ODISHA LANDSCAPE SYMPOSIUM ON

HUMAN ELEPHANT COEXISTENCE

PROCEEDINGS & POLICY INSIGHTS DOCUMENT

2026

ODISHA LANDSCAPE SYMPOSIUM ON

HUMAN ELEPHANT COEXISTENCE

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ACKNOWLEDGEMENT

As a key elephant-bearing state, Odisha has been continuously working towards strengthening coexistence-based conservation through community participation, field-level interventions, and improved management practices. In this context, the Odisha Landscape Symposium serves as an important platform for dialogue, knowledge sharing, and collaborative action among forest officials, researchers, conservation practitioners, and stakeholders.

We extend heartfelt gratitude for the kind support from the Government of Odisha, Department of Forest, Environment & Climate Change, and the Offices of Principal Chief Conservator of Forests and Head of Forest Force, Principal Chief Conservator of Forests – Wildlife & Chief Wildlife Warden, and Office of the Regional Chief Conservator of Forests – Angul Circle.

We place on record our deep gratitude to Shri Ganesh Ram Singkhuntia, Honourable Minister for Forest, Environment & Climate Change, Dr. K. Murugesan, IFS, Principal Chief Conservator of Forests and Head of Forest Force, and, Shri Prem Kumar Jha, IFS, Principal Chief Conservator of Forests & Chief Wildlife Warden for their kind consent and support in organizing the symposium.

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EXECUTIVE SUMMARY

The Odisha Landscape Symposium on Human–Elephant Coexistence: Towards Evidence-Based Mitigation and Co-existence, held on 6 March 2026 at Hotel Nirupama, Kapilash Wildlife Sanctuary, Dhenkanal, convened as a strategic platform to address the escalating challenge of Human–Elephant Conflict (HEC) in Odisha. The state remains among the most severely affected in India, with over 1,157 human deaths, 842 elephant deaths, and extensive crop and property losses recorded over the past decade, underscoring the urgent need for science-based and scalable solutions .

Organised by the Dhenkanal Forest Division in collaboration with GMR Group and implemented by SNEHA NGO, the symposium brought together over 200 participants, including forest officials, wildlife experts, researchers, conservation organisations, industry representatives, and community stakeholders. The event facilitated a multidisciplinary dialogue aimed at bridging scientific research with field-level management practices.

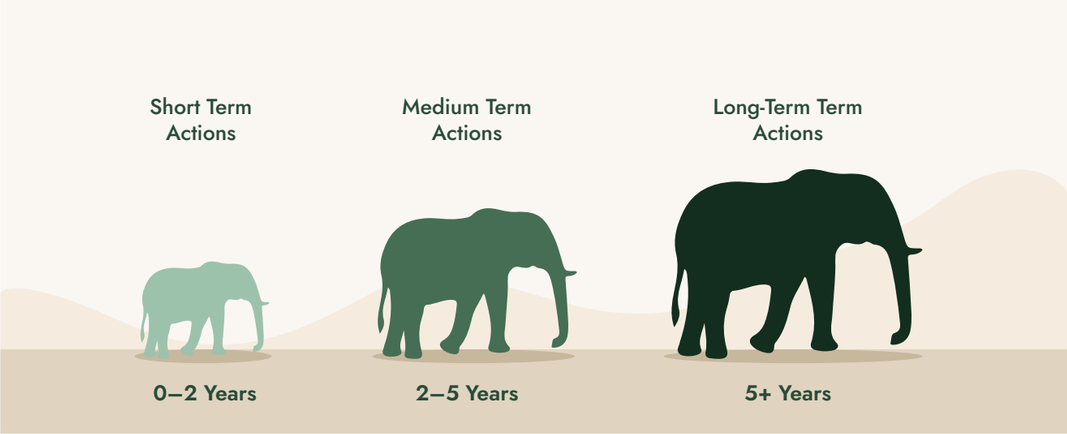
Deliberations focused on key thematic areas such as elephant behaviour and movement ecology, habitat fragmentation, early warning systems, electrocution mitigation, crop-loss reduction strategies, community-based conflict management, and landscape-level planning. Experts emphasised that HEC is fundamentally a landscape issue driven by habitat fragmentation, declining habitat quality, and increasing human–wildlife interface, necessitating integrated planning across conservation, infrastructure, and rural development sectors.

A key outcome of the symposium was the collective recognition of the need to transition from reactive conflict response to proactive, evidence-based coexistence strategies. The discussions highlighted the importance of strengthening ecological corridors, enhancing habitat quality, leveraging technology, and empowering communities as active partners in mitigation efforts.

A cultural highlight of the symposium—a sand animation performance—powerfully depicted the narrative of human–elephant coexistence, reinforcing the central message of shared landscapes and collective responsibility.
The symposium is expected to inform the development of actionable guidelines and policy frameworks to support long-term coexistence, safeguarding both human livelihoods and elephant populations.

OPERATIONAL HANDBOOK
FOR WILDLIFE RAPID RESPONSE TEAM

POLICY RECOMMENDATIONS



SHORT-TERM ACTIONS (0–2 YEARS)

Focus: Immediate risk reduction, rapid response systems, and field-level effectiveness

1. Creation and Training of Specialised Foot Tracker Units

Establish and train dedicated teams of foot trackers at the forest division level, drawing on indigenous knowledge and fieldcraft and trained by professionals . These teams should support real-time tracking of elephant herds in forested and fringe areas, significantly improving early warning, response accuracy, and conflict prevention.

2. Awareness Creation to protect lives and livelihood and reduce intolerance

Capacity building of farmers and farm owners to reduce crop loss, accept crop diversification and income enhancement through training and market linkages while educating about best practices of fencing removing electrocution threats. Engage with school students to instil long-term behavioural change through education, interactive learning, and participatory activities and create young ambassadors. Prevent open defecation by sensitizing enterprising women like Women Self Help group members, create change makers who can play a pivotal role in influencing decisions in the family and the village as a whole.

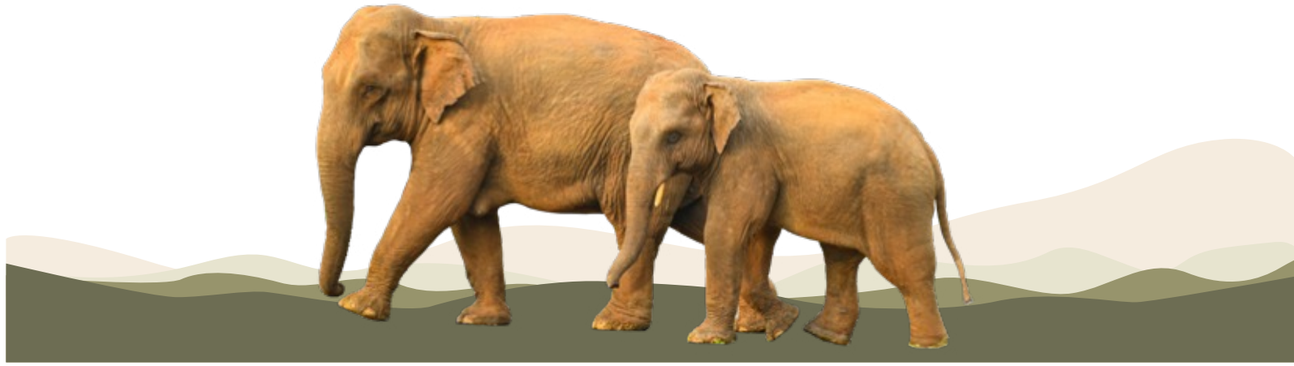
3. Training, Deployment, and Decentralisation of Kumki Elephant Units

Strengthen the use of Kumki elephants for conflict response by creating decentralised Kumki stations in high-conflict divisions. Build capacity for trained mahouts and veterinary support to enable rapid deployment for driving elephants away, rescue operations, radio collaring and emergency interventions.

