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PROJECT ELEPHANT

MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE 2024



भारतीय वन्यजीव संस्थान
Wildlife Institute of India

Project Elephant

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From the Director's Desk....



Ramesh Kumar Pandey

Inspector General of Forests (PT&E) & Director, Project Elephant

It gives me immense pleasure to announce that we are revealing the latest progress and accomplishments of Project Elephant from August 2023 to February 2024 in this edition of “Trumpet”. We have articles related to elephant upkeep, housing and other management issues, written by respective author based on their invaluable field experience. We also have conservation news about the work done for the betterment of Elephants and their habitats.

For the first time ever, the Ministry has carried out management effectiveness and evaluation of the elephant reserves across the country and completed the pilot exercise in the following four elephant reserves across the four elephant bearing regions of the country:

- i. Shivalik Elephant Reserve, Uttarakhand
- ii. Kaziranga-Karbi Anglong Elephant Reserve, Assam
- iii. Simplipal Elephant Reserve, Odisha
- iv. Nilgiri Elephant Reserve, Tamil Nadu.

The 19th meeting of the Steering Committee of the Project Elephant was held on 12th Au-

gust, 2023 at Bhubaneswar, Odisha under the Chairmanship of Shri Bhupender Yadav, Hon'ble Minister, EFCC and in presence of Shri Ashwini Kumar Choubey, Hon'ble Minister of State, EFCC & Vice Chairman of the Project Elephant Steering Committee. The meeting deliberated upon further strengthening elephant corridors and management of elephant reserves and emphasized on efforts to deal with human-elephant conflicts in a responsive manner.

The Ministry has also initiated the joint surveys of the critical stretches of railway lines in the country. To start with, 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 re-

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

The Ministry with support of Elephant Cell, Wildlife Institute of India (WII) had organized capacity building programmes for officers/officials of the Railways and Power during November, 2023 and January, 2024 respectively.

The Ministry had conducted the all India elephant population estimation through more scientific & robust methodologies and hybrid mode i.e. dung based mark recapture and camera trap based distance sampling estimation. The Phase I and Phase II of the project have been completed and the report is in finalization state.

The Ministry has also released the report on the Elephant Corridors of India, prepared by the Project Elephant with support of Elephant Cell,

WII. The report is an outcome of ground-validation of all the identified elephant corridors in India in coordination with the State Forest Departments of the elephant range states and involves nearly two years of concerted efforts. The report comprises of details pertaining to 150 elephant corridors across India with corresponding maps.

More than 600 captive elephants from all India have had their data collected and their DNA profiles done as part of the project to create a database repository for elephants kept in captivity.

With the combined efforts of the Central Government, State Forest Departments, line departments, civic society, and others, I have no doubt that the habitats, landscapes, and corridors of elephants will be protected, and future generations will live in peace.

Collaborative and participatory elephant conservation in West Bengal, India



Vinod Kumar Yadav

Former, PCCF & Chief Wildlife Warden, West Bengal

West Bengal is known as wild elephant Country. The State of West Bengal comprises two distinct and disjunct geographical ranges of elephants. The Northern elephant range covers around 3000 Sq km area located in the sub-Himalayan foot hill region, mostly comprises forest areas of Darjeeling, Kalimpong, Jalpaiguri and Alipurduar districts. Eastern Duar Elephant Reserve (977.51 Sq km) comprising mainly Buxa Tiger Reserve and Jaldapara National Park has major elephant population. However, conflict with elephants is higher in the Western Duars. Elephants occurring in the northern range are generally residential but some inward and outward movements occurs through contiguous landscape across Assam and international boundaries with Nepal and Bhutan. The elephant population in North Bengal is estimated to be around 450 elephants with more than 45% of the population as adults.

Contrary to the Northern elephant range, the Southern elephant range is mostly constituted by the migratory elephants coming from Dalma Wildlife Sanctuary in Jharkhand. Around 150

elephants migrate from Dalma to Sal Coppice forests of Jhargram, Midnapore, Bankura and part of Purulia district since 1987. There are more than 50 resident elephants which are mostly scattered individual / groups, mostly males and remain throughout the year in South West Bengal. The wild herds of elephant from Dalma hills of Bihar are regular visitors to South Bengal during the winter months and gradually increased their home range to more than 3000 Sq km, exploring new areas and extending their stay in South West Bengal for around eight months. Mayurjharna Elephant Reserve (414.06 Sq km) was declared in 2002 for elephant conservation in this region. These elephants also migrate across the Orissa State and move upto the base of Simlipal Tiger Reserve even after facing strong resistance from public and return back to South Bengal Forests.

West Bengal is heavily populated state with the average human population density of 1,029 people/km². Because of the rapid increase of population and resultant high population density, the State faces huge biotic pressure on forest

resources. The problems in Elephant Conservation are mainly Increased and excessive biotic pressure on forest resources leading to degradation and fragmentation of habitat. Forest fire, weed infestation, timber theft, encroachment of forest areas, enclaved forest villages add to the depletion and shrinkage of elephant habitat. Moreover, heavy grazing of cattle in the forest fringes and other forest areas have created acute pressure on the fodder of the large herbivores. Conversion of natural forests into value-added monoculture plantations of commercial species like Teak, Eucalyptus, and Akashmoni has further restricted the fodder base of the elephants and other wild animals. Further, encroachment in the elephant corridors not only hinders migration of elephants but also increases Human-Elephant conflict in such areas.

Human-Elephant conflict, of late, have be-

come more acute and is serious problem in the State. The State of West Bengal harbors less than 3% of the total wild elephant population in the country. However, this population is well known for its conflict dimensions and on an average 75 persons are killed and more than 3000 ha of crops are damaged every year. The man and elephant confrontation in the present Socio-economic situation has reached to a menacing stage. The elephants are in direct conflict with human because of fragmentation of forests, developmental activities, expansion of human habitation and agriculture and degradation of habitat. Rapid expansion of human habitations, agriculture and tea gardens had not only encroached upon the forests and grasslands over the decades, but also cut off the corridors needed for migration of wide-ranging animals like elephants.



The management of wild elephants focuses on various conservation strategies which are mainly protection measures for elephant population and their habitat, habitat management by restoration of degraded forest areas by creation of fodder plantations of trees, grass and bamboo, water management, soil and moisture conservation, conversion of monoculture plantations into indigenous species plantations, grassland management, Control of forest fire and weed eradication are being implemented for long term conservation of elephant in the state. Action plan has been developed for mitigation of Human- Elephant conflict in the state with short time and long term strategies.

Human are the integral part of the ecosystem and their active participation in the conservation strategies is vital and essential. West Bengal is pioneer in Joint Forest Management which started in Eighties and gradually spread in entire South Bengal with the aim for rejuvenation of degraded forests of Midnapore, Bankura and Purulia district. The strategy yielded excellent results in conservation of forests. On the success of this project, social forestry programmes were implemented vigorously and the Joint Forest Management was established as the main strategy for conservation of the forests and wildlife involving people living in the fringe villages of the forest. West Bengal formalized the people's participation in forest management by issue of government order in 1989. Forest Protection Committees were formed mostly in the degraded forest of South West Bengal with the objective of rejuvenation of degraded Sal forests. Presently there are more than 3849 JFMCs outside the Protected Areas in West Bengal protecting 502294.5 ha of

forest land involving 464252 members. Further, there are 146 Ecodevelopment Committees protecting 109375.74 ha of Protected Areas involving 45469 families. The success story of Joint Forest Management in South West Bengal is well known.

In North Bengal, the concept of Ecodevelopment was implemented in 1991 on small scale around Jaldapara Wildlife Sanctuary even prior to any Government order. The initial success of involvement of people in forest conservation by formation of Eco-development committees in the fringe villages of Jaldapara Wildlife Sanctuary encouraged the forest department to follow the strategy of ecodevelopment in attaining the goal of biodiversity conservation. High human density coupled with small size of many protected areas with diverse biological values led to the implementation of Participatory Protected Area Management. From the past experiences, government learned that involvement of the local people is essential for forest and wildlife conservation. Since 1992, the state government is following the policy of participatory management of National Parks and Sanctuaries (Protected Areas) through a strategy of ecodevelopment where biodiversity conservation is goal and ecodevelopment is tool to achieve this goal. The emphasis is given on the improvement of the management of Protected Areas, to involve local people in planning and implementations, to develop incentives for conservation and sustenance utilization of forest products. This collaborative management is part of decentralization of planning process and empowerment to local communities in decision making and sharing of benefits. The overall strategy is to reduce the biotic pressure on these sacred ecosystems and

to develop site specific development packages in the fringe villages linking conservation aspects.



National Forest Policy was declared in 1988 giving emphasis on the involvement of the local people in forest conservation and sustainable utilization of forest products in such a manner that needs of the local population is taken care of as well as biodiversity conservation is given priority over commercial over exploitation. Joint Forest Management (JFM) was adopted all over the country after 1990 and is a concept of developing partnerships between fringe forest villagers and the Forest Department on the basis of mutual trust and jointly defined roles and responsibilities with regard to forest protection and development.

The functioning of the Forest Department has undergone a vast change from the top-down planning and implementation approach has been progressively replaced by the decentralized approach with emphasis on Participatory and collaborative forest and wildlife management involving local communities at the grassroot level in the state. This approach and practice in the field is quite helpful in elephant conservation and in reduction of Human-Elephant conflict in West Bengal. The Joint Forest Management Committees are actively involved in

elephant conservation as is evident in following areas of management.

1. Active Involvement of Joint Forest Management Committees (JFMC) in Protection Measures for Elephant Population and Habitat

A) Joint Patrolling of forests: JFMCs play a pivotal role in organizing and conducting regular patrols in forest areas with staff of Forest Department. Members of JFMCs, often drawn from local communities, actively participate in surveillance and monitoring activities on rotational basis. These patrols serve as a deterrent to poachers, illegal loggers, and other illegal activities. Regular patrolling by JFMCs helps ensure the safety of elephants by minimizing the risks of poaching and unauthorized activities in their habitats. It contributes to the overall protection of the ecosystem, maintaining a balance in the flora and fauna that elephants depend on. JFMCs are actively involved in preventing timber theft through vigilant monitoring of susceptible forest areas. Members collaborate with forest department officials to detect and report any suspicious activities related to illegal logging or the unauthorized extraction of timber. Timber theft contributes to habitat degradation, impacting the availability of resources for elephants. JFMCs' efforts in preventing such activities help conserve the integrity of the forests, ensuring that elephants have access to essential components of their natural habitat.

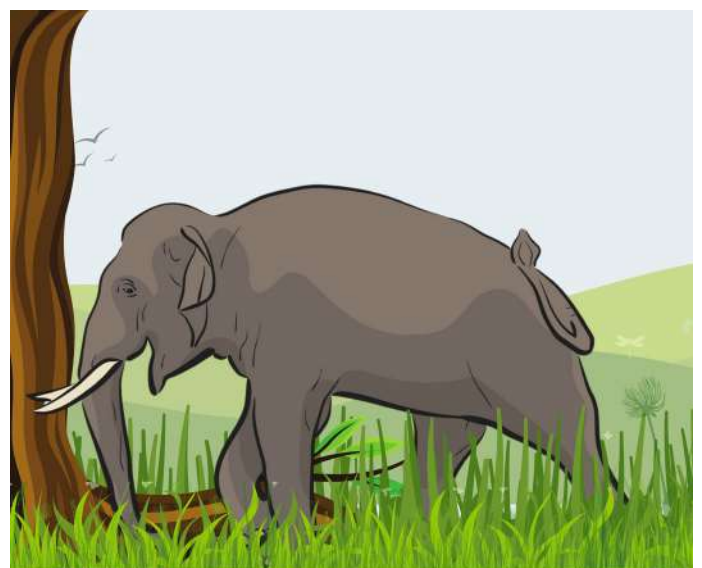
B) Removal of Encroachments in Forests: There are many instances where

JFMCs have helped Forest Department in removal of encroachments of forest land in Jhargram, Midnapore and Bankura districts. These encroached forest land were used of agriculture purpose and so attracted elephants from the adjacent forests areas. Even there were some human death and injury in such areas. Meetings were held with the villagers in different Forest Divisions and JFMCs were requested in identifying and addressing instances of encroachment in forest areas. They worked in coordination with the forest department to demarcate and protect elephant habitats from encroachers, whether individuals or communities. Thousands of acres of encroachments were removed and plantations were raised with active participations of villagers. Encroachments lead to habitat fragmentation and disturbance, posing a significant threat to elephants. The proactive involvement of JFMCs in removing encroachments helps in maintaining the continuity of elephant habitats, reducing the likelihood of human-elephant conflicts.

C) Collection of Dry Sticks and Leaves as Firewood: Firewood is still main source of cooking in the rural areas. It important that the villagers are persuaded to oversee sustainable collection practices for firewood within the forest. They regulate the gathering of dry sticks and leaves to ensure that small seedlings and established poles are not harvested and only dry sticks are collected in a manner that does not harm the ecosystem or compromise the availability of these resources for elephants. Sustainable harvesting practices endorsed by JFMCs contribute to the conservation of the elephants' fodder sources. By promoting responsible collection without cutting

established seedlings, JFMCs help maintain a balanced ecosystem, ensuring elephants have access to the vegetation essential for their dietary needs.

D) Acting as Informers for the Forest Department: JFMC members act as eyes and ears on the ground, providing crucial information to the forest department. They report any suspicious activities, movements of elephants, or potential threats to the authorities, facilitating timely interventions. The information network established by JFMCs enhances the effectiveness of conservation efforts. Timely alerts enable the forest department to respond swiftly to emerging challenges, such as potential conflicts or illegal activities, safeguarding both elephants and their habitats. The active involvement of Joint Forest Management Committees in protection measures is instrumental in creating a collaborative and vigilant environment. There is no case of poaching or intentional killing of elephants in South Bengal. Their efforts contribute significantly to the safeguarding of elephants and their habitats, addressing immediate threats and fostering a sustainable coexistence between human communities and these majestic creatures.





2. Role of Joint Forest Management Committees in Restoration of Degraded Forests

A) Promoting Natural Regeneration of Forests: Joint Forest Management Committees actively contribute to the protection and conservation of degraded forests, allowing for natural regeneration. Through regular patrolling and monitoring, JFMCs ensure that the forests are free from illegal activities such as logging and poaching, providing a conducive environment for the natural regrowth of vegetation.

Natural regeneration is crucial for restoring biodiversity and maintaining the ecological balance. JFMCs' efforts in protecting the forests

enable the re-establishment of native plant species, creating a more resilient and sustainable ecosystem for elephants and other wildlife.

