areas in Alipurduar.
- As per the discussion held with the local forest department staffs, it was informed that the elephant movement is being affected (reduced) due to coarse ballast used on the railway tracks.
- There is dense vegetation on both the sides of the railway tracks at various locations which needs to be cleared at least 30 meters from the railway track.
- The present speed restriction implemented by NEFR during 17:00-05:00 hrs is 30 Km/hr and 50 Km/hr from 05:00 to17:00 hrs.
- The elevation in track height near Torsa River Bridge near railway OHE Mast no. 128/1 to 130/8 and the additional layer of ballast on the railway tracks makes it difficult for elephants to make quick decisions and move away from a railway track in the event of an approaching train.

Recommendations:

- Construction of level crossings for elephants by using suitable material (soil/ cement/ rubberised pads) and with smooth gradient to help in easy movement across the railway tracks.
- The night speed restriction timings for all the trains may be imposed from 17:00-08:00 hrs.
- Installation of more signage and boards about animal crossings near the railway tracks.
- Regular pruning of vegetation (30 meters) on both sides of the track for clear visibility to the loco pilots and the elephants. Annually 4 pruning are proposed as dense vegetation comes up very fast in the region owing to high rainfall and needs frequent pruning.

  The proposed schedule of pruning are as follows:

  a. First pruning- May-June

  b. Second pruning -August

  c. Third pruning - October

  d. Fourth pruning – December-January
- Frequent honking by rail engine when passing through critical stretches, especially when elephant or wildlife movement near the railway tracks has been reported or observed.

- A new ramp to be constructed near OHE Mast no. 130/8 as per WII's guidelines by using suitable material (soil/cement/river stones etc.) that flattens towards the top of the track, and allow for smooth and quick movement for the elephants.
- The existing ramps should be levelled with the surrounding terrain by smoothening out the slope.
- Proposed to construct an underpass between OHE Mast no. 130/1 to 129/9.
- The existing ramps around the track should be widened to allow easy movement to the herd of elephants.
- Proposed full time (24 x 7) speed restriction of 30 Km/hr during day and night in the stretch between OHE Mast no. 162/3 to 153/9 in Buxa Tiger Reserve and OHE Mast no. 128/1 to 130/8 in Jaldapara National Park. Since, speed restriction is already imposed in part section in Buxa Tiger Reserve, extending speed restriction to full stretch for distance within Buxa Tiger Reserve and Jaldapara will not significantly delay and hamper the operations as both the stretches are of small distances. This will reduce rail Elephant collision significantly in the stretch.
- The Divisional Forest Officer of Kalimpong Forest Division suggested some measures which are as follows:
  a. Breaking of ramp on both sides between Pillars no. 29/2 to 33/0 to ensure movement of elephants smoothly on both sides.
  b. The ditches on both sides need to be filled up.
  c. Increase the speed restriction hours from 17.00 hrs to 8.00 hrs between pillars no. 29/2 to 33/0.
  d. Two watch towers near railway track Pillar no. 32/3 and 31/1 may be constructed and manned by railways to monitor the movement of elephants.
- Imposition of speed restrictions of 30 Km/hr, through out day and night in all the above mentioned critical stretches for all the unscheduled trains (including the goods trains) passing through these stretches as unscheduled trains have contributed significantly to accidents in this route.
- Regular cleaning of food waste and other garbage thrown by railway passengers onto forest stretches passing through Wildlife Sanctuaries and National Park by Railway Management.

Figure 3.12.1: Field survey conducted by Project Elephant (MoEF&CC) representatives in collaboration with Indian Railways and State Forest Department officials in sensitive railway line stretches in Alipurduar, Jalpaiguri and Darjeeling districts, West Bengal.

Date of survey: 28th December, 2023

Locations:

- Binaguri- Near army cantonment and Binaguri railway station- railway Pillar no. 100/3 to 100/9 at Alipurduar.
- OHE Mast nos. 101/8; OHE Mast no. 96 to 97; OHE Mast no. 96/4 to 96/7; OHE Mast no. 89/0 to 89/1; OHE Mast no. 87/7 to 87/8; OHE Mast no. 87/7 to 87/4; OHE Mast no. 86/1 to 86/2; OHE Mast no. 83/7 to 86/2; Near Chapramari railway crossing. OHE Mast no. 72/3; OHE Mast no. 72/4 to 72/5; OHE Mast no. 68/7 to 68/7 at Alipurduar.
- Mahananda Wildlife Sanctuary at railway OHE Mast no. 21/6 to 21/5 at Darjeeling District.

Observations:

- The elephants cross the railway track to move between the two habitats.
- As per the discussions with the local forest department staffs, it was informed that the elephant movement is being effected (reduced) due to uneven ramps and coarse ballast used on the railway tracks.
- Sometimes the elephant enter in the Binaguri cantonment area.
- Presently the speed restrictions are between 18:00 to 05:00 hrs.
- Elephant movements are being detected/recorded through IDS system at OHE Mast no. 83/7 to 86/2 and appropriately communicated to the concern people.
- Elephants cross the railway track to move between the two habitats in Chapramari. The elephant movement is reduced due to no visibility in the curves, coarse ballast used on railway tracks and cliff on the other side.

Proposed Recommendations:

- A ramp to be constructed at railway OHE Mast no. 21/6 to 21/5 and OHE Mast no. 100/3 to 100/9 as per WII's guidelines by using suitable material (soil/cement/ river stones) that flattens towards the top of the track, and allow for smooth and quick movement for the elephants. The ramp should be levelled with the surrounding terrain by smoothening out the slope.
- The night speed restriction timings for all the trains may be imposed from 17:00-08:00 hrs.
- Proposed an underpass as per WII's guidelines in between stretch of OHE Mast no. 87/7 to 87/4.
- Installation of more signage and boards about animal crossings near the railway tracks.
- Regular pruning of vegetation (30 meters) on both sides of the track for clear visibility to the loco pilots and the elephants. Annually 4 pruning are proposed as dense vegetation comes up very fast in the region owing to high rainfall and needs frequent pruning.

  The proposed schedule of pruning is as follows:
  a. First pruning- May-June
  b. Second pruning –August
  c. Third pruning – October
  d. Fourth pruning - Dec-January
- Frequent honking by train engine when passing through critical stretches especially when elephant or wildlife movement near the railway tracks has been reported or observed.
- Need efficacy testing of the heavier vehicles such as Tractor trolleys, trucks etc. near the tracks where IDS is being used.

- Proposed an overpass as per WII guidelines in between OHE Mast no. 72/4 to 72/5.
- Proposed 24 hours speed restriction of 30 Km/hr in between OHE Mast no. 72/3 to 68/7.
- Imposition of speed restrictions of 30 Km/hr, throughout day and night in all the above mentioned critical stretches for all the unscheduled trains (including the goods trains) passing through these stretches as unscheduled trains have contributed significantly to accidents in this route.
- Regular cleaning of food waste and other garbage thrown by railway passengers onto forest stretches passing through Wildlife Sanctuaries and National Parks by Railway Management.

Figure 3.12.2: Field survey conducted by Project Elephant (MoEF&CC) representatives in collaboration with Indian Railways and State Forest Department officials in sensitive railway line stretches in Alipurduar, Jalpaiguri and Darjeeling districts, West Bengal.

North South Bengal Region: Jhargram and Paschim Medinipur Districts (I)

Date of survey: 29th December, 2023

Locations:

- Guptmani- Kumari-Dogeriya near railway Overhead Equipment Number (OHE) Mast no. 132/6. GPS Location: 87°10'12" E, 22° 20'54" N
- Banstala near railway OHE Mast no. 144/6. GPS Location: 87°04'34" E, 22° 24'52" N

Observations:

- The railway tracks is frequently used by all categories of trains including Goods and Rajdhani trains as it is the main line which connects Kolkata with Mumbai.
- It was informed by the Railway officers that there is a planning of laying a new railway track and proposal of running the high speed trains at around 160 km/hr.
- It was also informed by the railway officers that fencing would be done around the tracks to avoid the cattle movement on tracks.

- Due to straight railway tracks and clear visibility, very few incidents of train-elephant hits have been recorded in the area. However, it is envisaged that since, elephants frequently cross the railway tracks to move between the districts of Pachim Medinipur and Jhargram, the cattle fencing for high speed trains would become a major hurdle in their movement in future.
- A fencing of around 1.2 Km was erected by railways near OHE Mast no. 144 and the same was damaged by the elephants at 3-4 locations to cross the railway tracks. The terrain was also high at one side near OHE Mast no. 144 which is obstructing the smooth movement and crossing of tracks by elephant.
- There is a narrow stretch of approximately 30 to 50 meters which is generally used by Elephant for crossing the railway track. There are total 6 such crossing points under the jurisdiction of Jhargram Forest Division. Point no. 1 and 2 are covered in field inspection conducted on 29.12.2023. Remaining four crossing points are covered in the field inspection conducted on 30.12.2023.

Recommendations:

- Construction of either Overpass or Underpass as per WII guidelines in the mentioned crossing point will allow the safe movement of Elephants across the railway track.
- A ramp to be constructed near OHE Mast no. 144 as per WII's guidelines by using suitable material (soil/cement/river stones) that flattens towards the top of the track, and allow for smooth and quick movement of the elephants. The ramp should be levelled with the surrounding terrain by smoothening out the slope.
- Soft rubber pads as per WII guidelines should be laid down over the stones lying on railway track to make the crossing of railway track easier for elephants.
- Installation of more signages and boards about animal crossings throughout the elephant passing stretches.
- Regular pruning of bushes (upto 30 meters) on both sides of the track for clear visibility to the drivers and the elephants.
- Frequent honking by the train engine when passing through critical stretches especially when elephant or wildlife movement near the railway tracks has been reported or observed.
- No barriers should be erected along the crossing points by Railways without the completion of overpass/underpass at such crossing locations.

South Bengal Region: Jhargram and Paschim Medinipur Districts (II)

Date of survey: 30th December, 2023

Locations:

- Jhargeriya near OHE Mast no. 159/18A/1. GPS Location: 86°56'31" E, 22° 28'27" N.
- Lalbana near OHE Mast no. 146/21. GPS Location: 87°03'21" E, 22° 25'30" N.
- Banstala near OHE Mast no. 145/11. GPS Location: 87°04'01" E, 22° 25'09" N.
- Rasua-Lalgeriya near OHE Mast no. 142/5 to 142/11. GPS Location: 87°05'33" E, 22°24'21" N.
- OHE Mast no. 172/24 to 172/26 (Ledagmara) Amlagora Range in Paschim Medinipur District. OHE Mast no. 184/1 to 184/5 (Nachanjam) Garhbeta Range.

Observations:

- The railway tracks is frequently used by all categories of trains including Goods and Rajdhani trains as it is the main line which connects Kolkata with Mumbai.
- It was informed by the railway officers that there is a planning of laying a new railway track and proposal of running the high speed trains at around 160 Km/hr in the railway line passing through Jhargram Forest Division.
- It was also informed by the railway officers that fencing would be done around the tracks to avoid the cattle movement on tracks.
- Due to straight railway tracks and clear visibility, very few incidents of train-elephant hits have been recorded in the area.
- However, it is envisaged that since, elephants frequently cross the railway tracks to move between the districts of Paschim Medinipur and Jhargram, the cattle fencing for high speed trains would become a major hurdle in their movement in future.
- Coordination between Railways and Forest Department personnel is playing a significant role in safe crossing of elephants across the railway track.

Recommendations:

- At most of the identified critical stretches, the railway tracks are on the ground level.
- Hence, as a short term measure, construction of ramps at these stretches would help the elephants in crossing the railway tracks more quickly and smoothly. However, considering the future scenarios, the possibility of construction of permanent mitigation measures such as elevated railway tracks, overpasses and underpasses for elephants and other wildlife must be explored.
- The efficacy of electric barrier with energised steel padding and fencing on the railway track must be explored.
- The feasibility of finalizing the mitigation measures such as construction of elevated railway tracks, overpasses and underpasses must be carried out by the Ministry of Railways with the support of State Forest Department.
- The ramps must be constructed at critical stretches as per WII's guidelines by using suitable material (soil/cement/river stones etc.) that flattens towards the top of the track, and allow for smooth and quick movement for the elephants.
- Land leveling is needed about 500 Meters on both sides at OHE Mast no. 172/9 and 172/8.
- Regular pruning of bushes (30 meters) on both sides of the track for clear visibility of the drivers and the elephants.
- Installation of more signages and boards about animal crossings throughout the elephant passing stretches.

Figure 3.12.3: Field survey conducted by Project Elephant (MoEF&CC) representatives in collaboration with Indian Railways and State Forest Department officials in sensitive railway line stretches in Jhargram and Paschim Medinipur districts, West Bengal.

List of West Bengal Forest Department and Indian Railways officials consulted during the survey

State Forest department:

1. Shri Ujjal Ghosh, *APCCF, North Bengal*
2. Shri Apurba Sen, *Field Director, Buxa Tiger Reserve*
3. Shri Bhaskar J V., *Conservator of Forest, Wildlife North*
4. Shri Sandeep Berwal, *Divisional Forest Officer, Jaldapara Wildlife Division*
5. Shri A.K. Kushwaha, *Northeast Frontier Railway*
6. Shri Rajesh Kumar, *IFS, APCCF (Wildlife) West Bengal.*
7. Shri Ashok Pratap Singh, *IFS, CCF Western Circle, West Bengal.*
8. Shri Pankaj Suryawanshi, *IFS, DFO Jhargram Division.*
9. Shri Manish Kumar Yadav, *WBFS, DFO Kharagpur Division.*
10. Shri Balaram Panja, *WBFS, ADFO Jhargram Division.*
11. Shri Partha Mukherjee, *WBFS, ADFO Jhargram Division.*

Indian Railways:

12. Shri Narendra Singh, *Senior Engineer, Northeast Frontier Railway*
13. Shri A.K. Kushwaha, *Northeast Frontier Railway*
14. Shri Anil Kumar Gupta, *DEN West, Kharagpur Railway Division.*

Madhya Pradesh

B. Tiger Range States

3.13. MADHYA PRADESH

Introduction

The habitat of elephants in central India includes Madhya Pradesh but very rarely elephants used to enter the area. There are roughly 3128 elephants living in the habitat, which covers more than 21,000 sq.km. across the states of Odisha, Jharkhand, Chhattisgarh, and southern West Bengal. Nowadays, the elephants are regularly entering into Madhya Pradesh creating a state of panic for both the residents and the Forest department. Residents and forest officials in Madhya Pradesh are especially concerned when elephants wander into the eastern districts of Singrauli and Anuppur from the neighboring northern Chhattisgarh due to abundant standing crops, water, and bamboo. Chhattisgarh has a small elephant population that originally migrated from Jharkhand and Odisha in the 1980s and 90s. Illegal felling, encroachment, industrialization, and mining have all contributed to the degradation of these two states' forested areas during the recent past. The degradation of habitat quality has forced elephants to engage in long-distance disoriented movements, using smaller forest patches to move to larger forest regions. This is one of the key causes of elephant migration into Chhattisgarh extending into Madhya Pradesh. This landscape supports a sizeable elephant population that has increasingly come into conflict with humans because of habitat fragmentation. Linear infrastructure such as roads and railway lines has further fragmented elephant movement pathways, leading to elephant mortalities especially through collisions with trains. Elephant and wildlife movement within the landscape is hampered because of the aforementioned railway lines, leading to several wildlife mortalities.

Based on a meeting on 17th August 2022, the Hon'ble Minister of Railways, Government of India, instructed the Ministry of Environment, Forest and Climate Change (MoEF&CC) to provide at least 100 locations of existing railway segments across sensitive elephant and tiger landscapes in the country for construction of permanent mitigation measures in view of wildlife-train collisions (Proceedings under Ministry of Railways letter No. 2022/CE- IV/ Elephant Pass dated 30th September 2022). Consequently, details of sensitive stretches for constructing permanent and temporary mitigation measures were provided by the MoEF&CC (vide OM F.No. 12-1/2019-PE (Part-I), dated 30th August 2022).

Further, meeting to review the progress of the survey and finalization of the mitigation measures to mitigate wildlife- rail collisions across identified sensitive stretches on railway lines passing through sensitive elephant habitats across India was held on 22nd November, 2023 under the Chairmanship of Shri Ramesh Kumar Pandey Inspector General of Forests, Project Tiger and Elephant and Director, Project Elephant, MoEF&CC through virtual mode (OM F.No. 1-32/2017-PE). Based on the discussion during the meeting, a team from Elephant Cell conducted the survey in Madhya Pradesh between 16th and 26th February, 2024.

Field Survey

The survey was conducted in the critical stretches in Sidhi and Umaria districts of Madhya Pradesh and with an objective to identify specific elephant crossing zones to suggest site-specific mitigation measures based on the location and the extent of these crossing zones to mitigate train elephant collisions.

The area surveyed comprised of the Dubri, Sehdol and Bihari range of Sanjay- Dubri Tiger Reserve (Figure 3.13.1 & 3.13.2), and a railway segment near Bandhavgarh Tiger Reserve (Figure 3.13.3). There have been regular incidents of wild animal mortality on the Katni- Singhrauli Railway track
recently and in the past.

Prior to the survey, the survey team was provided with locations points along railway lines that were considered priority wildlife crossing zones by the Forest Department. Thereafter, the team walked along the railway lines with Railway officials and Forest Department personnel, and collected data on animal signs on and near the railway tracks, information of previous railway line crossings and use of trails near railway lines by elephants and other wildlife. The GPS coordinates of these sites were noted down. Records of previous wild animal mortality and wildlife sightings on the railway track from the Department and Railways were also collected.

The aforementioned information was collated in the GIS-domain to determine priority high-use railway segments. Mitigation measures were then suggested based on width of crossing zone, track height of the railway line, presence of drainage structure and human infrastructure (potential for conflict) in that segment.

* The objective of the field survey was to minimise elephant-train collisions either by constructing underpasses and overpasses wherever possible, by reducing the time taken by elephants to cross the railway tracks by easing movement across the track through construction of ramps and level crossings, and by implementation of technology for early detection and warning systems.

Figure 3.13.1: Railway segment inspected inside Sanjay- Dubri Tiger Reserve during the field visit.

Figure 3.13.2: Railway segment inspected inside Sanjay- Dubri Tiger Reserve during the field visit.

Figure 3.13.3: Railway segment inspected near Bandhavgarh Tiger Reserve during the field visit

Site-Specific Findings & Mitigation Measures

Katni- Singhrauli railway line railway line passing through Sanjay- Dubri Tiger Reserve

The railway track along this segment is relatively flat with regard to the surrounding terrain. Based on the field survey, discussions and data obtained from the Forest Department and Railways, majority of this segment was found suitable for wildlife movement, since most of the crossing sites have similar characteristics in terms of track height and adjacent vegetation. Multiple sites of elephants crossing the track were reported by the railways (Table 3.13.1), FD ground staff and observed on field. Wildlife mortality sites were also reported and duly GPS marked (Table 3.13.2).

However, same issue had already been discussed and worked upon with the railway department and the process of removing the railway line completely from within the Sanjay-Dubri Tiger Reserve has already started.

Table 3.13.1: Major crossing points and underpasses for wildlife on the Katni- Singhrauli railway line

S. No.	Latitude	Longitude	Animal Movement details
1	23.302	81.244	Narrow underpass, tiger crossing line
2	23.36	81.137	Major animal crossing used by leopards
3	23.301	81.246	Tiger crossing
4	23.308	81.236	Non-functional underpass, functional track at mouth of underpass
5	23.31	81.234	Underpass used by tigers
6	23.364	81.144	Naon- functional underpass
7	23.318	81.226	New underpass under construction
8	23.365	81.15	New underpass under construction
9	23.364	81.154	Underpass seldom used by wildlife for crossing
10	24.002	81.213	Underpass used by elephants
11	23.997	81.227	Old elephant crossing point on railway track which is now blocked due to construction on new railway track
12	23.994	81.234	New crossing point of elephants
13	23.993	81.236	Underpass besides the new crossing point
14	23.994	81.508	Tiger crossing
15	23.993	81.519	Tiger crossing
16	23.991	81.545	Underpass used by tigers
17	23.991	81.572	Underpass
18	23.991	81.576	Underpass used by tigers
19	23.992	81.585	Underpass used by tigers
20	23.992	81.589	Underpass
21	23.014	81.638	Tiger crossing
22	23.009	81.638	Underpass used by tigers

Table 3.13.2: Mortality of different animal species on the Katni- Singhrauli railway line passing through forests of the Sanjay- Dubri Tiger Reserve as reported by the railways and forest department.

S.no.	Month	Year	Latitude	Longitude	Details of incidence
1	March	2022	24.005N	81.629	Death of tigress while crossing
2	February	2020	23.308	81.236	Leopard death
3	December	2023	23.308	81.236	Wild pig death
4	December	2023	23.363	81.16	Leopard cup death while chasing chital
5		2021	23.994	81.512	Chital death
6	April	2015	23.993	81.521	Wild pig death
7	January	2021	23.992	81.526	Chital death
8	April	2021	23.992	81.534	Chital death
9	December	2014	23.991	81.553	Wild pig death
10		2014	23.991	81.557	Hyena death
11		2014	23.991	81.56	Sloth bear death
12	October	2019	23.992	81.589	Sloth bear death
13	December	2022	23.991	81.593	Sloth bear death
14		2010	23.997	81.616	2 Hyenas death
15		2010	23.997	81.616	Nilgai death
16		2021	23.997	81.616	Hyena death
17	March	2022	24.005	81.629	Tigress death

Burhar to Shahdol

The railway track along this segment is approximately 30 km in length and the stretch is being renovated with additional lines being developed near the old lines. The railway track along this segment is relatively flat with regard to the surrounding terrain. Based on the field survey, discussions and data obtained from the Forest Department, majority of segment was found suitable for wildlife movement, since most of the crossing sites have similar characteristics in terms of track height and adjacent vegetation. Consequently, given the importance of almost entire stretch for wildlife movement, and the relatively flat track, we recommend construction of ramps with level crossings that would help wild animals, especially elephants, quickly cross the railway track.

These stretches are indicative of the aggregations of signs and sightings of elephants and other wildlife as observed and reported, and ramps may be constructed on other suitable sites along this track as well. One ramp with rubberised level crossing is to be constructed every 250 m within these segments wherever the maximum slope gradient can be maintained (Fig. 3.13.4). The width of the crossing should be 25 m (at the top).

Ramps should be made of compressed soil, and cement wherever feasible. Ramps should be at least 25 m wide at the top, and the slope of the ramps should not be more than 25°. Adequate land may be acquired to ensure that a gradual incline is provided at both ends of the overpass. The ramps should be maintained regularly to check for erosion and breakage. Ramps should be revegetated using native grass species, and landscaping should be done in such a way so as to make the overpass appear contiguous with the surrounding landscape. The orientation (direction) of the ramp can be perpendicular or oblique with respect to the railway track considering the land and slope available to flatten the ramp to a navigable slope.

Though underpasses are being constructed keeping in mind the suggested width and height (30 m and 6 m), water logging is to be avoided under these passages by avoiding excavation of ground for achieving minimum height of underpass.