4. Implement Individual-Based Monitoring and Advanced Profiling Systems

Develop a robust database for identification and monitoring of high-conflict elephants, particularly tuskers, using standardised morphological profiling protocols (e.g., ear tears, tusk characteristics, tail features, depigmentation patterns, etc.), photographic cataloguing, and integration with GPS/radio-collaring where feasible.

Enable behavioural classification of individuals (habitual crop raiders, aggressive individuals, corridor users) to support targeted and evidence-based intervention. Also development of an app or software solution to identify tuskers by uploading of photos and maintenance of circle level database of tuskers and division level Elephant cell Creation.



5. Radio Collaring and Tracking of conflict Tuskers

Radio collaring of identified Tuskers and tracking them 24X7 to facilitate communication to community through warning systems to prevent loss of life and properties.

6. Scale and Standardise Early Warning Systems (EWS)

Expand existing EWS network and development of multi-channel early warning systems (mobile alerts, community networks, sensor-based technologies) to ensure real-time dissemination of elephant movement information in conflict prone areas.

7. Strengthen Field Capacity and Operational Protocols

Enhance training of frontline staff in behavioural interpretation, safe handling, and conflict response in collaboration with leading institutions like CWH, Wildlife SOS, WTI , WWF etc. Standardise SOPs for capture, rescue, and emergency response and regular sharing of best practices through RRT conclave and workshops. Also expand use of modern drugs like BAM etc in RRT operations.

8. Deploy Scientific and Strategically Placed Solar Fencing for Movement Diversion

Install solar-powered fencing possibly vertical hanging ones in strategically identified locations (e.g., choke-points, village peripheries, crop fields along elephant pathways) to divert and regulate elephant movement rather than completely block it. Ensure adherence to technical design standards and establish community-based maintenance mechanisms for long-term functionality. Develop a state plan to regulate and set guidelines for solar fencing standards.

MEDIUM-TERM ACTIONS (2–5 YEARS)

Focus: Institutionalisation, community integration, and governance convergence

1. Strengthen Community-Based Conflict Mitigation Models

Institutionalise community-led conflict mitigation through the formation and strengthening of local response groups and trained volunteers. Integrate Human–Elephant Conflict (HEC) mitigation into Gram Panchayat Development Plans (GPDPs) to ensure sustained funding, accountability, and local ownership.

2. Promote Livelihood-Linked and Barrier-Based Mitigation Strategies

Encourage adoption of alternative cropping patterns using less palatable crops and promote bio-fencing and other nature-based barriers that provide economic returns. Align these interventions with rural livelihood schemes to enhance community acceptance and long-term sustainability.

3. Enhance Inter-Departmental and Multi-Stakeholder Convergence

Establish formal coordination mechanisms across key departments—Forest, Agriculture, Revenue, Rural Development, Energy, and Infrastructure—at district and state levels. Facilitate convergence of schemes, data sharing, and joint planning for HEC mitigation.

4. Strengthen Corporate and CSR/CER Engagement

Encourage industries, particularly in mining and infrastructure sectors, to align Corporate Social Responsibility (CSR) and Corporate Environmental Responsibility (CER) initiatives with state HEC priorities. Promote outcome-based interventions with measurable indicators and provisions for third-party monitoring.

5. Improve Compensation Systems and Expand Risk Coverage Mechanisms

Strengthen and digitise compensation systems to ensure efficiency, transparency, and accountability. Scale up insurance-based models and community risk-sharing mechanisms to provide broader and more reliable financial protection for loss of Crop, House, Cattle and Vehicles of affected communities.

6. Strengthen Awareness, Communication, and Behavioural Change Frameworks

Develop structured, long-term communication strategies focusing on risk avoidance, safe behaviour, and coexistence practices. Institutionalise engagement with schools, local governance institutions, and media to drive sustained behavioural change.

7. Next Generation Early Warning Systems (EWS)

Invest in technologies especially AI to develop robust and sophisticated EWS to predict and caution elephant movement using RFID Sensors and the like linked to mobile phones and hooters.

8. Social Media Scrutiny, Monitoring and Regulating

A combination of awareness and control through enforcement departments over social media postings showing harassment and teasing of elephants by boisterous groups.

9. Grassland and Meadows to create fodder

Invest on research and development by engaging reputed institutions such as RPRC, RFRI Jorhat, KFRI etc to develop appropriate fodder such as fast-growing bamboo clonal variety and indigenous bamboo for elephants at strategic locations to dissuade elephants from farmlands and develop appropriate supply chain for supply of seeds and seedlings to conflict divisions.

10. Water body mapping and appropriate Decision support system (DSS)

To scientifically plan for new water body creation to minimise conflict incidences.

LONG-TERM ACTIONS (5+ YEARS)

Focus: Structural ecological planning, habitat restoration, and data-driven governance

1. Adopt Landscape-Level Planning for HEC Management

Develop and institutionalise integrated landscape-level management plans that prioritise ecological connectivity across forest divisions and administrative boundaries. Embed these plans within district and state-level land-use planning frameworks to ensure long-term alignment between conservation and development. Develop landscape level GIS habitat suitability modelling and other GIS modelling through collaboration with research institute like IIT Bhubaneswar, NISER, FSI etc. Develop mechanism to study inter-division boundary and its permeability to facilitate cross division movement of elephants and removal of any obstructions.

2. Prioritise Habitat Quality and Functional Connectivity

Shift focus from increasing forest cover to improving habitat quality and ecological functionality through enrichment of native vegetation, restoration of grasslands, and removal of invasive species. Promote targeted interventions that enhance resource availability within forests and reduce elephant dependence on agricultural landscapes. Scientific ranking of Forest Block based on fodder and grass availability to support elephant populations and appropriate measure to improve food availability for elephants in degraded patches.

3. Institutionalise Corridor Protection Mechanisms

Identify, notify, and legally secure critical elephant corridors across the state. Establish regulatory frameworks to guide infrastructure development in these areas, including mandatory adoption of wildlife-friendly designs for roads, railways, canals, and transmission lines.

4. Establish Integrated Data-Driven Decision Support Systems

Develop and operationalise a state-level integrated data platform leveraging GIS, remote sensing, and real-time monitoring tools. Integrate datasets on elephant movement, habitat characteristics, land use, infrastructure, and socio-economic variables to support predictive analytics, planning, and evidence-based decision-making.

5. Form separate body to manage and process compassionate (Anukampa) scheme

To reduce workload and diversions from primary role of protection and conservation of forests and wildlife, a separate body can assess and disburse compassionate payments.