B) Conversion of Monoculture Plantations into Sal Plantations and Indigenous Species: JFMCs play a pivotal role in guiding the conversion of monoculture plantations, often consisting of fast-growing exotic species like teak, Eucalyptus, and Akasmoni, into Sal (*Shorea robusta*) plantations and other indigenous species. This conversion is driven by the understanding that diverse vegetation, including indigenous plants, provides a more suitable habitat for elephants. More than 3500 ha of such Sal plantations were created in South West Bengal in the last decade. Monoculture plantations limit the biodiversity of an area and can adversely impact the natural

habitat of elephants. The involvement of JFMCs in shifting towards Sal and indigenous species enhances the availability of diverse flora, thereby increasing the fodder base for elephants. Sal, in particular, is a preferred food source for elephants.

The other important forestry practice is enrichment of degraded forests of South West Bengal through Coppice Regeneration. More than 11000 ha of coppice Sal forests has been thinned by removal of unwanted stems and only retaining the main stem. This helps in proper growth of Sal forest in South Bengal.

By actively participating in the restoration process, JFMCs contribute to the increased availability of fodder for elephants. Sal plantations and the promotion of indigenous species create a more natural and diverse environment, providing elephants with a variety of food sources. Adequate fodder is essential for the health and sustenance of elephant populations as well it help in reduction in crop raiding by elephants in the agriculture fam lands of villagers. The transition from monoculture to diverse plantations ensures a year-round supply of nutritionally rich vegetation, reducing the likelihood of elephants straying into human settlements in search of food.

JFMCs facilitate awareness programs and community engagement to encourage villagers, who are often tribal communities, to prefer Sal and indigenous plant species over exotic monocultures. Through education and economic incentives, JFMCs help in building a consensus among villagers for the sustainable management of forests.

The shift in villagers' preferences towards Sal

and indigenous species is significant for long-term conservation. It not only enhances the ecological integrity of the forests but also aligns with the dietary preferences of elephants, ensuring a more harmonious relationship between local communities and wildlife.

The transition to Sal and indigenous species is often accompanied by economic considerations. JFMCs facilitate sustainable practices that not only benefit the environment but also provide economic opportunities for local communities, fostering a sense of ownership and responsibility towards forest conservation.

It is evident that the active involvement of Joint Forest Management Committees in the restoration of degraded forests in South Bengal demonstrates a holistic approach to conservation. By championing natural regeneration, encouraging the shift to indigenous species, and balancing economic interests, JFMCs play a vital role in creating ecosystems that are not only resilient but also conducive to the well-being of elephants and other wildlife

C) Soil and Moisture Conservation works in South West Bengal was essential as the lateritic soil of the region is prone to erosion and gully formation. Efforts were made with the active participation of Panchayats and FPCs to collaborate to implement essential measures for controlling soil erosion in South Bengal. Regular meetings were held with these important rural local institutions for adoption of natural and traditional methods such as contour plowing, cover cropping, and check dams. The active involvement of local communities in these initiatives ensures the effective implementation of erosion control techniques.

Soil erosion poses a significant threat to the stability of lateritic soil in South Bengal. The collaboration between Panchayats and FPCs in implementing these measures helps preserve the integrity of the soil, maintaining the health of the ecosystem. This is particularly crucial for elephant conservation, as soil erosion can negatively impact the vegetation and overall habitat quality.

Panchayats and FPCs play a critical role in preventing gully formation through the construction of check dams and contour trenches. By strategically placing these structures in vulnerable areas, they help slow down water flow, reduce soil erosion, and prevent the formation of gullies. Gully formation exacerbates soil erosion and disrupts the natural landscape. The efforts of Panchayats and FPCs in implementing preventative measures contribute to maintaining the stability of the terrain, supporting vegetation growth, and indirectly benefiting elephant habitats.

Panchayats and FPCs are actively engaged in combating the illegal extraction of lateritic soil from forest areas. They collaborate with the Forest Department to monitor and report any unauthorized activities related to the extraction of laterite blocks for construction purposes. Illegal extraction of lateritic soil not only contributes to habitat degradation but also disrupts the natural processes that sustain the ecosystem. The vigilance of Panchayats and FPCs in curbing these activities ensures the conservation of critical elephant habitats and protects the integrity of the forest land.

Soil erosion, if unchecked, can lead to the degradation of vegetation and loss of crucial feed-

ing grounds for elephants. By implementing soil erosion control measures, Panchayats and FPCs contribute directly to preserving the quality of elephant habitats.

Illegal extraction of lateritic soil contributes to habitat fragmentation, disrupting elephant corridors and increasing the risk of human-elephant conflict. The actions taken by Panchayats and FPCs to combat illegal extraction align with broader conservation goals, ensuring the uninterrupted movement of elephants.

Involving local communities through Panchayats and FPCs creates a sense of responsibility and ownership over the conservation of forests. When communities actively participate in soil and moisture conservation efforts and resist illegal extraction, it fosters a harmonious relationship between humans and elephants.

The collaborative efforts of Panchayats and Forest Protection Committees in South Bengal are integral to the conservation of elephant habitats. By addressing soil erosion and preventing illegal extraction of lateritic soil, these local bodies contribute significantly to maintaining the ecological balance, protecting vegetation, and ensuring the long-term well-being of elephant populations in the region.

Integrated Watershed Management Programme (IWMP) was launched by the Government of India in the year 2008. The main objectives of the IWMP is to restore the ecological balance by harnessing, conserving and developing degraded natural resources such as soil, vegetative cover and water. This programme has given desired results in prevention of soil run-off, regeneration of natural vegetation, rain water harvesting and recharging of the ground water

table in South Bengal forests. Many rain water harvesting structures and large earthen dams were constructed inside forest areas at strategic locations under various programmes of State Plan, Rashtriya Krishi Vikas Yojana and Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA).

Restoration in forests of South Bengal was done by Panchayats and Joint Forest management committees on large scale inside the forest areas by making Earthen dams at strategic locations to provide water requirement of wild elephants and other wild animals in this dry zone. This programme emphasized on collective action and community participation, including participation of primary stakeholders through community-based organizations, non-governmental organizations and Panchayati Raj Institutions (PRI), Agriculture Department and Forest Department. Guidelines were issued and the Grama Panchayats were vested with the total responsibility of implementation of water shed programmes with involvement of other stakeholders.

3. Participatory Forest Fire Management

The coordinated efforts of Panchayats and Joint Forest Management Committees play a pivotal role in forest fire management in both South and North Bengal. Their proactive approach, community engagement, and collaboration with the Forest Department contribute significantly to the conservation of elephant habitats, safeguarding these majestic creatures and the rich biodiversity of the region.

Panchayats, as local village governments, and

JFMCs collaborate effectively with the Forest Department in West Bengal to manage forest fires, particularly in the dry zones prone to fires during the summer season. They actively engage in planning and implementing strategies for fire prevention, early detection, and firefighting.

Panchayats and Joint Forest Management Committees (JFMCs) work closely with local communities to implement community-based fire prevention measures in association with forest staff. These include creating fire lines, maintaining clearings, and conducting controlled burns in certain areas to reduce fuel load.

Panchayats and JFMCs establish early detection systems through regular patrolling and monitoring. In case of a fire outbreak, these local bodies, equipped with knowledge and resources, respond rapidly to contain and extinguish the fire before it spreads uncontrollably.

Panchayats and JFMCs play a crucial role in raising awareness about fire safety and prevention among local communities. Educational and awareness programs were conducted to emphasize responsible practices and the potential consequences of uncontrolled fires on the forest ecosystem and wildlife, including elephants. Forest department prioritize training and capacity building for local communities to enhance their skills in firefighting and prevention. This empowers communities to take swift action during fire incidents, minimizing potential damage to forest ecosystems. Further, the coordination enhances the efficiency of firefighting operations and ensures a more comprehensive approach to forest fire management.

Similar to South Bengal, Panchayats and JFMCs in North Bengal actively contribute to forest fire

management. Given the prevalence of grassland fires and fires in other forest areas, their involvement is essential for preventing habitat loss for elephants and other wildlife. It helps reduce the risk of uncontrolled fires and promote the growth of fresh vegetation, which is essential for elephants' dietary needs. There is hardly any case of intentional fires of grassland in Jaldapara and Gorumara National parks.

Panchayats and JFMCs actively monitor forest areas and report any signs of potential fire hazards to the Forest Department. This proactive approach aids in early intervention and helps prevent the escalation of fires.

The active involvement of Panchayats and JFMCs in forest fire management directly contributes to the preservation of elephant habitats. By preventing uncontrolled fires, these local bodies help maintain the integrity of the forest cover, ensuring the availability of food and shelter for elephants. The collaborative efforts of Panchayats and JFMCs in managing fires contribute to the overall health and biodiversity of forest ecosystems. By preserving a diverse range of plant species, they indirectly support the varied dietary requirements of elephants.

4. Implementation of Socio-economic programme through Ecodevelopment of fringe villages

People's participation is key to the Forest and wildlife Conservation in long term and it is essential taking into account the constraints of growing human & cattle population to decrease the pressure of forests. The government of

West Bengal issued notification in June 1996 for formation of Ecodevelopment Committees in and around the National Parks, Sanctuaries and Tiger Reserves with the active participation of local communities in the fringe villages. Ecodevelopment is basically a strategy which aims to conserve biodiversity by reducing both the negative impact of local people on the Protected Areas and the impact of the Protected Areas on local people. In order to achieve the objectives it seeks to improve the capacity of PA Management to conserve biodiversity effectively, to involve local people in PA planning and protection, to provide incentives to local people for conservation, and to support sustainable alternatives to prevent harmful use of forest resources.

Since 1996, many community beneficiary works were implemented as per microplans prepared for each village to improve socio-economic conditions of fringe villages through some prioritized, site specific and need based Eco-development packages, having integration with activities of other government departments and NGOs. Such developmental works were implemented in the forest fringe villages around Protected Areas of North Bengal as well as in JFMC areas of South Bengal. This has helped in generation of alternate employment to reduce traditional dependency on forests, through provision of vocational skill development training and inputs. Gradually trust was built between the local communities and forest department and village communities came forward to ensure in the protection and conservation of biodiversity and ecosystem. The overall programme also helped in promotion of conservation awareness values for long term sustainable utilization of natural

resources by reducing biotic pressure on the Protected Areas. The other important outcome of this programme in last two decades is efficient management of Human- Wildlife conflict especially conflict with elephants. Forest Department, West Bengal has paid more than 379 Crores to JFMCs in South Bengal as part of their share since 1995 to 2021. The EDC are also receiving regularly their shares from tourism and other income. The part of money received by JFMCs and EDCs are utilized in effective management of Human Elephant Conflict in vulnerable villages. They have constructed watch towers and maintenance power fencing for protection of their crops. Many villages have used the fund for solar lights and chilly fences, bee keeping to distract entry of elephants in their villages.

5. Resolving Human-Elephant Conflict

The active participation of local communities, JFMCs, and local self-help governments in collaboration with the State government is crucial for the effective resolution of human-elephant conflicts. Their involvement ensures a holistic, community-centric approach that is essential for long-term success in mitigating conflicts, conserving elephants, and fostering harmonious coexistence between humans and wildlife. In West Bengal local communities are proactive and are taking initiatives for management of Human-Elephant conflict as mentioned below:

i. Power Fence Management by Villagers: JFMCs are actively engage in the management, protection, and maintenance of power fences in Jaldapara National Park, Go-

rumara National Park, Bankura, Bishnupur, Jhargram and Midnapore. These electrified barriers are essential in preventing elephants from entering human settlements and agricultural fields. In initial years there were many case of theft of wires of power fences. However, later people realized that such barrier are effective in protection of their crops and properties. The power fence was gradually received social acceptance. Villagers, under the guidance of Forest department and active participation of JFMCs took part in the construction, monitoring, and repair of these fences. JFMCs receive money from Forest department as part of their contribution to forest protection and usufruct sharing as per the Government order which are kept in their bank account. Many JFMCs earmarked some fund for repair and regular clearing of vegetation. They deployed some villagers on rotational basis for monitoring of power fences and alert villagers about movement of elephants in near villages.

Now they understand that power fences act as effective physical deterrent, reducing human-elephant conflicts and protecting their crop and properties. The involvement of local communities in their management ensures the sustainability of such barriers and fosters a sense of ownership as well as responsibility among villagers towards mitigating conflicts.

ii. Formation of Voluntary Squads and awareness camps in Villages and Tea Gardens: JFMCs and Panchayats play a crucial role in forming voluntary squads comprising local villagers and tea garden workers. These squads are trained to respond to elephant depredation incidents swiftly. Many such voluntary squads were formed in sensi-

tive villages in South Bengal and Tea Gardens in North Bengal. Training were imparted to them and training camps were organized in Tea Gardens. They work in coordination with the Forest Department to drive stray elephants back to forest areas and prevent damage to crops and property.

Voluntary squads act as a first line of defense against human-elephant conflicts. The formation of these squads, guided by JFMCs and Panchayats, exemplifies the collaborative effort between communities and authorities in managing and mitigating conflicts. This helps in driving operations of Stray elephants towards Forests.

JFMCs and Panchayats facilitate the organization of awareness meetings in villages. These meetings involve discussions on strategies for driving stray elephants back to the forests. Local communities are educated about the importance of avoiding disturbances during these operations.

Awareness meetings promote a shared understanding of the challenges and solutions related to human-elephant conflicts. They enhance cooperation between villagers and the Forest Department, creating a more informed and responsive community.

iii. Early Warning Systems and Daily SMS Alerts: The Forest Department is instrumental in establishing early warning systems through network of bulk SMS messaging. Forest staff and villagers gather information on daily movement of elephants in each beat and provide timely information. Forest Department send daily bulk SMS messages alerts to public representatives, police Administration, JFMC

and Panchyats for taking timely actions. Early warning systems are crucial in preventing conflicts by allowing communities to take proactive measures. The active involvement of JFMCs and Panchayats ensures the efficient functioning of these systems and enhances the overall effectiveness of conflict management.

iv. Payment of Ex-gratia to victims of elephant depredation: JFMCs and Panchayats play a pivotal role in the identification of victims affected by elephant depredation. Local knowledge and community networks enable them to swiftly respond to incidents, identify impacted individuals, and assess the extent of damage to crops, houses, and other properties in collaboration with Forest Department.

There are well established mechanisms to receive immediate reports of human-elephant conflict incidents. This ensures a rapid response in identifying and assisting affected individuals.

JFMCs and Panchayats facilitate joint inspections and assessments of the damaged crop fields, houses, and other properties in collaboration with the Forest Department. This involves on-site visits to gather comprehensive information on the losses incurred due to elephant depredation. The involvement of local bodies ensures transparency in the assessment process. JFMCs and Panchayats work to ensure that assessments are fair, accurate, and consider the full extent of the impact on victims. Panchayats take resolutions in their Forest Committee for settlement of claims by collaborating with the Forest Department and other relevant authorities. They facilitate transparent discussions and negotiations to ensure that victims receive fair compensation for the losses incurred. In cases

of disputes or disagreements, JFMCs and Panchayats act as mediators, facilitating discussions between affected individuals and the concerned authorities. Their involvement contributes to the fair and just resolution of conflicts related to compensation claims.