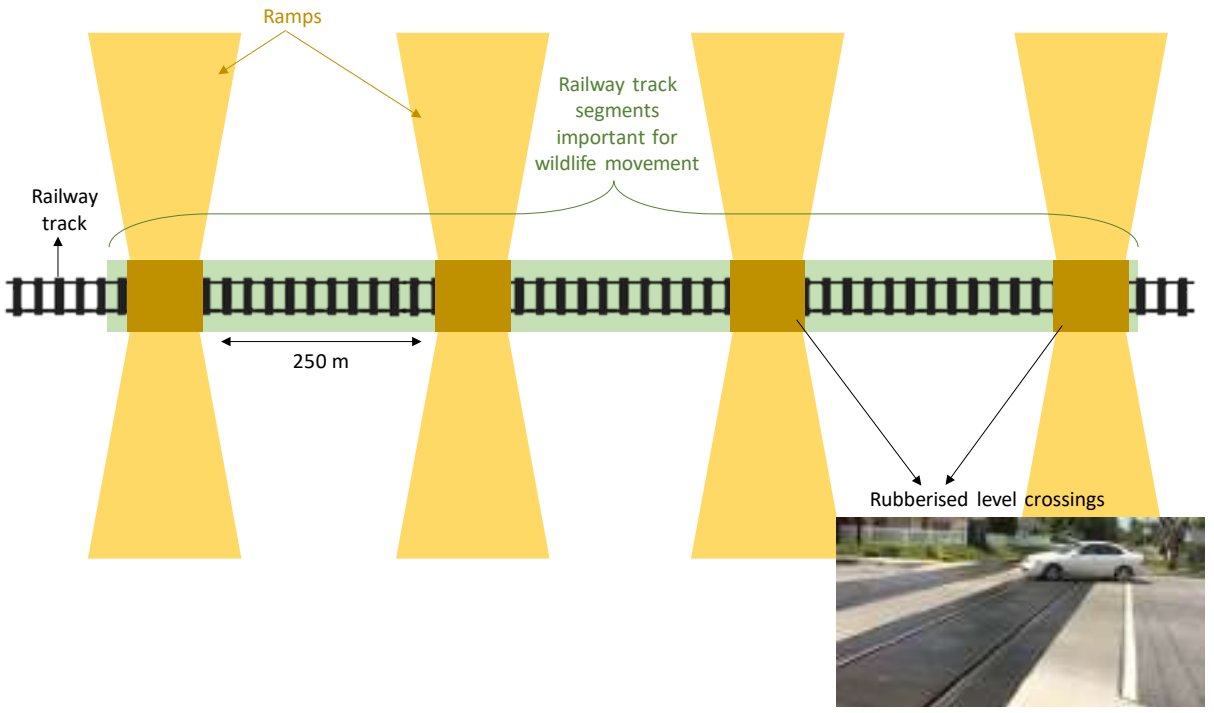


Figure 3.13.4: Diagrammatic representation of layout of ramps, spaced 250 m apart, on elephant movement stretches

Table 3.13.3: Approximate start and end GPS coordinates of stretches of the railway line segment considered sensitive with respect to presence and movement of elephant and other wildlife.

S. No.	Start GPS	End GPS	Length (m)
1	23° 21' 48.26"N 81° 9' 37.66"E	23°21'41.18"N 81°10'0.50"E	700
2	23° 17' 59.65"N 81° 15' 3.48"E	23°17'30.42"N 81°15'38.69"E	1300

Figure 3.13.5: Underpasses being constructed on the Railway segment from Burhar to Shahdol Railway segment

Figure 3.13.6: Construction of new railway line on Shahdol Railway segment

List of Madhya Pradesh Forest Department and Indian Railways officials consulted during the survey

State Forest Department:

1. Shri. Hari Om, *Deputy Director, Sanjay Tiger Reserve*
2. Shri. L. L. Uikey, *Field Director, Bandhavgarh Tiger Reserve*
3. Shri. Prakash Verma, *Deputy Director, Bandhavgarh Tiger Reserve*
4. Shri. Fateh Singh Ninama, *SDO, Bandhavgarh Tiger Reserve*
5. Shri. Mahaveer, *Range Officer, Sanjay Tiger Reserve*
6. Shri. Sheel Sindhu Srivastava, *Range Officer, Bandhavgarh Tiger Reserve*
7. Shri. Mahendra Singh, *Forest Patroller, Bandhavgarh Tiger Reserve*

Indian Railways:

8. Shri Ashutosh Chourasia, *Sr. DEN/ Coordination/ Jhansi*

Maharashtra

3.14. MAHARASHTRA

Introduction

The Central Indian Landscape comprises of a network of protected areas, including 25 tiger reserves, and has one of the highest potentials for long-term tiger and wildlife conservation. The landscape, along with the Eastern Ghats, is spread over the semi-arid zone of Rajasthan, and the Central Indian plateau in the states of Maharashtra, Madhya Pradesh, Chhattisgarh, Jharkhand.

The landscape is currently home to the largest population of tigers (*Panthera tigris*) (1439) in India (Qureshi *et al.*, 2022), and good populations of co-predators like leopard (*Panthera pardus*), Asiatic wild dog or dhole (*Cuon alpinus*), and sloth bear (*Melursus ursinus*), and a diversity of ungulate, smaller carnivore and small mammal diversity.

The state of Maharashtra holds about 30% (444) of the central Indian tiger population within and outside its six tiger reserves, national parks and wildlife sanctuaries. Notably, a large proportion of tigers and other wildlife exist outside this network of protected areas. The state also has a rich network of corridors connecting different tiger habitats, that comprise of a variety of land uses (Habib *et al.*, 2021).

Maharashtra state has a vast railway network, connecting major economic centres like Mumbai, Nagpur, Chandrapur and Pune. Like in most parts of the country, railway tracks here pass through prime tiger habitats and corridors, leading to wildlife mortality.

Furthermore, multiple representations by the State Forest Department of Maharashtra have been made to the Railways (Appendix 5), flagging the issue of wildlife mortality on railway tracks passing through prime wildlife habitats in the state, and urging the Railways to take measures to mitigate the problem.

In view of the cases of wildlife mortality on railway tracks, based on a meeting on 17th August 2022, the Hon'ble Minister of Railways, Government of India, instructed the Ministry of Environment, Forests and Climate Change (MoEF&CC) to provide at least 100 locations of existing railway segments across sensitive elephant and tiger landscapes in the country for construction of permanent mitigation measures in view of wildlife-train collisions (Proceedings under Ministry of Railways letter No. 2022/CE-IV/Elephant Pass dated 30th September 2022). Consequently, details of sensitive stretches for constructing permanent and temporary mitigation measures were provided by the MoEF&CC (vide OM F.No. 12-1/2019-PE (Part-I), dated 30th August 2022).

A total of 12 priority railway segments passing through tiger habitats and intersecting tiger corridors (Habib *et al.*, 2021) were identified (Fig. 3.14.1), and 9 were surveyed in Maharashtra. It was found that the Chiplun-Karad railway line did not exist presently. Further, the Adilabad-Nanded railway line and Akola-Purna railway line could not be surveyed because of logistical constraints.

Field Survey

A representative of the Wildlife Institute of India, local representatives of the Forest Department and Indian Railways conducted a joint field survey of the identified priority railway stretches in the state of Maharashtra (Fig. 3.14.1 and Table 3.14.1) during 4th – 19th December 2024. During the survey, the survey team inspected the railway track, particularly sites vulnerable to wildlife mortality and areas where frequent wildlife crossings were observed, based on information from the Forest Department. We relied on information such as previous incidences of tiger/wild animal mortality, wildlife movement trails intersecting railway tracks, GPS coordinates and chainages (km) of these sites from concerned officials. We then suggested

mitigation measures based on multiple factors including width of crossing zone, track height of the railway line, presence of drainage structure and human infrastructure (and consequent potential for conflict) in that segment.

* The objective of the field survey was to minimise wildlife-train collisions either by constructing underpasses and overpasses wherever possible, by reducing the time taken by wildlife to cross the railway tracks by easing movement across the track through construction of ramps and level crossings, and by implementation of technology for early detection and warning systems.

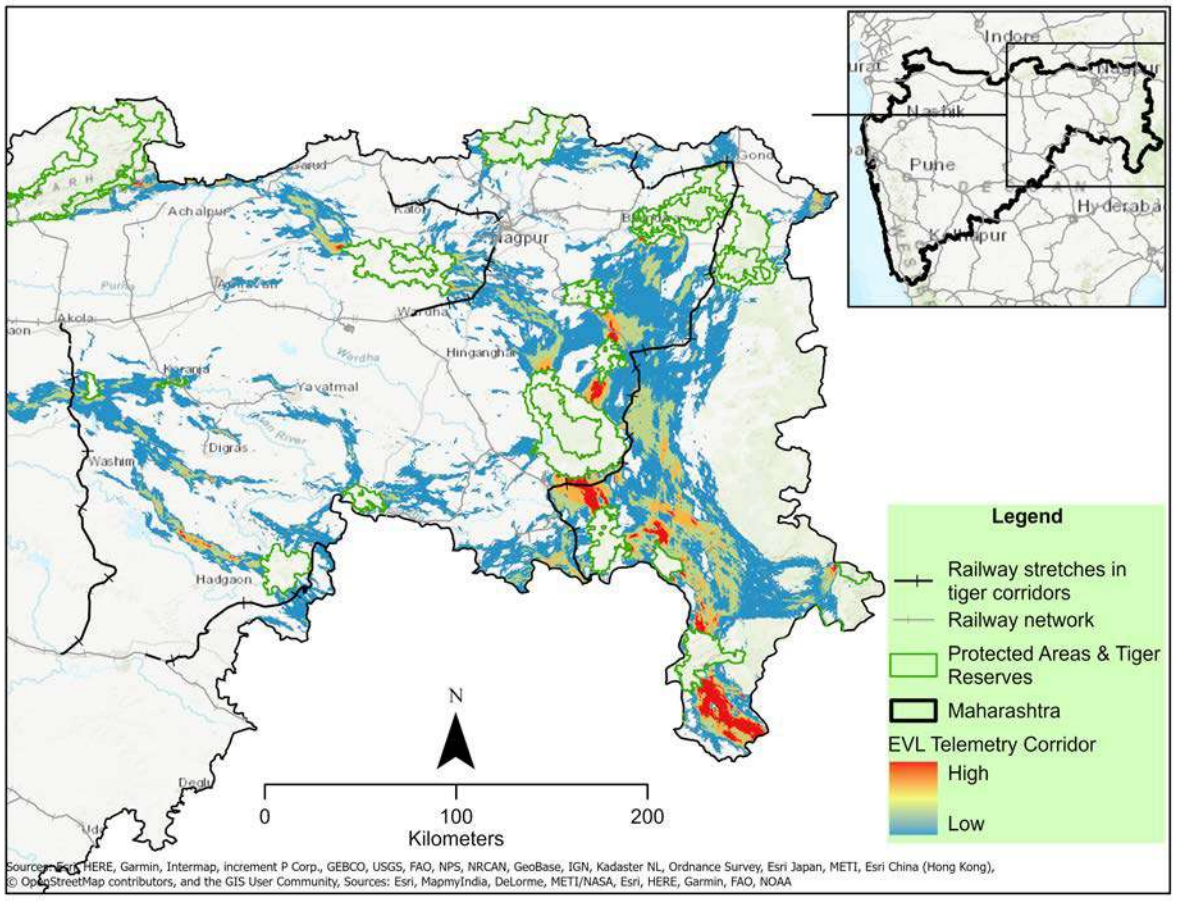


Figure 3.14.1: Identified priority railway line stretches for field survey in the state of Maharashtra, with respect to protected areas, tiger reserves and tiger corridors.

Table 3.14.1: Details of railway stretches surveyed during 4th – 19th December 2024 in Maharashtra.

S. No.	Railway stretch	Railway Division	Forest Division	Date of visit
1.	Nagpur-Katol	Nagpur (Central Railway)	Nagpur	4th December
2.	Nagpur-Butibori-Wardha	Nagpur (Central Railway)	Nagpur, Wardha	4th and 19th December
3.	Dewhadi-Gobarwahi	Nagpur (South East Central Railway)	Bhandara	5th December
4.	Dewhadi-Gondia	Nagpur (South East Central Railway)	Gondia	5th – 6th December
5.	Gondia-Wadsa	Nagpur (South East Central Railway)	Bhandara, Gondia and Wadsa	6th – 7th December
6.	Wadsa-Nagbhid-Mul	Nagpur (South East Central Railway)	Brahmapuri	8th December
7.	Mul-Chandrapur	Nagpur (Central Railway)	Chandrapur	9th – 10th December
8.	Chandrapur-Rajura-Kagaznagar	Secunderabad (Central Railway)	Central Chanda	10th December

Site-Specific Findings & Mitigation Measures

Nagpur-Katol Railway Line in Nagpur Forest Division

Survey date: 04th December 2024

The Nagpur-Katol railway line is triple-tracked and passes through the Bor-Pench tiger corridor (Habib *et al.*, 2021). The landscape consists of mostly agricultural fields (Fig. 3.14.3). The train traffic on the segment is currently low, and no wildlife mortality has been reported from the stretch yet.

Observations:

- The land use types immediately adjacent to the highway and railway line is agriculture.
- Movement of leopard, nilgai and wild pig has been reported across the railway track, with occasional tiger movement. No wildlife mortality has been reported from the tracks yet.
- Crop raiding by wildlife such as nilgai and wild pig has been reported from the adjacent areas.
- The triple railway tracks are relatively flat as compared to the adjacent ground (Fig. 3.14.4).
- Two prominent crossing zones were reported (Fig. 3.14.5):
    a. Location marked as Crossing 1,
    b. Chainage 1006/500-1007/200

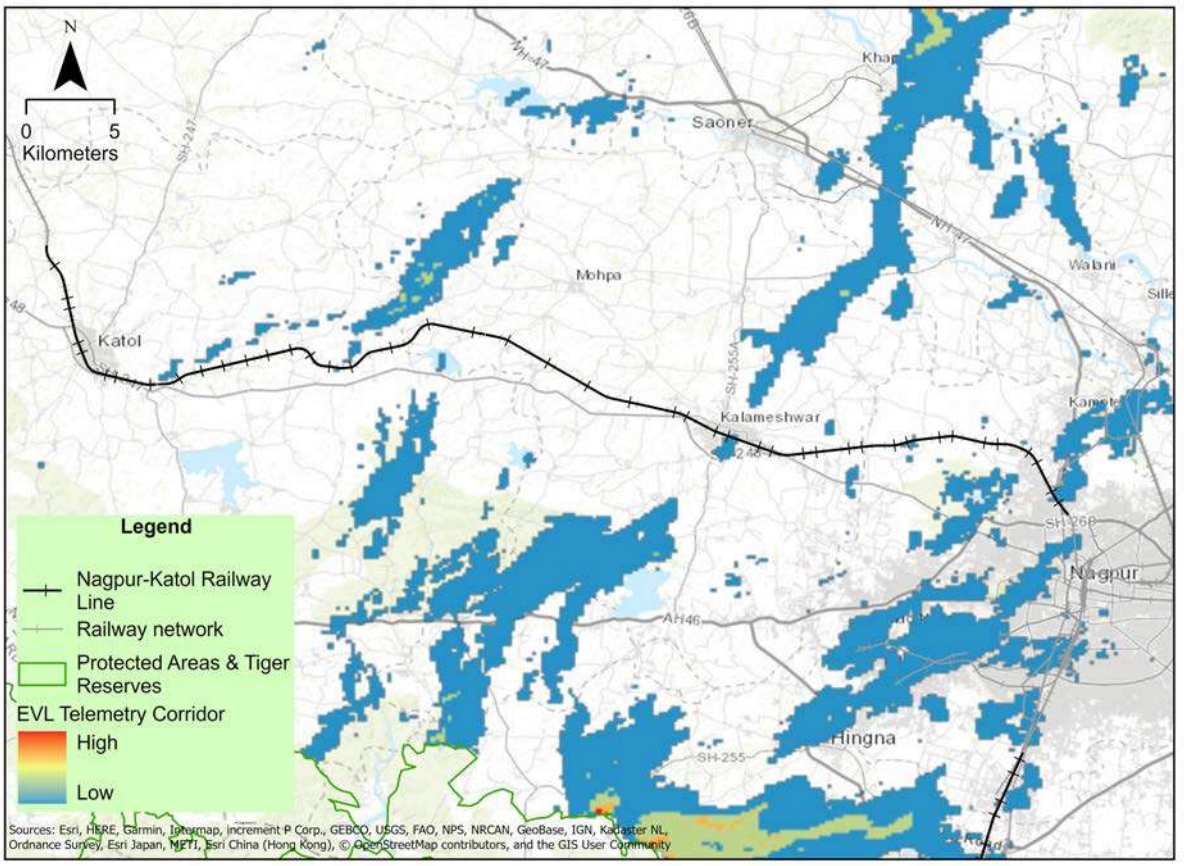


Figure 3.14.3: The Nagpur-Katol railway line passing through the Pench-Bor tiger corridor in Maharashtra.

Figure 3.14.4: The Nagpur-Katol triple railway track in the Nagpur Forest Division.

Figure 3.14.5: Identified wildlife crossing zones and mitigation measures on the Nagpur-Katol railway line intersecting the Pench-Bor tiger corridor in Nagpur Forest Division, Maharashtra.

Recommendations:

- Two level crossings are suggested for the railway line at Chainage 1006/500 – 1007/200, considering the flat terrain of the track bed. The width of the ramps should be at least 30 m, and that of level crossing should be at least 50 m.
- The bridge at Crossing 1 is of adequate height and width. Two additional spans of 5 m each are recommended on either side of the bridge.

The details of the mitigation measures recommended are given in Table 3.14.2 and Fig. 3.14.5.

Table 3.14.2: Details of mitigation measures recommended on the Nagpur-Katol railway line in Nagpur Forest Division, Maharashtra.

S. No.	Chainage/GPS location	Remarks
1.	1006/500 – 1007/200	Two level crossings and ramps on the 700 m long segment is recommended, with DAS system.
2.	21° 16.011'N 78° 42.240'E	Bridge expansion is recommended with two 5 m spans on either side of the bridge.

Nagpur-Butibori-Wardha railway line in Nagpur and Wardha Forest Divisions

Survey date: 04th December 2024

The Nagpur-Butibori-Wardha railway line has four tracks, and intersects the tiger corridor connecting Bor Tiger Reserve with Umred-Karhandla and Brahmapuri Wildlife Sanctuaries, and Tadoba Andhari Tiger Reserve (Fig. 3.14.6).

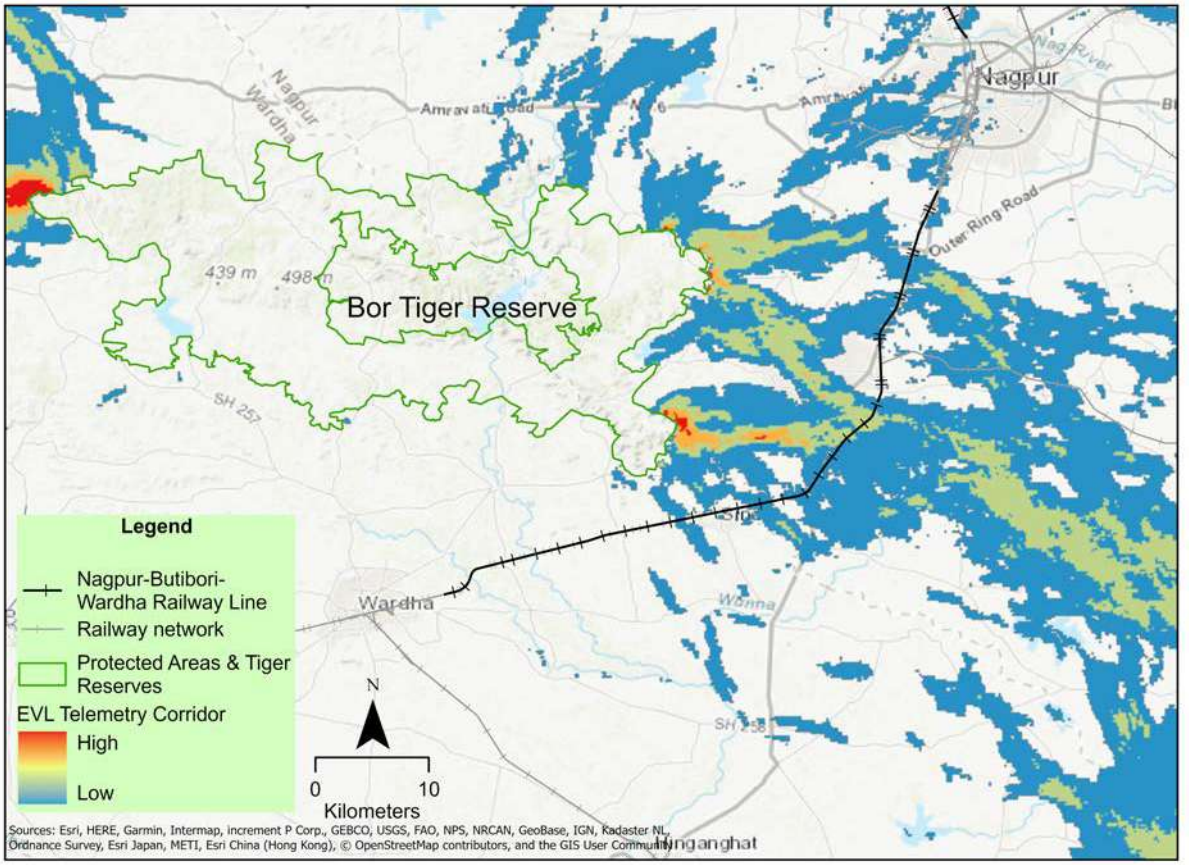


Figure 3.14.6: The Nagpur-Butibori-Wardha railway line passing through the Bor-Umred-Karhandla-Brahmapuri tiger corridors in the Nagpur and Wardha Forest Divisions, Maharashtra.

Observations:

Nagpur-Butibori railway stretch

- Rare-infrequent wildlife movement has been reported on the stretch, although a leopard roadkill was found on NH 44 running parallel to the railway line near Jamtha (Fig. 3.14.7).
- The railway track embankment on this stretch is 4-4.5 m high.

- The railway line is a 4-track line, with concrete fences being constructed on both sides by the railways (Fig. 3.14.8).
- There is rapid land use conversion on the land on both sides of the railway track; plots of land have been marked and construction is anticipated to be carried out in the near future.

Butibori-Wardha railway stretch

- The land on either side of the railway track in this segment is predominantly agricultural, with few industrial compounds, interspersed with some connected open forest and scrub patches.
- Multiple wild animal crossing points were found on this stretch (Fig. 3.14.9).
- Wildlife mortality on the railway track, particularly in the corridor stretches, has been recorded in the past, including chital, nilgai and wild pig (Fig. 3.14.10).