SL No.	Actions	Indicators and Outcomes	Priority
1	Creation and Training of Specialised Foot Trackers	Create division-level trained foot tracker teams integrating indigenous knowledge and modern tools. Achieve a ≥30% improvement in elephant movement detection.	High Priority
2	Awareness Creation to protect lives and livelihood and reduce intolerance	Capacity building of farmers and farm, engaging with school students create young ambassadors and prevent open defecation by sensitizing enterprising women like Women Self Help group members.	High Priority
3	Implement Individual-Based Monitoring and Advanced Profiling Systems	Develop a state-wide database using morphological ID, camera traps, and GPS collars. Develop a comprehensive state-wide database that identifies high-conflict elephants using modern technology. Identify ≥80% of potential conflict elephants	High Priority
4	Radio Collaring and Tracking of conflict Tuskers	Radio collaring of identified Tuskers and tracking them 24X7 to prevent loss of life and properties.	High Priority
5	Scale and Standardise Early Warning Systems (EWS)	Launch integrated systems that utilize SMS alerts, mobile applications, community networks, and sensor data for timely alerts. Achieve a ≥50% reduction in surprise encounters.	High Priority
6	Strengthen Field Capacity and Operational Protocols	Behavioural science training. Conflict de-escalation techniques	High Priority
7	Strengthen Community-Based Conflict Mitigation Models	Establish village-level response teams that are integrated into development plans, fostering local ownership and accountability. Form village-level rapid response teams and integrate into the Gram Panchayath	High Priority
8	Enhance Inter-Departmental and Multi-Stakeholder Convergence	Set up district-level coordination cells and implement shared digital platforms for seamless collaboration	High Priority
9	Improve Compensation Systems and Expand Risk Coverage Mechanisms	Digitise and streamline processes to facilitate timely compensation, including Direct Benefit Transfers. Ensure compensation disbursement within 15 days	High Priority
10	Adopt Landscape-Level Planning for HEC Management	Land-use planning	High Priority

SL No.	Actions	Indicators and Outcomes	Priority
11	Prioritise Habitat Quality and Functional Connectivity	Forest cover to improvement. Water security interventions. Grassland restoration. Invasive species removal	High Priority
12	Training, Deployment, and Decentralisation of Kumki Elephant Units	Set up strategically located Kumki stations with trained mahouts and veterinary backup. Reduce emergency response time to below 2 hours.	Medium Priority
13	Deploy Scientific and Strategically Placed Solar Fencing for Movement Diversion	Transition to community-maintained, behaviour-guided fencing solutions to mitigate conflict. Decrease the incidents of fence breaches	Medium Priority
14	Promote Livelihood-Linked and Barrier-Based Mitigation Strategies	Encourage the cultivation of unpalatable crops and agroforestry, which will aid in coexistence. Also prompt Drought-resilient cropping systems	Medium Priority
15	Strengthen Corporate and CSR/CER Engagement	Move towards outcome-based funding models, incorporating third-party audits to ensure accountability.	Medium Priority
16	Strengthen Awareness, Communication, and Behavioural Change Frameworks	Launch long-term information and education campaigns that include school programs and local language materials	Medium Priority
17	Next Generation Early Warning Systems (EWS)	Invest in technologies especially AI to develop robust and sophisticated EWS to predict and caution.	Medium Priority
18	Social Media Scrutiny, Monitoring and Regulating	Combination of awareness and control through enforcement departments over social media	Medium Priority
19	Grassland and Meadows to create fodder	Invest on research and development by engaging reputed institutions to develop appropriate fodder for elephants	Medium Priority
20	Institutionalise Corridor Protection Mechanisms	Notify and secure corridors. Infrastructure mitigation, such as underpasses and overpasses	Medium Priority
21	Establish Integrated Data-Driven Decision Support Systems	Data-driven approach using technology	Medium Priority
22	Form separate body to manage and process compassionate scheme	To reduce workload and diversions from primary role of protection and conservation of forests and wildlife.	Medium Priority

ODISHA LANDSCAPE SYMPOSIUM ON
HUMAN ELEPHANT COEXISTENCE

BACKGROUND

Human–Elephant Conflict (HEC) has emerged as one of the most complex conservation and human safety challenges across India, particularly in regions where expanding human activities intersect with elephant habitats. Odisha is among the most severely affected states, with conflict manifesting in significant human casualties, elephant mortality, and widespread economic losses to rural communities. The scale and persistence of these impacts highlight the multidimensional nature of the issue, affecting both conservation outcomes and livelihood security.

The persistence of HEC in Odisha reflects a complex interplay of ecological and anthropogenic factors. Habitat fragmentation, declining forest productivity, and increasing pressures from agriculture, infrastructure expansion, and settlement growth have disrupted traditional elephant movement patterns. Consequently, elephants are increasingly compelled to traverse human-dominated landscapes, leading to frequent and often fatal interactions.

Across India, several states and practitioners have demonstrated promising approaches to mitigating conflict, including early warning systems, radio-collaring, community-based monitoring, alternative cropping strategies, and technological innovations. However, these interventions remain fragmented and context-specific, with limited consolidation into scalable frameworks tailored to Odisha's ecological and socio-cultural conditions. This underscores the need for a structured platform to facilitate knowledge exchange, cross-learning, and the adaptation of best practices.

In this context, the Odisha Landscape Symposium on Human–Elephant Coexistence was conceived as a knowledge-to-action platform to bring together policymakers, forest officials, scientists, practitioners, and community stakeholders to collaboratively address the challenge of HEC.

The key objectives of the symposium were to:

- Identify and document best practices in Human–Elephant Conflict mitigation from across India
- Examine technological, ecological, and community-based interventions addressing conflict drivers
- Facilitate inter-state learning and collaboration among forest departments and stakeholders
- Engage solution providers and innovators to showcase practical tools and technologies for conflict mitigation

By integrating scientific knowledge, field experiences, and community perspectives, the symposium aimed to support a transition from reactive conflict management to proactive, evidence-based, and landscape-level coexistence strategies.

ELEPHANT DISTRIBUTION AND HUMAN–ELEPHANT CONFLICT SCENARIO IN ODISHA

Odisha is one of India's key elephant-bearing states, supporting a significant population of Asian elephants across a diverse and dynamic landscape. The state forms an important part of the eastern Indian elephant range and plays a crucial role in sustaining both resident and migratory elephant populations. Elephants in Odisha are distributed across multiple forested landscapes spanning the northern, central, and southern regions of the state. Major elephant-bearing areas include the forests of Mayurbhanj, Keonjhar, and Sundargarh in the north; Angul, Dhenkanal, and Athmallik in central Odisha; and Koraput, Malkangiri, and Rayagada in the south. These landscapes comprise a mosaic of protected areas, reserve forests, and multi-use zones where human settlements and agricultural lands coexist alongside wildlife habitats.

The state supports an estimated population of over 2,000 elephants, with herds exhibiting both resident and seasonal migratory behaviour. Elephant movement is often guided by traditional corridors that connect different forest patches, enabling access to food, water, and suitable habitat conditions across seasons.

Over time, however, increasing anthropogenic pressures such as agricultural expansion, infrastructure development, mining, and settlement growth have significantly altered these landscapes. Many traditional elephant corridors have become fragmented or degraded, leading to changes in movement patterns. As elephants increasingly navigate through human-dominated areas, particularly forest fringe villages and agricultural lands, interactions between people and elephants have become more frequent and more severe.

Human–Elephant Conflict (HEC) has therefore emerged as one of the most significant conservation and socio-economic challenges in Odisha. The conflict manifests in several forms, including:

- Crop depredation
- Damage to houses and property
- Human injuries and fatalities
- Elephant mortality due to electrocution, train accidents, poaching, and retaliatory actions

Among these, crop depredation is the most widespread and recurrent issue, particularly affecting small and marginal farmers in forest fringe areas. Conflict often follows seasonal patterns, with higher incidences during crop harvesting periods when elephants are attracted to standing crops.

Several districts have consistently emerged as conflict hotspots, particularly Angul, Dhenkanal, Keonjhar, Sundargarh, and Mayurbhanj, where forests, agricultural lands, and settlements occur in close proximity. In these regions, traditional coexistence practices have been increasingly challenged by changing land-use patterns, declining natural forage availability, and growing human activity within elephant habitats. In some areas, elephants have adapted to modified landscapes and now spend prolonged periods in agricultural zones, further increasing the risk of conflict.