Forest Department ensures that compensation is directly transferred to the bank accounts of affected individuals. Direct disbursement through bank accounts enhances transparency and accountability in the compensation process. JFMCs and Panchayats monitor the disbursement to ensure that the rightful recipients receive timely and accurate compensation.

The active involvement of Joint Forest Management Committees and Panchayats in the identification, inspection, and settlement of claims related to human-elephant conflicts ensures a transparent and community-centric approach. By facilitating direct disbursement of ex-gratia payments, these local bodies contribute to the fair compensation of victims, enhancing community resilience and fostering a collaborative relationship with conservation authorities.

Local communities possess valuable traditional knowledge about elephant behavior, movement patterns, and local ecosystems. Involving them ensures that conservation strategies are grounded in the realities of the specific landscape and the unique characteristics of the elephant populations.

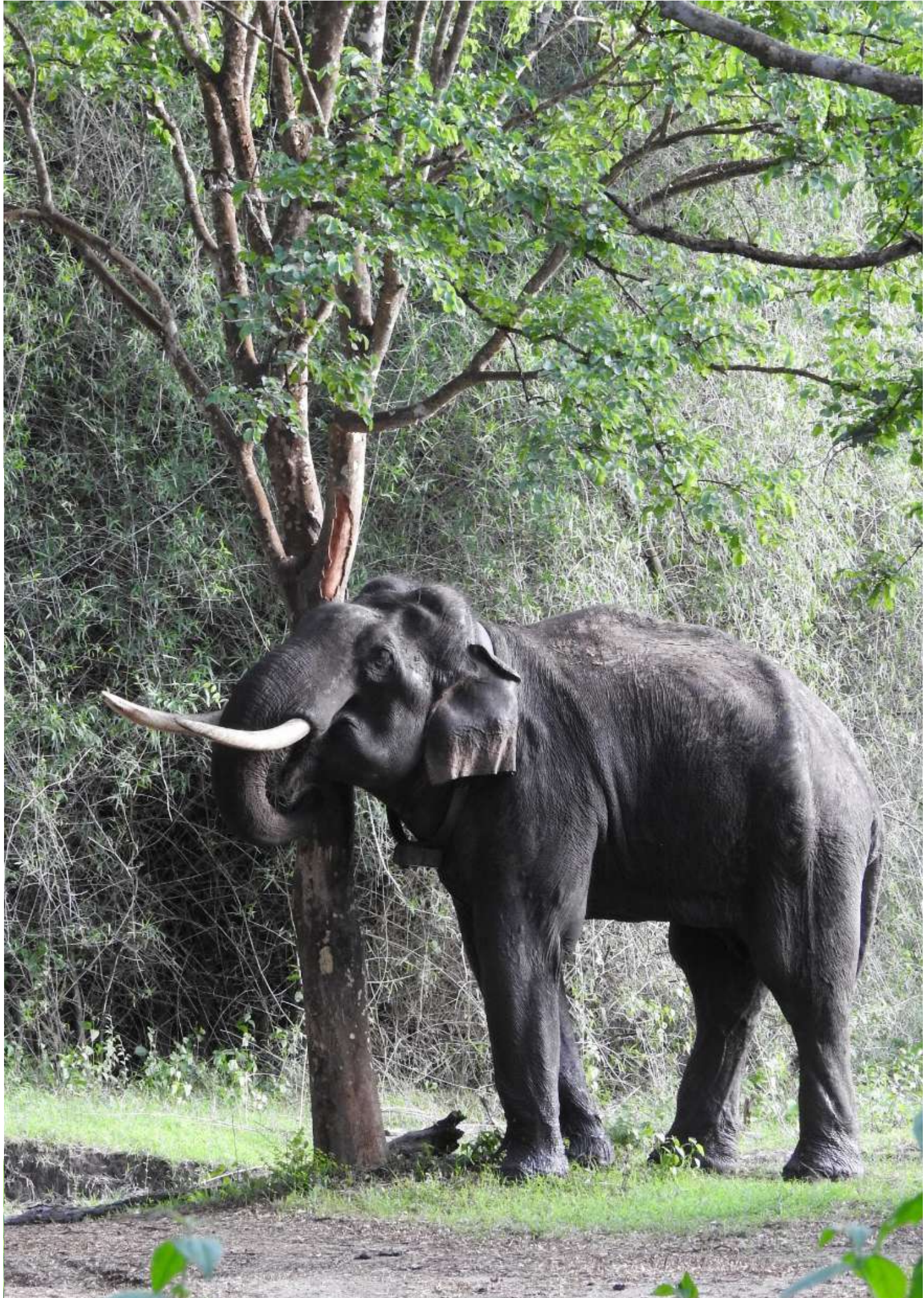
Joint Forest Management Committees and local self-help governments act as intermediaries, translating local knowledge into actionable strategies. Their understanding of community dynamics enhances the effectiveness of

conservation efforts. They play a crucial role in establishing communication channels for quick reporting and response. Their networks help bridge the gap between communities and government authorities, ensuring timely intervention. Local residents are the first to witness and report human-elephant conflict incidents. Involving local communities empowers them to take ownership of conservation initiatives. When communities feel a sense of responsibility and connection to the conservation goals, they are more likely to actively participate in and support conflict resolution strategies. JFMCs and local self-help governments facilitate community-driven initiatives, fostering a sense of ownership. By involving communities in decision-making processes, these entities promote sustainable practices that align with local needs and aspirations. Local people are intimately familiar with the specific challenges and vulnerabilities in their areas. Their input is essential in developing effective conflict mitigation strategies that address the root causes of conflicts, such as habitat fragmentation and resource competition. JFMCs and local self-help governments act as conduits for implementing community-specific conflict mitigation plans. They coordinate with the State government to tailor strategies that are practical and culturally sensitive, ensuring better adherence and success. Active engagement fosters trust between local communities and conservation authorities. Transparent communication ensures that communities understand the rationale behind conservation decisions, minimizing resistance and promoting collaboration. Their role in building and maintaining trust is crucial for the long-term success of conservation efforts.

To address these challenges, West Bengal adopts a multi-faceted approach, emphasizing collaborative and participatory conservation strategies. Protection measures focus on safeguarding elephant habitats, managing degraded forests, and implementing habitat restoration initiatives. Additionally, an action plan targets human-elephant conflict mitigation through short and long-term strategies. Key to these efforts is the active involvement of local communities and decentralized approach shifts from top-down planning to collaborative forest and

wildlife management. JFMCs play a pivotal role in protecting elephant habitats, preventing timber theft, and restoring degraded forests. collaborative and participatory elephant conservation in West Bengal integrates local communities, JFMCs, and local self-help governments and Forest Department in a synergistic approach. This model not only addresses the immediate challenges of human-elephant conflict but also ensures sustainable, community-driven conservation efforts for the long-term well-being of both elephants and humans.





Segur Corridor: Connecting between Western Ghats and Eastern Ghats



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Introduction

Retention of wildlife corridors to link adjacent habitats is one of the most practicable measures for the conservation of large mammalian species in habitats which are fragmented. Elephant play vital role in the forest ecosystem as a “Key-stone Species”. The Nilgiri Biosphere Reserve (5520 Sq km) in the Western Ghats encompasses not only the protected areas such as Tiger Reserves, National Parks and Wildlife Sanctuaries but also vast tracts of managed forests such as reserve forests, private forests, plantations and reserve lands. Most of the protected areas within the biosphere reserve are linked through forest corridors with the managed forests. Of late, various development activities such as expansion of crop fields and roads, livestock grazing, hydro-electric projects, indiscriminate growth of constructions and fire have bisected the forest connectivity. The threats are likely to expand in future with increasing human population who depends on forest resources for a

variety of purposes.

Forest corridors can be defined as the ‘narrow strip of forest connecting between two habitats that facilitate major functions such as exchange of genes between populations, dispersal, provide access to variety of seasonal foraging grounds, and prevention of faunal collapse’ (Saunders et al. 1991). Elephant corridors have received lot of attention in conservation measures, and are widely used in devising conservation strategies, especially in recent years, with the reduction of contiguous habitats into islands. Of late several authors have emphasized the need and urgency for conserving corridors (Davidar 1972; Soule and Simberloff 1986; Noss 1987; Simberloff and Cox 1987; Bennet 1990; Saunders and Reberia 1991; Desai 1995; Sunderraj et al. 1995; Baskaran et al. 1995; Sivasubramanian and Sivaganesan 1996; Williams and Johnsingh 1996; Ramakrishnan et al. 1997).

Corridors have been investigated in detailed in India. Davidar (1972) surveyed the status of ele-

phant corridors in the Nilgiri District. Ali (1990) evaluated status of elephant corridors south of the Palghat gap in the Western Ghats. Desai (1991) reported the importance of preserving Sigur plateau in the Nilgiri hills which link the Mudumalai Wildlife Sanctuary. Studies on the use of corridors between Rajaji and Corbett National Park by elephants and tiger (Jonhsingh et al. 1990 and Johnsingh 1992), human impact on the same corridor (Sunderraj et al. 1995), biotic threats in the Masinagudy–Moyar Corridor in Nilgiri Biosphere Reserve (NBR) (Silori and Mishra 1995) and threatened elephant corridors in Garo hills, North East (Williams and Johnsingh 1996) are examples of research highlighting the importance of the corridors. Easa (Per. Comm) has documented the status of elephant corridors in the Kerala portion of the NBR. Sukumar and Sivaganesan (2000) documented a detailed map showing important elephant corridors in South India. Menon et al. (2003) depicted most of the elephant corridors, legal status and their conservations issues throughout India.

Of late, a few studies have stressed the importance of corridors for elephants in the Nilgiri Biosphere Reserve (NBR). Sukumar (1985) stated that elephants from the Eastern Ghats use the Moyar Valley which has connectivity to the northern part of the reserve. Desai (1991) and Desai & Baskaran (1996) have reported the importance of various corridors located in the protected areas, reserve forests and private estates in the NBR. The use of Moyar Valley and Kallar Corridors by elephants from Mudumalai Wildlife Sanctuary for migrating to the Eastern Ghats and movement between Mudumalai Wildlife Sanctuary and Sigur reserve forests

through crucial corridors such as Masinagudy, Singara Road and Masinagudy–Moyar were reported by Baskaran et al. (1995). Silori and Mishra (1995) & Ramakrishnan et al. (1997) mainly focused on the impact of human interference on the integrity of elephant corridors in the Nilgiri North and Sathyamangalam Forest Divisions respectively. Sivasubramanian and Sivaganesan (1996) have studied the interaction of elephants with fauna and flora in the Sujalkuttai–Bannari Corridor of the Sathyamangalam Forest Division. Thus, importance of corridors to elephants was highlighted by many studies.

The Segur corridor acts as a migratory path connecting elephant population of western ghats and eastern ghats. The elephants especially from Nagarhole, Bandipur in the north and Wayanad and adjoining forest areas in the west and south west use this migratory route to reach Eastern ghats.

The migration starts every year from September, October and the herd along with the bulls slowly graze and reach the Bhavanisagar Reservoir in summer when the water in the Segur plateau slowly dries up.



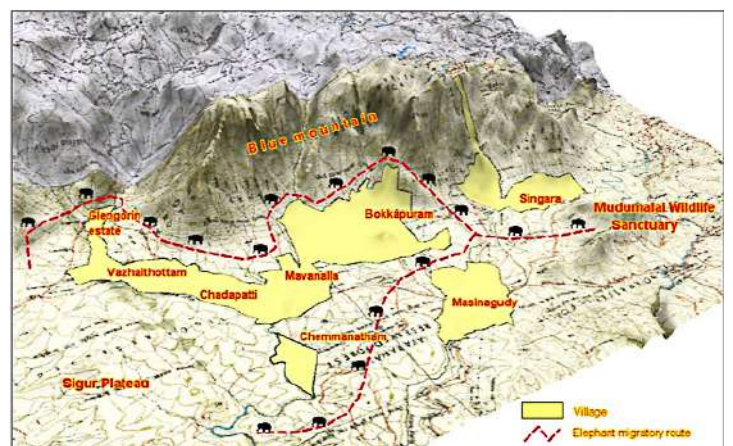
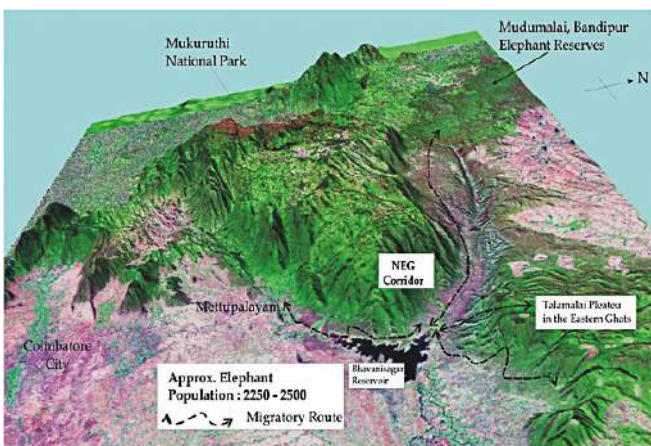
In the same way the population from eastern Ghats from north of Tamil Nadu and also from Coimbatore division which falls towards the south of Bhavanisagar Reservoir reaches the reservoir and this congregation helps in the gene flow from distantly related population and hence helps in the long term population stabilization.

Many revenue villages and tribal settlements are acting as serious impediments for the free movement of elephants in the flat terrain. Apart

from elephants various large and medium ranging animals also used the corridors effectively. Crucial microhabitats such as natural saltlicks and bamboo patches are predominantly available throughout the Segur plateau. The existence of many tributaries of Moyar all along the Segur plateau also ensures that the elephants that feed along the plateau does not have to move long distances for water which is very crucial for these giants.



An overview of Nilgiris Landscape (Source: Ramakrishnan 2007)



Elephant corridor connecting between Western Ghats and Eastern Ghats (Source: Ramakrishnan 2007)

Background

Today, the elephant species is severally threatened in India. The crux of the problem is one that affects all wildlife in the country. As India's human population has grown exponentially in the past several decades, so has its demand for resources. At its essence, that demand boils down to the requirement for more land – for agriculture to grow more food and for construction of roads, dams, mines, railways and housing. This demand for land has led to the degradation and fragmentation of the country's forest cover. The elephant, being a large agrarian animal, may weigh up to 4-5 tons and requires about 200-300 Kg of fodder comprising of various plant species daily. It therefore, needs large areas, which it uses by rotation, so that it may

not overgraze an area and in the process deconstruct it altogether. This allows the natural vegetation of the habitats a chance to re-generate. The Segur plateau which has towards its south the Nilgiris hill slopes with altitude as high as 2000 Mean Sea Level (MSL), the plateau itself with altitude ranging between 1000 to 900 MSL and valleys scattered all around interspersed with rivers flowing carrying water from the upper plateau and the adjoining catchment areas from the lower slopes is blessed with forest types ranging from the lower elevation sholas, deciduous forests, Riverine forests, bamboo brakes, scrub forests and also the dry thorn forests, majority of the plateau is open forests with very good grass lands.