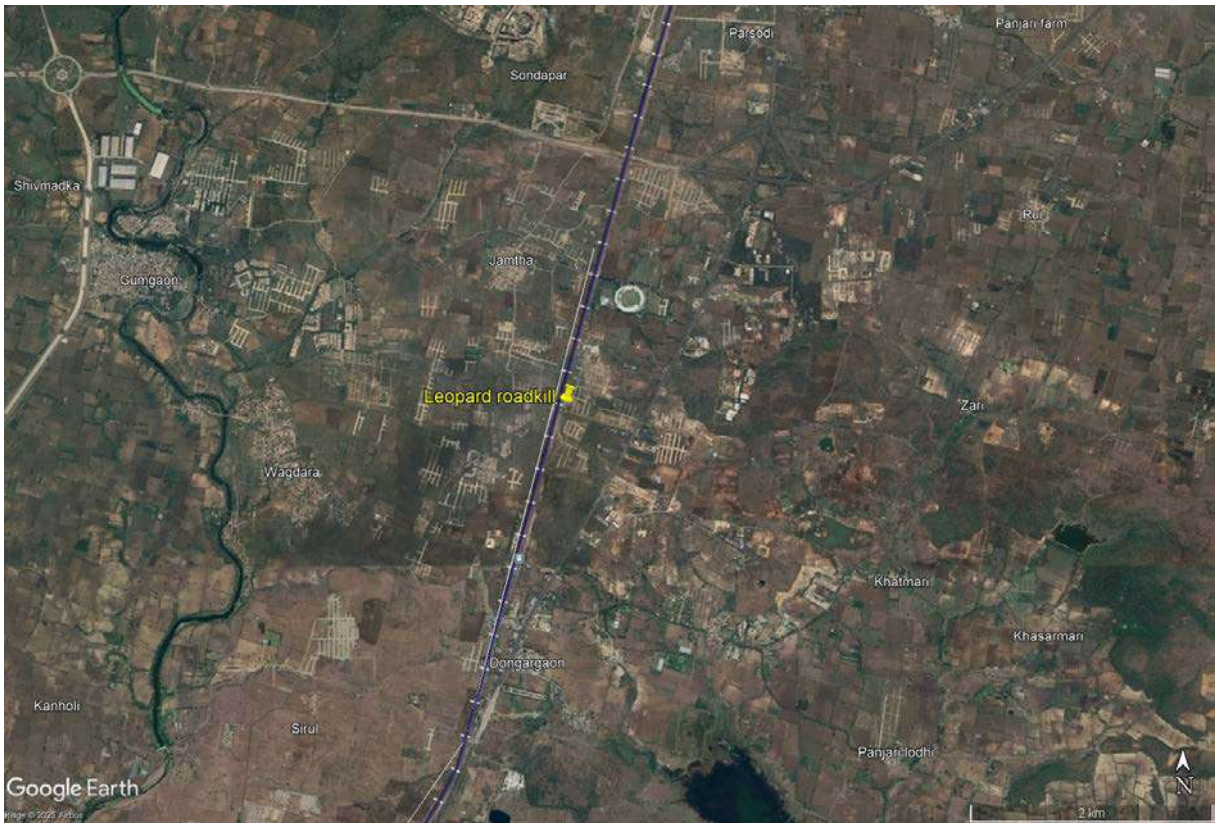


Figure 3.14.7: Location of the Nagpur-Butibori railway stretch showing parallel location of leopard roadkill on NH 44, and the land use pattern around the railway line, Nagpur Forest Division, Maharashtra.

Figure 3.14.8: Concrete fencing under construction on the Nagpur-Butibori railway track segment.

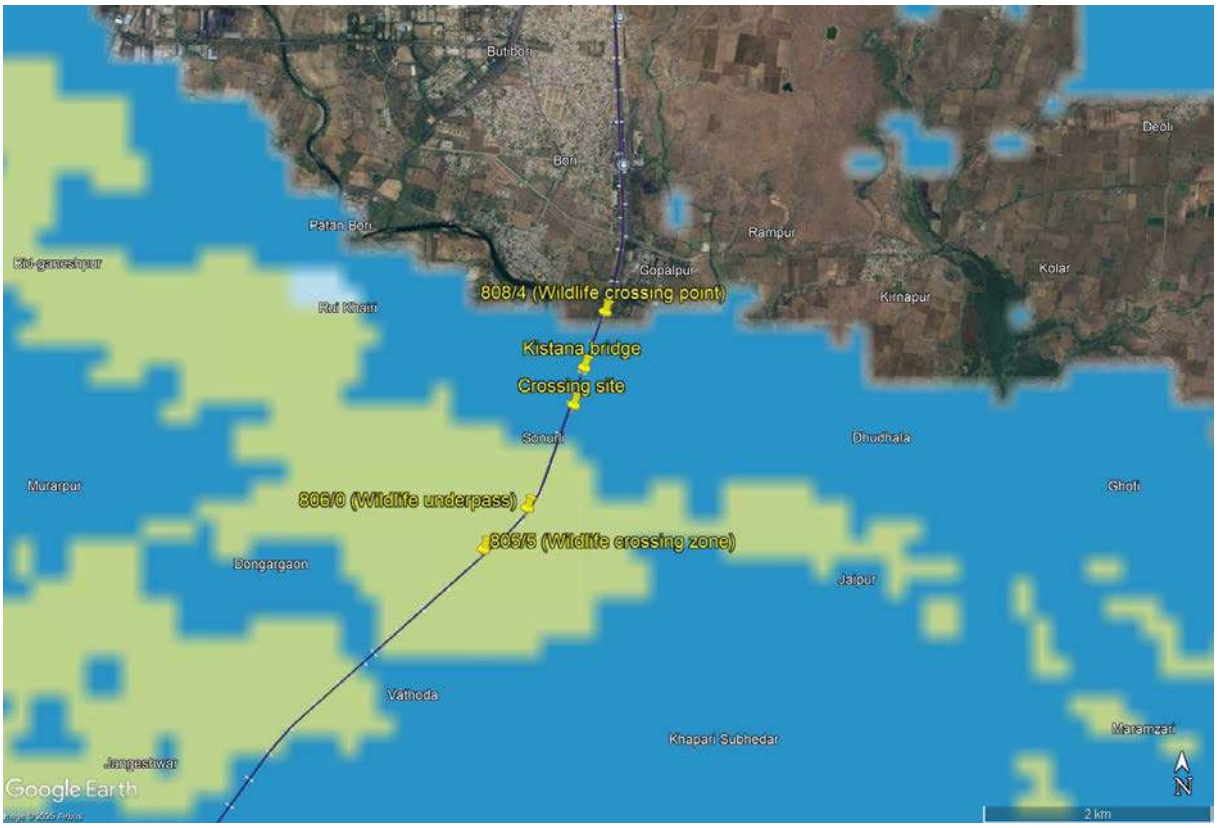


Figure 3.14.9: Locations of wildlife crossing zones on the Butibori-Wardha railway section, with EVL tiger corridor.

Figure 3.14.10: Locations of wildlife mortality points on Butibori-Wardha railway segment.

Recommendations:

- Corridor restoration between Nagpur-Butibori:
  Mitigation measures on the Nagpur-Butibori railway stretch would have to be complemented with measures on the NH 44, and a land use plan for the land adjacent to the railway line and the highway. Land use planning to ensure functionality of the corridor is essential to maintain the functionality of this corridor.
- All drainage structures on the stretch should be excluded from the concrete fencing to enable wildlife movement, and the structure should be maintained so as to avoid waterlogging.
- The bridge on Kistana should be kept free of human presence as much as possible to enable wildlife movement.
- The wildlife crossing structure at chainage 806/0 should be kept free of human presence as much as possible to enable wildlife movement.

Table 3.14.3: Details of mitigation measures recommended on the Nagpur-Butibori-Wardha railway line.

S. No.	Chainage/GPS location	Mitigation measure recommended	Remarks
1.	Between 808/2 – 808/7	One ramp with level crossing every 300 m.	A ramp and level crossing across the railway line measuring 50 m is to be constructed.
2.	Wildlife crossing structure at 806/0 measuring 3.5 x 3.5 m	Regular maintenance	The structure is to be kept free of human presence.
3.	805/5 – 805/6	One ramp with level crossing.	A ramp and level crossing across the railway line measuring 50 m is to be constructed.
4.	Kistana Bridge	Maintenance	The dry spans of the bridge are to be kept free of human presence to enable wildlife movement.
5.	797/0 – 798/0	One ramp with level crossing every 300 m.	A ramp and level crossing across the railway line measuring 50 m is to be constructed.

Survey date: 05th December 2024

The railway line connecting Dewhadi with Gobarwahi intersects the Pench-Kanha-Navegaon-Nagzira tiger corridor (Fig. 3.14.11). It is a single-track broad-gauge railway line with 3-4 passenger trains daily. The survey team also visited the railway track beyond Gobarwahi towards the Dongri-Buzurg manganese mine, where a tiger mortality occurred in 2024.

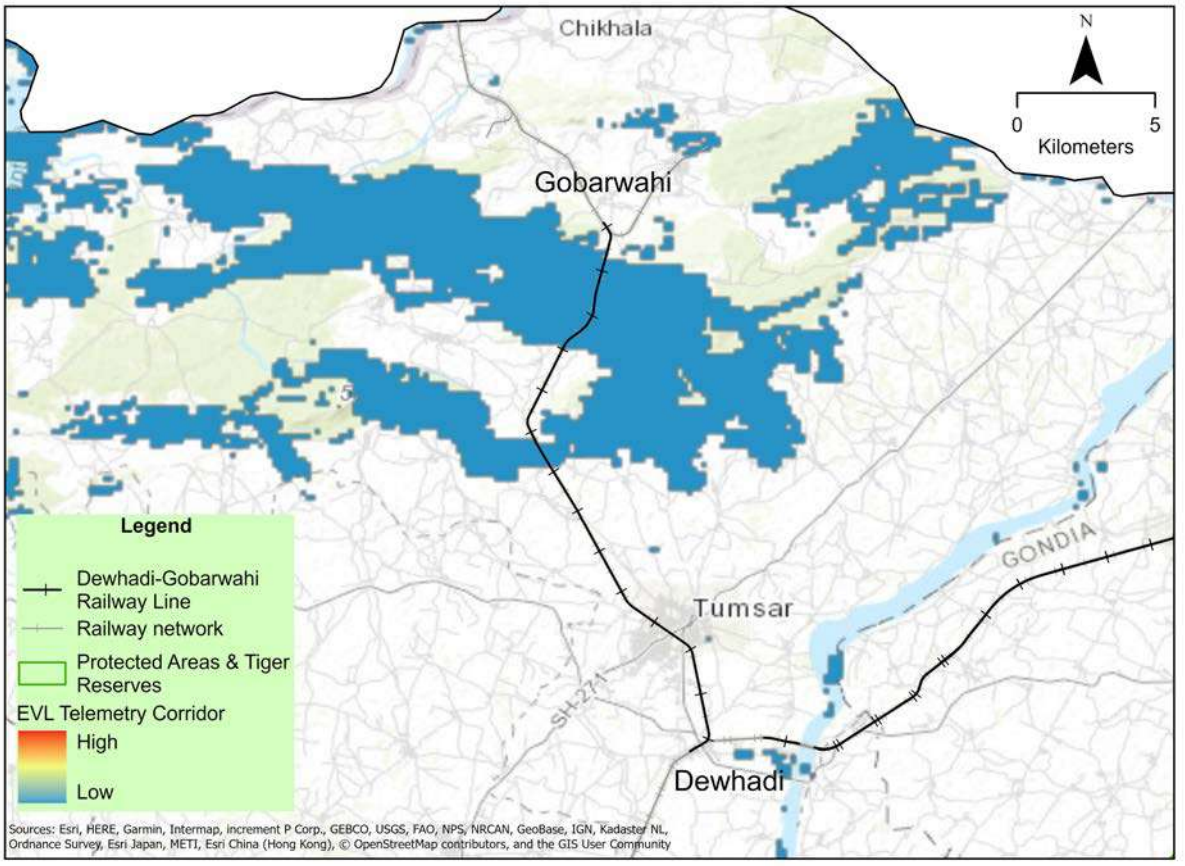


Figure 3.14.11: The Dewhadi-Gobarwahi railway line intersecting the Pench-Kanha-Navegaon-Nagzira tiger corridor in Bhandara Forest Division, Maharashtra.

Observations:

- Crossing zones are regularly used by a range of wildlife species such as tiger, leopard, sloth bear, barking deer, chital and wild pig.
- The railway line runs parallel to the Chicholi-Sodepur road for about 1.3 km. Tiger signs (pugmarks) were recorded under two bridges spanning the road and the railway line (Fig. 3.14.12).
- In the railway line segment passing through the Chicholi-Gobarwahi forest, wildlife movement across the track is rampant.
  Intensively used crossing zones coincide with flat terrain on either side of the track.
- Some drainage structures coincide with animal crossing zones, and have adequate track height to allow for construction of wider and higher structures that would function as both animal crossing structures and drainage structures (Fig. 3.14.13).
- The mortality of a female tiger in 2024 was reported on the railway line beyond Gobarwahi in the forest patch near the Dongri Buzurg manganese mine (Fig. 3.14.14).

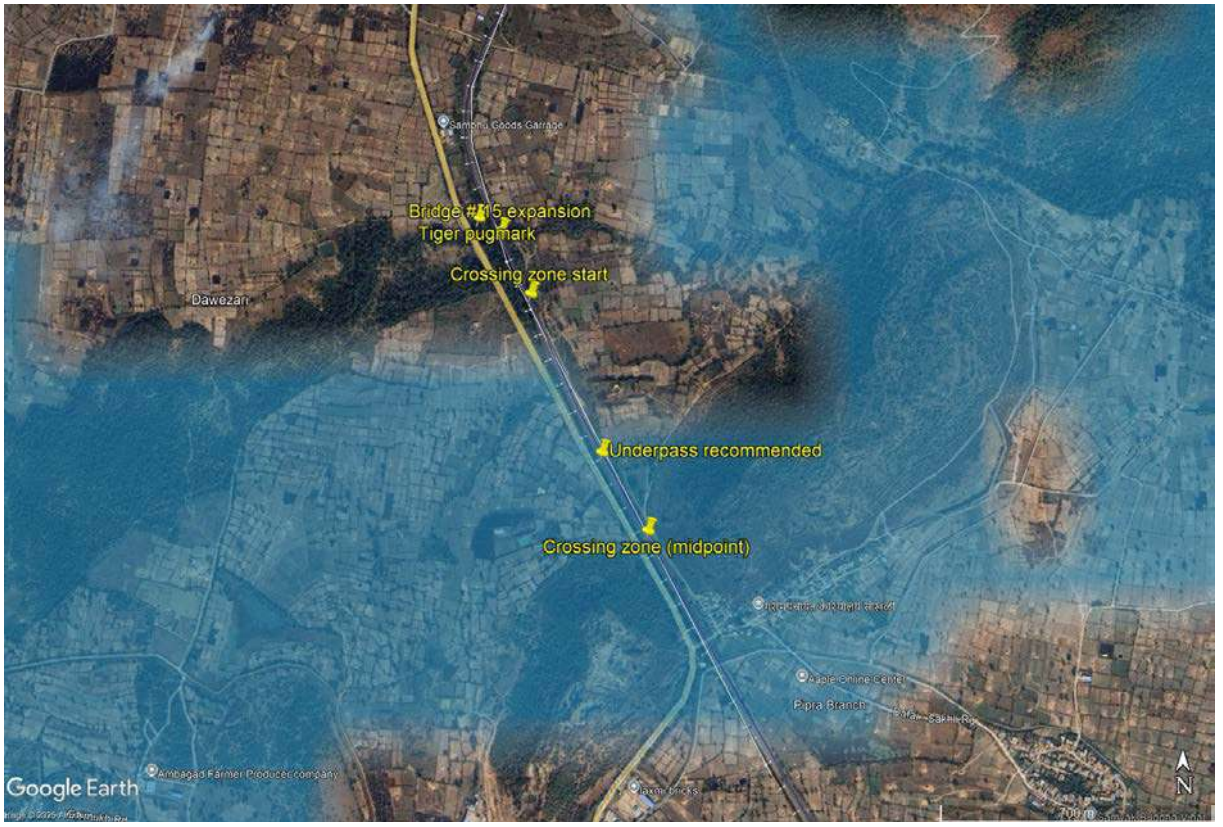


Figure 3.14.12: The Dewhadi-Gobarwahi railway line runs parallel to the Chicoli-Sodepur road for ~1.3 km. An animal underpass on the railway line (bridge extension) and on the road (on upgradation) is recommended.

Figure 3.14.13: The Dewhadi-Gobarwahi railway line passing through the forest patch before Gobarwahi. Wildlife movement here is rampant, consequently multiple bridge expansions have been recommended here.

Figure 3.14.14: The railway track extending beyond Gobarwahi towards the Dongri-Buzurg manganese mine, through a dense forest patch where a tiger mortality was reported in 2024. A wildlife overpass has been recommended in this patch.

Recommendations:

- Adequate mitigation measures *viz*., construction of wildlife underpass measuring 300 m is recommended on the Chicholi-Sodepur road whenever it is upgraded in the future.
- 50 m wide level crossings with ramps are recommended every 300 m along the railway line passing through the Chicholi-Gobarwahi segment. The level crossings must be accompanied by DAS system.
- In the cutting section near Dongri Buzurg where a tiger mortality occurred, an overpass measuring 50 m is recommended. The remaining cutting section should be fenced off, including the entry to the cut portion.
- In addition to the points recommended for construction of level crossings, the local forest department may recommend additional points according to their understanding of frequently used animal crossing zones.

Mitigation measures recommended on this segment are as under:

Table 3.14.4: Details of mitigation measures recommended on the Dewhadi-Gobarwahi railway line in Bhandara Forest Division.

S. No.	Chainage/GPS location	Recommendations	Remarks
1.	21° 26.486'N 79° 42.118'E	Animal underpass	Recommended dimension of the underpass is 50 m with 4-5 m height (as much as the track permits).
2.	Bridge # 15 at 21° 26.803'N 79° 41.965'E	Bridge expansion recommended.	A 5 m wide dry span on the southern side of the bridge is recommended. The span is to be kept dry to enable wildlife movement.
3.	Bridge # 22 at 21° 29.198'N 79° 43.206'E (Ch. 540)	Bridge expansion recommended.	A 20 m wide and 4-4.5 m high crossing structure is recommended.
4.	Bridge # 23 at 21° 29.301'N 79° 43.219'E (Ch. 730)	Bridge expansion recommended.	A 20 m wide and 5-6 m high crossing structure is recommended.
5.	21° 29.453'N 79° 43.240'E	Level crossing with ramp is recommended.	A level crossing should be 50 m wide.
6.	Bridge # 24 at 21° 29.595'N 79° 43.275'E (Ch. 270)	Bridge expansion recommended.	A 30 m wide and 5-6 m high crossing structure is recommended.
7.	21° 29.676'N 79° 43.298'E	Level crossing with ramp is recommended.	A level crossing should be 50 m wide.
8.	21° 30.053'N 79° 43.399'E	Level crossing with ramp is recommended.	A level crossing should be 50 m wide.
9.	21° 32.640'N 79° 41.845'E	An overpass (prefabricated) measuring 50 m wide is recommended here.	The remaining portion of the cut section should be fenced off to avoid entrapment of wildlife within the rail corridor.
10.	21° 32.560'N 79° 41.979'E	Level crossing with ramp is recommended.	A level crossing should be 50 m wide.
11.	21° 32.509'N 79° 42.066'E	Level crossing with ramp is recommended.	A level crossing should be 50 m wide.

Dewhadi-Gondia railway track in Gondia Forest Division, Maharashtra

Survey date: 05th- 06th December 2024

The railway line from Dewhadi to Gondia intersects the Navegaon-Nagzira-Kanha tiger corridor for about 11 km.The railway line intersects the tiger corridor between NNTR and the Balaghat Forest Division in Madhya Pradesh and other tiger habitats northwards (Fig. 3.14.15). The railway line is triple tracked, and passes through different land uses through the 11 km, particularly affecting wildlife in the forested segment near NNTR.

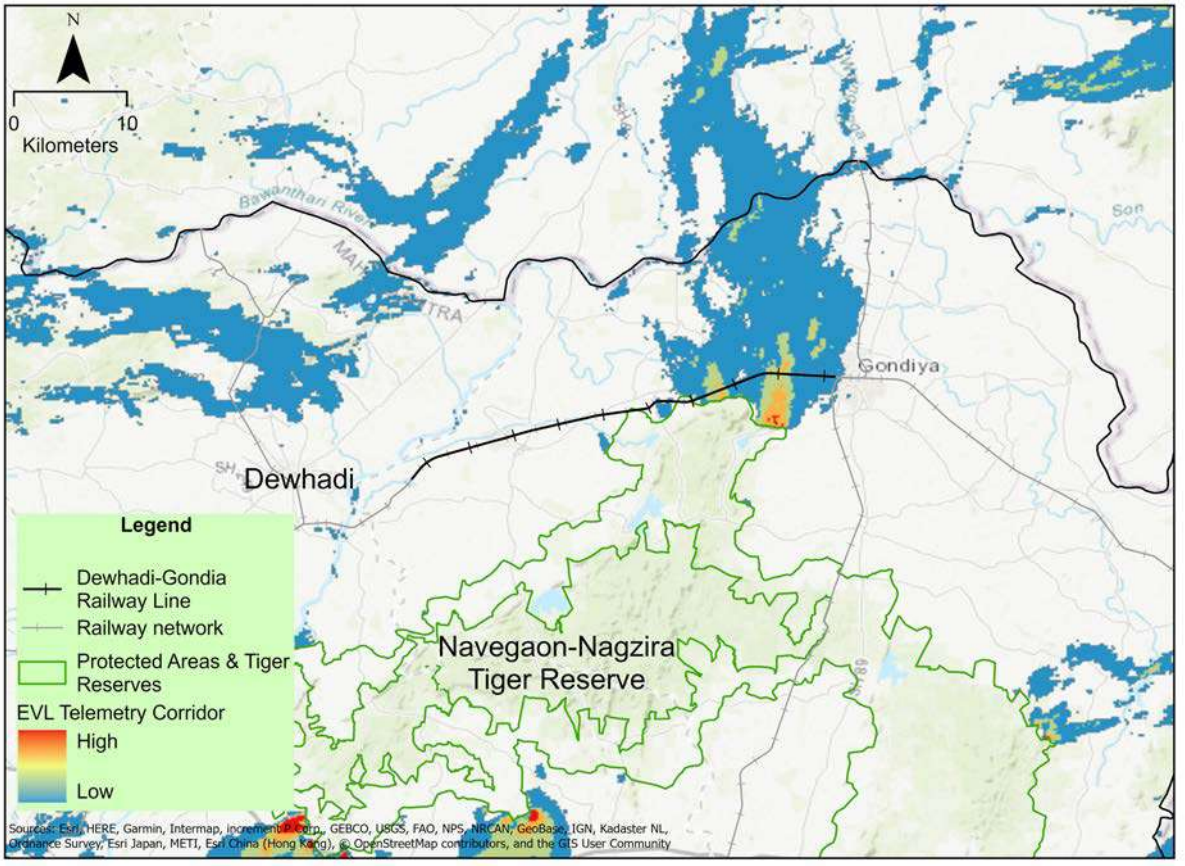


Figure 3.14.15: The Dewhadi-Gondia triple track railway line intersecting the Navegaon-Nagzira-Kanha tiger corridor in the Gondia Forest Division, Maharashtra.

Observations:

- The railway track passing through the agriculture-open forest matrix between Hetitola and Gangazari has multiple sites of wild pig and chital mortality, possibly because of movement of these animals for crop depradation (Fig. 3.14.16).
- The track is flat with respect to the adjacent terrain for most of this stretch.
- The railway line is triple-tracked, making the rail corridor wide (Fig. 3.14.17).

Figure 3.14.16: Wildlife mortality locations on the Hetitola-Gangezari stretch of the Dewhadi-Gondia railway line.

Figure 3.14.17: The triple-tracked Dewhadi-Gondia railway track passing near Navegaon-Nagzira Tiger Reserve, Gondia Forest Division.