Despite these challenges, Odisha has identified several critical elephant habitats, corridors, and conflict-prone zones that are now the focus of targeted conservation and management interventions. The Forest Department and associated agencies have initiated a range of measures, including:

- Rapid response teams for conflict management
- Early warning systems and elephant tracking mechanisms
- Community awareness and sensitisation programmes
- Compensation mechanisms for loss of life, crops, and property
- Corridor protection and habitat improvement initiatives

Odisha possesses a strong institutional framework, experienced frontline forest staff, and growing emphasis on community-based and technology-driven solutions. However, the scale and complexity of Human–Elephant Conflict require a shift from reactive responses to more proactive, preventive, and landscape-level strategies. Strengthening coordination among departments, improving data-driven decision-making, protecting and restoring elephant corridors, and enhancing community participation will be essential for promoting long-term human–elephant coexistence.
Understanding both the spatial distribution of elephants and the evolving patterns of conflict is central to designing effective interventions that balance wildlife conservation with the safety, livelihoods, and well-being of local communities.

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COEXISTENCE
Satyakam Parida

KEY DRIVERS OF HUMAN–ELEPHANT CONFLICT

Human–Elephant Conflict in Odisha is driven by a complex interplay of ecological, socio-economic, and developmental factors. Understanding these underlying drivers is essential for designing effective, long-term mitigation strategies.

One of the primary drivers is habitat fragmentation and degradation. Expansion of agriculture, mining activities, and infrastructure development has led to the reduction and fragmentation of contiguous forest habitats. As natural habitats shrink and become increasingly patchy, elephants are compelled to move through human-dominated landscapes in search of food and shelter.

Closely linked to this is the disruption of traditional elephant corridors. Many of the historical movement routes that once enabled safe passage between forest patches are now encroached upon or obstructed by settlements, roads, railways, and other linear infrastructure. This forces elephants to take alternative routes, often passing through villages and agricultural fields, thereby increasing the likelihood of conflict.

The availability of high-nutrient crops in agricultural fields is another significant factor. Crops such as paddy, maize, and vegetables are highly attractive to elephants and provide an easy and energy-rich food source. This often leads to repeated crop-raiding behaviour, particularly during harvesting seasons.

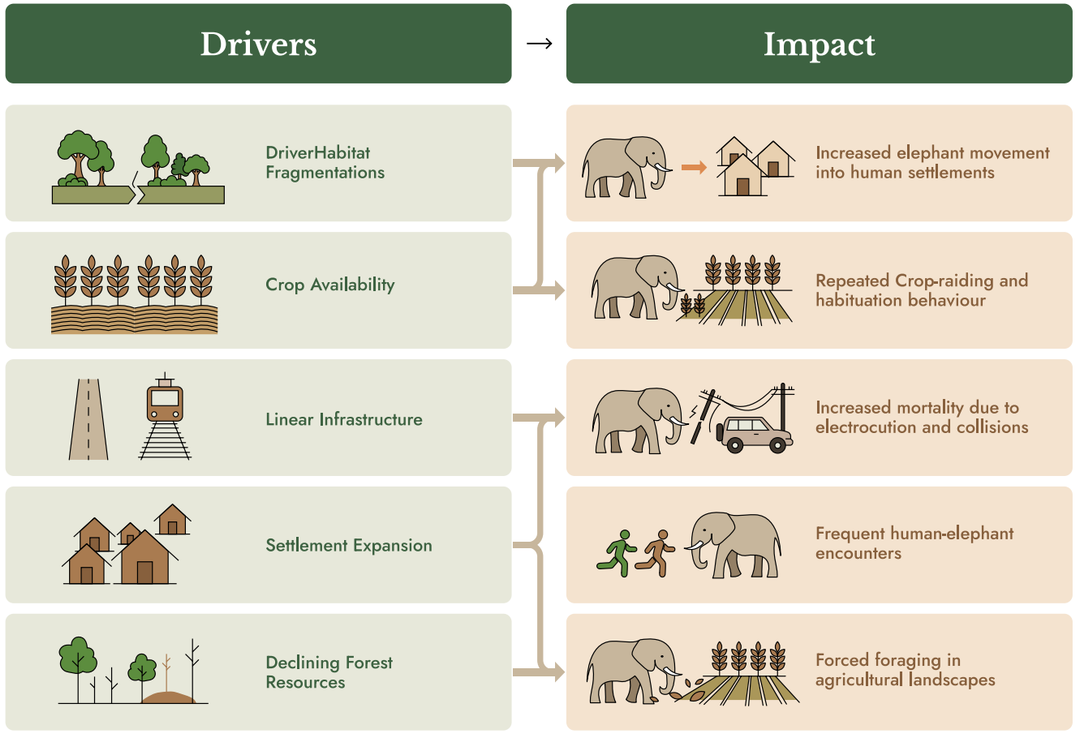
Human settlement patterns and land-use changes have also contributed to intensifying conflict. Expansion of villages into forest fringes and increased human activity in and around forest areas have reduced the spatial separation between humans and elephants. In many areas, this has resulted in overlapping use of landscapes by both humans and wildlife.

In addition, declining availability of natural forage and water sources within forests, especially during dry seasons, pushes elephants towards agricultural lands and water sources near human habitations. Climate variability and changing rainfall patterns may further exacerbate this trend.

Behavioural factors also play a role. In some regions, elephants have become habituated to human-modified landscapes and exhibit altered movement and foraging patterns. Similarly, human behaviour—such as risky practices, lack of awareness, or attempts to chase elephants—can escalate conflict situations.

Finally, the presence of linear infrastructure, including highways, railway lines, and transmission corridors, has not only fragmented habitats but also increased the risk of elephant mortality due to collisions and electrocution, further complicating conservation efforts.

Addressing these drivers requires a shift towards integrated, landscape-level planning that balances ecological needs with developmental priorities, while actively involving local communities in coexistence strategies.



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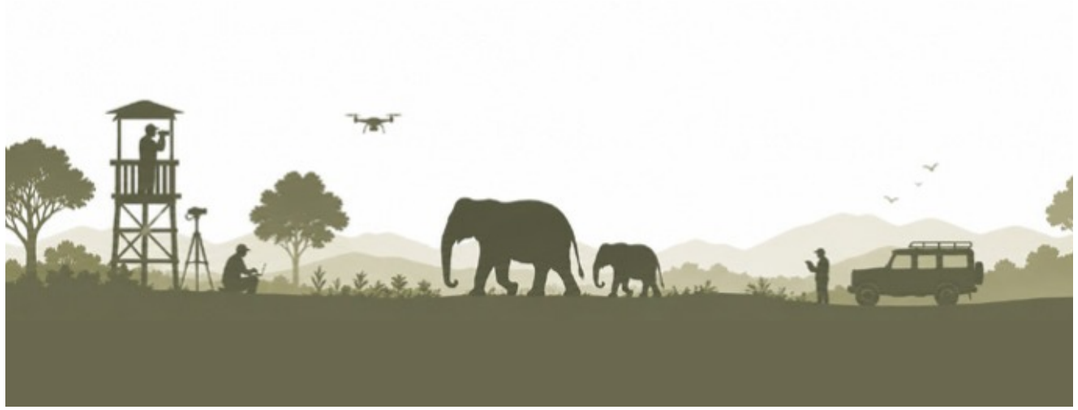
POLICY & INSTITUTIONAL FRAMEWORK

The management of Human–Elephant Conflict (HEC) in Odisha is guided by a well-defined policy and institutional framework led primarily by the State Forest Department. As a Schedule I species under the Wildlife (Protection) Act, 1972, the Asian elephant receives the highest level of legal protection, mandating strong conservation and management measures.
At the state level, the Forest Department plays a central role in planning and implementing strategies related to elephant conservation and conflict mitigation. This includes habitat management, protection of elephant corridors, deployment of frontline staff, and coordination of rapid response mechanisms in conflict-prone areas.