Thus this is a perfect habitat for elephants to feed on the various trees, shrubs and grasses species. One can find elephants on the grasslands, riverine ecosystems, sometimes climbing up the slopes to find some preferred species and some times in the open scrub jungle feeding on variety of tree species like the *Zyzyplus* sp, *Albizia amara*, several species of *Acacia* to name a few.



However, this beautiful and breath taking landscape also suffered due to the ever-growing need for land, infrastructure, tourism pressure and energy requirements of our large population all of which have slowly fragmented the elephant's natural spaces which are now surrounded by human habitation, resorts, agriculture and roads. The more forest habitat is fragmented, the farther an elephant herd has to roam in search of food and water. Increasingly, elephants have to move farther, even from one forest area to another, often through small patches of forests called corridors. As forest lands continue to be lost, the relatively narrow and linear patches of vegetation form vital natural habitat linkages between larger forest patches. They allow elephants to move between secure habitats freely, without being disturbed by humans. Further, elephants are genetically

programmed by nature to never inbreed within their birth family and thus need to move around between gene pools to reproduce.



These corridors aid this process by helping divergent elephant populations to intermingle, which is essential for retaining the vigour of the species and ensuring its long-term survival. By identifying and nurturing such corridors, deadly confrontations between humans and elephants can be avoided, in addition to safeguarding the welfare of the wildlife. Unfortunately, in Segur plateau, the existing corridors are repeatedly being destroyed by ever increasing tourists pressure, mushrooming resorts, human habitation, continuous inflow of tourists, agriculture and roads which will block migration routes of the elephants and would result in the fragmentation of the habitats as well as increased human elephant conflict. Hence, the call to save this corridor started to slowly creep up.



The Genesis of the Segur Elephant corridor can be traced back to the W. P. No. 897 of 1996 filed in Supreme Court of India by Rangarajan and others with the prayer to restore the elephant corridors all over India. Subsequently W.P. No. 10098 of 2008 was filed by Elephant G. Rajendran in The Hon'ble High Court of Madras with a prayer to revive elephant corridor specifically in Segur plateau from encroachment and mushrooming resorts. During the course of hearing the High court passed many daily orders and observations that ultimately led to the notification of the "Segur Elephant Corridor" the first corridor to be notified in India.

Highlights of the judgment:

On 02.02.2009, the High Court passed an interim direction to the District Collector, Nilgiris to file status report showing the steps taken to remove the encroachers from the lands falling under the elephant corridor. It was further contended that on the strength of the order dated 02.02.2009 in Writ Petition No.10098 of 2008, the District Collector had directed them to stop the cultivation of these lands and that they were being prevented from collection of minor forest produce and grazing their cattle. The State's PCCF also made submissions before the High Court to highlight the necessity of preservation of the elephant corridor by acquisition of patta lands. Considering the rival contentions of the parties in this case, on 30.09.2008, the High Court issued the following directions:

- I. The state Government to send proposal for formation of corridor to the central Government.
- II. The District Collector, Nilgiris to remove all encroachments from revenue land in corridor

and the state Government to send proposal for formation of corridor to the central Government.

III. Again on 10.09.2009 the court gave the following directions:

- i. forest department, which has the knowledge of movement of elephant in the corridor, may identify and inform the same;

- ii. the State Government may publish the information regarding the elephant corridor and the area, in leading newspapers and also by drum beating/tom tom, calling for objections of locals, if any, in the area in question;

- iii. after hearing the locals, particularly those who may be affected, they may finalize the elephant corridor from which unauthorized occupants are to be evicted;

IV. To ensure that schedule tribes and other forest traditional dwellers are not affected, it is required to identify the other traditional forest dwellers in terms with Schedule Tribes and other Traditional Forest Dwellers (Recognition of Forest Tribes) Rules, 2007;

V. Only after the recommendation and recording their names in the appropriate register, they may proceed with eviction, by giving notice in the newspaper, by drum beating/tom tom and by giving individual notice to the unauthorized occupants.

VI. So far as the acquisition of the land is concerned, if any private land is required to be acquired, they will have to follow the procedure under the Land Acquisition Act, 1894. Prima facie, as the tribal and other forest dwellers cannot be evicted from the unauthorized lands, their lands need not required to be acquired, if it is a forest land. Learned counsels for the parties are requested to give further suggestion in the matter, in the interest of public and ele-

phants.”

Subsequently based on directions from the High Court of Madras an expert committee was constituted to identify and prepare map on corridor and filed before the court and published in newspapers objections were heard and the state government notified Segur corridor vide GO (MS) No. 125, E & F department dated 31.08.2010 (Notified area:3413.73.98 ha.).

On 7.4.2011, Hon'ble High Court after hearing all the parties concerned, passed final order in W.P No. 10098 of 2008 directing the resorts and private land owners to vacate the land in the notified corridor and hand it over to the District Collector within 3 months from the date of the order. This was a landmark judgement considering the importance the corridor holds for existence of elephants in this landscape.

In the meantime, 32 persons filed the SLPs in Supreme court of India, against the high court order dated 07.04.2011. The Honorable Supreme Court merged all relevant SLPs with main case in WP. No. 897 of 96 filed by Ranganathan. During the course of the hearing the Apex court ordered closure of 38 illegal resorts in the corridor and the District Collector sealed these resorts and filed status report in the Supreme court. The court also ordered to remove all the electric and barbed wire fences surrounding the resorts. In its final order dated 14.10.2020 the Supreme Court upheld the orders of the High Court and said that the Segur Elephant Corridor identified by the expert committee is scientifically correct and that state Government is well within its powers to notify the Segur Elephant Corridor. It further appointed a three member committee consisting of: (i) Hon'ble

Mr. Justice K. Venkatraman, Former Judge of the Madras High Court (Chairman); (ii) Mr. Ajay Desai, Consultant to World Wide Fund for Nature-India and Member of the Technical Committee to come up with a National Elephant Action Plan (NEAP), constituted by the Union Ministry of Environment, Forest and Climate Change (MoEF&CC); and (iii) Mr. Praveen Bhargava, Trustee of Wildlife First and Former Member of National Board for Wildlife to decide the individual objections of the appellants and any other persons claiming to be aggrieved by the actions of the District Collector, Nilgiris pursuant to the impugned G.O. and as recorded before us through her Plan of 42 Action Report and her twin Action Taken Reports, as also the allegations regarding arbitrary variance in acreage of the elephant corridor under the G.O. No 125 E & F dated 31.08.2010.

The committee constituted by the Supreme Court issued public notice inviting objections to be filed before 14.2.2021. 224 objections/claims received by the committee were viewed by the committee and the committee conducted a detailed hearing of all the objections raised before it. It also conducted detailed field inspections in all the objector's land and passed orders on 219 of the 224 objections.

Important Observations of the Committee in its order:

While pronouncing orders after its hearing and field visits the Committee laid down conditions for all the private land owners living in the corridor for continuing to live in the corridor.

I. The house should be used for the bona fide living of the owner and should not be used for any commercial activity what so ever.

II. The Septic Tank of the house should be elevated above the ground level and covered with concrete of minimum 12 Cm thickness.

III. Except in critical bottle neck areas, any type of fencing around the house should only be solar powered battery operated connection with 12 V power and be duly certified by the Deputy Director of Mudumalai Tiger Reserve Buffer Zone that the solar powered fencing would not cause any danger to wild animals. In the bottle neck areas where the household falls within 500 meter of nearest forest boundary, and in places where the patta lands fall right across the corridor literally blocking the corridor no fencing in any form should be allowed in order to ensure free movement of elephants in the corridor. The petitioner should apply before the district committee under TNPPF Act to install/retain the existing solar fence and permission for the same will be granted subject to conditions.

IV. In the Cultivation field in case of critical bottle neck areas like Bokkapuram, Vazhaithotam, Leighwood estate cultivation will not be allowed up to minimum of 500 m from the 1000 m contour line boundary of the corridor and in case of other areas where cultivation is done, there should be no fencing made around the field and the route for the movement of Elephants should be cleared without any hindrance. Further crops that would attract elephants such as banana, sugarcane, coconut, Palm etc. should not be cultivated. Open wells in cultivated lands and households should be surrounded by wall up to 5 feet and closed with iron mesh.

V. Any wires that carry electricity in the above areas should be underground.

VI. Motor pump sets for drawing water should not be in the open area and the power supply to

such pump sets should be only through underground.

VII. Water should not be drawn from the natural water bodies/streams/ rivers in the elephant corridor.

VIII. No sewage water shall be discharged in the natural water bodies/ streams/rivers.

IX. Dumping of garbage in the habitations in the corridor should not be done in open area and the same shall be collected inside the individual residences properly and disposed off in the facilities provided in the nearby villages.

X. Fire crackers, loud speakers, cone speakers and loud noise of Religious and secular origin that is a source of disturbance and annoyance for wildlife for any occasion should not be used by the households and others in this landscape.

XI. Details of occupants shall be intimated to the Jurisdictional Range Officer.

XII. In respect of any alienation provisions of Tamil Nadu Preservation of Private, Forests Act, 1949 should be strictly followed.

XIII. The district administration in consultation with the forest department would impose additional conditions if needed in the future, whichever it feels necessary for maintaining a free passage to the elephants in the corridor.

XIV. In the event of any violation of the above said conditions, it will be open to the authorities to take legal action besides taking over the possession of the land owned by the petitioner under the provisions of Tamil Nadu private Forests (Assumption of Management) Act 1961, after following due process of law.

It said that the District Administration in consultation with the Forest Department could impose additional conditions, if needed, in the future, for maintaining a free passage for elephants and other wild life in the notified

corridor and the objectors will be bound to comply with such conditions in the event of any violation of the above said conditions, it will be open to the State Government to take over the possession of the land and the building owned by the Objector under the provisions of Tamil Nadu Private Forests (Assumption of Management) Act 1961, after following due process of law.

Further the committee observed that all structures inside the corridor including the mud cottages, machan (wildlife viewing tower) etc., constructed without approvals must be voluntarily dismantled by the owners themselves.

In case of encroachments on Government land the committee said that all the encroachments in Government land to be evicted as these are the crucial bottle neck in the corridor.

Conclusion

Elephant corridors allow elephants to continue their nomadic mode of survival, despite shrinking forest cover, by facilitating travel between distinct forest habitats. Corridors are narrow and linear patches of forest which establish and facilitate connectivity across habitats. In the context of today's world, where habitat fragmentation has become increasingly common, these corridors play a crucial role in sustaining wildlife by reducing the impact of habitat isolations and ensuring gene flow. In their absence, elephants would be unable to move freely, which would in turn affect many other animal species and the ecosystem balance of several wild habitats would be unalterably upset. It would also eventually lead to the local extinction of elephants, a species which is widely revered in our country and across the world.



To secure wild elephants' future, it is essential that we ensure their uninterrupted movement between different forest habitats. Elephant corridors must be protected to ensure the safety of elephants in this landscape.

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Working together: Collaborative approaches by the Ministry of Environment, Forest and Climate Change and Ministry of Railways to tackle elephant-train hits in India



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The issue of elephant-train collisions in India underscores the complex intersection of wildlife conservation and transportation infrastructure. As elephants roam freely across diverse landscapes, their migratory/dispersal paths often intersect with railway lines, leading to tragic collisions. This challenge necessitates a collaborative effort between the Ministry of Railways and the Ministry of Environment, Forest and Climate Change (MoEF&CC).

The Ministry of Railways plays a pivotal role in mitigating these incidents by implementing measures such as creating wildlife crossings, installing early warning systems, and establishing speed restrictions in identified elephant corridors. Simultaneously, the MoEF&CC is tasked with ensuring the protection and conservation of wildlife habitats, including those traversed by elephants.

Finding a sustainable balance involves a holistic approach that combines technological innovations, habitat preservation, and community engagement. Public awareness campaigns can educate communities residing near elephant habitats about the importance of coexistence and responsible behavior. Additionally, research initiatives can provide valuable insights into elephant behavior, aiding in the development of targeted strategies to reduce collisions.

Ultimately, addressing the issue requires a coordinated effort, leveraging the expertise of both ministries to safeguard both the endangered elephants and the safety of railway operations. As India progresses, the collaborative approach between the Ministry of Railways and MoEF&CC becomes increasingly vital to finding lasting solutions to this pressing challenge.

As you are aware Wildlife Institute of India and Project Elephant of MoEF&CC have identified 110 stretches of railway lines passing through sensitive elephant habitats as vulnerable to elephant-train collisions, for priority implementation of mitigation measures. In addition, 17 stretches of railway lines passing through important tiger habitats and corridors have also been identified. The issues has been discussed and deliberated by the Hon'ble Ministers of both the Ministries in person.

General Guidelines for Suggesting Mitigation Measures 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 MoEF&CC 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 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 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 (Fig. 1) may also be used in place of cement and soil.



Figure 1. A level crossing with a rubberized 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 smoothing 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.



An example of a ramp built for aiding elephant movement across a railway line near Coimbatore, Tamil Nadu, India



Figure 2. An elephant group using a ramp constructed for ease of movement in Deepor Bheel Assam, India

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.

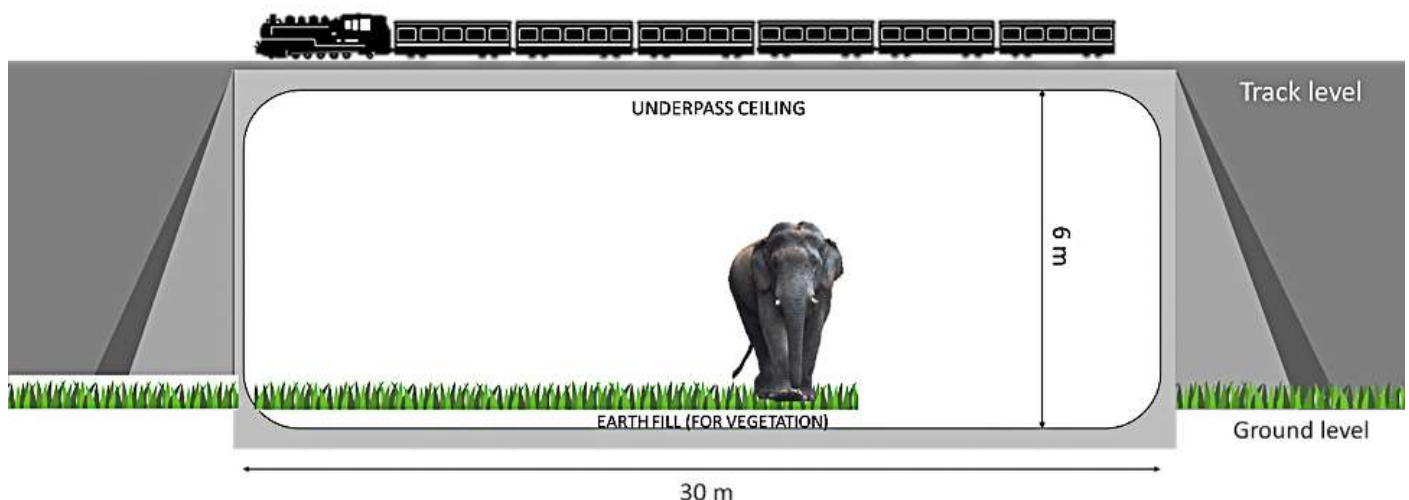


Figure 3. Graphic representation of an underpass for elephants below a railway track.