Recommendations:

Almost the entire stretch of the railway line seems to be regularly used by wildlife, including tiger. Specific measures are recommended for stretches highlighted as major movement zones by forest department personnel.

- In the agriculture-open forest matrix between Hetitola and Gangazari, level crossings are to be provided in consultation with the forest department along the entire stretch at every 300 m.

- On the railway line passing through agricultural areas near Tirora and Gangazari railway stations where mortality of species such as wild pig and blackbuck have occurred; it is suggested to fence the railway line to avoid wildlife mortality and crop raiding.
- There are a number of existing bridges/culverts in the forested patch intensively used by wildlife, especially tiger. These structures should be expanded to enable wildlife movement across the railway tracks. These structures should be maintained so as to avoid water logging that would discourage wildlife movement.

Table 3.14.5: Details of mitigation measures recommended on the Dewhadi-Gondia railway line, Gondia Forest Division.

S. No.	Chainage/GPS location	Mitigation measure recommended	Remarks
1	21° 27.291'N 80° 5.721'E	Bridge expansion	Two additional spans of 5 m each should be added to either side of the existing bridge. Water logging on the structure should be checked.
2	21° 27.166'N 80° 5.365'E	Bridge expansion	Two additional spans of 5 m each should be added to either side of the existing bridge.
3	21° 27.091'N 80° 5.147'E	Bridge expansion	Two additional spans of 5 m each should be added to either side of the existing bridge.

Gondia-Wadsa railway track passing through NNTR-Balaghat-Kanha corridor & NNTR, in the Gondia, Bhandara and Wadsa Forest Divisions, Maharashtra

Survey date: 06th & 07th December 2024

The Gondia-Wadsa railway line passes through the Goregaon range of Navegaon-Nagzira Tiger Reserve (NNTR), and bisects the tiger corridor connecting NNTR with Ghodazari and Umred-Karhandla Wildlife Sanctuaries and other tiger habitats in the south-west (Fig. 3.14.18). The line is presently a single-track line, with the possibility of being doubled. The daily train traffic on the line is 30-35 trains.

Observations:

- There is a frequently used wildlife crossing zone on the stretch between Hirdamali and Pindkepar stations measuring about 3.5 km, reportedly used by multiple wildlife species such as tiger, chital, leopard, nilgai and wild pig.
- There is regular wildlife movement across the railway line passing through Nagzira range forest inside NNTR. A tiger cub mortality occurred here in March 2022.
- In the railway stretch between Gondumari and Morgaon, the landscape is a mix of agriculture and open forest, where wildlife species such as leopard, wild pig and sloth bear regularly cross the railway track. Wildlife has also been reported to use vehicle underpasses (VUP).
- Most wildlife mortalities have been reported from the stretches in dense forests, *i.e.*, the Nagzira and Wadsa ranges (Fig. 3.14.19).
- Multiple wild pig and leopard crossings have been recorded near the human settlements next to Navegaon Bandh railway station. This could possibly be because of attraction to garbage and livestock in the human settlements.
- The railway track passing through the Arjuni Morgaon Forest range was reported to have regular wildlife movement throughout.

Segment-wise animal signs, mortality locations and mitigation measures are provided in Fig. 3.14.20 (a and b).

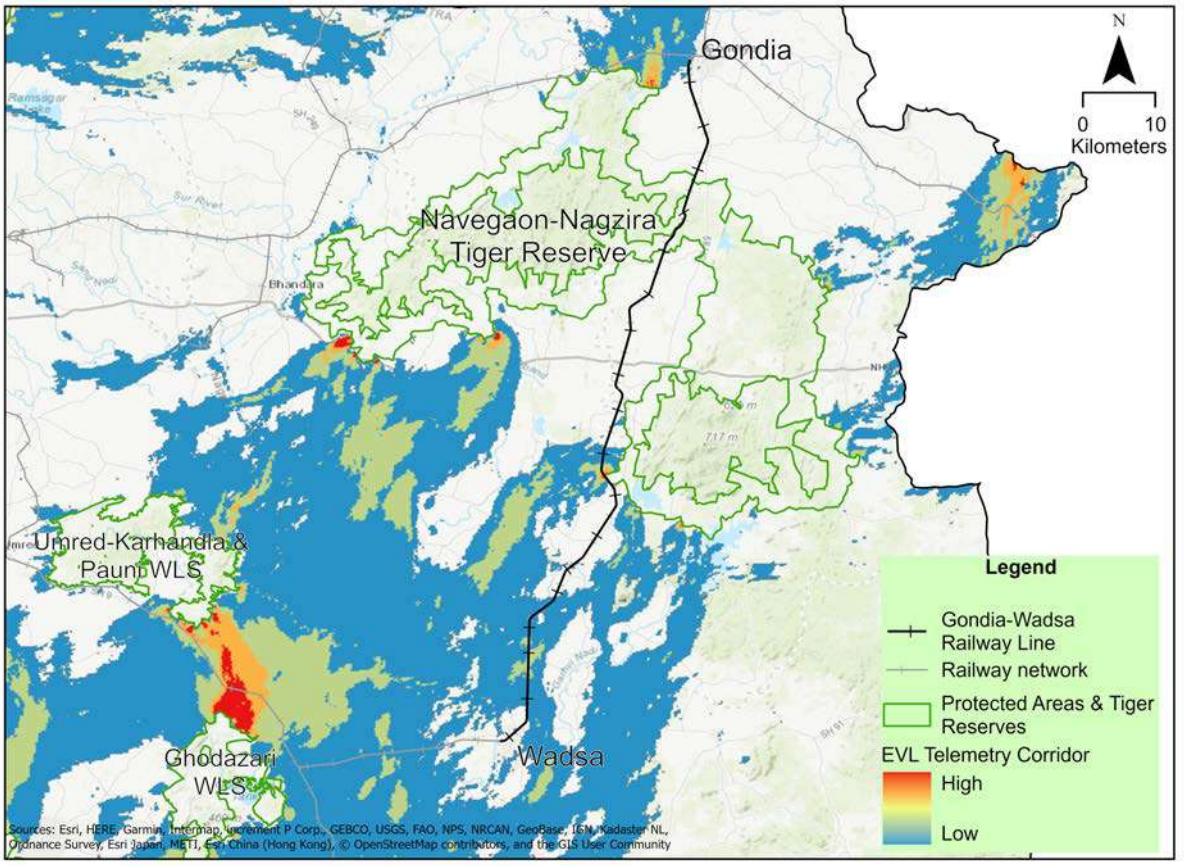
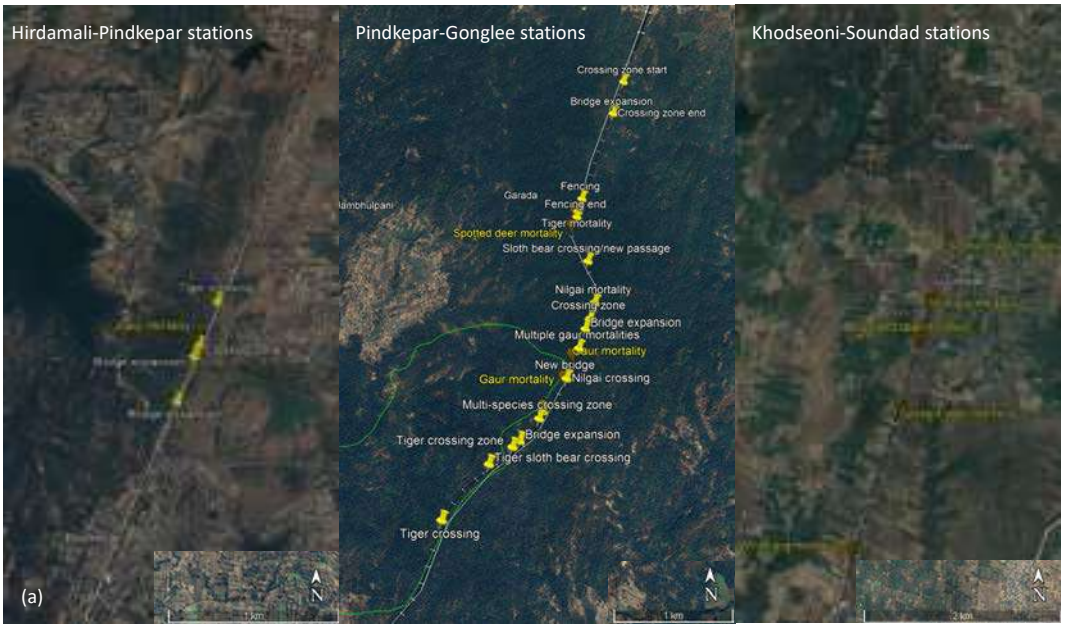


Figure 3.14.18: The Gondia-Wadsa railway line passing through the Goregaon range of Navegaon-Nagzira Tiger Reserve (NNTR), and the NNTR-Ghodazari-Umred-Karhandla tiger corridor.

Figure 3.14.19: Wildlife movement as well as mortality was reported from flat railway sections such as this inside NNTR.



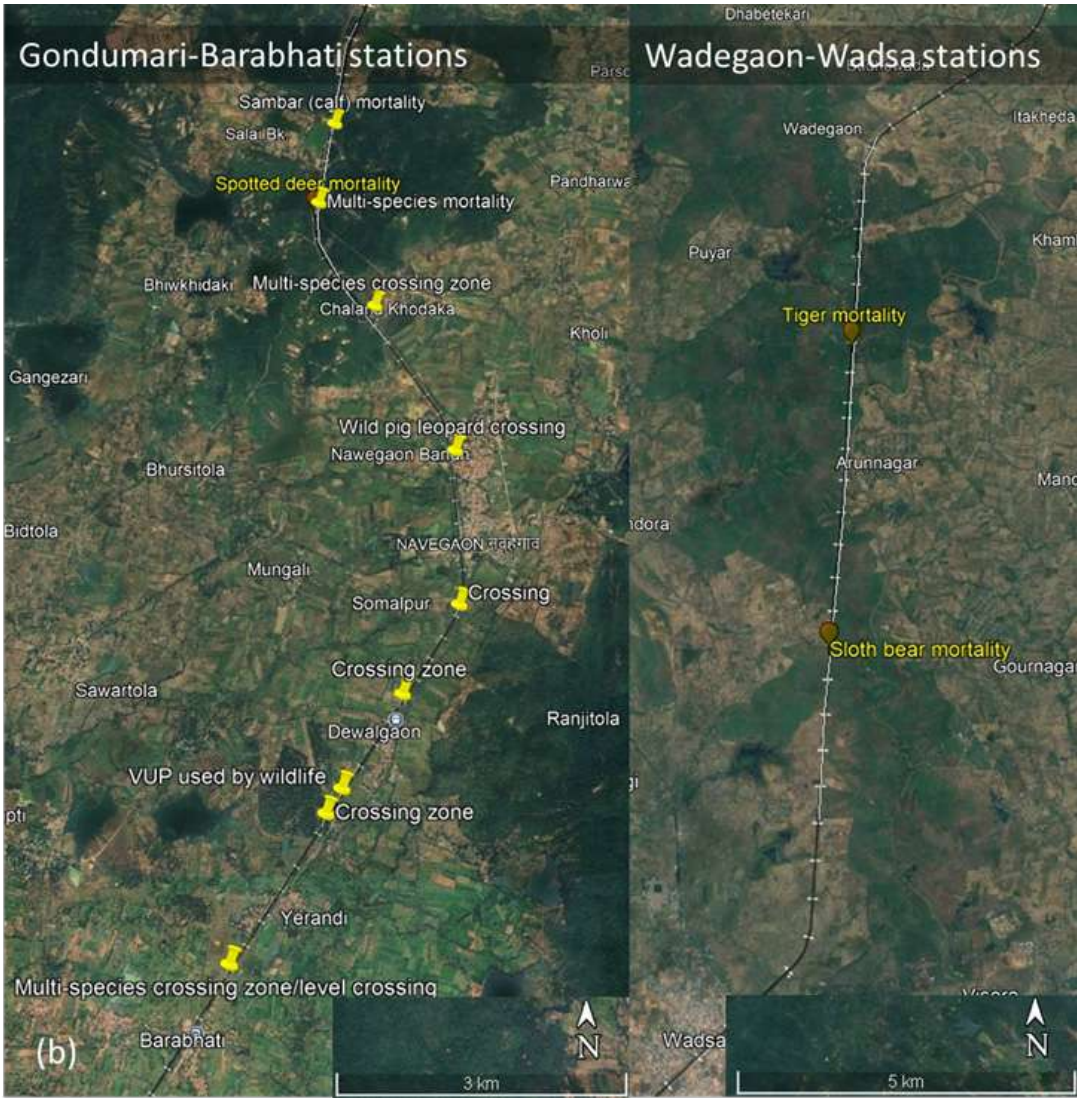


Figure 3.14.20: Wildlife signs, crossing zones and recommended mitigation measures on the Gondia-Wadsa railway line through (a) Hirdamali-Pindkepar, Pindkepar-Gonglee and Khodseoni-Soundad stations, and (b) Gondumari-Barabhati and Wadegaon-Wadsa stations.

Recommendations:

- Bridge expansion and construction of new bridges/wildlife passages have been recommended wherever bank height permits, and where frequent wildlife crossing and/or mortality has been reported.
- A series of 50 m wide level crossings are recommended on the wildlife crossing zone between Hirdemali and Pindkepar stations at every 300 m.
- Intensive garbage management is required near the human settlements adjoining the railway tracks near the forested patches, as this can attract wildlife such as wild pig.
- On the railway line passing through agricultural-open forest matrix between Khodseoni and Sondad railway stations where mortality of species such as wild pig and chital have occurred, it is suggested to fence the railway line.
- Owing to regular animal movement on the railway track between Wadegaon and Wadsa railway stations, a series of level crossings are recommended, each measuring 50 m wide, particularly near spots where animal crossing occurs.
- A herd of 23 elephants crossed the railway line in November 2022 north of Arjuni Morgaon (20° 50.459'N 80° 2.870'E). Level crossings are recommended in this patch.
- In addition to the level crossings recommended in Table 6, more level crossings may be installed in consultation with the local forest department, especially in areas with high wildlife movement across the railway track.

Table 3.14.6: Details of mitigation measures recommended on different segments of the Gondia-Wadsa railway line.

S. No.	Chainage/GPS location	Mitigation measure recommended	Remarks
		Pindkepar to Gonglee railway station (Nagzira Forest Range)	
1.	21° 19.130'N 80° 11.286'E	Bridge expansion	A box culvert measuring 5 m x 3 m height is recommended.
2.	21° 18.969'N 80° 11.227'E	Bridge expansion	A box culvert measuring 5 m x 3.5 m height is recommended
3.	21° 16.883'N 80° 10.508'E	Bridge expansion	A box culvert measuring 5 m x 3 m height is recommended.
4.	21° 15.976'N 80° 10.367'E	New wildlife passage	A box culvert measuring 5 m x 5 m height is recommended.
5.	21° 15.603'N 80° 10.357'E	Bridge expansion	An opening measuring 15 m x 3 m height is recommended.
6.	21° 15.500'N 80° 10.323'E	Level crossing	A level crossing of 50 m width is recommended.
7.	21° 15.743'N 80° 10.407'E	New wildlife passage	A box culvert measuring 5 m x 3.5 m height is recommended.
8.	21° 15.342'N 80° 10.260'E	New wildlife passage	A bridge measuring 10 m x 5 m height is recommended.
9.	21° 15.175'N 80° 10.138'E	Bridge expansion	A bridge measuring 20 m x 6 m height is recommended.
10.	21° 15.139'N 80° 10.119'E	Level crossing	A level crossing of 50 m width is recommended.
11.	21° 15.028'N 80° 10.022'E	Bridge expansion	A bridge measuring 20 m x 6 m height is recommended.
12.	21° 14.999'N 80° 9.985'E	Level crossing	A level crossing of 50 m width is recommended.
		Gondumari-Barabhati stations	
13.	20° 52.039'N 80° 3.858'E	Level crossing	A level crossing of 50 m width is recommended.
14.	20° 52.886'N 80° 4.407'E	Level crossing	A level crossing of 50 m width is recommended.

15.	Between Navegaon and Dewalgaon railway stations	Level crossings	Four level crossings at every 500 m measuring 50 m width are recommended.
16.	20° 56.516'N 80° 4.363'E	Bridge expansion	A bridge measuring 10 m x 3.5 m height is recommended.
17.	20° 56.998'N 80° 4.172'E	Level crossing	A level crossing of 50 m width is recommended.
18.	20° 57.036'N 80° 4.176'E	Bridge expansion	A bridge measuring 10 m x 4 m height is recommended
19.	20° 57.519'N 80° 4.242'E	Level crossing	A level crossing of 50 m width is recommended.
20.	20° 57.581'N 80° 4.259'E	Bridge expansion	A bridge measuring 10 m x 4 m height is recommended.
21.	20° 57.626'N 80° 4.260'E	Level crossing	A level crossing of 50 m width is recommended.
		Wadegaon-Wadsa stations	
22.	Bridge # 136	Bridge expansion	A bridge measuring 10 m x 3.5 m height is recommended.
23.	Bridge # 170	Level crossing	A level crossing of 25 m width on either side of the bridge is recommended.
24.	Kamani Puliya	Bridge expansion	A bridge measuring 10 m x 5 m height is recommended.

Wadsa-Nagbhid-Mul railway line in Brahmapuri Forest Division

Survey date: 08th December 2024

The railway line from Wadsa westward to Nagbhid, and further southwards to Mul cuts through the vital tiger corridor connecting Tadoba Andhari Tiger Reserve and Ghodazari Wildlife Sanctuary with Navegaon-Nagzira Tiger Reserve. It also intersects vital tiger habitat in the Brahmapuri Forest Division (Fig. 3.14.21). It is a single-track railway line.

Observations:

Wadsa-Brahmapuri-Nagbhid

- Regular animal movement has been reported from the railway stretch between Brahmapuri and Nagbhid stations. The railway line passes through prime tiger habitats.
- The railway track along this stretch is relatively flat as compared to adjacent terrain (Fig. 3.14.22).

Nagbhid-Mul

- Regular wildlife movement was reported between Talodhi road and Alewahi stations, with multiple mortality incidents involving sambar, gaur and chital.
- Regular wildlife movement including tiger, leopard, nilgai and wild pig has been recorded near the Alewahi railway station.
- Further, regular wildlife movement has been recorded in the Alewahi beat forest, particularly on either side of the road under bridge (at 20° 21.122'N 79° 42.190'E).

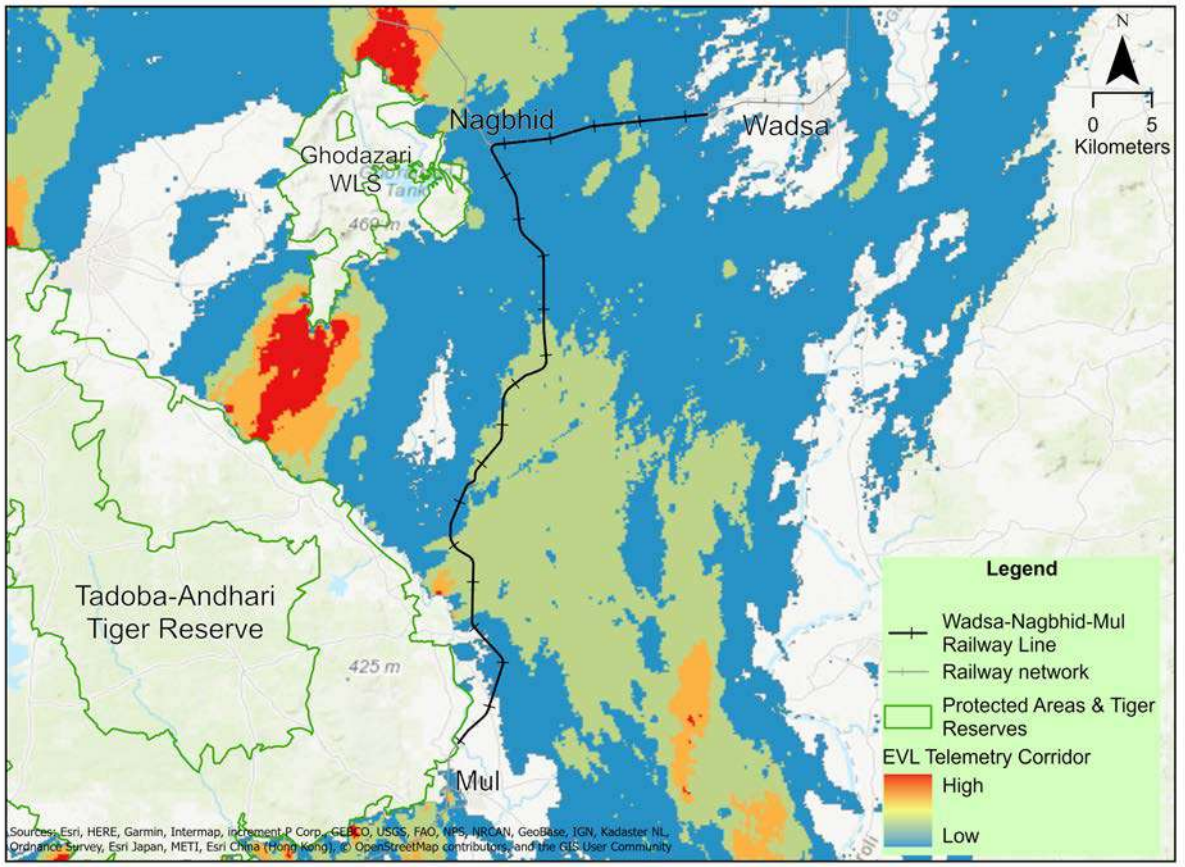


Figure 3.14.21: The Wadsa-Nagbhid-Mul railway line passing through the corridor connecting tiger habitats in Tadoba-Andhari, Ghodazari, Brahmapuri and Navegaon-Nagzira.

Figure 3.14.22: Flat railway segments such as this within forested patches were reported to be regularly used by wildlife.

Recommendations:

- A series of level crossings are recommended in the forest patches between Talodhi road and Alewahi railway stations, Alewahi and Sindewahi railway stations and Sindewahi and Rajuli stations at every 300 m distance, measuring 50 m each.
- Speed restriction of 40 kmph from evening 5 PM to morning 7 AM should be followed on the following railway stretches (Ref. Letter Desk No.3(4)/Vig/15/2015-16/4088 dated 15.12.2018 from the CCF, Chandrapur Circle, Maharashtra) till mitigation measures are not ready:
  a. Railway line passing through the forested patch between Brahmapuri and Kirmiti Mendha stations (North Brahmapuri Forest Range),
  b. Forested patches between Midhala-Talodhi road-Alewahi-Sindewahi railway stations (Nagbhid and Talodhi Forest Ranges), and
  c. Forested patch between Sindewahi and Rajoli railway stations (Sindewahi Forest Range).
- Fencing of the track up to 50 m on either side of Alewahi railway station is recommended.
- Excavated land along the railway line filled up with water over time that may attract wildlife and make them vulnerable to collisions should be managed and levelled. A list of such locations where such water bodies have been created is given on the Table on Page 4 (Sr.No. 9-21) of Appendix 5 (Letter Desk No.3(4)/Vig/15/2015-16/4088 dated 15.12.2018 from the CCF, Chandrapur Circle, Maharashtra).
- Fencing along the canal being constructed in Sindewahi that intersects the railway line is recommended to avoid drowning of wildlife in the canal.
- The railway line should be aligned with the MSH 9 (Nagbhid-Mul road) in case future upgradation or multi-tracking is proposed. The elevated railway line should have adequate provisions for animal crossing structures.