Odisha has been proactive in adopting a range of measures to address HEC, including:

- Establishment of Rapid Response Teams for immediate conflict mitigation
- Deployment of tracking and monitoring systems for elephant movement
- Installation of early warning systems in vulnerable areas
- Provision of ex-gratia compensation for loss of human life, injury, crop damage, and property loss



In addition, the state has identified critical elephant habitats and corridors, and efforts are ongoing to secure and manage these areas through habitat improvement, afforestation, and regulation of human activities.

At the national level, initiatives such as Project Elephant provide financial and technical support to states for elephant conservation, including habitat restoration, corridor protection, and conflict mitigation. These efforts are complemented by guidelines and advisories issued by the Ministry of Environment, Forest and Climate Change (MoEFCC) to promote science-based management practices.

Institutional coordination is an important component of effective HEC management. Addressing conflict requires collaboration between multiple departments, including forest, revenue, agriculture, rural development, and infrastructure agencies. Increasingly, partnerships with research institutions, non-governmental organisations, and community-based groups are also contributing to improved outcomes.

Despite these efforts, the dynamic nature of human–elephant interactions presents ongoing challenges. Issues such as delays in compensation, limited resources in high-conflict areas, and the need for greater integration of land-use planning with conservation priorities highlight areas for further strengthening.

Moving forward, enhancing institutional capacity, improving inter-departmental coordination, and integrating technology and community participation into policy frameworks will be critical for achieving sustainable human–elephant coexistence in Odisha.

EVENT OVERVIEW

The Odisha Landscape Symposium on Human–Elephant Coexistence: Towards Evidence-Based Mitigation and Co-existence was held on 6 March 2026 at Hotel Nirupama, located in the Kapilash Wildlife Sanctuary, Dhenkanal, Odisha. The symposium was organised by the Dhenkanal Forest Division in collaboration with GMR Group and implemented by SNEHA (Support for Network and Extension Help Agency) as a knowledge-sharing platform to address the growing challenge of Human–Elephant Conflict (HEC).

The event brought together over 200 participants, including forest department officials from Odisha and other elephant range states, wildlife ecologists, conservation practitioners, researchers, technology providers, industry representatives, and community organisations. The symposium was designed as a multidisciplinary platform to facilitate dialogue between scientific research, policy frameworks, and field-level implementation.

The programme comprised an inaugural session, followed by a series of landscape and technical sessions covering diverse aspects of HEC, including elephant ecology and behaviour, habitat fragmentation, early warning systems, electrocution mitigation, crop-loss reduction, community-based conflict management, and the role of industry in conservation. A dedicated "Voices from the Field" session provided practical insights from frontline practitioners managing conflict situations across Odisha.

In addition to technical deliberations, the symposium incorporated a cultural component through a sand animation performance that depicted the narrative of human–elephant coexistence, reinforcing the central theme of shared landscapes and collective responsibility.

Overall, the symposium served as a platform for cross-learning and collaboration, enabling stakeholders to exchange knowledge, share experiences, and identify context-specific solutions for addressing HEC in Odisha.

INAUGURAL SESSION

The symposium commenced with an inaugural session attended by key representatives from government, conservation organisations, and industry. The dignitaries present included Shri Sangram Keshari Behera, Director, Odisha Forest Rangers College; Shri Sumit Kumar Kar, Divisional Forest Officer, Dhenkanal; Shri Praveen Anant, Head – Environment, Health and Safety (EHS), GMR Group; Shri Ramasamy Krishnan, Executive Director, SNEHA; and Dr. N. S. Manoharan, Senior Wildlife Veterinarian.

The session began with a welcome address and contextual overview of the symposium, highlighting the urgency of addressing Human–Elephant Conflict in Odisha through coordinated and evidence-based approaches. In his address, the Divisional Forest Officer, Dhenkanal, emphasised the need to move beyond reactive conflict management and adopt proactive, science-driven, and socially inclusive strategies for long-term coexistence.

Speakers during the inaugural session underscored the importance of integrating ecological understanding with community participation and institutional coordination. The discussions highlighted that effective conflict mitigation requires not only protection of elephant habitats but also improved landscape planning, enhanced habitat quality, and stronger engagement with local communities.

The inaugural session set the tone for the symposium by framing Human–Elephant Conflict as a landscape-level challenge that demands collaborative, interdisciplinary, and forward-looking solutions.

ARTICLE

Shrinking Spaces, Rising Conflicts: How Electric Fences Are Saving Elephants and Humans in India

N. Mohanraj

A prominent Nilgiris-based former WWF landscape coordinator who works on technological solution for conservation.

India is a land of majestic biodiversity, home to over 60% of the world's Asian elephant population. But as the human population swells and agricultural settlements expand into ancient elephant corridors, the relationship between man and pachyderm has become increasingly fraught. What was once a coexistence of respect has, in many regions, turned into a war of attrition.

The statistics are stark. Across the country, the conflict claims over 500 human lives annually, while retaliatory and accidental killings result in more than 100 elephant deaths each year. At the heart of this crisis lies a single, devastating activity: crop raiding.

For a small-scale farmer, a herd of elephants raiding a field is not merely a nuisance; it is an economic catastrophe. A single elephant can destroy an entire year's livelihood in one night. This economic devastation often leads to desperate measures—poisoning, electrocution, or spearing—breeding deep-seated animosity that undermines decades of conservation work.
However, amid this grim landscape, a technology is proving to be a critical lifeline: the electric fence. When designed and maintained correctly, it offers a scientific, non-lethal solution to an ancient problem.

The Science of Deterrence

Modern solar-powered electric fences function on a simple principle: respect through memory. Unlike lethal barriers, these systems are designed to teach, not kill.

The Pulse: The system delivers a short, high-voltage pulse—typically around 9 kV—but with a strictly limited current of just 30 milliamps for a duration of 3 milliseconds. This creates a very strong jolt to the muscular system. It is sharp and unforgettable, yet harmless.

The Energizer: At the heart of the system is the energizer unit. It converts low-voltage battery power into these intermittent high-voltage pulses.

Psychological Barrier: Elephants are among the most intelligent mammals on the planet. They learn rapidly. After one or two encounters with a well-installed fence, the boundary becomes a psychological barrier. The jolt is never forgotten, and often, the mere sight of the fence is enough to deter elephants from attempting a crossing.

The System: Engineering for Safety and Reliability
For a fence to be a true conservation tool rather than a hazard, the engineering behind the power supply is critical. A poorly designed system can lead to fence failure or, worse, accidental mortality. A robust system relies on several key components working in harmony.

1. Solar Power Supply

A solar-based system is essential for two main reasons:
Autonomy: It operates as a stand-alone unit. Even during grid power outages or in remote locations, there is no break in the fence's operation.
Safety: By relying solely on solar energy, the system eliminates the temptation for farmers to illegally connect the fence to dangerous mains electricity (220V AC) in a hurry, which is the leading cause of elephant electrocutions.

2. Site Preparation and Clearance

The physical environment around the fence is as important as the electrical components. Proper clearance ensures both visibility and functionality:
Clearance Zone: The fence should have at least 3 meters of clearance on both sides. This vegetation-free zone serves two purposes. First, it ensures the fence is visible to approaching elephants, allowing the

psychological deterrent to take effect before physical contact is made. Second, it prevents vegetation from touching the wires and draining the charge, which would otherwise weaken the fence's effectiveness.

3. Right-Sizing Components

The heart of the solar charging system lies in properly scaling each component to the local climate. Engineers must account for the maximum number of consecutive days an area might experience heavy cloud cover.
Solar Panel: Depending on the number of rainy days in the region, a panel rated between 100 to 150 watts is recommended to ensure the battery receives sufficient charge even in overcast conditions.
Battery: Typically a 12V system, the battery bank usually requires a capacity of around 80 Amp Hours (Ah) . This sizing ensures that most of the time, the battery is discharged to only 60% of its capacity. Avoiding deep discharge significantly enhances the battery's lifespan, reducing the overall maintenance cost of the fence.