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).

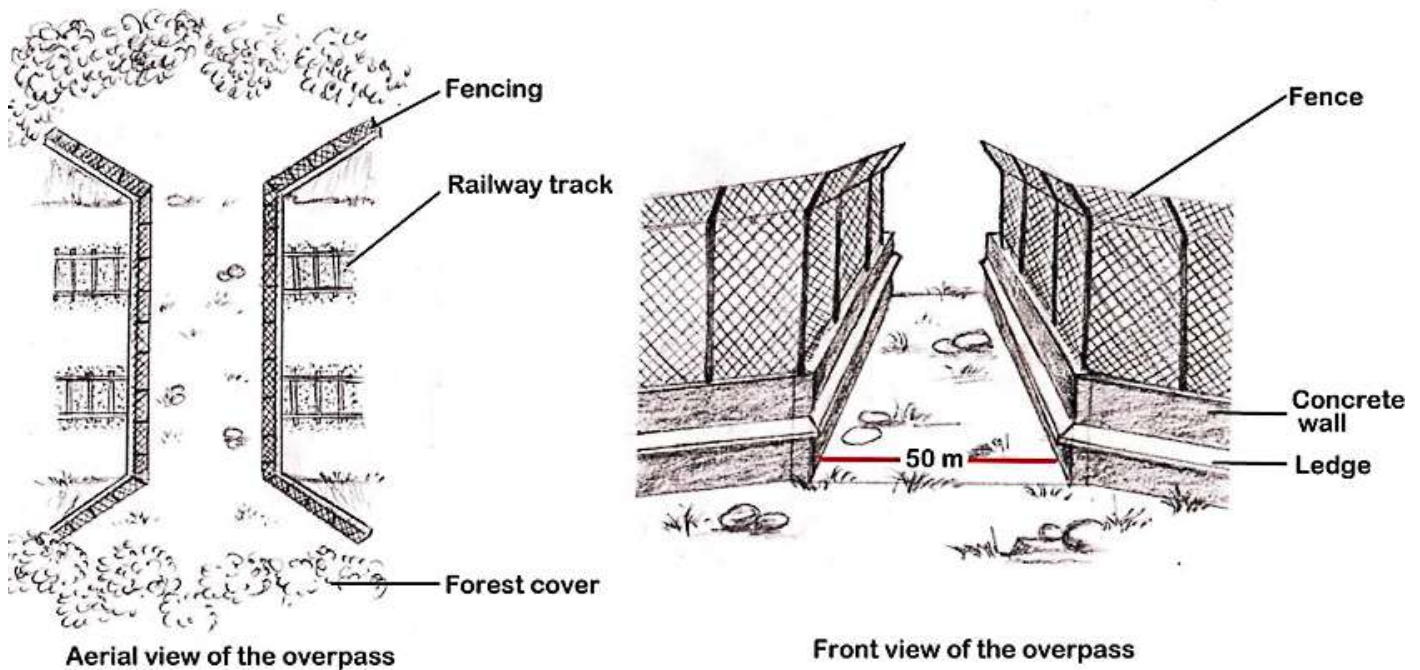


Figure 4. Aerial and front view of overpasses on railway tracks, with fencing/noise and sound barrier details.

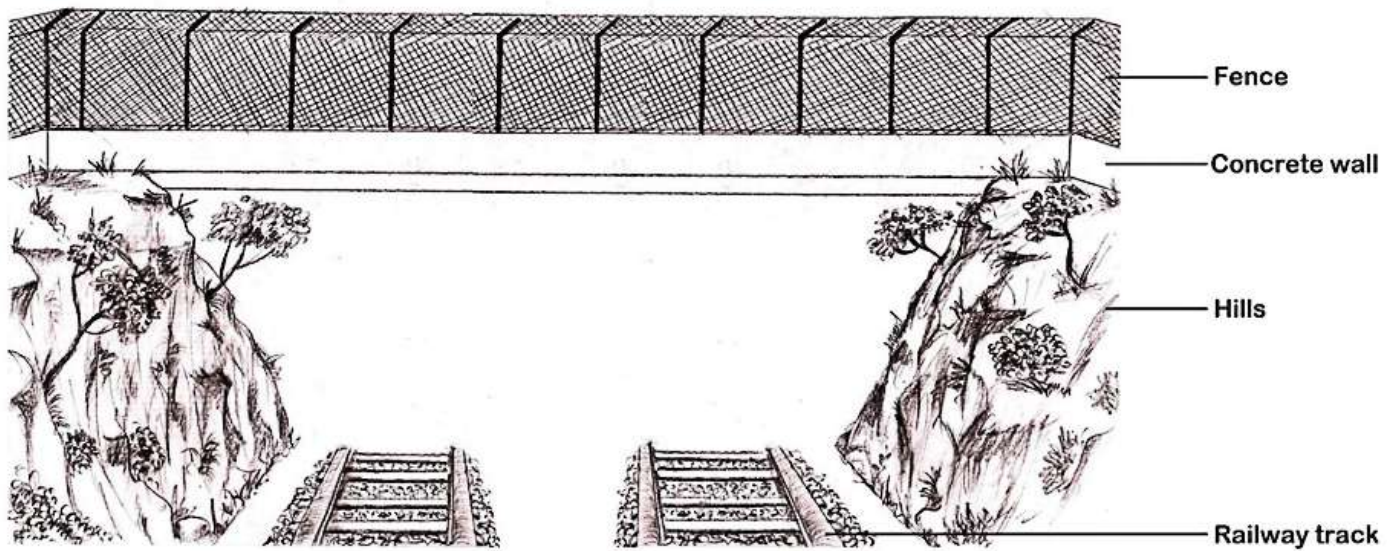


Figure 5. Lateral view of a wildlife overpass on a double-track railway line.

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. 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.

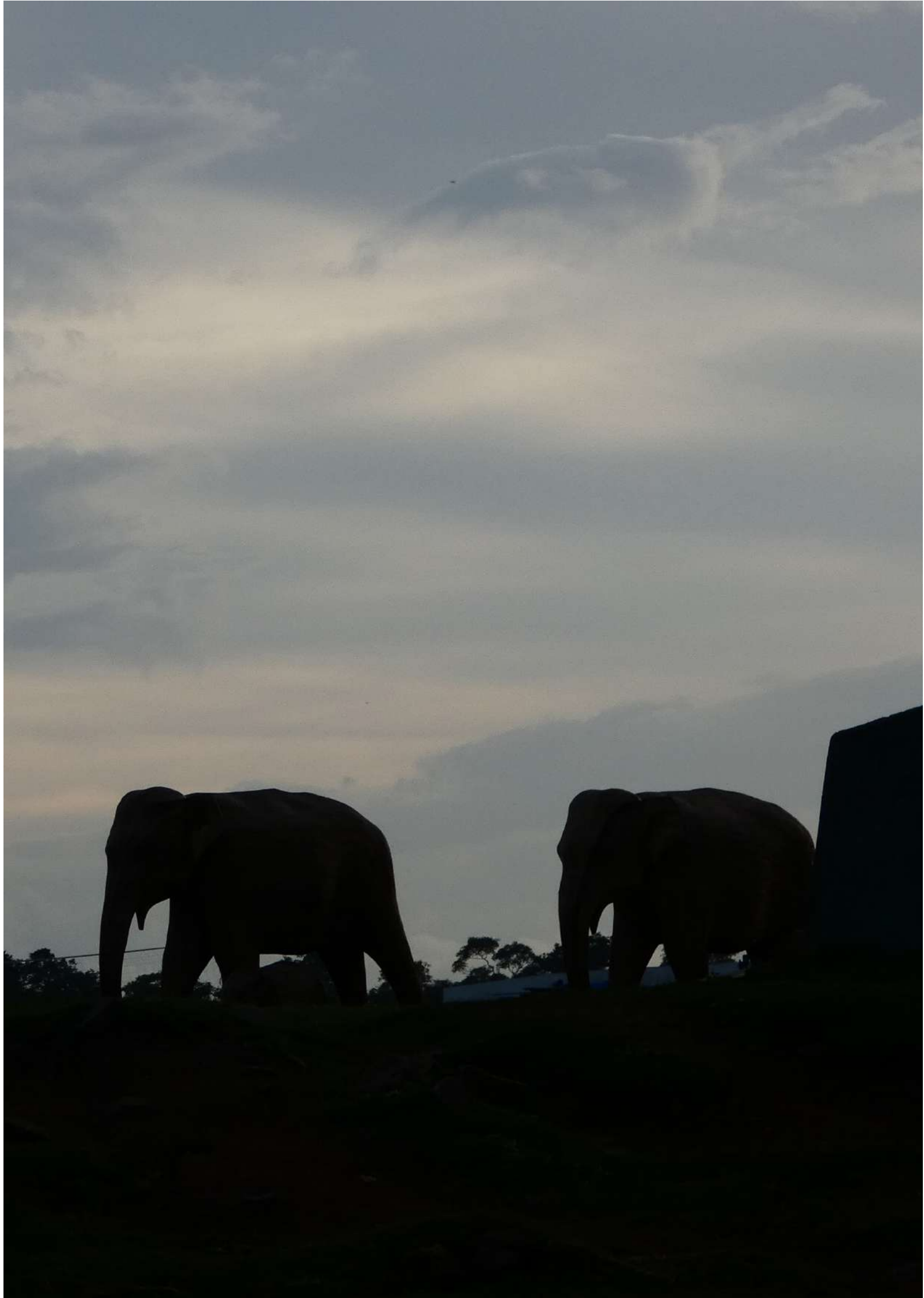
The system can show the precise location of the event, and information about what event has taken place, which means the laser pulse frequency, pulse width, and many other parameters. These parameters can be controlled, enabling the system to be tuned to the desired requirement. Integrated with machine 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 MoEF&CC 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.

Monitoring Portal for Implementation of Mitigation Measures Across Sensitive Elephant-Tiger Habitats

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.

Wildlife Institute of India and Project Elephant of MoEF&CC have identified sensitive stretches which need prioritization for mitigation planning. The portal is developed to monitor the progress of the 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.





Training Elephants - A General Guidance



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Wild elephants into captivity

The elephant and human relationship is millennia old. So is the training and management practice in captivity. Matanga leela by Shri Neelakanda Sastri and Gajasastra have ample mention about this. With increased incidents of Human Elephant negative interactions and conflicting situations due to various reasons, elephants moving into camps, rehabilitation centers which many times become lifetime care also become more. Elephants, especially with altered behavior like continuous crop raiding, house/building breaking, property damaging, endangering human lives, when relocation, translocation, rewilding efforts fail then they are moved to captivity. Sometimes medical/surgical affections bring them to rehabilitation centers. Also orphaned, abandoned, stranded elephant calves if reunion with their mother fail is brought to captivity. The background of the case and age group has influence in the training process.

Basics of training

Training elephants is an art and science and also a challenging task. Elephants in its own way learn the life science by inherent instincts, by going through the day to day activities, observing the mother, siblings, herd members and with their natural intelligence. They are also tutored and mentored by mother, aunts and other herd members.

In captivity, handlers play the major role in training the elephants. The handlers, generally called as mahouts and their assistants as cavadies need to be knowledgeable and consistent in their efforts and commands. Training methods and local practices vary in different geographical locations.

Calves are usually given training from 18 to 24 months onwards. If captive born, they are first weaned from their mother at this age and subjected to basic training so that they start listening to commands and later they can be handled with confidence. One should remember that even a two years old calf if untrained can cause serious injuries to humans.



The learning ability, time taken to positively respond by the elephants may vary between individuals, their background and age. This is also influenced by the knowledge and ability of the mahouts. Training is a continuous process that may last the entire lifetime of the elephant given the present scenario and the varying tasks they face. Patrolling duties, guiding and driving the straying wild elephants back to their habitats, dealing bulls in musth, capturing operations involving elephants, tigers, weed clearing and removing the fallen trees in the forest roads

which are inaccessible to machineries, kumki operations, tourism activities are some of the tasks which is a shift from timber hauling operations mainly in the past. The juveniles and sub adults from the wild usually settle quickly, learn rapidly, acclimatize to the environment, accept the mahouts and obey the commands in a short span of time. Whereas, the older individuals of more than 30 years of age often takes longer time to get settled and trained. Patience is the key word in elephant training. Older elephants require best of the efforts from the mahouts.



vivo V20 @praveen photography

Elephant and mahout bondage

Effective and clear communication by the mahout is important for developing relationship and thick bondage. It should be like mother and child relationship. Kindness, love, persistence, appreciations by rewarding with treats play crucial role in elephant training. Even a simple pat, caressing the cheek, lowering the sound with soft words will do wonders. The mahouts should be knowledgeable, dedicated, concerned about the welfare and wellbeing of the animal. The mahout should be steadfast in accomplishing the tasks. Hence providing a right person as

mahout is paramount importance for making a well-trained and dependable elephant. Some of the desirable characters of a good mahout are patience, dedication, emotional connection, clean habits etc. The relationship and bondage are for lifetime and long. Winning the elephant by trust is foremost for tenacious long-term relationship than breaking the spirit of the animal by force or deprivation and trying to gain control over it. Any abnormality or injury during capture or training processes should be attended properly to avoid long term negative implications.



Positive and native reinforcements

Broadly elephant training falls into positive and negative reinforcements. In both the cases, the objective is to make the elephant learn. The trainer to begin with assess the elephant for its nature, behavior, health, age, physical characters etc. primarily. The process of training involves gaining confidence, mutual trust, acceptance, vocal, tactile recognition of each

other. After completion of initial process, the elephant starts obeying the commands of the mahout and allow him to touch various parts of the body. Later the mahout will be able to give bath, scrub the body, change the rope or chain on the legs, from trunk feeding to mouth feeding, holding the tusk in case of males and able to mount and sit on the back of the elephant and get down. All the above said processes may take about a month depending on the animal and the mahout. In positive reinforcement

technique appreciation by words of gentleness and softness, patting, caressing, food rewards (sugarcane, jiggery, banana). The mahout has to remain with the elephant, persistently engage in giving command and when the animal satisfactorily responds, it should be adequately encouraged and rewarded so that the behavior sets in.