Table 3.14.7: Details of mitigation measures recommended on the Wadsa-Nagbhid-Mul railway line passing through the Brahmapuri Forest Division.

S. No.	Chainage/GPS location	Mitigation measure recommended	Remarks
		Wadsa-Brahmapuri-Nagbhid	
1.	20° 35.782'N 79° 47.725'E	Level crossing	This is a railway trolley refuge, where wildlife crossing has been observed. It may be expanded to a level crossing with 50 m width.
2.	Between 20° 35.949'N 79° 49.409'E and 20° 35.790'N 79° 47.619'E	Level crossings	A series of level crossings may be provided at every 300 m, each measuring 50 m wide. The terrain may be flattened on both sides.
3.	Bridge # 172 20° 35.823'N 79° 48.123'E	Bridge expansion	A bridge measuring 10 m with present height is recommended.
4.	From 20° 35.854'N 79° 48.437'E to 20° 35.877'N 79° 48.694'E	Smoothening of terrain along cutting to provide escape.	The section (450 m) has cutting on both sides with not enough height to provide an overpass. Providing escapes every 100 m through smoothened trails can help animals escape.
5.	20° 35.877'N 79° 48.694'E	Level crossing	A level crossing of 50 m width is recommended.
6.	20° 35.937'N 79° 49.149'E	Level crossing	A level crossing of 50 m width is recommended.
		Nagbhid-Mul (Mindala-Talodhi road stations section)	
7.	Bridge # 195 20° 30.996'N 79° 43.033'E	Bridge expansion	A bridge measuring 5 m x 4.5m height is recommended.
8.	20° 30.757'N 79° 43.082'E	Level crossing	A level crossing of 50 m width is recommended.

9.	20° 30.287'N 79° 43.445'E	Level crossing	A level crossing of 50 m width is recommended.
10.	20° 30.065'N 79° 43.686'E	Level crossing	A level crossing of 50 m width is recommended.
11.	Pillar 1144/5	Level crossing	A level crossing of 50 m width is recommended.
12.	20° 29.626'N 79° 44.127'E	Level crossing	A level crossing of 50 m width is recommended.
13.	20° 28.768'N 79° 44.186'E	Level crossing	A level crossing of 50 m width is recommended.
	Talodhi road – Alewahi stations		
14.	20° 26.766'N 79° 44.193'E	Level crossing	A level crossing of 50 m width is recommended.
15.	Between Talodhi road and Alewahi stations	Level crossings	A series of level crossings are recommended here, measuring 50 m each at an interval of 300 m.
16.	Bridge # 203	Bridge expansion	A bridge measuring 10 m with present height is recommended.
17.	Bridge # 204	Bridge expansion	A bridge measuring 10 m x 2.5 m with present height is recommended.
	Alewahi to Sindewahi railway stations		
18.	Bridge # 216 20° 23.161'N 79° 42.469'E	Bridge expansion	A bridge measuring 10 m x 7 m height is recommended.
19.	Bridge # 218	Bridge expansion	A bridge measuring 10 m x 4 m height is recommended.
20.	From Alewahi station to 20° 18.472'N 79° 40.477'E	Level crossings	A series of level crossings are recommended here, measuring 50 m each at an interval of 300 m.
21.	Bridge # 220 20°20.556'N 79° 42.016'E	Bridge expansion	A bridge measuring 20 m x 5 m height is recommended.
22.	20° 20.354'N 79° 41.842'E	Level crossing	A level crossing of 50 m width is recommended.
23.	20° 20.183'N 79° 41.702'E	Level crossing	A level crossing of 50 m width is recommended.
24.	Bridge 221	Bridge expansion	A bridge measuring 20 m with present height is recommended.
25.	20° 19.781'N 79° 41.370'E	Fencing	Fencing along the canal is recommended.
	Sindewahi to Mul segment		
26.	20° 15.588'N 79° 40.028'E	Bridge expansion	A bridge measuring 10 m with present height is recommended.
27.	20° 14.103'N 79° 40.809'E	Bridge expansion	A bridge measuring 10 m with present height is recommended.

Survey date: 09th December 2024

The single-track railway line from Mul to Chandrapur stations cuts through high quality wildlife habitat and tiger corridor emanating from Tadoba-Andhari Tiger Reserve towards Kanhargaon and Chaprala Wildlife Sanctuaries, connecting it to other tiger habitats to the south (Fig. 3.14.23).

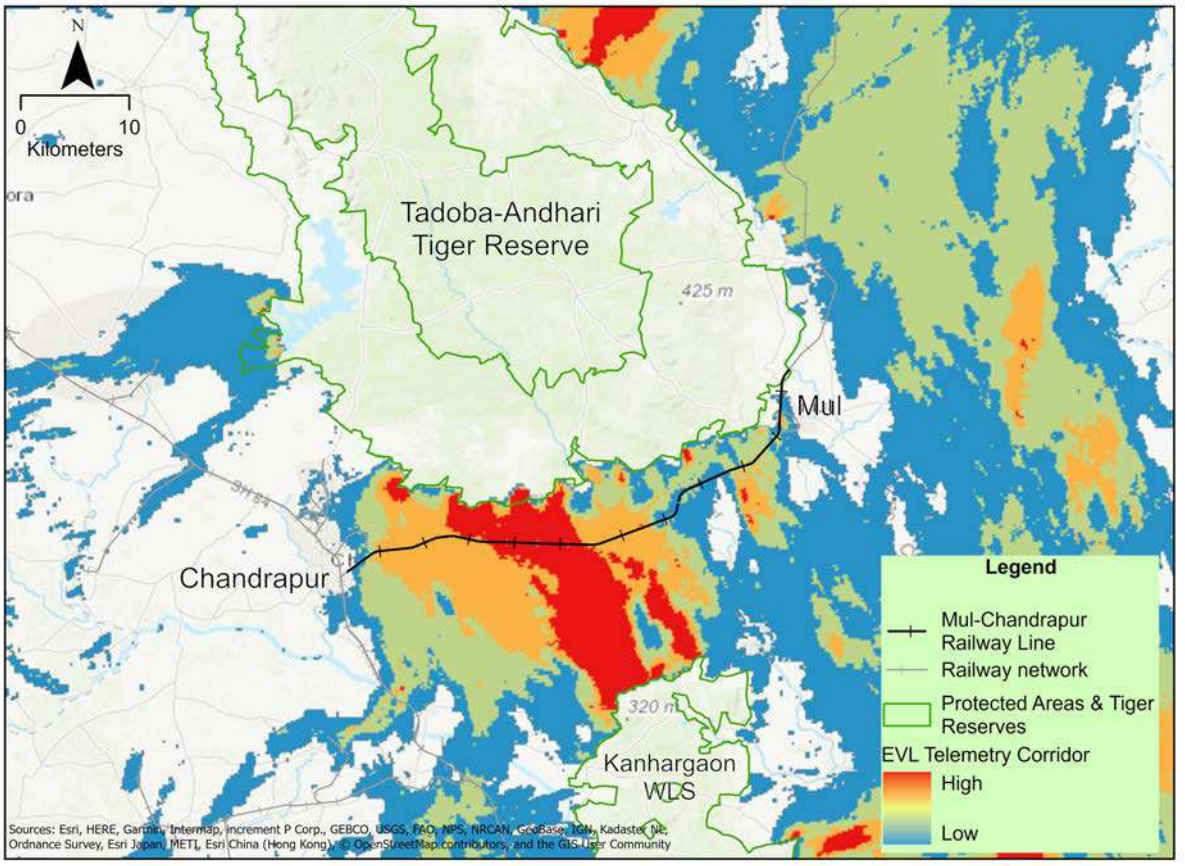


Figure 3.14.23: The Mul-Chandrapur railway track cutting through the Tadoba-Andhari-Kanhargaon-Chaprala tiger corridors in Chandrapur Forest Division, Maharashtra.

Observations:

- Since the railway track passes through dense forest with no intervening human use areas, wildlife movement across the track was reported to be rampant.
- Regular wildlife mortality is recorded on the track, including species like tiger, gaur, sambar, sloth bear.
- The railway track is elevated in several segments where several bridges have adequate height for animal passages.
- Wildlife movement on the RUB near Kelzar village has been reported. The RUB is near an agricultural patch, and crop depradation by wild pig and other herbivores has been reported.
- Old/disused level crossings (for humans) were reported to be regularly used by wildlife for crossing the track (Fig. 3.14.24).

Figure 3.14.24: Disused level crossings such as these were reported to be used regularly by wildlife to cross the railway track.

Recommendations:

- Escape ramps on segments with cutting <5-6 m is recommended all along the railway track to prevent wildlife getting trapped in the rail corridor.
- Speed restriction of 40 kmph from evening 5 PM to morning 7 AM should be followed throughout the Mul-Chandrapur stretch (Ref. Letter Desk No.3(4)/Vig/15/2015-16/4088 dated 15.12.2018 from the CCF, Chandrapur Circle, Maharashtra) till mitigation measures are not in place.
- The railway line should be aligned with the National Highway 930 (Mul-Chandrapur road) in case future upgradation or multi-tracking is proposed. The elevated railway line should have adequate provisions for animal crossing structures.
- Widening of several bridges with adequate height is available has been recommended. Animal signs and reports of use by wildlife were found during the survey. It is vital for maintain the additional spans recommended on such bridges for the purpose of animal movement, and avoid water flow/logging in them.
- Dense vegetation along the track also reduces the visibility for the train loco-pilot and wild animals. Clearing of vegetation till 20 m on either side of the railway track is thus recommended.
- The Mul station where regular wildlife movement has been reported may be fenced for safety.
- Excavated land along the railway line filled up with water over time that may attract wildlife and make them vulnerable to collisions should be managed and levelled. A list of such locations where water pits have been created is given on the Table on Page 4 (Sr. No. 1-9) of Appendix 5 (Letter Desk No.3(4)/Vig/15/2015-16/4088 dated 15.12.2018 from the CCF, Chandrapur Circle, Maharashtra).
- In addition to the recommendations given in Table 3.14.8 below, new crossing structures may constructed at locations given on the table (under point # 4 on page 5) of Appendix 5 (Letter Desk No.3(4)/Vig/15/2015-16/4088 dated 15.12.2018 from the CCF, Chandrapur Circle, Maharashtra). The dimensions of these structures should be in the range of 15-20 m, with height as much as is possible given the track height at the location, but not less than 4 m.

Table 3.14.8: Details of mitigation measures recommended on the Mul-Chandrapur railway track passing through the Tadoba-Andhari-Kanhargaon-Chaprala tiger corridors in Chandrapur Forest Division, Maharashtra.

S. No.	Chainage/GPS location	Mitigation measure recommended	Remarks
1.	19° 57.681'N 79° 21.738'E	Escape ramps	Escape ramps to be provided along the slopes on both sides of the segment.
2.	Bridge # 324	Bridge expansion	A bridge measuring 5 m with present height is recommended.
3.	Bridge # 325 19° 57.635'N 79° 21.239'E	Bridge expansion	A bridge measuring 10 m x 3 m height is recommended.
4.	Between ch. 1236/03 – 1236/04	New animal underpass	An animal underpass measuring 20 m x 3.5 m height is recommended
5.	19° 57.933'N 79° 22.552'E	Level crossing	A level crossing of 50 m width is recommended.
6.	19° 57.975'N 79° 22.649'E	Level crossing	A level crossing of 50 m width is recommended.
7.	Bridge # 326	Bridge expansion	A bridge measuring 20 m x 5 m height is recommended.
8.	Bridge # 322	Bridge expansion	A bridge measuring 5 m x 4 m height is recommended.
9.	Bridge # 321	Bridge expansion	A bridge measuring 20 m with present height is recommended.
10.	Bridge # 320	Bridge expansion	A bridge measuring 20 m x 4 m height is recommended.
11.	Ch. 1231/10 – 1231/11	Level crossing	A level crossing of 50 m width is recommended.
12.	Ch. 1231/4 – 1231/5 19° 58.254'N 79° 23.582'E	New animal underpass	An animal underpass measuring 20 m x 3 m height is recommended
13.	Ch. 1230/3 - 5	Level crossings and escape ramps	Level crossings of 50 m width on flat sections and escape ramps on the cut sections are recommended.
14.	Ch. 1229/16 15	Level crossings	Two level crossings of 50 m width are recommended in this segment.
15.	Ch. 1229/6	Level crossings	One level crossing each measuring 50 m width is recommended on 500 m on either side of this point.
16.	Bridge # 317	Bridge expansion	A bridge measuring 30 m x 5 m height is recommended.
17.	Ch. 1224/4 19° 57.943'N 79° 27.614'E	Level crossing	A level crossing of 50 m width is recommended. This is an old level crossing, which may be converted to one for wildlife.
18.	Bridge # 312	Bridge expansion	Presently, the bridge measures 2 x 6 m wide with a height of 7-8 m. Two additional dry spans of 6 m on either side of the existing bridge may be provided.
19.	Bridge # 280	Bridge expansion	Two additional dry spans of 5 m may be added on either side of the existing bridge, while maintaining the existing height.
20.	20° 2.590'N 79° 39.006'E	Level crossing	A level crossing of 50 m width is recommended.
21.	Bridge # 281	Bridge expansion	Two additional dry spans of 5 m may be added on either side of the existing bridge, while maintaining the existing height.
22.	Ch. 1203/12	Level crossing	A level crossing of 50 m width is recommended.
23.	Bridge # 283	Bridge expansion	Presently, the bridge measures 2 x 6.1 m wide with a height of 6 m. Two additional dry spans of 6 m on either side of the existing bridge may be provided.

24.	Bridge # 293	Retrofitting	The end spans on both sides of Bridge 293 on Andhari river may be retrofitted to make the beds dry to facilitate movement during the peak monsoon.
25.	19° 58.782'N 79° 33.266'E	Level crossing	A level crossing of 50 m width is recommended.
26.	Bridge # 302	Bridge expansion	Presently, the bridge measures 6.1 m wide with adequate height. Two additional dry spans of 6 m on either side of the existing bridge may be provided.
27.	19° 58.401'N 79° 32.210'E	Level crossing	A level crossing of 50 m width is recommended.
28.	Ch. 1216/2 – 3	Level crossings	Two level crossings of 50 m width are recommended.
29.	Bridge # 310	Bridge expansion	Presently, the bridge measures 2 x 4 m wide with adequate height. Two additional dry spans of 4 m on either side of the existing bridge may be provided.
30.	Ch. 1217/4 – 5	Level crossing	Two level crossings of 50 m width are recommended.

Chandrapur-Rajura-Kagaznagar railway line in Central Chanda Forest Division

The triple tracked railway line from Chandrapur to Kagaznagar via Rajura cuts through the tiger corridor connecting Kanhargaon Wildlife Sanctuary and TATR to the Kawal Tiger Reserve and other tiger habitats in the south and south west. We surveyed the ~15 km stretch of the railway line from Rajura to Wirur stations circumventing the Rajura Forest Range (Fig. 3.14.25).

Observations:

- The railway line has been triple tracked at different times. Consequently, the track levels and heights of the drainage structures are different (Fig. 3.14.26).
- Different track heights and additional structures like drains between tracks make the tracks more non-navigable by wildlife.
- A study by the Wildlife Conservation Trust (WCT) assessed the use of the railway track and drainage structures by wildlife, and came up with recommendations for mitigation measures, including expansion of existing bridges and building of new ones.

Recommendations:

- The exits of the bridges should be made level with the adjacent terrain for easy wildlife movement.
- All bridge expansions must be accompanied with naturalisation of the crossing structures. This should be done by levelling the approach of the end of the structure to the surrounding land.
- Further, the gap in recommended crossing structures between tracks should be left open for natural light, with adequate fencing around these gaps to avoid access of wildlife within the railway corridor.
- Even though no animal signs and previous records of crossings were found from Bridge # 280 (Panch Kaman Bridge), it is recommended to retrofit the bridge as a wildlife passage.

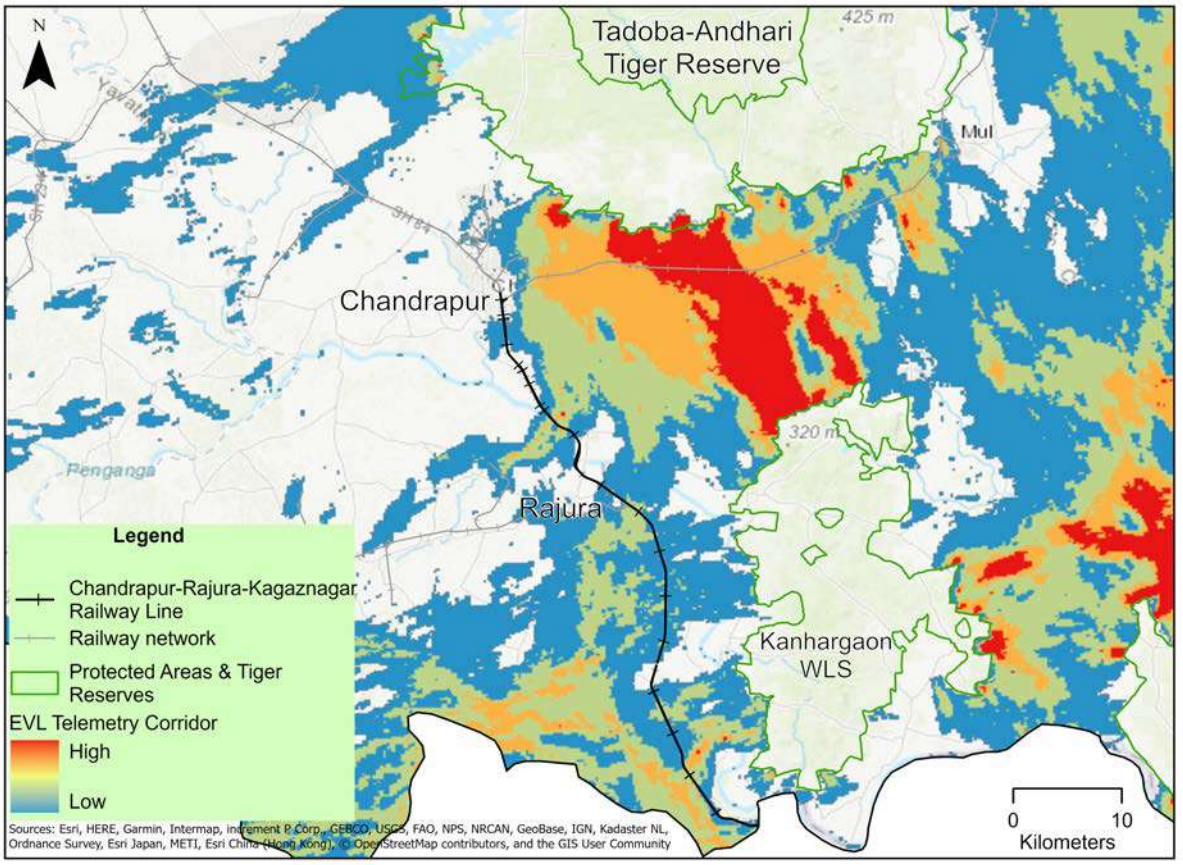


Figure 3.14.25: The Chandrapur-Rajura-Kagaznagar railway line passing through tiger corridors, and the Rajura Forest Range in Central Chanda Forest Division, Maharashtra.

Figure 3.14.26: Different track heights and structure sizes of three railway tracks on the Chandrapur-Rajura-Kagaznagar railway line passing through Rajura Forest Range, Central Chanda Division, Maharashtra.

- The entire railway track falling within forested areas of Rajura Forest Range should be fenced.
- The entire railway track falling within forested areas of Rajura Forest Range should be fenced, with the exception of sites where bridges have been modified into crossing structures for wildlife, where suitable guiding fences/walls may be provided.
- The following mitigation measures are recommended for the railway stretch. The measures are a combination of measures based on the present field survey and those from the report by WCT (Joshi *et al.*, 2023).

Table 3.14.9: Details of mitigation measures recommended on the Chandrapur-Rajura-Kagaznagar railway line passing through the Rajura Forest Range, Central Chanda Forest Division.

S. No.	Chainage/GPS location	Mitigation measure recommended	Remarks
1.	Bridge # 292	Bridge expansion	A bridge measuring 10 m with present height is recommended.
2.	Bridge # 288	Bridge expansion	A bridge measuring 10 m with present height is recommended.
4.	Bridge # 286	Bridge expansion	A bridge measuring 10 m x 3 m height is recommended.
5.	Bridge # 285	Bridge expansion	A bridge measuring 15 m x 3 m height is recommended.
6.	19° 44.588'N 79° 26.168'E	Level crossing	A level crossing of 50 m width is recommended.
7.	Bridge # 280	Retrofitting	The end spans on both sides of Bridge 280 may be retrofitted to make the beds dry to facilitate movement during the peak monsoon.
8.	Bridge # 278	Bridge expansion	Two additional dry spans of 5 m on either side of the existing bridge may be provided.
9.	19° 43.748'N 79° 26.417'E	New structure (based on WCT report)	A bridge measuring 10 m with maximum height (as achievable from embankment height) is recommended.
10.	19° 42.711'N 79° 26.474'E	New structure (based on WCT report)	A bridge measuring 10 m with maximum height (as achievable from embankment height) is recommended.
11.	Bridge # 277	Bridge expansion	A bridge measuring 10 m with present height is recommended.
12.	19° 42.037'N 79° 26.463'E	New structure (based on WCT report)	A bridge measuring 10 m with maximum height (as achievable from embankment height) is recommended.
13.	Bridge # 271	Bridge expansion	A bridge measuring 10 m with present height is recommended.