Charge Controller: Often overlooked, the charge controller is arguably the most important part of the solar supply. It prevents the battery from being overcharged or fully drained, ensuring a long operational life. While traditional lead-acid batteries require regular maintenance (like distilled water top-ups), newer Lithium-based batteries are becoming a viable alternative. Although they have a higher upfront cost, a smaller Ah lithium battery can power the system for over a decade with zero maintenance.

4. Earthing: The Critical Circuit

A fence is only as effective as its earth return path. Proper earthing ensures that when an elephant touches the fence, the pulse completes its circuit through the animal, delivering the full intended deterrent.
Recommended Configuration: It is recommended to earth the energizer with three earth kits placed at a distance of 3 meters, connected in series. This creates a low-resistance path to ground.
Best Practice: For optimal results, a buried earth wire should be run along the length of the fence, particularly in locations where elephants are most likely to attempt a breach. This ensures that the animal standing at the fence line is in direct contact with a highly conductive earth return, maximizing the effectiveness of the jolt.

5. Energizer Standards

The energizer must supply current according to National Standards. Adhering to these standards ensures that the output remains a high-voltage, low-current pulse that deters effectively but guarantees no mortality.

Maintenance: The Backbone of Success

The functioning of an electric fence depends almost entirely on the rigor of its maintenance. A well-designed fence that falls into disrepair becomes worse than useless—it creates a false sense of security while providing elephants with a predictable, unguarded crossing point. Effective maintenance rests on two pillars:

A. Monitoring the Power Supply

The power supply must be kept within specified parameters to ensure consistent operation.
Battery Voltage: For lead-acid batteries, voltage should be maintained above 13 volts when fully charged and must never be allowed to drop to 11 volts or below. Deep discharge permanently damages the battery and leads to fence failure.

Diagnostic Tools: A simple multimeter (set to DC voltage reading) is indispensable for diagnosing problems with the power supply components—the solar panel, charge controller, battery, and energizer.
Record Keeping: A detailed logbook should be maintained, recording voltage readings, maintenance actions taken, and any observed animal interactions with the fence. This historical record provides invaluable insights into system performance and helps predict potential failures before they occur.

B. Ensuring Fence Integrity

The fence must be able to deliver its full charge at the point of contact with an elephant. This is often compromised by vegetative growth, which drains the charge and reduces the deterrent effect.
Daily Voltage Monitoring: Fence voltage should be monitored every day using a dedicated fence voltmeter. A standard multimeter is useless for this purpose, as it cannot accurately measure the high-voltage pulses. If budget permits, a fault detector is even more valuable, allowing rapid localization of shorts and breaks along the fence line.

Vegetation Control: Any vegetation touching the wires must be cleared immediately. The 3-meter clearance zone must be maintained through regular cutting.

The Game-Changer: Low-Cost Monitoring

Today, electronic development in India is advancing rapidly. A low-cost fence monitoring system would be a true game-changer for human-elephant conflict mitigation. Such a system could provide real-time alerts when voltage drops, when a section is breached, or when the battery is low. By ensuring the fence is working continuously, these technologies could drastically reduce conflict incidents.

However, technology alone is not enough. Proper financial support must be allocated for at least every three years to ensure fences are maintained and continue to play their critical role in protecting both communities and elephants.

Proven Impact: A Statistical Decline in Conflict

The efficacy of this approach is visible in the data. Forest departments across various elephant-range states have documented a significant drop in conflict incidents where electric fences have been strategically installed and maintained.

(Estimated percentage reduction in conflict incidents post-installation based on combined Forest Department reports)

Karnataka: Estimated reduction of 70-80% in targeted areas.
Kerala: Estimated reduction of 60-75% .
Tamil Nadu: Estimated reduction of 65-80% .
Odisha: Estimated reduction of 50-70% .
West Bengal: Estimated reduction of 55-75% .

These numbers represent not just saved crops, but lives—both human and elephant—spared from violent encounters.

Regional Success Stories: Innovation on the Ground

The "one-size-fits-all" approach fails in elephant conservation. Different terrains and elephant behaviors require specific solutions. Two states offer compelling case studies in innovation:

Case Study: Karnataka's Hanging Fences

In Karnataka, the introduction of "hanging fences" has been a game-changer. In this design, the electrified wires hang loosely from a top cable rather than being tied taut to rigid posts. This design addresses two key elephant behaviors: the use of tusks to uproot fence posts and the use of dry wood to short-circuit the system. Because the fence is flexible and suspended, elephants cannot easily push it over or ground it with debris, maintaining its integrity as a barrier.

Case Study: Kerala's Community Solar Fences

In the conflict-prone hills of Wayanad, Kerala, the focus has shifted to community ownership. Community-owned solar fences, managed by local Vana Samrakshana Samithis (Forest Protection Groups), have seen success rates as high as 70%. By involving the farmers who are directly affected, these programs ensure that the fences are monitored daily and that locals have a stake in the preservation of the elephants, turning potential adversaries into custodians of the solution.

Evolving Design: Beyond Elephants
A well-designed fence can serve as a robust protection system against multiple threats. While the hanging fence is ideal for elephants, integrating three horizontal strands at lower heights can effectively keep out wild pigs and deer, which are also significant crop raiders. This multi-species approach future-proofs the investment, creating a protected zone that can even help mitigate future conflicts with predators like tigers.

The Challenges: Intelligence and Persistent Threats
Despite the successes, electric fencing is not a panacea. It comes with significant operational challenges that require constant vigilance.

1. Vegetation and Wear

As noted, vegetation growth, fallen branches, or the theft of batteries and solar panels can render a fence useless. A single break in the circuit creates a safe passage for elephants, who are quick to exploit these weaknesses.

2. Elephant Intelligence

Conservationists often joke that elephants have "read the manual." These animals are remarkably adept at testing boundaries. Forest department reports frequently note that elephants have been observed using their trunks to drop dry logs onto wires to break them, or strategically kicking at the base of fence posts to snap insulators, allowing them to cross without receiving a shock.

3. The Threat of Illegal High Voltage

Perhaps the greatest threat to the credibility of electric fencing is illegal electrification. In frustration, some farmers bypass approved solar energizers and connect their fences directly to 220V (or higher) AC power lines. This is catastrophic. It transforms a non-lethal deterrent into a deadly trap, resulting in the gruesome electrocution of elephants, and often, accidental deaths of humans who touch the fence. These illegal connections are a major legal and ethical concern, often leading to criminal charges and undermining legitimate conservation efforts.

Conclusion

The data from Karnataka, Kerala, and other states proves that it is possible to drastically reduce conflict. However, the future of this mitigation strategy hinges on precise engineering, rigorous maintenance, and ethical implementation.

By adhering to national standards for energizers, right-sizing solar components to ensure reliability, implementing proper earthing and clearance protocols, and designing fences that account for elephant intelligence (such as hanging fences), we can create barriers that are both psychologically insurmountable and physically non-lethal.

Yet technology alone is insufficient. A fence is a living solution that demands the same intelligence to maintain as the animals it seeks to deter. Daily voltage checks, meticulous record-keeping, and consistent vegetation management are not optional—they are the backbone of success. With the advent of low-cost monitoring systems and sustained financial support for maintenance, India can scale this solution effectively.

By combining technology with community stewardship and a commitment to maintenance, India can protect its farmers' livelihoods while ensuring that its majestic heritage—the Asian elephant—continues to roam its forests for generations to come.