In negative reinforcement, often the elephant's movement is restricted. It involves strong vocalization, showing the hands, using sticks as psychological tool to discourage unwanted acts, behavior, movements etc. Deprivation of food or water should not be done to accomplish a task.

Open and closed contact methods

In open contact method the elephant is tied to trees in open and approaching it freely for imparting training. The possibilities of injuries by pulling the rope or chain and stress would be high in this method.

In closed contact method, a kraa (wooden enclosure) is built in which the elephant is confined but free during the period of settling, acclimatization to the new environment and mahouts and training processes. Kraal making, whether make shift or permanent with reliable structural strength require experience and expertise. The site selection and materials used

are important since repairing or changing the structures with elephant inside would be challenging and risky.

Protective contact method

In this method the caretaker and the trainer will not have any social interaction with the animal. The animals will be in an enclosure and there will be strong barriers between the handler and the animal. Provisions and ambience are designed in such a way that selective manipulation like medical intervention, biological sample collection, foot care etc. is carried out. In this way the elephants may not be suitable for any of the forestry activities.

The elephant facts, its biology, behavior, natural lifestyle, psychology, strength, weakness etc. are to be understood and considered during the training processes. The fundamental rule for the mahouts and training are winning the elephant by trust, showing love, affection and consistency.

Scientific principles and applied psychology are also incorporated in the training. Presently it is a mixture of indigenous traditional knowledge with modernity. Now a days trained elephants have to undertake tasks in human dominated landscapes and need to work along with machineries like JCB and cranes. A systematic training design, protocol and comprehensive understanding of the historic management practices are important factors in captive elephant management.



Concerns

Mostly tribals are engaged in elephant training and work as mahouts though non tribals are also engaged as handlers and trainers. The art of mahoutry is fading and there is less interest in the younger generation of traditional communities to take up the profession. Risks

involved, low monetary benefits, lack of life/job security, less demand etc. are some of the reasons for diminished interest. These have impacts on elephant training with increased incidents of conflicts and interventions in the long run.





Housing and Enclosure Enrichment for Captive Elephants



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Introduction

The living conditions of wild animals in captivity are to be taken into consideration very importantly when it comes to their housing design. This housing will have both positive and negative impacts on the animal if it is not designed well. The vital concept of housing design should consider their free movement in the wild and design the enclosure in such a way as to at least fulfill their need to a certain extent. Wild animals in captivity need to be provided suitable housing which can ensure their quality of life. The quality of housing is an important factor for the successful breeding of captive wild animals. Animal welfare studies “Five Freedoms” originated from the report of Brambell in December 1965 (HMSO London, ISBN 0-10- 850286-4) and was mentioned in the Farm Animal Welfare Advisory Committee (FAWAC) report in December 1979. The five freedoms concept was refined further by FAWC and is followed throughout the captive animal facilities (UKPGA 2006).

1. Freedom from hunger and thirst.
2. Freedom from discomfort.
3. Freedom from pain, injury, or disease.
4. Freedom to express normal behaviour.
5. Freedom from fear or distress.

The four freedoms are related to the physical health of the animal, whereas the fifth one depicts its psychological health. This can be explained by the limited size of the enclosure which can suppress the predator animal’s natural behaviour in stalking their prey (Khan and Balieva 2021). This results in abnormal stereotypical behaviour of the captive animals (Vaz et al. 2017). To eradicate or minimize this, naturalistic enclosures are created in zoos with lots of enrichments and possibilities of social interactions (Mellor et al. 2015; Yilmaz and Alpak 2019; Khan and Balieva 2021). The concept of enrichment was introduced by Robert Yerkes in 1920s and is being probably used by animal keepers all along. We take away some of the most important aspects of that animal’s being

in the captivity even though how beautiful and naturalistic the environment is. Also, we limit the opportunity for the animal to use its senses and adaptations to “earn” a living by taking control of almost every facet of that animal’s life (Martin 1999). Enrichments are created to address animal welfare issues. The main role of enrichment should be to ensure that the exhibits are naturalistic for both the viewer and the inhabitant (Shepherdson 1998). The addition of enrichments creates opportunities for the expression of species-specific social behaviour including courtship, mating, grooming and playing as well as overall activity levels are likely to increase (Baer 1998). Swaisgood and Shepherdson, 2005 reported that the zoo community was among the first to raise concerns over abnormal and stereotypic behaviours in captive animals and to begin to develop environmental enrichment strategies to deal with the perceived problem. Stereotypic behaviours are relatively invariant, repetitive behaviours that do not have an immediate function (Mason 1991). Most of the stereotypic behaviour studies strongly suggest that there is no one-to-one relationship (Mason and Mendl 1993; Mason and Latham

2004). Stereotypic behaviour can be a black mark or psychological effect from previous life environments. Poor welfare and environmental conditions are some of the main causes of stereotypies (Mason and Latham’s 2004).

Aim

- To provide a high standard of medical treatment and care for the rescued elephants.
- To become a model facility in the humane management of captive elephants.
- To provide training for the elephant managers and mahouts for humane training and treatment of captive elephants.

Housing

The elephant enclosures at Elephant Conservation and Care Centre (ECCC) are designed with a combination of materials like;

- High-tensile vertical wires
- Solar powered fences
- Concrete barriers for the shed area
- I section girders
- MS pipes-both round and square



Enclosure barrier-I section girders (left) and High tensile wires (right).



MS square pipe barrier with round pipe support.



Overview of the enclosures.

Enclosure Enrichment

- Feeding enrichment using puzzle feeder (Barrel/Cans).
- Green fodder feed enrichment with vegetation/browse on top of the shed inside.
- Logs for the bull elephants inside the enclosure and logs outside for cow elephants.
- Large enclosure with adequate precaution for musth elephants. Along with the intensive introduction of enrichments to reduce the stress level and deviate from charging, pacing, and hurting himself.



Hay Net for fodder hang.



Barrel for fodder hang.



Round pipe enrichment for fodder hang from outside.



Fodder cages installed along the boundary.

Summary and Conclusion

Housing and environmental enrichment are crucial for the well-being of captive wild animals. Proper planning and design of housing ensures the comfort of every animal. In accordance with Central Zoo Authority guidelines, elephant enclosures are designed with a minimum area of 5,000 Sq Mt. Each enclosure includes a shed with mud and concrete areas for rest and treatment, as well as an Elephant Restraint Device (ERD) area. Additionally, every enclosure has a Protective Contact Wall (PCW) for operant conditioning training, a water trough for drinking water, and a pond for bathing. Different kinds of enrichments are designed as per the necessity of the elephants. The enrichments designed are well researched to avoid any abnormal behaviour in these elephants. The elephants housed in the ECCC are rescued from various conditions and while designing housing and enrichments, special needs have to be taken care of concerning their behaviours. 90% of the elephant's common stereotypic behaviour like swaying and bobbing the head has been eliminated. Enrichment plays an important role in this. Allowing them to form groups as per their choice also helps in management.

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Electrocution: A silent killer of Elephants



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Linear infrastructure development plays a crucial role in the growth and functionality of modern societies. This type of infrastructure, characterized by its elongated and interconnected nature, includes various elements such as roads, highways, railways, power lines, pipelines, and communication networks. Achieving a balance between linear infrastructure development and wildlife conservation is essential for sustainable development. Striking this balance requires careful planning, implementation of effective mitigation measures, and a commitment to environmental stewardship.

Electrocution is emerging as a major threat in conservation of wildlife, including the flagship species like the elephants and tigers in the country.

Around 900 elephants have died due to electrocution in India during 2009-10 till 31st March, 2023 involving a variety of circumstances. Nearly 64% of all the unnatural elephant mortalities reported in the country during the last decade were due to electrocution.

This silent killer has been on the rise and poses a significant danger to the already endangered elephant population in India. Wildlife electrocution incidences including of elephants, tigers etc. can be broadly ascribed to:

- (i) transmission-related incidences and
- (ii) crop-protection related incidences.

The former, largely pertains to electrocution of elephants that come into accidental contact with the conductors of the power transmission lines due to reasons such as sagging of power lines, collision with transformers etc. The latter pertains to both deliberate as well as inadvertent tapping of power to protect crop fields and other properties by people. There are also sporadic reports of deliberate electrocution attempts to poach and kill wild animals.

With the increasing numbers of human settlements around the protected areas and elephant habitats, these jumbos are facing numerous threats in their natural habitat including habitat loss, human-elephant conflict, poaching etc. The increasing threats of the illegal electric

fences and poorly maintained transmission lines around these areas have led to a rise in the fatal accidents.

Elephants often come into contact with human settlements in search of food and water, leading to increased human-elephant conflict. In an attempt to mitigate this conflict, some farmers install electric fences to deter elephants from entering agricultural areas. If these fences are not properly installed or maintained, elephants may accidentally encounter the live wires, resulting in electrocution. Elephants, with their sensitive trunks, get electrocuted when they come into contact with these improperly managed fences. The problem is reported more in the states of Assam, West Bengal, Jharkhand, Odisha, Kerala etc.

Elephants may also be at risk of electrocution when they come into contact with high-tension power lines which are sometimes located in areas where elephants frequently move, and the lack of proper insulation can lead to fatal accidents. Young elephants are particularly vulnerable to electrocution as they may be unaware of the dangers posed by electrical infrastructure. They may inadvertently touch or approach electrified structures, leading to tragic consequences.

In order to address this issue, the Ministry of Environment, Forest and Climate Change, Government of India and other line Ministries and organizations such as Ministry of Power, State Power Transmission Agencies, DISCOMS etc. have been working to implement measures such as installation of elevated power lines, insulated power poles, awareness generation through workshops, installation of wildlife-friendly fencing etc. These efforts aim to reduce the risk

of electrocution and create safer habitats for elephants. Strict enforcement of regulations is essential to prevent electrocution incidents.

An advisory on implementation of measures to mitigate the impact of power transmission lines and other power infrastructure on elephant and other wildlife issued by Ministry of Power to all DISCOMS and TRANSCOs has been circulated to all States/UTS on 16th September, 2022.

Raising awareness among local communities about the risks of electrocution and the importance of properly maintaining electrical infrastructure is crucial. Educational programs aim to foster coexistence between humans and elephants while minimizing potential harm to both. It's important to continue to raise awareness about the threat of electrocution to elephants and to advocate for the implementation of wildlife-friendly infrastructure to mitigate this risk. Additionally, promoting coexistence between humans and elephants through community engagement and conservation programs is crucial in reducing human-elephant conflicts and protecting these magnificent animals.

These factors highlight the urgent need for wildlife-friendly infrastructure and careful planning to mitigate the risk of electrocution for elephants in India. Some of the measures which can play a crucial role in safeguarding these magnificent animals from the dangers of electrocution are as follows:

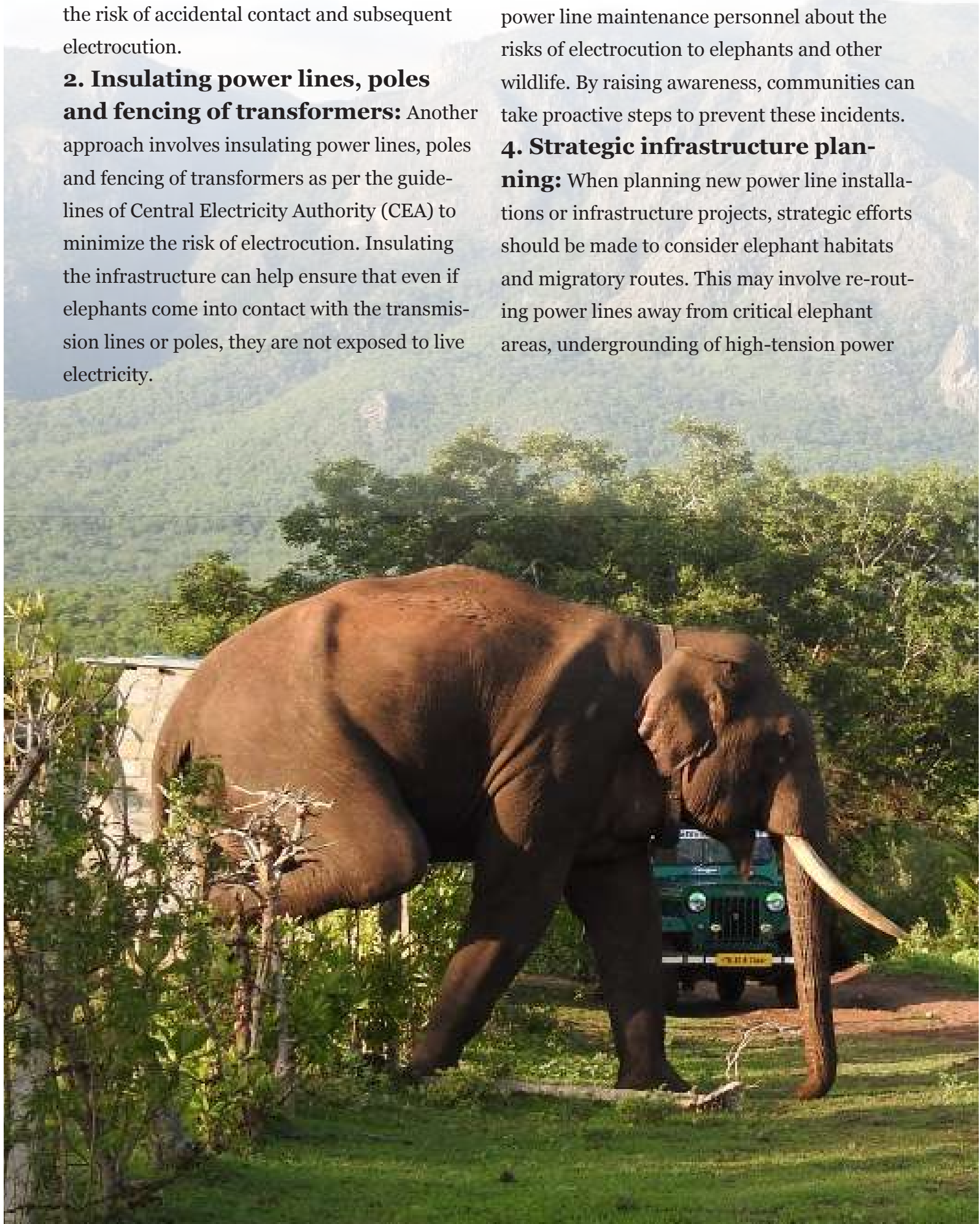
1. Elevating power lines: One of the primary methods to prevent elephants from coming into contact with power lines is to elevate the transmission lines to a height that is beyond

the reach of the elephants. The transmission lines and the high tension power lines must be aerially bunched. This can significantly reduce the risk of accidental contact and subsequent electrocution.