List of Maharashtra Forest Department and Indian Railways officials consulted during the survey

State Forest Department:

Smt. Sreelakshmi Annabathula *Conservator of Forests Nagpur (Territorial)*
Shri Bharat Singh Hada *DCF, Nagpur Division*
Shri Pramod Panchbhai *DCF, Gondia Division*
Shri Rahul Gawai *DCF, Bhandara Division*
Shri Pawan Jeph *Deputy Director, Navegaon Nagzira Tiger Reserve*
Shri Varun B.R. *DCF, Wadsa Division*
DCF, Wardha Division
Shri Rakesh Sepat *DCF Brahmapuri Division*
Shri Prashant Khade *DCF, Chandrapur Division*
Smt. Sweta Boddu *DCF, Central Chanda Division*
Shri Bhongade *ACF, Bhandara Division*
Shri Avinash Meshram *ACF, Navegaon*
Shri Adesh Shendage *ACF, Central Chanda*
Shri S. Dongarwar *ACF, Gondia*
Shri Vikas Tarase *ACF, Chandrapur*
Shri B.T. Durge *ACF, Navegaon National Park*
Shri Wade *RFO Butibori*
Shri D. Kaushik *RFO Gondia*
Shri Mithun Tarone *RFO Sadak Arjuni*
Shri Dhondhane *RFO Wadsa*
Shri Salkar *RFO Sindewahi*
Shri Bahure *RFO Arjuni Mor*
Shri Pravin Shirpurkar *RFO Kalmeshwar, Nagpur Division*
Shri V.W. Narkhedkar *RFO Katol, Nagpur Division*
Smt. Apeksha Shende *RFO, Nakadongri, Bhandara Division*
Shri C.G. Rahangade *RFO, Tumsar, Bhandara Division*
Smt. Priyanka Welme *RFO Chichpalli*
Smt. S.P. Tembhare *RFO Umarzari*
Shri Karekar *RFO Mul*
Shri V. B. Dolas *Round officer, Katol Range*
Shri Y.S. Rathod *Round Officer, Soundad*
Round Officer, Talodhi
Shri Paware *Round Officer, Mindhada*
Shri S.M. Kondewad *Round Officer, Junona Round*
Shri Shriram Bhanudas *Kekan Round Officer, Butibori*
Shri D.B. Borkar *Round Officer, Wadegaon*
Shri N.W. Padwe *Round Officer, Kelzar*
Shri P.D. Khanke Round Officer, Mahadwadi, Mul Range
Ms. Anita Dinkar Gunde *Forest Guard, Dongargaon Beat, Butibori*
Shri D.E. Yadav *Nakadongri, Bhandara Division*
Shri Watgure *Forest Guard, Navegaon*
Shri Ahir *Forest Guard, Wadsa*
Shri Suresh Ramteke *Forest Guard, Ekalpur*
Shri Chanande *Forest Guard, Dongargaon*
Shri C.C. Watgure *Forest Guard, Navegaon Bandh Range*
Shri A.M. Naike Forest Guard
Shri D.K. Suryavanshi Forest Guard
Shri G.V. Sayam Forest Guard, Barabhati
Shri Mekewad Forest Guard, Deopalli Beat
Shri Bharne Gangasagar Heti
Shri Navghare Mindhada, Nagbhid
Shri Bajrang Kawre Forest Guard, Ghilbili Beat, Junona

Shri Ketan Waghmare Forest Guard, Butibori
Shri B.D. Aade Forest Guard
Smt. N.A. Sheikh Forest Guard
Shri Pedapalliwar, Mul
Shri Warguntiwar, Mul
Shri R.B. Sandewar Forest Guard
Shri G.P. Kunghadkar Forest Guard, Asoli Beat
Shri P.M. Mekewad Forest Guard, Alewahi
Shri S.S. Ramteke Forest Guard
Shri M.K. Ahir Forest Guard
Smt. S.M. Garmale Forest Guard
Shri Chahande Forest Guard, Dongargaon
Shri R.V. Dhanavijay Forest Guard, Kargata
Shri Pundlik
Shri Mangesh
Shri Hemaraj Kur
Shri Noor Biologist, Central Chanda Forest Division
Shri Rakesh Ahuja Biologist, Brahmapuri Forest Division

Indian Railways:

DRM Nagpur SECR
DRM Nagpur, CR
DRM Secunderabad
Shri Jagtap ADRM, Nagpur SECR
Prafull Khairkar Nagpur CR
Shri Ayush Dubey SrDEN NGP SECR
SrDEN S SECR
Shri Khan ADEN Nagbhid
Shri Nehal Narayne Sr. ADEN/TMR
ADEN Bellampalli/BPA Rajura, SCR
Shri G.G. Rajurkar SSE Works BPQ
Shri Rajendra Kumar Meena JE/WKS (works)/SEGM
Shri B K Mishra IOW/NGP I/C
Shri Khemraj Meena Fitter/SEGM
Shri Atul Khaiwale SSE/Works CR Butibori
Shri Dilip Ghule MDM/TMR
Shri Tarkesh Naktode
Shri Dhananjay Kumar SSE
Shri Pratap Singh SSE/PW/MME
Shri Pradeep JE/PW/NAB
Shri Shimbhu Dayal Meena SSE/Pway/SKKR
Shri Shaikh Saidjan JE/W/SKKR

04. General recommendations

A. Elephant range states

The following blanket recommendations are to be implemented across all sites:

1. Distributed Acoustic Sensing (DAS) – based Intrusion Detection Systems (IDS) are to be implemented on all sensitive stretches on priority. Further all level crossings and ramps should incorporate the DAS IDS system as well.
2. Sign boards on the sensitive stretches should be erected to alert loco pilots, along with indications of specific wildlife-crossing zones.
3. Goods trains should be scheduled for the daytime as much as possible or during the time period when the activity of the wildlife species especially elephants is at its minimum.
4. For construction of structural mitigation measures (underpasses, overpasses, level crossings and ramps), the WII report on specifications of mitigation measures should be referred.
5. Regular clearing of vegetation till at least 30 m on either side of the railway tracks is to be done to increase visibility for both loco pilots and elephants. The frequency and responsibility of carrying out pruning may be decided mutually by both parties.
6. Strict restriction and fines on disposal of garbage, especially food items, from operating trains on railway tracks in sensitive stretches and railway stations near them should be imposed.
7. Joint teams of railways and forest department personnel should be formed for all critical stretches. The team would be responsible for joint patrolling on the track of elephant presence, coordination and information sharing, and regular cleaning of railway tracks. This can be achieved by creating WhatsApp groups for each region comprising of senior officials and frontline staff of the railways and forest department.
8. There should be regular cooperation and exchange of information between forest department and railways staff. Regular sensitization workshops for railway staff, especially loco pilots and ground staff should be conducted.
9. Most railway tracks in the surveyed areas are in the process of getting electrified. Adequate measures (insulation and proofing of all electric infrastructure) should be taken to avoid incidents of electrocution of wildlife because of the railway electric infrastructure.
10. To discourage use of wildlife-friendly ramps and level crossings by people and vehicles, concrete barrier poles and/or other barriers should be built that are high enough to block passage of 2 and 4-wheelers, but low enough to allow elephants to pass.
11. Incidences of elephant and wildlife injury and mortality should be documented by both parties, with complete details on GPS location, chainage, date and time of day.
12. In the future, all metre-gauge to broad-gauge conversion projects in elephant landscapes should include comprehensive elephant mitigation plans.
13. In the future, railway stretches posing collision and barrier risks to wildlife should be identified that exist beyond elephant reserves and protected areas, such as corridors.

B. Tiger range states

The following blanket recommendations are to be implemented across all sites:

1. Sign boards on the sensitive stretches should be erected to alert loco pilots, along with indications for caution order/speed restrictions.

2. Goods trains should be scheduled for the day time as much as possible.

3. For construction of structural mitigation measures (underpasses, overpasses, level crossings and ramps), the WII report on specifications of mitigation measures should be referred. Any other site-specific alteration has been mentioned in the present report.

4. Regular clearing of vegetation till at least 30 m on either side of the railway tracks is to be done to increase visibility for both loco pilots and wildlife. The frequency and responsibility of carrying out pruning may be decided mutually by both parties.

5. Strict restriction and fines on disposal of garbage, especially food items, from operating trains on railway tracks in sensitive stretches and railway stations near them should be imposed. This is important as food waste on railway tracks acts as a major attractant to wildlife, making them vulnerable to collisions with trains.

6. Joint teams of railways and forest department personnel should be formed for all critical stretches. The team would be responsible for joint patrolling on the track of wildlife presence, coordination and information sharing, and regular cleaning of railway tracks.

7. There should be regular cooperation and exchange of information between forest department and railways staff. Regular sensitization workshops for railway staff, especially loco pilots and ground staff should be conducted.

8. It was observed and reported during the field survey that wildlife would often use trolley refuges and old level crossings (for humans) to cross the railway tracks, as it was found to be contiguous with adjacent terrain and provided a quick and easy escape to wildlife crossing the track (Fig. 4.1). It is therefore suggested to retrofit all such trolley refuges and disused level crossings as wildlife crossing zones. The concrete planks of the trolley refuges may be made uniform with the adjacent land, and level crossings may be provided on the tracks (instead of ballast) in such spots.

9. Most of the landscape is relatively flat, with track cuttings not more than 4 m in most places that do not allow for construction of animal overpasses. Escape ramps for wildlife to avoid getting trapped in these sections is recommended.

10. Concrete drains on either side of the railway tracks should be covered with slabs. This would also enable quick escape of wildlife from the tracks.

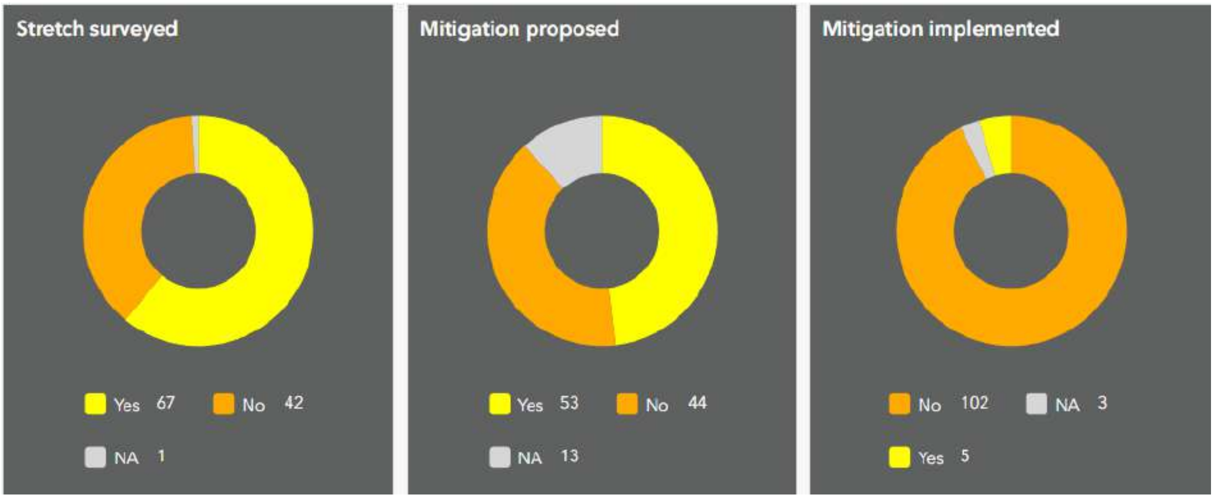
Figure 4.1: Trolley refuges and old level crossings were reported to be used extensively by wildlife to cross the railway tracks.

11. Management and removal/levelling of pits created along the railway tracks because of short-term construction work or daily operations and maintenance of railway tracks should be carried out on priority, i.e., creation of artificial water bodies along the railway track as a result of railway operations should be avoided. A list of such water pits along some railway tracks that require management is given on Page 4 of Appendix 2 (Letter Desk No.3(4)/ Vig/15/2015-16/4088 dated 15.12.2018 from the CCF, Chandrapur Circle, Maharashtra).

12. All bridges that have been extended as well as existing bridges that are considered suitable for wildlife use should be managed as wildlife crossing structures. It should be ensured that water logging does not occur in the bridges and excess vegetation that may block wildlife passage should be regularly removed.

13. Distributed Acoustic Sensing (DAS) – based Intrusion Detection Systems (IDS) are to be implemented on all sensitive stretches on priority. Further all level crossings and ramps should incorporate the DAS IDS system as well.

05. Dashboard for monitoring implementation of mitigation measures



Crossing zone details

Serial No	Name of area	State	Crossing zone width (m)	Stretch surveyed	Mitigation proposed	Mitigation implemented	Remarks	ReportLink
1	Elephant reserve	Uttarakhand	8.60	Yes	Yes	No		https://drive.google.com/file/d/[illegible]/view?usp=drive_link
2	Elephant reserve	Uttarakhand	14.30	Yes	Yes	No		-
3	Elephant reserve	Uttarakhand	28.90	Yes	Yes	Yes	This stretch has been surveyed under Harrawala Project & seperately discussed with MoR	-
4	Elephant reserve	Uttarakhand	4.50	Yes	Yes	Yes	This stretch has been surveyed under Harrawala Project & seperately discussed with MoR	-
5	Elephant reserve	Uttarakhand	21.30	Yes	Yes	Yes	This stretch has been surveyed under Harrawala Project & seperately discussed with MoR	-
6	Elephant distribution	Uttarakhand	5.90	Yes	No	No	Stretch falls within Kathgodam city limits	-
7	Elephant distribution	Uttarakhand	4.40	Yes	Yes	No	Surveyed by Forest Department	https://drive.google.com/file/d/[illegible]/view?usp=sharing
8	Elephant distribution	Uttarakhand	39.80	Yes	Yes	Yes	This stretch has been surveyed under Harrawala Project & seperately discussed with MoR	-
9	Elephant distribution	Uttarakhand	30.70	Yes	Yes	Yes	This stretch has been surveyed under Harrawala Project & seperately discussed with MoR	-
10	Elephant reserve	Uttar Pradesh	7.40	No	No	No		
11	Elephant distribution	Uttar Pradesh	7.60	No	No	No		
12	Elephant distribution	Uttar Pradesh	3.30	No	No	No		
13	Elephant distribution	Uttar Pradesh	10.30	No	No	No		
14	Elephant distribution	Uttar Pradesh	49.80	No	No	No		
15	Elephant distribution	Uttar Pradesh	19.00	No	No	No		

India is a megadiverse country, with only 2.4% of the world's land area, but accounts for 7-8% of all recorded species of the world, including about 91,000 species of animals and 45,500 species of plants. India is also the second-most populous country in the world with a population of over 1.3 billion people! To transport and cater to the needs of such a large population, the Indian Railway is the main artery of inland transportation in India. In 2020, it carried a total of 808.6 crore passengers! Indian Railways is also the single largest employer in India and the eighth largest in the world, employing approximately 13 Lakh people. It is the country's lifeline for large-scale traffic movement – freight and passengers. Railways are at the core of India's economic development and make it possible to conduct many activities like business, sightseeing, and pilgrimage along with the transportation of goods over longer distances. In fact, the Indian Railways is among the world's largest rail networks and runs thousands of trains daily. To cater to India's fast-growing economy, the railway sector has envisaged Vision 2024 to achieve targets of 2024 MT freight loading by 2024. The railway also aims to electrify the entire network.

Recognized as economic, energy-efficient, and environment-friendly relative to other means of transport such as roads and air, the expansion and upgrading of railways is seen as an important measure in supporting development through large-scale movement of people and goods. However, railway construction and operation has its ecological effects, and a range of impacts on wildlife and habitats have also been documented. Several of India's passenger

and freight trains crisscross through some of the country's most sensitive wildlife habitats, particularly protected areas and corridors that are home to critically endangered tigers and elephants, amongst other animals. The extensive network of our Railways cuts through several of these forested landscapes, compromising the connectivity of the landscape and resulting in a barrier effect.

To reduce the impact of railways on our wildlife, it is important to come together and develop measures that can protect India's rich biodiversity and also help to develop a system that is more sustainable and effective in minimizing mortalities and reducing barrier effects across the railways tracks passing through sensitive habitats in India

Project Elephant Division of MoEF&CC in coordination with Ministry of Railways and Wildlife Institute of India has identified sensitive stretches which need prioritization for mitigation planning. The portal is developed to monitor the progress of implementation of mitigation measures from the beginning. The process involves joint surveys of the identified stretches by officials of the Forest Department, Railways and Wildlife Institute of India, recommendation of mitigation measures and implementation of the mitigation measures. The mitigation proposed on the stretches surveyed by various team has been upload on the dashboard. The dashboard can be accessed at Railway Crossing Zones Dashboard (Elephant Railway Portal).

The purpose of the dashboard is to monitor the implementation of the mitigation measures on the surveyed stretches. The officers are requested to update the information on the dashboard developed for the purpose. In case of any issues please reach us at projectelephant.moef@gmail.com or elephantcell@wii.gov.in

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APPENDICES

भारतीय वन्यजीव संस्थान
Wildlife Institute of India

GENERAL GUIDELINES

FOR SUGGESTING MITIGATION MEASURES ON EXISTING RAILWAY TRACKS THROUGH ELEPHANT HABITATS IN INDIA

General Guidelines for Suggesting Mitigation Mesaurs on Railways Tracks through Elephant Habitats in India

Railway lines passing through elephant habitats can alter movement patterns and cause collisions of elephants with trains. Considering the threats to both elephant and human life, WII in consultation with Project Elephant Division of MoEFCC and State Forest Departments has identified 105 stretches of railway lines cutting through elephant reserves and elephant distribution beyond elephant reserves. Subsequently, the Ministry of Environment, Forests and Climate Change (MoEF&CC) and the Ministry of Railways (MoR) in a joint meeting directed that surveys by the railway officials, respective state forest department officers, and WII should be conducted within these stretches. The objectives of the joint field surveys would be to identify specific elephant crossing zones on these stretches and to suggest site-specific mitigation measures based on the location and the extent of these crossing zones.

In the case of existing railway lines, designing and locating structural mitigation measures for wildlife are confounded by several factors. Most critical among these is the limitation of the track height i.e., the height of the railway track with respect to surrounding terrain, making it difficult to allocate the minimum underpass height of 6 m required for animal underpasses in elephant landscapes. Additionally, excavating the ground under the track to achieve the prescribed height makes structures vulnerable to damage by rainwater, and also renders the structures unusable by wildlife. Thus, the choice of mitigation measures on existing railway lines has to be based on multiple factors that include wildlife, landscape as well as railway track design considerations. However, in the case of new railway lines, allocating adequate height to the railway tracks to incorporate wildlife mitigation measures along the line should be ensured.

In light of these factors, the following general pointers are prescribed to guide the Railway and Forest Officials in designing and choosing between different structural mitigation measures in the identified critical elephant zones intersected by railway lines. The choice of mitigation measures can be based on landscape, topography, railway track height, and other logistics.

1. Level crossings

The coarse ballast used on railway tracks is unsuitable for movement by wildlife, particularly elephants. For this reason, level crossings for elephants built using suitable material (soil, cement) and with smooth gradient can help ease movement across the railway track at grade. Level crossings are ideally located where the surrounding land is at level (flat) with the railway track and coincides with a known/identified elephant crossing area. Rubberized level crossings[1] (Fig. 1) may also be used in place of cement and soil.

[1] Functional Specification for Rubberised Surface at Level Crossings. 2019. Ministry of Railways, Govt of India. https://rdso.indianrailways.gov.in/

Figure 1. A level crossing with a rubberised surface that can be replicated on level crossings for wildlife.

2. Ramps

At most elephant crossing locations intersected by railway lines, the elevation in track height and the additional layer of ballast makes it difficult for a large-bodied hoofed animal like an elephant to make quick decisions and move away from a railway track in the event of an approaching train, leading to elephant-train collisions. At such locations, ramps using suitable material (soil, cement) may be constructed that flattens towards the top of the track, and allow for smooth and quick movement by elephants. It is important to include a level crossing instead of ballast at the top of the ramp (near the railway track) to ensure smooth movement by elephants. The sites for construction should be based on identified animal crossing zones and suitable terrain. Ramps should be levelled with the surrounding terrain by smoothening out the slope (Fig. 2). Additionally, in areas with human presence, the ramps may be fenced to funnel elephant movement across the railway track.

The orientation of the ramps with respect to the railway track may be oblique or perpendicular, depending on the land available for flattening the ramp to a navigable slope. The width of ramps and level crossings for elephants should be at least 50 m wide. Early warning systems or wildlife sensors may be provided at these places as additional measures to detect elephant movement and to avoid collision with trains.

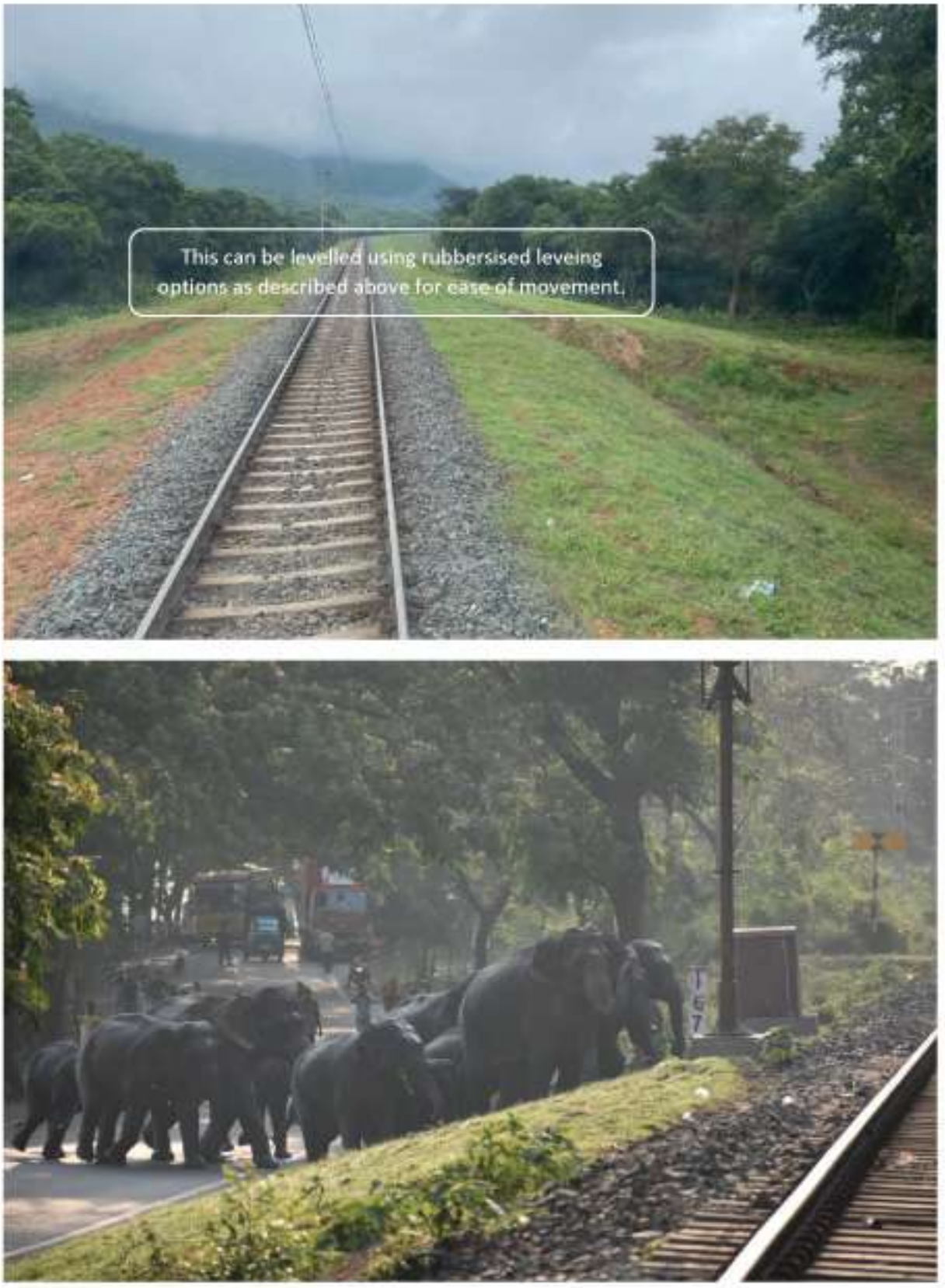

Figure 2. An example of a ramp built for aiding elephant movement across a railway line near Coimbatore, Tamil Nadu, India (Top) and an elephant group using a ramp constructed for ease of movement in Deepor Bheel Assam, India (Bottom).

3. *Wildlife underpasses*

The term wildlife underpass can be used to describe different types of structures built below the railway track to facilitate wildlife movement. These can be box culverts, viaducts, or bridges with natural drainage of different heights and widths, depending on the target wild species or community. In elephant landscapes, the minimum height of an underpass should be 6 m, with adequate width (minimum 30 m) to allow for the movement of large elephant herds (Fig. 3). However, the actual size would depend on the width of the crossing zone and feasibility of construction of underpass considering track height and curvature. Nonetheless, all efforts should be made to maintain a minimum width of 30 m. At locations where the track height is suitable, the topography of the adjacent land should be such to avoid flooding of the underpass by rainwater. Additionally, light and sound barriers should be installed above the railway track to reduce the disturbance due to train traffic on animals using underpasses.