LIST OF SPEAKERS AND PROFILES

Dr. Laxminarayanan Natarajan

Former Scientist, Elephant Cell, Wildlife Institute of India

Dr. Laxminarayanan Natarajan is a distinguished wildlife scientist with extensive experience in human–elephant conflict across northern and central India. His work focuses on landscape-level conservation, elephant movement ecology, and conflict mitigation strategies. He has contributed significantly to research and policy frameworks aimed at promoting coexistence between elephants and human communities.

Dr. Ragunathan Ganesh

Wildlife Biologist & Conservation Researcher

Dr. Ragunathan Ganesh is a noted wildlife biologist with extensive field experience in southern India, particularly in elephant landscapes of Karnataka and Tamil Nadu. His work spans biodiversity research, conservation education, and field-based ecological studies. He brings valuable insights into landscape connectivity and species interactions in human-dominated ecosystems.

Ms. Upasana Ganguly

Conservation Practitioner

Ms. Upasana Ganguly is a conservation practitioner working on wildlife corridors and landscape connectivity across India. Her work focuses on identifying, securing, and managing critical corridors to ensure safe movement of wildlife. She has been actively involved in collaborative conservation initiatives that integrate science, policy, and stakeholder engagement.

Dr. B. Navaneethan

Wildlife Researcher

Dr. B. Navaneethan specialises in elephant behaviour, profiling, and movement ecology. His research focuses on understanding behavioural patterns of elephants to inform conflict mitigation strategies. He has contributed to field-based studies that use scientific data to improve management interventions in human–elephant interface zones.

Dr. Manoharan

Veterinary Expert & Wildlife Health Specialist

Dr. Manoharan is a veterinary expert specialising in wildlife health and disease management. His work focuses on emerging threats, disease surveillance, and health interventions in wild elephant populations. He brings critical insights into the role of animal health in conservation and conflict mitigation.

Ms. Ankana Sanyal

Researcher – Elephant Behaviour

Ms. Ankana Sanyal is a researcher specialising in tusker behaviour and its implications for human–elephant conflict. Her work focuses on understanding behavioural patterns of individual elephants, particularly conflict-prone individuals, to inform targeted mitigation strategies. She contributes to bridging behavioural science with practical conflict management approaches.

Ms. Rabiya Daimari

Conservation Practitioner

Ms. Rabiya Daimari works on community-based approaches to reduce crop loss and promote sustainable agricultural practices in conflict-prone regions. Her work focuses on alternative cropping strategies and livelihood interventions that minimise human–elephant interactions while supporting local communities.

Mr. Ramasamy Krishnan

Community Engagement Specialist

Mr. Ramasamy Krishnan specialises in community mobilisation and participatory approaches to wildlife conservation. He has extensive experience working with local communities in conflict-prone landscapes, focusing on awareness, capacity building, and fostering coexistence through inclusive and community-led initiatives.

Mr. A. Sikkandar Basha

Technical Expert – Human–Wildlife Conflict Mitigation

Mr. A. Sikkandar Basha works on developing and deploying technological solutions to reduce human–wildlife conflict, particularly elephant electrocution risks. His work includes field-based innovations and tools that enhance early detection and prevention, contributing to safer landscapes for both wildlife and communities.

Mr. Pradeep Ghosal

Chief of CSR & Special Projects, Tata Power Odisha

Mr. Pradeep Ghosal leads CSR and special initiatives at Tata Power Odisha, with a focus on sustainable development and community engagement. He has been actively involved in supporting initiatives that address human–elephant conflict through industry participation, infrastructure safety, and collaborative conservation efforts.

Sri Manu Ashok Bhat

Divisional Forest Officer, Jharsuguda Division

Sri Manu Ashok Bhat is a senior forest officer with extensive field experience in managing human–elephant conflict in Odisha. He has been actively involved in implementing on-ground mitigation measures, community engagement, and rapid response strategies in high-conflict areas, bringing practical insights from frontline conservation.

TECHNICAL & THEMATIC SESSIONS

Dr. Laxminarayanan Natarajan

Former Scientist, Elephant Cell, Wildlife Institute of India

Topic:

Landscape Ecology, Behavioural Dynamics, and Strategic Mitigation of Human–Elephant Conflict in East-Central India

Summary:

Dr. Natarajan presented a landscape-level understanding of human–elephant conflict, emphasising the role of habitat quality, connectivity, and behavioural ecology. He highlighted that fragmented and low-quality habitats, combined with disruptions in elephant social structure, are key drivers of conflict. The session underscored the need for science-based, landscape-scale planning and targeted management interventions.

Key Insights:

- Elephants are ecological generalists requiring diverse habitat mosaics; fragmented and low-quality habitats push them into human-dominated landscapes.
- Habitat management must prioritise quality over quantity, focusing on forage availability, micronutrients, and ecological productivity rather than just forest extent.
- Young dispersing bulls (10–15 years) account for a majority of conflict incidents due to disrupted social structures and absence of older bulls.
- Human–elephant conflict exhibits "auto-correlation," where one incident can trigger multiple subsequent events due to herd stress and behavioural responses.
- Effective management requires a shift from herd-based to individual-based monitoring, including identification of high-risk animals and use of tracking technologies.

Dr. Ragunathan Ganesh

Wildlife Biologist & Conservation Researcher

Session 2:

Comparative Analysis of Human–Elephant Conflict Management in Valparai and Hassan Landscapes

Summary:

Dr. Ganesh presented a comparative analysis of human–elephant conflict across two contrasting landscapes, highlighting how conflict dynamics vary based on land use, infrastructure, and community context. The session emphasised the need for site-specific mitigation strategies, combining behavioural interventions, infrastructure design, and early warning systems to reduce risk and improve coexistence.

Key Insights:

- Conflict patterns differ across landscapes, requiring context-specific solutions rather than uniform approaches.
- Infrastructure such as highways and railway barriers can alter elephant movement and shift conflict zones.
- Use of smell-proof storage (e.g., shipping containers) effectively reduces food-driven elephant incursions.
- Multi-channel Early Warning Systems (SMS, WhatsApp, alerts) improve preparedness and reduce accidental encounters.
- Behavioural awareness, such as the "stay indoors" approach during night encounters, significantly reduces fatalities.

Ms. Upasana Ganguly

Conservation Practitioner, Wildlife Trust of India (WTI)

Topic:
Securing the Right of Passage for Elephants in India

Summary:

Ms. Ganguly focused on the critical role of elephant corridors in enabling true coexistence, highlighting the transition from mere co-occurrence to functional connectivity. She emphasised that increasing numbers of identified corridors reflect growing fragmentation, and stressed the need for securing and managing these corridors through a combination of policy, community engagement, and targeted interventions.

Key Insights:

- Elephant corridors are narrow linkages between viable habitats, and their increasing number indicates fragmentation of larger landscapes.
- Linear infrastructure such as roads, railways, and canals significantly disrupt functional connectivity, even when corridors physically exist.
- Electrocution and infrastructure-related risks are major causes of elephant mortality and require inter-agency coordination for mitigation.
- Corridor securement requires multiple models, including private purchase, community-led conservation, government acquisition, and public participation.
- Low-cost, practical interventions—such as canal ramps, raised power lines, and traffic regulation during crossings—can significantly reduce conflict and mortality.

Dr. B. Navaneethan

Wildlife Researcher, WWF-India

Topic:
Elephant Profiling and Behavioral Mapping

Summary:

Dr. Navaneethan emphasised the importance of shifting from population-level management to individual-based approaches in addressing human–elephant conflict. He highlighted the use of morphological profiling and behavioural mapping to identify high-conflict individuals and improve targeted interventions. The session also discussed the limitations of conventional mitigation measures and the need for informed, science-based management strategies.