2. Insulating power lines, poles and fencing of transformers: Another approach involves insulating power lines, poles and fencing of transformers as per the guidelines of Central Electricity Authority (CEA) to minimize the risk of electrocution. Insulating the infrastructure can help ensure that even if elephants come into contact with the transmission lines or poles, they are not exposed to live electricity.

3. Awareness and education: Regular organization of awareness and education programs to inform the local communities and power line maintenance personnel about the risks of electrocution to elephants and other wildlife. By raising awareness, communities can take proactive steps to prevent these incidents.

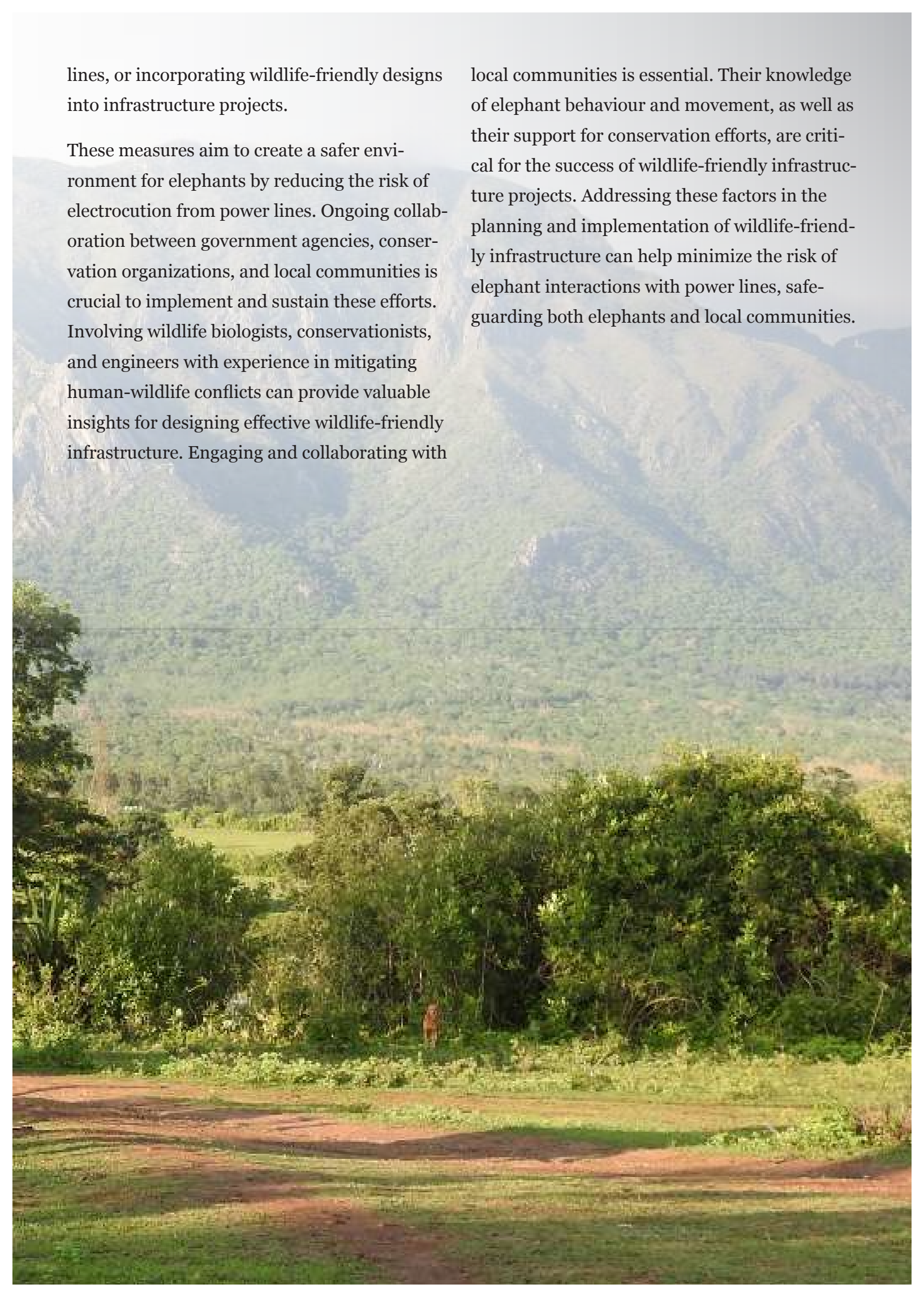
4. Strategic infrastructure planning: When planning new power line installations or infrastructure projects, strategic efforts should be made to consider elephant habitats and migratory routes. This may involve re-routing power lines away from critical elephant areas, undergrounding of high-tension power



lines, or incorporating wildlife-friendly designs into infrastructure projects.

These measures aim to create a safer environment for elephants by reducing the risk of electrocution from power lines. Ongoing collaboration between government agencies, conservation organizations, and local communities is crucial to implement and sustain these efforts. Involving wildlife biologists, conservationists, and engineers with experience in mitigating human-wildlife conflicts can provide valuable insights for designing effective wildlife-friendly infrastructure. Engaging and collaborating with

local communities is essential. Their knowledge of elephant behaviour and movement, as well as their support for conservation efforts, are critical for the success of wildlife-friendly infrastructure projects. Addressing these factors in the planning and implementation of wildlife-friendly infrastructure can help minimize the risk of elephant interactions with power lines, safeguarding both elephants and local communities.



Techniques for monitoring and tracking of Elephants to mitigate Human-Elephant Conflict



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Monitoring and tracking elephants to mitigate human-elephant conflict involves various techniques aimed at understanding elephant movements and behaviours.

A. I. Introduction

Brief overview of the importance of elephants

As a keystone species, elephants serve a crucial role in shaping and sustaining ecosystems. They are responsible for creating and maintaining habitats that support a wide range of other species, promoting biodiversity and bolstering the overall health of ecosystems. Elephants are particularly important for their ability to disperse seeds over long distances, which in turn contributes to the survival and regeneration of forests and numerous plant species. Their foraging and movement patterns can transform entire landscapes, creating diverse habitats and influencing vegetation structure, which in turn has a profound impact on other species within their

environment.

In many cultures, elephants are held in high regard and are considered to be of significant cultural and religious value, symbolizing wisdom, strength, and resilience. They are often revered and play a central role in various traditions and folklore. Furthermore, elephants are a cornerstone of ecotourism in many regions, attracting visitors and contributing to local economies.

They support local livelihoods through activities such as elephant safaris and wildlife tourism.

Their presence is essential for maintaining a balance within ecosystems, preventing habitat degradation, and promoting a healthy coexistence between wildlife and their surroundings.

Importance of monitoring and tracking elephants

Robust and reliable monitoring of elephants will help us in assessing the current state of elephant populations in the country. This will allow us to study the impact of conservation

interventions and anthropogenic pressures on elephant populations and their habitats, which will enable us to identify potential solutions and improvements to enhance elephant conservation efforts. Furthermore, we can also study their behavior and migration patterns, which will help us develop better conservation strategies. This will allow us to provide better protection for elephants from unnatural deaths and mitigate conflicts. Ultimately, this will help us ensure that elephant populations continue to thrive

Methods of monitoring and tracking elephants

- Traditional tracking methods

Throughout history, traditional methods have played a vital role in tracking and understanding the movements, behaviours, and ecological significance of elephants within their natural habitats. These methods are often rooted in cultural practices, local knowledge, and indigenous traditions. Experienced trackers use techniques like examining footprints and dung to estimate the presence, movement, and health of elephant herds/individuals. They also observe and interpret signs like broken vegetation, feeding patterns, and trampled areas to determine the direction and behavior of elephant herds. Listening posts are used to detect the low-frequency calls and rumbles of elephants, enabling traditional trackers to discern their presence and movement. Indigenous communities and local trackers rely on oral traditions and indigenous knowledge passed down through generations to understand elephant behaviour, movement patterns, and seasonal migrations. By observing elephant movements around water sources

and mineral-rich areas, traditional trackers can identify the specific requirements of these magnificent creatures, ultimately guiding them towards the locations they need to survive and thrive.

- Camera traps

Camera traps are an effective method for monitoring wildlife populations in a non-invasive way, which is essential for conservation and management purposes. These traps capture images of elephants and provide valuable insights into group dynamics, and distribution within an area and across the landscape. Continuously observing elephants through, camera traps also help in understanding behaviours such as mating rituals (must/non-must period), feeding patterns, and social interactions that are crucial for conservation efforts and ecological studies of elephants. These observations are particularly useful for studying elusive or large-ranging species that are difficult to monitor. This technique provides valuable data without disturbing their natural behaviours.

Moreover, this type of technique also helps in assessing habitat use, movement patterns, and connectivity between different forest patches/landscapes, which is vital for conservation and management. It also aids in identifying areas of high activity and potential human-conflict hotspots, thus promoting coexistence. Additionally, the captivating images and videos captured by camera traps can be used to raise public awareness and support for wildlife conservation, as they provide real evidence of the presence and behaviour. Overall, camera trapping is a powerful tool for wildlife monitoring, and its data can inform conservation policies and management practices for the benefit of both

wildlife and humans.

- Radio telemetry:

Since the 1960s, the study of wild animals and their behaviour has experienced significant advancements. The utilization of radio-telemetry technology, albeit with certain limitations, has greatly facilitated the acquisition of more comprehensive knowledge about animals. Wildlife tracking has come a long way since the introduction of very high frequency (VHF) radio devices, which had limited range. Satellite telemetry, which uses ultra-high frequency (UHF) radio signals transmitted and tracked by polar-orbiting satellites, has become highly useful due to the better quality of data transmission and platform terminal transmitters (PTTs). The US National Oceanic and Atmospheric Administration manages the satellites that track the PTTs, providing a quality index for each location. GPS collars and tags with inbuilt GPS receivers were introduced in 1994, allowing animals to be located using the Navstar GPS system. Iridium and Inmarsat are satellite communication companies ideal for GPS collar tracking of wildlife in remote areas. They offer global coverage and reliable connectivity, making them valuable for transmitting GPS data from wildlife collars even in regions lacking traditional infrastructure.

The latest technology, GPS-GSM, uses the GSM mobile phone network to facilitate communication between the collar and the receiver, providing control over the schedule of fixes by sending and receiving commands via the Short Message Service. In India, radio telemetry for wildlife was first introduced in 1976 by LD Mech from the US Fish and Wildlife Service. By 1980, one Asiatic elephant, one tiger, and one Asiatic lion

had been radio-collared and tracked.

When it comes to tracking animals, there are different methods and tools available. VHF telemetry is one such method that involves the use of transmitters and receivers. Transmitters can have either a whip antenna or a loop antenna, and their length is tuned to the frequency of the transmitter. Receivers, on the other hand, use antennas such as whip, H-shaped, Yagi, paddle, etc. that are set for a specific range of frequencies.

Animals can be fitted with transmitters using collars, harnesses, back-packs, surgical implants, ear-tags, or adhesive. Once the transmitter is attached, the animal can be tracked using either homing or triangulation. Homing involves following the strongest signal and approaching the animal either on foot, in a vehicle, or from trained elephants (while tracking carnivores by foot). Triangulation, on the other hand, involves taking simultaneous directional bearings from more than two locations and using the angles to calculate areas of intercept to estimate the animal's location.

However, it's important to note that there is always some degree of error associated with each bearing, which is why an error polygon is calculated to describe the region in which the animal is located with a set probability (e.g., 95% probability). Overall, VHF telemetry is an effective and reliable method for tracking animals and gathering data about their behavior, movements, and habitat use.

- Aerial surveys

The challenges of monitoring and tracking elephants in remote or inaccessible areas, such

as dense forests or areas with limited infrastructure. The modern development in monitoring is aerial surveys which have proven to be an indispensable tool in the conservation and protection of elephants. With the ability to cover large areas and provide a bird's-eye view, aerial surveys offer a comprehensive perspective on elephant populations and their habitats. They provide accurate estimates of population size, distribution mapping, and tracking of elephant movements. This data is critical for informed decision-making on conservation and land management strategies. This technology plays a crucial role in anti-poaching efforts. By monitoring elephant habitats and identifying potential threats, law enforcement agencies can take appropriate action to protect these iconic species from illegal activities.

The data obtained through aerial surveys helps assess the impact of habitat loss, which is very useful for planning conservation activities and mitigating conflict. Overall, aerial surveys have proven to be an essential tool for tracking and monitoring elephant populations, providing valuable insights for conservation, management, and protection efforts.

- DNA and Fecal sample

DNA Based Monitoring: Advancements in the field of genetics and more recently, genomics has made it possible to monitor elephant populations in non-intrusive ways based on DNA. DNA sequencing, the building block of life, can be used to distinguish between individual elephants and can be used to map the genetic diversity within a population. In cases where elephant populations are isolated then they display less genetic diversity and, in such cases,

active management may be required to enable genetic exchange. Recent development in the field of genomics means that even low-quality DNA obtained from dung samples can be used to extract vital information on the status of individuals and populations. Hence, DNA extracted from elephant dung when coupled with robust study design and analysis can be a vital tool to monitor vital population parameters for wild Asian elephants in India.

Challenges of monitoring and tracking elephants

To tackle these challenges, prioritize and develop cost-effective tracking solutions, upgrade our technological infrastructure, meticulously plan for safe access to elephant habitats, and establish and implement robust safety protocols for field personnel. These efforts are critical for ensuring efficient elephant conservation and management. Overcoming these obstacles is crucial for effective elephant conservation and management

Cost: Using devices like GPS collars and camera traps to keep track of elephants can be costly, especially for big projects that cover a lot of elephant areas. This includes expenses for buying the equipment, keeping it in good condition, and analyzing the data.

Technological resource and limitations: In places where elephants live far away, it can be hard to use technology to keep track of them. This is because there might not be good phone or internet service there. Also, sometimes the technology we use to track them can run out of battery or not have enough space to store all the information we need.

Accessibility: The habitats of elephants are

usually located in remote and dense areas which are quite challenging to navigate. This makes it difficult for researchers and conservationists to access these areas for monitoring and tracking purposes. As a result, it can become difficult to install and maintain tracking equipment and to observe the elephants frequently on the ground.

Safety concerns: Monitoring and tracking elephants in the wild can be a challenging task. It is important to note that elephants are large and powerful animals, and their behaviour can be unpredictable, which may result in hazardous situations. Furthermore, human-elephant conflict is a significant concern for local communities involved in monitoring efforts, as it poses a safety risk to their well-being. Appropriate measures must be taken to mitigate these risks and ensure the safety of all individuals involved in elephant monitoring and tracking activities.

Success stories in elephant conservation and management include

These success stories demonstrate the positive impact of collaborative conservation efforts, community involvement, and the application of scientific knowledge in safeguarding elephant populations and their habitats.