Figure 3. Graphic representation of an underpass for elephants below a railway track.

4. *Wildlife overpasses*

Wildlife overpasses are bridge-like structures built at a height across linear infrastructure (roads and railway lines) to allow wildlife to move across the gap in the habitat. Such structures are usually enhanced with natural habitat features such as native vegetation, rocks and logs. Wildlife overpasses are less confining, quieter and have ambient natural conditions of light and weather as compared to wildlife underpasses. Since wildlife overpasses are built at a height, construction of overpasses requires adequate height on either side of the road/railway line. Thus, overpasses should be built at locations with suitable height (> 7m) and topography on either side. A wildlife overpass should not be less than 30 m wide, and may be wider in case of double or triple parallel railway lines.

Overpasses should ideally be built using pre-fabricated material and installed on-site. The overburden from the construction site or excavated from other sites may be used for filling. Further a suitably thick layer of soil should be laid on top of the pre-fabricated material. Revegetation should then be carried out using native grasses and shrubs on the substrate to provide a natural movement path. Either side of the top of the

overpasses should be fenced with light and sound barriers (Fig. 4). The slope/approach of the overpass should be not more than 30 degrees at any point. If the overpass is to be constructed across two or more railway tracks, a supporting pillar/post may be provided for structural support (Fig. 5).

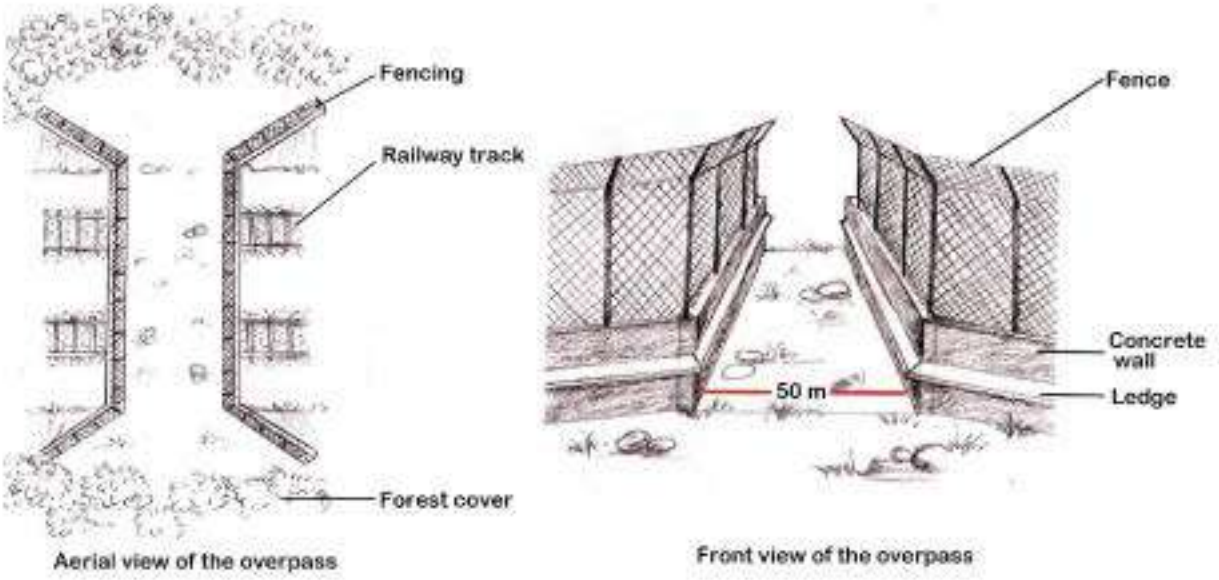

Figure 4. Aerial and front view of overpasses on railway tracks, with fencing/noise and sound barrier details.

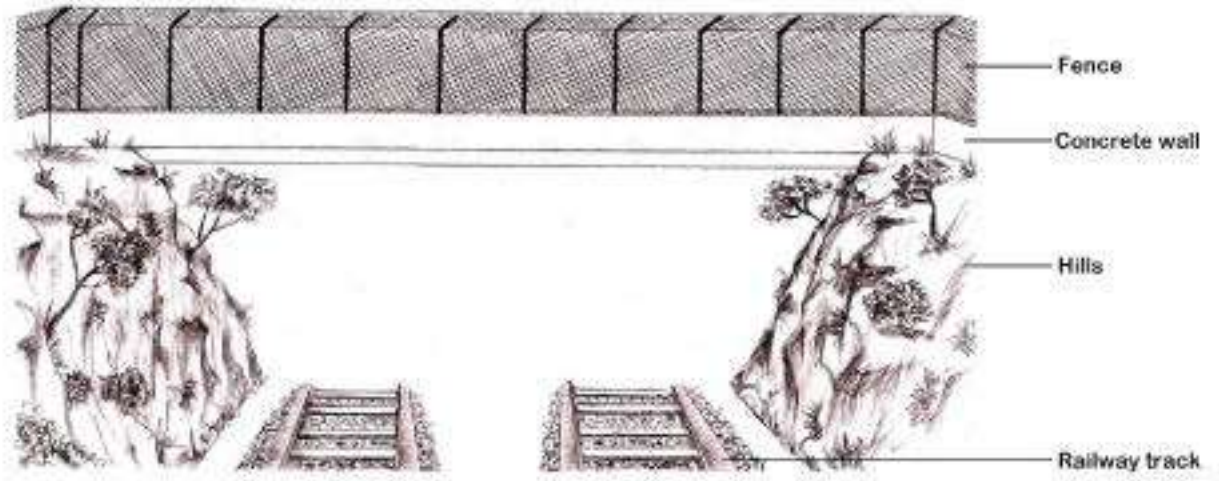

Figure 5. Lateral view of a wildlife overpass on a double-track railway line.

5. Installation of Distributed Acoustic Sensing (DAS) System

Irrespective of the type of mitigation measures to be employed across the sensitive railway stretches, all the sensitive stretches have to be installed with DAS. The system developed by railways to detect the presence and movement of the elephants along the railway tracks is basically an intrusion-based detection system based on Distributed Acoustic Sensing (DAS). A DAS monitoring interrogator converts a standard communications single-mode fiber into thousands of extremely sensitive

acoustic and vibration sensors. The Distributed Acoustic Sensor connected to one end of the fiber uses a laser to send thousands of short pulses of light along the fiber every second. A small portion of the light traveling in fiber is reflected by the process known as Rayleigh Backscatter. The concept of securing a network from malicious entities by capturing and monitoring data packets was first employed by James Anderson in 1980. Since then, researchers have developed various approaches to enhance the performance and accuracy of intrusion detection.

Vibrations from the surrounding environment will disturb the light in the fiber and will therefore be observed by the DAS interrogator. The events that are of concern are reported to the alarm server. As the data is processed in real-time, advanced algorithms can recognize the unique signatures of each type of event.

The system can show the precise location of the event, and information about what event has taken place, which means the laser pulse frequency, pulse width, and many other parameters. These parameters can be controlled, enabling the system to be tuned to the desired requirement. Integrated with machine learning and artificial intelligence, the system can differentiate even between minor variations in the scatter. The optic fiber cable running along infrastructure and other important assets can give uninterrupted and real-time feedback on activities occurring along and around them.

The recommendations of the MoEFCC committee constituted vide office order No. WL-8/28/2022-WL on 3rd January 2023 needs to be considered for the implementation of the DAS.

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Appendix-2

Correspondence from Forest Range Officer, Parvathipuram to the Additional Divisional Engineer, Rayagada regarding elephant movement

GOVERNMENT OF ANDHRA PRADESH
FOREST DEPARTMENT

Rc.No.12/2024
Dt.07.06.2024

o/o Forest Range Officer
E M U, Parvathipuram

From
Sri.K.Manikantesh
Forest Range Officer
Elephant Monitoring Unit
Parvathipuram

To
The Assistant Divisional Engineer
East Coast Railway Division
Rayagada
Odisha State

Sir,

Sub: Wildlife – A heard of Wild Elephants roaming in between Artham Railway gate to Kuneru Railway Station – Creation of Awareness to Pilot Drivers of Railways – Fixation of caution boards along with Railway track – Requested – Reg.

Ref: Verbal instructions of District Forest Officer, Parvathipuram Manyam Dt.02.06.2024

@ @ @

It is submitted that A heard of Wild Elephants roaming in between Artham Railway gate to Kuneru Railway Station since 2018. In the reference cited the District Forest Officer, Parvathipuram Manyam has instructed to addressed to Railway Authorities to fix the caution boards wherever necessary along with Railway track on creation of awareness on Wild Elephants to eradicate untoward incidents such as sudden hits by the Trains.

Hence I request that the Assistant Divisional Engineer, East Coast Railway Division, Rayagada kindly arrange the caution boards wherever necessary along the Railway track from Artham Railway gate to Kuneru Railway station over a distance of 8 Kms on creation of awareness on Wild Elephants to eradicate untoward incidents and as well as protect the Wild Elephants as it is Scheduled 1 species of Wildlife Protection Act,1972. We have identified the main regions from Artham to Kummarigunta across which the Elephants tend to cross the railway line. The details are as mentioned hereunder:

Sl.No	Pole No	Latitude	Longitude
1	379/33	18.845973	83.457752
2	379/34	18.846039	83.457665
3	380/5	18.844345	83.454615
4	380/5A	18.844288	83.457712

Appendix-3

Correspondence from ADE, Tirupathi, South-Central Railway regarding sensitive railway stretch

SOUTH CENTRAL RAILWAY

No. 39/Misc/TPTY

Office of the
Asst. Divl.Engineer
Tirupati, Date: 10-07-2023

DEN/West/GTL

Sub: Regarding sensitive stretches on existing Railway lines for the construction of Permanent mitigation measures to mitigate wildlife-rail collision – Reg.

Ref: 1. HqS/Works branch/SC lr.No:W.T-5/Gen Accidents/PQ/Vo:.III –Dated:22-11-2022
2. Rly Board letter No. 2022/CE-IV/Elephant Pass dt. 30.09.22
3. MOEP OM No. F.No.12-1/2019-PE(Part-I) dated 30.08.2022.

<<<<<>>>>>

In connection with the above subject, jointly visited the location between TPW-PAK with Forest Ranger Officer/Panapakam.

The Joint report enclosed for your information and to process further please.

Asst. Divl. Engineer
Tirupati

Joint Inspection Report

Sub: Regarding senstitve stretches on existing Railway lines for the construction of Permanent mitigation measures to mitigate wildlife-rail collision – Reg.

Ref: HqS/Works branch/SC Ir.No:W.T-5/Gen Accidents/PQ/Qo;III – Datcd.22.11.2022.

<<<<<>>>>>

Vide letters cited above; the following locations are identified as sensitive stretch provided by MOEF for constructing permanent/temporary mitigation measure across Elephant areas.

S.No	Between Stations	GPS Co-ordinates		Chainage (Km)		Distance Kms
		North	East	From	To	
1	Tirupati West-Pakala	13.449356	79..143044	65.77	--	32.47
		13.620141	79.364358	--	98.24	
Note: Above Chainage are approximated, measured from Google Earth.						

The location between Tirupati West and Pakala stations is jointly inspected between 05.07.2023 and 08.07.2023, enquired local people and gathered information on history of Elephant crossings in this area.

There are no cases of Elephant Track crossings in the said location till now and also observed sufficient Bridges/under passes available to cross the track in this stretch.

Hence there is no need of any new constructions of permanent/temporary mitigation measures between Tirupati West and Pakala station.

Forest Range Officer,
Panapakam.

सहायक मंडल इंजीनियर
Asst. Divl. Engineer
द.म. रेलवे / S.C. Railway
तिरुपति/TIRUPATI

C/-DFO/TPTY for kind information please
C/-DEN/West/GTL for kind information please.

Appendix-4

कार्यालय प्रमुख वन संरक्षक, वन्यजीव/मुख्य वन्यजीव प्रतिपालक, उत्तराखण्ड, देहरादून।

85 राजपुर रोड, देहरादून, फोन नं० 0135–2742884 फैक्स नं० 0135–2745691 ईमेल–cwlwua@yahoo.co.in

पत्रांक: 895 /6-18 देहरादून, दिनांक 31 अक्टूबर, 2022

सेवा में,

Dr. K. Muthamizh Selvan,
Scientist 'E' (Project Elephant),
6th Floor, Vayu Wing, Indira Paryavaran Bhawan,
Jor Bagh Road, Aliganj, New Delhi.

विषयः– Information requested regarding sensitive locations for construction of permanent measures to mitigate wildlife-rail collisions – reg.

संदर्भः– आपका पत्रांक F.NO. 12-1/2019-PE दिनांक 18 अक्टूबर 2022

महोदय,

उपरोक्त संदर्भित पत्र से राज्य के अन्तर्गत sensitive locations for construction of permanent measures to mitigate wildlife-rail collisions की वांछना की गई थी। उक्त के क्रम में वांछित सूचना संलग्न कर प्रेषित की जा रही है।

भवदीय,

31/10

(डा0 समीर सिन्हा)
प्रमुख वन संरक्षक (वन्यजीव)/
मुख्य वन्यजीव प्रतिपालक,
उत्तराखण्ड।

31/10/22

पत्रांक 895 /6-18 तद्दिनांकित।

प्रतिलिपिः निदेशक, भारतीय वन्यजीव संस्थान, देहरादून को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।

31/10

(डा0 समीर सिन्हा)
प्रमुख वन संरक्षक (वन्यजीव)/
मुख्य वन्यजीव प्रतिपालक,
उत्तराखण्ड।

31/10/22

Dr Bilal
2/11/2022

DWII OFFICE
DIARY NO. 2947
DATE 2/11/22

CWLW 2022/
General 2022

Information on Sensitive locations for construction of permanent measures to mitigate wildlife-rail collisions
State: UTTARAKHAND

S. No.	Area/landscape/Protected Area	Crossing Zone Priority (I/II/III)	Focal Species	Crossing zone width (m)	GPS location (mid-point)	Structure Proposed (Underpass/ Overpass)	Size of structure required (length x width x height)
1-	Dehradun Forest Division/Lachhiwala Range/Lachhiwala Compt.No. 13A	III	Sambhar, Barking Deer	20	N- 30°06'57.1" E-78°06'56.9"		
2-	Dehradun Forest Division/Lachhiwala Range/Lachhiwala Compt.No. 13A	III	Sambhar, Barking Deer	20	N- 30°13'18.9" E-78°07'42.2"		
3-	Dehradun Forest Division/Lachhiwala Range/Lachhiwala Compt.No. 9A	III	Sambhar, Barking Deer	20	N- 30°12'43.24" E-78°07'48.6"		
4-	Dehradun Forest Division/Rishikesh Range/Lalpani Compt. No. 2	III	Elephant, Sambhar, Barking Deer	100	N- 30°05'5.472" E-78°15'45.804"		
5-	Dehradun Forest Division/Rishikesh Range/Veerbhadra Compt. No. 1	III	Elephant, leopard	100	N- 30°04'27.624" E-78°15'80.7"		
6-	Dehradun Forest Division/Rishikesh Range/Veerbhadra Compt. No. 2C	III	Elephant, leopard	80	N- 30°04'42.463" E-78°15'29.608"		
7-	Dehradun Forest Division/Rishikesh Range/Bibiwala Compt. 1b	III	Elephant, leopard, Sambhar & Barking Deer	20 15	N- 30°11'75" E-78°27'95" N- 30°10'21" E-78°27'53"		
8-	Dehradun Forest Division/Rishikesh Range/Rishikesh Compt. No. 3	III	Elephant	5	N- 30°09'87" E-78°27'77"		
9-	Haridwar Forest Division/Haridwar Range/Laksar-Dehradun Railway line	Jamalpur Railway Crossing	-	-	N- 29°50'17" E-78°04'01"	Label Crossing	
10-	Haridwar Forest Division/Haridwar Range/Laksar-Dehradun Railway line	Pathri Subhash Railway Crossing			N- 29°54'06" E-78°06'16"	Label Crossing	
11-	Tarai West FD Ramnagar near CTE	Plot No. 19 to Plot no. 16	Elephant, Leopard, Tiger etc.	270	N- 29°19'09.58" E-79°02'10.63"	Under Pass	105856mt

12-	Tarai West FD	Nafa to Plot No. 15	Elephant, Leopard, Tiger etc.	320	N- 29°18'75.78'' E-79°01'39.99''	Under
13-	Tarai Central FD/Thimari East Plot No. 47B	I	Elephant	50	N29°05'15" E079°23'32"	Level with E
14-	Tarai Central FD/ Thimari East Plot No. 48A	I	Elephant	50	N29°5'16.24" E079°23'24.44"	Level with E
15-	Tarai Central FD/ Thimari East Plot No. 48A	I	Elephant	50	N29°5'17.16" E079°23'21.11"	Level with E
16-	Tarai Central FD/ Thimari East Plot No. 48A	I	Elephant	50	N29°5'15.82" E079°23'26.97"	Level with E
17-	Tarai Central FD/ Thimari East Plot No. 45	I	Elephant	50	N29°5'28.20" E079°22'30.46"	Level with E
18-	Tarai Central FD/ Thimari West Plot No. 56a(IV)	I	Elephant	50	N29°4'55.17" E079°25'40.74"	Level with E
19-	Tarai Central FD/ Gangapur Patiya Plot No. 57	I	Elephant	50	N29°4'49.32" E079°27'24.58"	Level with E
20-	Tarai Central FD/ Gangapur Patiya Plot No. 59	I	Elephant	50	N29°4'44.51" E079°29'11.25"	Level with E
21-	Tarai Central FD/ Gangapur Patiya Plot No. 20	I	Elephant	50	N29°2'51.86" E079°29'52.38"	Level with E
22-	Tarai Central FD/ South Haldu Chor Plot No. 23	I	Elephant	50	N29°2'11.62" E079°28'45.04"	Level with E
23-	Tarai Central FD/ South Haldu Chor Plot No. 7b	I	Elephant	50	N29°2'14.58" E079°28'7.30	Level with E
24-	Rajaji TR (Motichur Range)	I	Elephant, Leopard, Tiger, Hayna, Chital, Sambhar etc.	1500	N=30°0'50'49" E=78°11'47.41"	Over
25-	Rajaji TR (Motichur Range)	I	Elephant, Leopard, Tiger, Hayna, Chital, Sambhar etc.	4000	N=30°3'11.21" E=78°11'27.23"	Over

S. No.	Area/landscape/Protected Area	Crossing Zone Priority (I/II/III)	Focal Species	Crossing zone width (m)	GPS location (mid-point)	Structure Proposed (Underpass/ Overpass)	Size of structure required (length x width x height)
26-	Rajaji TR (Kansaro Range)	I	Elephant, Leopard, Tiger, Hayna, Chital, Sambhar etc.	15	N=30°06'26.62" E=78°07'03.34"	Overpass	40x15x30
27-	Rajaji TR (Kansaro Range)	II	Elephant, Leopard, Tiger, Hayna, Chital, Sambhar etc.	12	N=30°06'10.49" E=78°07'12.70"	Underpass	15x12x15
28-	Rajaji TR (Kansaro Range)	II	Elephant, Leopard, Tiger, Hayna, Chital, Sambhar etc.	10	N=30°05'47.81" E=78°07'26.62"	Overpass	40x10x30
29-	Rajaji TR (Kansaro Range)	I	Elephant, Leopard, Tiger, Hayna, Chital, Sambhar etc.	18	N=30°05'22.96" E=78°07'46.61"	Underpass	20x18x15
30-	Rajaji TR (Kansaro Range)	I	Elephant, Leopard, Tiger, Hayna, Chital, Sambhar etc.	15	N=30°05'16.28" E=78°07'52.87"	Underpass	20x15x15
31-	Rajaji TR (Kansaro Range)	III	Elephant, Leopard, Tiger, Hayna, Chital, Sambhar etc.	15	N=30°05'09.93" E=78°07'49.50"	Underpass	20x15x15
32-	Rajaji TR (Kansaro Range)	I	Elephant, Leopard, Tiger, Hayna, Chital, Sambhar etc.	15	N=30°04'41.82" E=78°08'33.41"	Underpass	40x15x30
33-	Rajaji TR (Kansaro Range)	II	Elephant, Leopard, Tiger, Hayna, Chital, Sambhar etc.	20	N=30°04'32.41" E=78°08'47.85"	Overpass	20x20x15
34-	Rajaji TR (Kansaro Range)	III	Elephant, Leopard, Tiger, Hayna, Chital, Sambhar etc.	18	N=30°04'01.79" E=78°09'34.21"	underpass	20x18x15
35-	Rajaji TR (Kansaro Range)	II	Elephant, Leopard, Tiger, Hayna, Chital, Sambhar etc.	16	N=30°03'36.98" E=78°10'20.50"	underpass	20x16x15

Appendix-5

OFFICE OF THE
CHIEF CONSERVATOR OF FORESTS,
CHANDRAPUR CIRCLE, CHANDRAPUR,
CIVIL LINE, NAGPUR ROAD,
CHANDRAPUR – 442401
E-mail: ccftchandrapur@mahaforest.gov.in

मुख्य वनसंरक्षक,
चंद्रपूर वनवृत्त, चंद्रपूर यांचे कार्यालय
सिव्हील लाईन, नागपूर रोड, चंद्रपूर - 442401
Phone (07172) 256279, Fax 07172-252232
E-mail: ccfchandrapur@gmail.com

Sub :- Mitigation measures to be adopted in Ballarshah - Gondia Railway line to prevent the death of wild animals due to hits by speeding trains.

Desk No.3(4)/Vig/15/2015-16/**4088**
Chandrapur, Dt. :- **15.12.2018**

To,

The Divisional Railway Manager,
South East Central Railway,
DRM complex,
Opposite to Nagpur Railway Station
Kingsway, Nagpur 440001.

Respected Madam,

This is to bring to your notice that 3 Tiger cubs were found dead on & near the railway track between Chanda Fort station & Kelzar station (near pole no.1232/17) in Ballarshah- Gondia railway line due to a speeding Train on 15.11.2018. Approximately 60 Km of the said railway line is passing through dense forest area which is inhabited by a variety of wild animals and more importantly being used as corridor by the Tigers and their cubs.

The following is the list of similar incidences happened in the same railway line in the last 8 years :-

(between Ballarshah and Bramhapuri i.e., in the jurisdiction of the undersigned.)

Sr. No	Date	Location/ Railway Pole No.	Forest area details					Name of the wild Animal dead due to speeding train	No.of wild animals dead
			Division	Range	Round	Beat	Compt No.		
1	2	3	4	5	6	7	8	9	10
1	15.11.2018	1232/17	FDCM West Chanda Forest Project Division	Junona	Junona	Junona 1	477	Tiger	3
2	18.07.2016	1165	Bramhapuri	Sindewahi	Sindewahi	Dongargaon	252	Wild pig	5
3	14.07.2016	1151/15 to 1139/1	FDCM Ltd.Bramhapuri	Balapur	Balapur	Balapur	72	Wild Boar	1
4	8.06.2016	1151/15 to 1139/1	FDCM Ltd.Bramhapuri	Balapur	Balapur	Balapur	74	Leopard	1
5	3.09.2015	1166	Bramhapuri	Sindewahi	Sindewahi	Dongargaon	253	Indian Gour	1
6	15.04.2013	Chichpalli railway line	Chandrapur	Chichpalli	Chichpalli	Chichpalli	430 & 458 FDCM Boundry Line	Tiger	1
7	13.03.2013	Chandrapur-Nagpur railway line	Chandrapur	Chandrapur	Chandrapur	South Lohara	408 Lohara	Sloth bear	1
8	21.01.2013	1151/15 to 1139/1	FDCM Ltd.Bramhapuri	Balapur	Balapur	Balapur	72	Chital	1
9	25.09.2012	1164	Bramhapuri	Sindewahi	Sindewahi	Dongargaon	252	Hyena	1
10	7.09.2012	1160/6	Bramhapuri	Talodhi	Talodhi	Alewahi	..	Hyena	1
11	29.02.2012	1167	Bramhapuri	Sindewahi	Sindewahi	Kargata	250	Leopard	1
12	11.02.2012	1145/8	Bramhapuri	Talodhi	Talodhi	Deopayali	725	Nilgai	1

13	25.01.2011	1140	Bramhapuri	Nagbhid	Mindala	Mindala	727	Indian Gour	1
14	24.12.2010	1102	Bramhapuri	North Bramhapuri	Bramhapuri	Bramhapuri	54 FDCM	Indian Gour	1
15	23.12.2010	1123/10 to 1120/9	FDCM Ltd.Bramhapuri	Bramhapuri	Bramhapuri	Bramhapuri	54	Indian Gour	1
16	5.09.2010	1156/14	Bramhapuri	Talodhi	Talodhi	Gangasagar heti	76	Hyena	2
17	27.08.2008	1238/02	FDCM West Chanda Forest Project Division	Junona	Asegaon	Asegaon 2	472	Bear	1
								Total	24

So far we have written the following letters to the the Railway Authorities for adopting mitigation measures to prevent such incidences of death of wild animals due to speeding trains.

Sr.No.	Name of the officer who wrote letter to Railway Authority	Name of the officer of the Railway department to whom letter is addressed.	Letter No & date
1	Divisional Manager, F.D.C.M. Ltd Bramhapuri	Divisionnal Railway Manager South Eastern Railway, Nagpur (M.S.)	FDCM/DM/Bramh/Wildlife/40, Bramhapuri Dt.8.04.2012
2	Chief Conseravator of Forests & field Director, Tadoba-Andhari Tiger Reserve, Chandrapur	Divisionnal Railway Manager South Eastern Railway, Nagpur (M.S.)	Desk no.1/offence/13-14/2175 dt.30.09.2013
3	Divisionnal Forest Officer, Chandrapur Division, Chandrapur	Station Superintendant, Central Railway	Desk-8/CC1/Case No.56/1028 dt.21.07.2017

Despite witnessing 17 incidences as mentioned above in the last 8 years, it is found that no efforts have been made by Railway department to prevent such incidences.

Now, it is highly desirable and need of the hour to bring to your kind notice that the following mitigation measures suggested by a team of field Forest Officers and interested local NGOs be adopted to prevent any further casuality to wild animals due to speeding Trains in the said track.

1. The following are the patches where the said railway track passes though dense forest areas or/and areas used as carridor by Tigers and other wild animals. We request you to direct the concerned authorities to reduce the speed of the passenger/Goods Trains to less than 40 Km/hr or to a speed which provides enough sight distance to apply the brakes and to blow horn to prevent Train collisions with wild animals in the following patches :-

Sr. No.	Location/ Railway Pole No. where speed is to be reduced.		Forest area details				
	From	To	Division	Range	Round	Beat	Compt No.
1	2	3	4	5	6	7	8
1	1237/11	1237/1	FDCM West Chanda Forest Project Division	Junona	Asegaon	Asegaon-2	472
2	1235/1	1235/5	Chandrapur	Chandrapur	Babupeth	Babupeth	408
3	1234/06	1233/14	FDCM West Chanda Forest Project Division	Junona	Junona	Junona 1	477
4	1233/3	1233/2	FDCM West Chanda 4Forest Project 2Division	Junona	Junona	Junona-1	472
5	1232/06	1231/14	FDCM West Chanda Forest Project Division	Junona	Junona	Junona 1	477
6	1230/15	1230/08	FDCM West Chanda Forest Project Division	Mamla	Lohara-1	Lohara-1	410
7	1225/8	1225/7	FDCM West Chanda Forest Project Division	Junona	Junona	Junona-1	423

8	1221/14	1221/17	FDCM West Chanda Forest Project Division	Chichpalli	Chichpalli	Chichpalli-1	--
9	1220/15	1220/16	FDCM West Chanda Forest Project Division	Chichpalli	Chichpalli	Chichpalli-1	472
10	1220/3	1220/4	FDCM West Chanda Forest Project Division	Chichpalli	Chichpalli	Chichpalli-1	472
11	1219/5	1219/6	Chandrapur	Chichpalli	Chichpalli	Chichpalli	430
12	1218/18	1218/19	Chandrapur	Chichpalli	Chichpalli	Chichpalli	430
13	1218/8	1218/18	FDCM West Chanda Forest Project Division	Chichpalli	Chichpalli	Chichpalli-1	423
14	1218/2	1218/3	Chandrapur	Chichpalli	Chichpalli	Chichpalli	430
15	1217/8	1217/9	Chandrapur	Chichpalli	Chichpalli	Chichpalli	430
16	1217/3	1217/4	Chandrapur	Chichpalli	Chichpalli	Chichpalli	430
17	1216/13	1216/14	Chandrapur	Chichpalli	Chichpalli	Chichpalli	430
18	1216/12	1216/13	Chandrapur	Chichpalli	Kelzar	Sandala	431,430
19	1216/6	1216/7	Chandrapur	Chichpalli	Kelzar	Sandala	431
20	1216/2	1216/3	Chandrapur	Chichpalli	Kelzar	Sandala	431
21	1215/8	1215/9	Chandrapur	Chichpalli	Kelzar	Sandala	431,432
22	1215/4	1215/5	FDCM West Chanda Forest Project Division	Chichpalli	Chichpalli	Chichpalli-1	424
23	1214/10	1214/1	FDCM West Chanda Forest Project Division	Chichpalli	Chichpalli	Chichpalli-1	423
24	1214/3	1214/4	Chandrapur	Chichpalli	Kelzar	Sandala	432
25	1212/7	1212/8	FDCM West Chanda Forest Project Division	Junona	Junona	Junona-1	423
26	1179/4	1180/1	Bramhapuri	Sindewahi	Sindewahi	Lonkhairi	247
27	1178/8	1174/6	Bramhapuri FDCM Ltd. Bramhapuri	Sindewahi	South sindewahi	Saradpar, Chitki	170,171,172
28	1177/1	1179/3	Bramhapuri	Sindewahi	Sindewahi	Lonkhairi	172 FDCM
29	1173/4	1176/18	Bramhapuri	Sindewahi	Sindewahi	Sindewahi	171 FDCM
30	1172/15	1173/3	Bramhapuri	Sindewahi	Sindewahi	Sindewahi	1329
31	1172/1	1173/2	Bramhapuri	Sindewahi	Sindewahi	Sindewahi	1334
32	1168/1	1168/8	Bramhapuri	Sindewahi	Sindewahi	Kargata	1348
33	1168/1	1168/8	Bramhapuri	Sindewahi	Sindewahi	Kargata	1349
34	1167/1	1167/27	Bramhapuri	Sindewahi	Sindewahi	Kargata	250
35	1165/10	1166/16	Bramhapuri	Sindewahi	Sindewahi	Dongargaon	253
36	1164/14	1165/9	Bramhapuri	Sindewahi	Sindewahi	Dongargaon	252
37	1163/17	1164/13	Bramhapuri	Sindewahi	Sindewahi	Dongargaon	258
38	1163/17	1164/13	Bramhapuri	Sindewahi	Sindewahi	Dongargaon	259
39	1163/11	1163/16	Bramhapuri	Sindewahi	Sindewahi	Dongargaon	184
40	1162/8	1166/11	Bramhapuri	Talodhi	Talodhi	Alewahi	91
41	1160/6	1161/12	Bramhapuri	Talodhi	Talodhi	Alewahi	97
42	1160/1	1161/12	Bramhapuri	Talodhi	Talodhi	Alewahi	701
43	1160/1	1160/15	Bramhapuri	Talodhi	Talodhi	Alewahi	--
44	1157/1	1159/2	Bramhapuri	Talodhi	Talodhi	Alewahi	92
45	1156/1	1156/20	Bramhapuri	Talodhi	Talodhi	Gangasagar Heti	97
46	1156/1	1156/20	Bramhapuri	Talodhi	Talodhi	Gangasagar Heti	76
47	1156/1	1156/18	Bramhapuri	Talodhi	Talodhi	Gangasagar Heti	97
48	1154/1	1154/21	Bramhapuri	Talodhi	Talodhi	Gangasagar Heti	97
49	1153/1	1153/15	Bramhapuri	Talodhi	Talodhi	Gangasagar Heti	97
50	1152/14	1152/16	Bramhapuri	Talodhi	Talodhi	Gangasagar Heti	97
51	1151/15	1139/1	Bramhapuri FDCM Ltd. Bramhapuri	Balapur	Balapur	Balapur	74,72,71,70,69
52	1150/16	1151/14	Bramhapuri	Talodhi	Balapur	Balapur	74
53	1149/3	1150/6	Bramhapuri	Talodhi	Balapur	Balapur	72
54	1146/1	1148/11	Bramhapuri	Talodhi	Talodhi	Deopayli	71 FDCM
55	1144/11	1145/15	Bramhapuri	Talodhi	Talodhi	Deopayli	725
56	1144/3	1144/8	Bramhapuri	Nagbhid	Mindala	Mindala	107
57	1143/11	1144/1	Bramhapuri	Talodhi	Talodhi	Deopayli	132
58	1143/1	1143/15	Bramhapuri	Nagbhid	Mindala	Mindala	107
59	1142/1	1142/19	Bramhapuri	Nagbhid	Mindala	Mindala	107
60	1141/1	1141/16	Bramhapuri	Nagbhid	Mindala	Mindala	107

61	1140/8	1140/16	Bramhapuri	Nagbhid	Mindala	Mindala	727
62	1140/2	1140/7	Bramhapuri	Nagbhid	Mindala	Mindala	108
63	1140	1140/1	Bramhapuri	Nagbhid	Mindala	Mindala	69 FDCM
64	1139/1	1139/17	Bramhapuri	Nagbhid	Mindala	Mindala	69 FDCM
65	1138/5	1138/17	Bramhapuri	Nagbhid	Mindala	Mindala	1814
66	1123/10	1120/00	Bramhapuri FDCM Ltd. Bramhapuri	Bramhapuri	Bramhapuri	Bramhapuri	54
67	1119/1	1119/2	Bramhapuri	North Bramhapuri	Bramhapuri	Bramhapuri	864
68	1111/1	1111/2	Bramhapuri	North Bramhapuri	Bramhapuri	Bramhapuri	864
69	1110/14	1110/15	Bramhapuri	North Bramhapuri	Bramhapuri	Bramhapuri	864
70	1110/1	1109/17	Bramhapuri	North Bramhapuri	Bramhapuri	Bramhapuri	864
71	1102/17	1102/16	Bramhapuri	North Bramhapuri	Bramhapuri	Bramhapuri	54 FDCM

2. During the maintenance and construction works along the tracks, the Railway contractors have made some pits in the area near the tracks. Subsequently, the water in the pits attracts the wild animals in the area, who may come on tracks and get hit by speeding Trains.

We request you to please direct the concerned authorities to level up the following unwanted pits which attract the wild animals near to the Railway Track.

Sr.No.	Location of pits Between		Forest area details				
	Pole No.	Pole No	Division	Range	Round	Beat	Compt.No.
1	2	3	4	5	6	7	8
1	1235/1	1235/5	Chandrapur	Chandrapur	Babupeth	Babupeth	430
2	1218/3	1218/3	Chandrapur	Chichpalli	Chichpalli	Chichpalli	430
3	1218	1218	Chandrapur	Chichpalli	Chichpalli	Chichpalli	430
4	1217/6	1217/5	Chandrapur	Chichpalli	Chichpalli	Chichpalli	430
5	1217/3	1217/3	Chandrapur	Chichpalli	Chichpalli	Chichpalli	430
6	1216/14	1216/14	Chandrapur	Chichpalli	Chichpalli	Chichpalli	430
7	1216/11	1216/11	Chandrapur	Chichpalli	Chichpalli	Chichpalli	430
8	1214/3	1214/4	Chandrapur	Chichpalli	Kelzar	Chichpalli	432
9	1179/16	1179/15	Bramhapuri	Sindewahi	Sindewahi	Lonkhairi	247/277
10	1179/14	1179/13	Bramhapuri	Sindewahi	Sindewahi	Lonkhairi	247/277
11	1179/7	1179/5	Bramhapuri	Sindewahi	Sindewahi	Lonkhairi	247/277
12	1177/14	1177/12	Bramhapuri	Sindewahi	Sindewahi	Saradpar	172 (FDCM)
13	1172/10	1173/15	Bramhapuri	Sindewahi	Sindewahi	Sindewahi	1329
14	1165/6	1165/7	Bramhapuri	Sindewahi	Sindewahi	Dongargaon	152
15	1165/3	1165/4	Bramhapuri	Sindewahi	Sindewahi	Dongargaon	252
16	1163/10	1163/11	Bramhapuri	Sindewahi	Sindewahi	Dongargaon	1843
17	1161/14	1161/16	Bramhapuri	Talodhi	Talodhi	Alewahi	91, 701
18	1159/18	1160/7	Bramhapuri	Talodhi	Talodhi	Alewahi	701
19	1152/2	1152/3	Bramhapuri	Talodhi	Talodhi	Gangasagar Heti	Private Land
20	1141/8	1141/9	Bramhapuri	Nagbhid	Mindala	Mindala	107
21	1139/2	1139/4	Bramhapuri	Nagbhid	Mindala	Mindala	69 (FDCM)

3. There are some underpasses along the track for the safe movement of wild animals. They are not being used by the wild animals as they are either blocked or not clearly visible. The following are the underpasses :-

Sr.No.	Location of the uderpass		Forest area details					Reasons for the blockages of underpass
	Between							
	Pole No.	Pole No.	Division	Range	Round	Beat	Compt No.	
1	2	3	4	5	6	7	8	9
1	1172/1	1173/2	Bramhapuri	Sindewahi	Sindewahi	Sinewahi	1334	Underpass blocked due to rain water.
2	1178/8	1178/6	Bramhapuri FDCM Ltd. Bramhapuri	Sindewahi	South sindewahi	Saradpar, Chitki	171	Natural unwanted growth of trees.
3	1235/1	1235/5	Chandrapur	Chandrapur	Babupeth	Babupeth	430	Underpasses blocked due to rainwater.

4. There is a need to create new underpasses at the following locations for the safe movement of the Tigers and other wild animals.

Sr.No.	Location/ Railway Pole No. where need to create new underpasses.		Forest area details				
	From	To	Division	Range	Round	Beat	Compt No.
1	2	3	4	5	6	7	8
1	1237/11	1237/1	FDCM West Chanda Forest Project Division	Junona	Asegaon	Asegaon-2	472
2	1236/5	1235/1	FDCM West Chanda Forest Project Division	Mamla	Lohara-1	Lohara-1	409
3	1234/08	1233/14	FDCM West Chanda Forest Project Division	Junona	Junona	Junona 1	477
4	1233/3	1233/2	FDCM West Chanda 4Forest Project SDivision	Junona	Junona	Junona-1	472
5	1232/06	1231/14	FDCM West Chanda Forest Project Division	Junona	Junona	Junona 1	477
6	1231/13	1231/11	FDCM West Chanda Forest Project Division	Mamla	Lohara-1	Lohara-1	409
7	1230/15	1230/08	FDCM West Chanda Forest Project Division	Mamla	Lohara-1	Lohara-1	410
8	1225/8	1225/7	FDCM West Chanda Forest Project Division	Junona	Junona	Junona-1	423
9	1221/14	1221/17	FDCM West Chanda Forest Project Division	Chichpalli	Chichpalli	Chichpalli-1	..
10	1220/15	1220/16	FDCM West Chanda Forest Project Division	Chichpalli	Chichpalli	Chichpalli-1	472
11	1220/3	1220/4	FDCM West Chanda Forest Project Division	Chichpalli	Chichpalli	Chichpalli-1	472
12	1218/20	1219/1	FDCM West Chanda Forest Project Division	Chichpalli	Chichpalli	Chichpalli-1	423
13	1218/8	1218/18	FDCM West Chanda Forest Project Division	Chichpalli	Chichpalli	Chichpalli-1	423
14	1216/1	1216/15	FDCM West Chanda Forest Project Division	Chichpalli	Chichpalli	Chichpalli-1	423
15	1215/4	1215/5	FDCM West Chanda Forest Project Division	Chichpalli	Chichpalli	Chichpalli-1	424
16	1214/10	1214/1	FDCM West Chanda Forest Project Division	Chichpalli	Chichpalli	Chichpalli-1	423
17	1212/7	1212/8	FDCM West Chanda Forest Project Division	Junona	Junona	Junona-1	423

5. **The food waste thrown from Train windows by passengers along the railway line attracts wild animals towards the tracks. Extra efforts need to be made to clean this food waste along the tracks in the above dense forest patches.**

Hence, we request your good office to intervene and direct the concerned authorities to take necessary steps to reduce the speed/blow horn in the above locations as mentioned and to level the unwanted pits made along the railway track and also to clear the underpasses to make them clearly visible and to create new underpasses at the above required locations and also to provide fencing of 200-300 meters on both sides of the underpasses to enable the wild animals to pass through the existing underpasses safely to prevent such incidences in future.

Thanking you in anticipation,

Ramarao

(S.V.Ramarao, IFS)
Chief Conservator of Forests,
Chandrapur Circle, Chandrapur,
Maharashtra State.

Copy submitted to :- The General Manager, South East Central Railway, New GM building, 5th Floor, Bilaspur (CG) for information and necessary action.

Copy submitted to :- The Principal Chief Conservator of Forests (Wildlife), Maharashtra State,Nagpur for information.

Copy submitted to :- The Additional Principal Chief Conservator of Forests (Wildlife), East, Maharashtra State, Nagpur for information

Copy submitted to :- The Chief Conservator of Forests (Territorial), Nagpur with a request to make a similar appeal to Railway authorities to prevent such incidences happening in the jurisdiction of Nagpur Forest Circle i.e.from Wadsa to Gondia in the same Ballarshah-Gondia line.

Copy submitted to :- The General Manager, FDCM Ltd. North Chandrapur, for information.

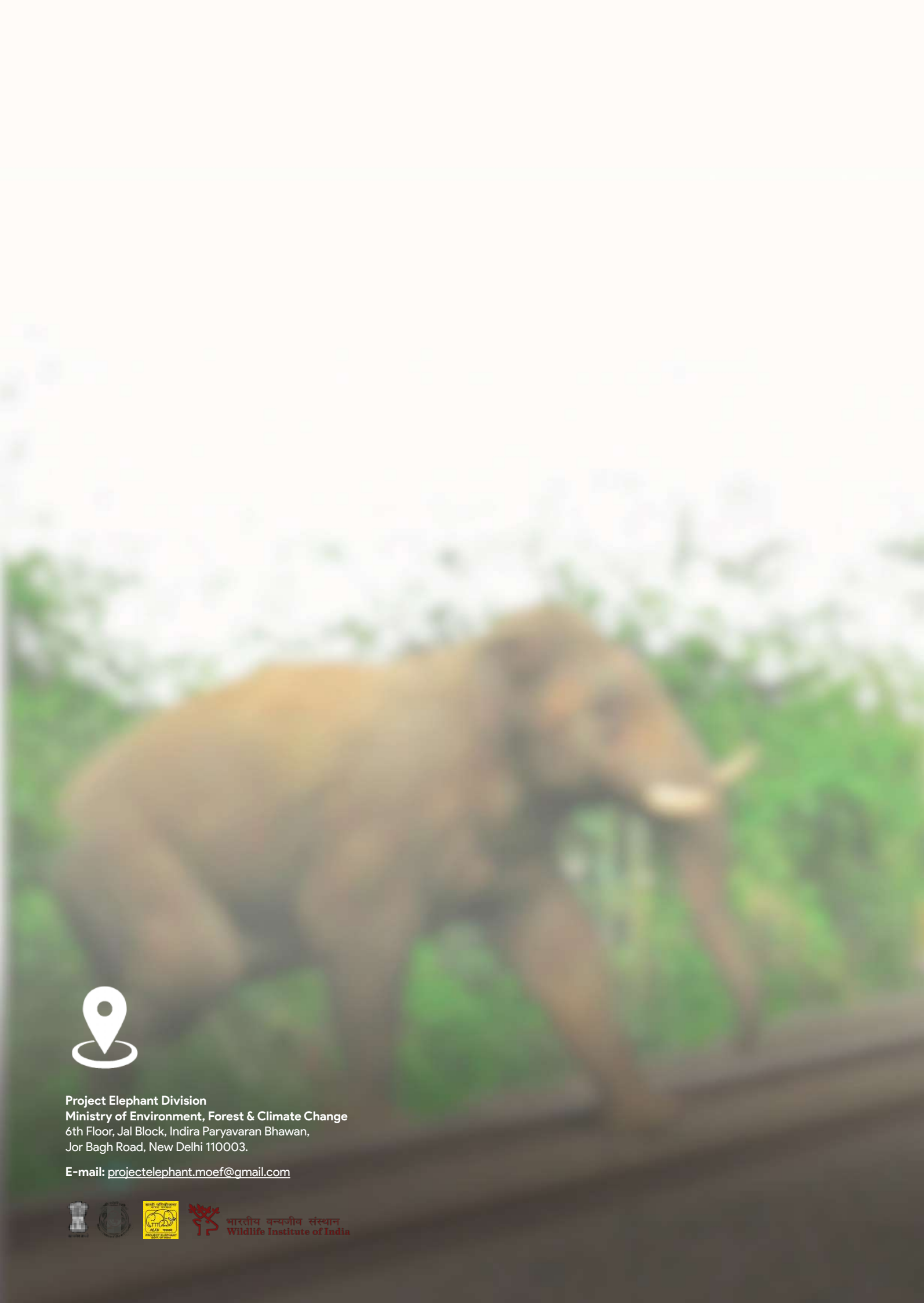
Copy to :- The Conservator of Forests & Field Director, TATR Chandrapur for information and necessary action.

Copy to :- Dy.conservator of Forests, Central Chanda & Bramhapuri division for information and necessary action.

Copy to :- Divisional Forest Officer, Chandrapur division, Chandrapur for information and necessary action.

Copy to :- Divisional Manager, FDCM Ltd. Bramhapuri F.P.Dn.& West Chanda F.P.Dn., Chandrapur for information and necessary action.

Sd/-
(S.V.Ramarao, IFS)
Chief Conservator of Forests,
Chandrapur Circle, Chandrapur,
Maharashtra State.



Project Elephant Division
Ministry of Environment, Forest & Climate Change
6th Floor, Jal Block, Indira Paryavaran Bhawan,
Jor Bagh Road, New Delhi 110003.

E-mail: projectelephant.moef@gmail.com

भारतीय वन्यजीव संस्थान
Wildlife Institute of India