Decrease in Poaching: The fight against elephant poaching has yielded remarkable results in regions where anti-poaching measures, law enforcement, and community engagement have been implemented. The credit for this success largely goes to the collaborative efforts of government with the conservation organizations, local communities, and law enforcement agencies. These efforts have proven to be effective

in curbing this heinous crime against wildlife.

Reduction in Human-Elephant

Conflict: The successful management of human-elephant conflicts in certain areas has been attributed to the application of innovative strategies such as the integration of early warning systems, community-based conservation initiatives, and habitat management. These achievements underscore the significance of proactive measures in minimizing conflicts and fostering harmonious coexistence between humans and elephants.

Improved Understanding of

Elephant Behaviour: Advancements in research and technology have facilitated a comprehensive comprehension of the behavioral patterns, social structures, and migratory movements of elephants. This improved knowledge has effectively informed conservation strategies, resulting in the more efficacious safeguarding of elephant populations and their habitats.

Future of monitoring and tracking elephants

Advancements in technology like refined GPS tracking systems, improved camera trap technologies, and the use of drones will improve data collection, analysis, and monitoring capabilities for elephants. Collaboration among researchers, conservation organizations, local communities, and governments will lead to more effective monitoring and conservation strategies. As human-elephant conflicts persist and habitat loss remains a critical issue, continued monitoring and tracking of elephants is crucial for informed decision-making and the

development of adaptive conservation measures. Long-term data collection and analysis is needed to understand the impacts of environ-

mental changes, human activities, and climate change on elephant populations.



Celebration of World Elephant Day, 2023

To reaffirm mankind's collective pledge in conserving one of the most iconic species in the planet, the Elephant, "World Elephant Day" is celebrated every year in the country on 12th August.

The World Elephant Day, 2023 was celebrated by the MoEF&CC with support of Odisha Forest Department on 12th August, 2023 at Bhubaneswar, Odisha. The occasion was graced by Shri Bhupender Yadav, Hon'ble Minister,

EFCC, Government of India, Shri Ashwini Kumar Choubey, Hon'ble Minister of State, EFCC, Government of India, and Shri Pradip Kumar Amat, Minister, FE&CC, Government of Odisha along with senior officers/officials from the MoEF&CC, and Government of Odisha and Chief Wildlife Wardens from different elephant range states, renowned elephant experts, and representatives from local communities.

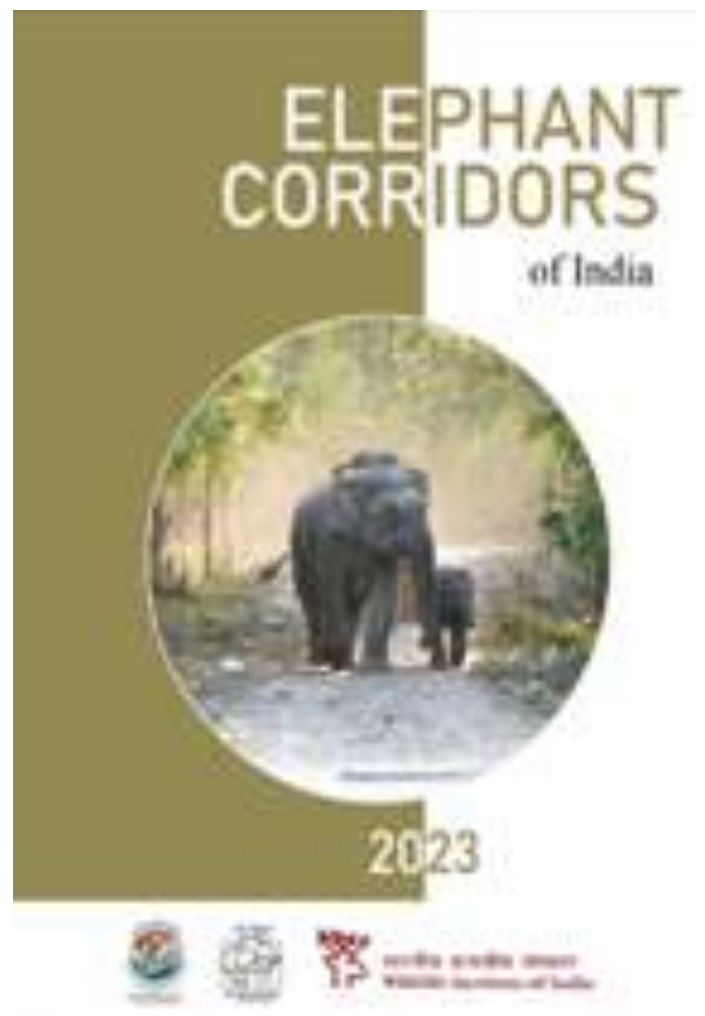


During the event, Hon'ble Minister highlighted how elephants are considered as ecosystem engineers, sculpting the landscape they move through and creating microhabitats for smaller mammals and invertebrates. He shared India's successes and future plans for elephant protection and habitat conservation. Hon'ble Minister

also interacted with the Gaj Saathi and other frontline staff of the Odisha Forest Department who are in the forefront of managing human–elephant conflict.



The report on the Elephant Corridors of India, prepared by the Project Elephant with support of Elephant Cell, WII was also released during the event. The report is an outcome of ground-validation of all the identified elephant corridors in India in coordination with the State Forest Departments of the elephant range states and involves nearly two years of concerted efforts. The report comprises of details pertaining to 150 elephant corridors across India with corresponding maps. The report is intended to serve as an important reference manual for the elephant corridors of India and would help the State Governments in taking appropriate measures to manage and protect these corridors for ensuring unhindered movement of elephants to avoid negative interactions with local people.



Gaj Gaurav Awards

The Hon'ble Minister, EFCC conferred the Gaj Gaurav Awards to the awardees for their exemplary contributions in the field of elephant conservation and management. During the event, the prestigious Gaj Gaurav awards were conferred to:

1. Alefnagar Joint Forest Management Committee, West Bengal.
2. (Late) Shri Bishwarrajan Panigrahi, (ex) protection squad in the Dhenkanal range of Odisha

for his exemplary services.

3. Shri Pitambara Gouda, watcher, elephant squad of Rayagada Forest Division in Koraput circle of Odisha.
4. Shri Deepak Sharma, Forest Guard, Assistant Gaj Yatra Team, Mahasamund Forest Division, Chhattisgarh.
5. Dr. Mirza Vaseem, Veterinary Officer, Bandipur Tiger Reserve, Karnataka.



19th Steering Committee Meeting of the Project Elephant

The 19th Steering Committee Meeting of the Project Elephant was held under the Chairmanship of Shri Bhupender Yadav, Hon'ble Minister, EFCC after the world elephant day celebra-

tions on 12th August, 2023 at Bhabaneshwar, Odisha. During the meeting, current issues facing elephant conservation and management were deliberated at length.



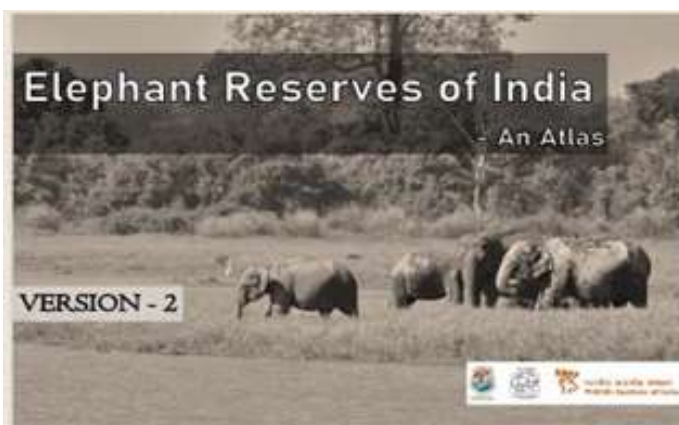
During the meeting, it was also decided to increase the ex-gratia amount from Rs. 5.00 Lakh to Rs. 10.00 Lakh for human death due to wildlife attack. The committee also deliberated on various matters related to conservation and protection of elephants (both wild and in captive) in the country.



Atlas of Elephant Reserves of India: Version 2

The second version of the Atlas of Elephant Reserves of India, which is intended to provide basic information on all the 33 Elephant Reserves of India was also released during the event.

The all-India atlas of the Elephant Reserves of India first published during August 2022 was revised in 2023 and the Version-II was released during the World Elephant Day, 2023 at Odisha. In this revised edition, several additional thematic details that were perceived to be important following the feedback for the first edition, have been included for the Elephant Reserves. The details additionally incorporated in the revised Atlas version-II includes:



i. Biogeographic region in which the Elephant Reserve falls.

- ii. The mean annual rainfall.
- iii. The number of revenue villages occurring within the Elephant Reserve.
- iv. extent of different types of main roads passing through the Elephant Reserve.
- v. The extent of irrigation canals and the power lines passing through the Elephant Reserve (vi) the extent of mining area.
- vi. Forest administrative details like the Forest

Ranges encompassing the Elephant Reserve and the Protected Areas and Tiger Reserves falling with the Elephant Reserve.

- vii. The elephant population estimated in the Elephant Reserve.

The elephant corridors falling within the Elephant Reserve have also been indicated in the maps in the Atlas: Version-II.





Conservation News...

The Ministry with an aim to avoid the elephant deaths due to train hits have identified 110 numbers of sensitive railway stretches with support of Wildlife Institute of India, Dehradun and shared with the respective State Forest Departments and the Ministry of Railways. 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 surveys were 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 surveys, 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 joint surveys are also being conducted in the other parts of the country by the joint teams of MoEF&CC/Wildlife Institute of India, State Forest Departments and the Ministry of Railways.

Management Effectiveness Evaluation (MEE):

To streamline the management approaches and to provide a platform for sharing best practices in managing elephant habitats, 'Management Effective Evaluation (MEE) of the following 4 Elephant Reserves in India' was initiated and completed:

- (i) Shivalik Elephant Reserve, Uttarakhand, Northern Region.
- (ii) Kaziranga-Karbi Anglong Elephant Reserve, Assam, North-East Region.
- (iii) Simlipal Elephant Reserve, Odisha, East Central Region.
- (iv) Nilgiri Elephant Reserve, Tamil Nadu, Southern Region.

These sites were chosen to represent the four elephant holding regions of our country and have distinct landscapes and issues related to elephant conservation and management. The report of MEE for the above four Elephant Reserves is being finalized.



Capacity Building Workshops:

Capacity building of stakeholders is essential for effective elephant conservation efforts. Elephants are keystone species that play a crucial role in maintaining the biodiversity and ecological balance of their habitats. However, they face numerous threats, including habitat loss, poaching, human-elephant conflict, and climate change. To address these challenges and ensure the long-term survival of elephants, it is imperative to build the capacity of various stakeholders involved in conservation.

Many stakeholders, including local communities, government officials, and even some conservation organizations, may lack adequate knowledge about elephants, their behavior, and their ecological significance. Capacity building programs can provide information and raise awareness about these issues.

Infrastructure development, such as roads, railways, and urban expansion, often leads to habitat fragmentation, isolating elephant populations and disrupting their migratory routes. Capacity building can help agencies design infrastructure projects that minimize these negative impacts through wildlife corridors and proper spatial planning.

It is vital to ensure that development projects can coexist harmoniously with elephant conservation efforts. By equipping these agencies with the knowledge and tools necessary to minimize environmental impacts and promote sustainable development, we can work towards a future where infrastructure and elephants can thrive together. Considering this, the Project Elephant, MoEF&CC with support of Elephant Cell, WII

have organized the following capacity building workshops:

i. A capacity building workshop on “Minimizing the Impact of the Railway on Elephants

and Other Wildlife” for the officials of Indian Railways was conducted on 23-25th November, 2023 at Wildlife Institute of India, Dehradun.



ii. A workshop on mainstreaming management of the Elephant Reserves for the Field Directors of the Elephant Reserves was organized during 28-29th November, 2023 at Wildlife Institute of India, Dehradun. Elephant Reserve managers from various states interacted and deliberated on contemporary issues facing elephant management in the country and deliberated on issues such as human-elephant conflict management, landscape management, veterinary health aspects etc.

iii. A capacity building workshop on “Exploring Solutions for Minimizing Electrocutation Risks and Promoting Wildlife Safety Across Power Infrastructure in India” for the officers/officials of the Ministry of Power, State Power transmission agencies, Central Electricity Authority (CEA), State Forest Departments was organized from 11–13th January, 2024 at Wildlife Institute of India, Dehradun.



DNA profiling of captive elephants

The Project Elephant, MoEF&CC decided to develop a comprehensive database (including DNA) for all the captive elephants regardless of their ownership in India to curb illegal wildlife practices and manage their population in a scientific manner. The objective of the programme is to account/ identify every single captive elephant in the country and bring it all in a central database which would have individual-level genetic data along with pictures of these captive elephants, making it extremely useful to stop any illegal activities involving these animals.



All India Synchronised Elephant Estimation:

The elephant estimation was conducted every 5 years by States Forest Departments. There were some disparities observed with the methodologies adopted by the States. Considering this, the Ministry had decided to conduct the all India elephant estimation through hybrid

mode i.e. through dung based mark recapture and camera trap based distance sampling estimation. For the first time ever, the all India Synchronised Elephant estimation has been conducted through more scientific and robust methodologies. The Phase I and Phase II of the project have been completed and the report is in process of finalization.

Elephant Conservation Plan:

The Ministry is in process of finalizing the “Elephant Conservation Plan of India”. The ECP is for the management of large forest tracts / landscape having enormous diversity in the topography, biodiversity, climate, hydrology and edaphic factors. A workshop was also organized at Wildlife Institute of India, Dehradun on 13th October, 2023 to deliberate on the broad framework of the Elephant Conservation Plan.

Mapping Human Elephant Conflict hotspots:

Wildlife Institute of India with funding support from MoEF&CC is implementing a project titled “Understanding Elephant Conflict Issues for Suggesting Conflict Reduction Measures”. The proposed study aims to understand the aspects of human-elephant conflict in the landscape through the following main objectives:

- i. Development of village-level database
- ii. Assess the present status of human – elephant conflict
- iii. Assess villages’ vulnerability to conflict
- iv. Tracking forest loss and pattern of fragmentation in target states
- v. Suggest measures for mitigating conflict

Standardizing the protocol for elephant estimation:



The elephant population estimation is being done in every five years in India by using different methodologies. Considering this, the Government of India has provided funding support to Wildlife Institute of India (WII) to evaluate and standardize the protocol for elephant estimation in the country. As a part of “Evaluation of efficacy of various population estimation

methods for Elephants, to develop population monitoring protocol Project” Phase-I, WII has initiated a study on an isolated elephant population of Western Rajaji National Park, spread across an area of 558.05 km², consisting of 7 ranges i.e., Ramgarh, Chillawali, Kansrao, Dholkhand, Beribara, Motichur and Haridwar.



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