Key Insights:

- A small proportion of elephants are responsible for a majority of conflict incidents, making individual-based management more effective than herd-level approaches.
- Morphological features such as ear patterns, tusk shape, tail structure, and body profile can be used to create reliable identification profiles without expensive tracking systems.
- Accurate identification of sex and age, particularly distinguishing makhnas and dispersing males, is critical for targeted conflict mitigation.
- Physical barriers like trenches and fences often fail due to poor maintenance and elephant learning behaviour, rather than design flaws.
- Translocation is a high-risk intervention with both physiological and behavioural consequences, and should be used only as a last resort.

Dr. Manoharan

Veterinary Expert & Wildlife Health Specialist

Topic:

Behavioral Insights and Biological Force in Human–Elephant Conflict Management

Summary:

Dr. Manoharan highlighted the importance of integrating behavioural understanding with field operations in managing human–elephant conflict. He emphasised that effective interventions require careful interpretation of elephant behaviour, disciplined field protocols, and the use of trained elephants (Kumkis) as a "biological force." The session also underscored the need for operational precision, safety, and compassionate approaches in conflict situations.

Key Insights:

- Elephant behaviour varies based on habitat, stress, and resource conditions, requiring context-specific interpretation rather than uniform responses.
- Accurate reading of body language and behavioural cues is critical for safe and effective field interventions, especially during capture and sedation.
- Kumkis act as a "biological force," enabling non-lethal guidance, separation of individuals, and safer management of high-risk elephants.
- Field operations must be conducted with high levels of focus and coordination, treating each intervention as a critical, high-risk activity.
- Categorising elephant mortality into preventable and non-preventable causes helps prioritise management efforts and improve conservation outcomes.

Ms. Ankana Sanyal

Researcher – Elephant Behaviour

Topic:

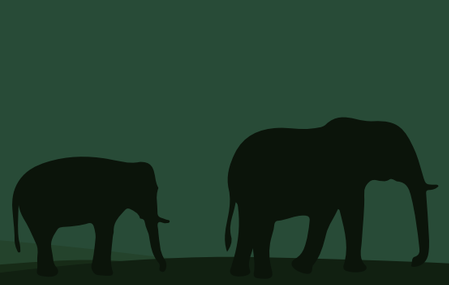
Insights from Long-term Monitoring in the Kabini Elephant Project

Summary:

Ms. Sanyal highlighted the importance of long-term monitoring and individual-based research in understanding human–elephant conflict. Drawing from the Kabini Elephant Project, she emphasised how behavioural patterns, social structures, and dispersal dynamics influence conflict. The session underscored the need for evidence-based interventions grounded in ecological data and long-term observation.

Key Insights:

- Long-term monitoring enables accurate understanding of population dynamics, behavioural variation, and conflict patterns.
- Elephant societies operate through complex clan-based structures, and disruptions in social hierarchy can influence conflict behaviour.
- Dispersing male elephants, particularly younger individuals, are at higher risk of engaging in conflict due to early exposure to human-dominated landscapes.
- Conflict behaviour such as crop-raiding can be socially learned and transmitted between individuals, making targeted management critical.
- Habitat changes, including invasive species and nutrient differences between forest and crops, significantly influence elephant movement and foraging decisions.



Rabiya Daimari

Conservation Practitioner, Aaranyak

Topic:

Community-Based Interventions for Human–Elephant Conflict in Assam

Summary:

Ms. Daimari presented community-driven approaches to managing human–elephant conflict, drawing from field experiences in Assam. She highlighted the role of habitat conditions, local livelihoods, and social dynamics in shaping conflict patterns. The session emphasised integrated solutions combining habitat management, community participation, and livelihood-linked interventions to promote sustainable coexistence.

Key Insights:

- Environmental factors such as water scarcity, habitat degradation, and mining pressures significantly influence elephant movement and conflict patterns.
- Elephant behaviour is shaped by social learning, and disruptions in herd structure can lead to increased conflict tendencies.
- Community-led infrastructure, such as village-level enclosure fencing and solar fencing, is more effective when supported by local maintenance systems.
- Bio-fencing using crops like lemon provides a dual benefit of conflict mitigation and sustainable income generation.
- Successful coexistence requires integration of multiple strategies, including habitat enrichment, alternative crops, and strong community engagement.

Mr. Ramasamy Krishnan

Community Engagement Specialist, Gaja Sanrakshana Project

Topic:

Community Mobilization and Stewardship in Human–Elephant Conflict Management

Summary:

Mr. Krishnan emphasised a shift towards human-centric approaches in managing human–elephant conflict, focusing on community behaviour, livelihoods, and local ownership. He highlighted the importance of transforming communities from passive recipients into active stakeholders through institutional mechanisms, grassroots leadership, and sustained engagement to ensure long-term coexistence.

Key Insights:

- Effective mitigation requires prioritising human behaviour, safety, and preparedness, alongside ecological considerations.
- Socio-economic factors such as open defecation, forest dependency, and mono-cropping significantly contribute to conflict risk.
- Community ownership is critical for sustaining mitigation measures, including maintenance of barriers and local monitoring systems.
- Institutional mechanisms such as Gram Panchayat integration and trained community volunteers (Gaja Satis) strengthen long-term implementation.
- Early warning systems supported by local trackers and community networks improve real-time response and reduce risk.

Mr. Mohan Raj and Mr A. Sikkandar Basha

Scientific Electric Fencing for Human–Elephant Conflict Mitigation

Topic:
Scientific Electric Fencing for Human–Elephant Conflict Mitigation

Summary:

Mr. Mohan Raj and Mr Basha discussed the increasing intensity of human–elephant conflict driven by crop raiding and shrinking habitats, and presented scientific electric fencing as an effective, non-lethal mitigation tool. He emphasised that well-designed solar-powered fencing acts as a psychological deterrent and can significantly reduce conflict when supported by proper engineering and regular maintenance.

Key Insights:

- Human–elephant conflict has escalated into a high-impact socio-economic issue, severely affecting small and marginal farmers.
- Scientific electric fencing functions as a non-lethal psychological barrier, delivering controlled pulses that deter elephants without causing harm.
- Solar-powered systems reduce dependence on grid electricity and prevent unsafe and illegal use of high-voltage current.
- Effectiveness of fencing depends on proper design, site preparation, and daily maintenance, including vegetation clearance and voltage monitoring.
- Innovative models such as hanging fences and community-managed systems have demonstrated significant reductions in conflict across multiple states.

Mr. Pradeep Ghosal

Chief of CSR & Special Projects, Tata Power Odisha

Topic:
Corporate Social Responsibility (CSR) in Biodiversity and Human–Elephant Conflict Mitigation

Summary:

Mr. Ghosal highlighted the evolving role of corporate sector engagement in biodiversity conservation and human–elephant conflict mitigation. He emphasised that CSR and Corporate Environmental Responsibility (CER) frameworks provide a strong mandate for industries to move beyond compliance and adopt outcome-driven, long-term interventions aligned with state priorities and sustainable development goals.

Key Insights:

- Human–elephant conflict mitigation is a valid and critical area under CSR frameworks, supported by legal provisions such as the Companies Act, 2013.
- Effective corporate engagement requires a shift from short-term, donation-based activities to long-term, impact-driven programmes with measurable outcomes.
- Integrated models like Gaja Sanrakshana demonstrate the value of combining technology, community engagement, and field-level capacity building.
- Treating HEC within a Disaster Risk Reduction (DRR) framework enables structured, safety-oriented planning and response mechanisms.
- Multi-stakeholder convergence between corporates, government, and NGOs is essential for scaling interventions and optimising resources.

Sri Manu Ashok Bhat

Divisional Forest Officer, Jharsuguda Division, Odisha

Topic:

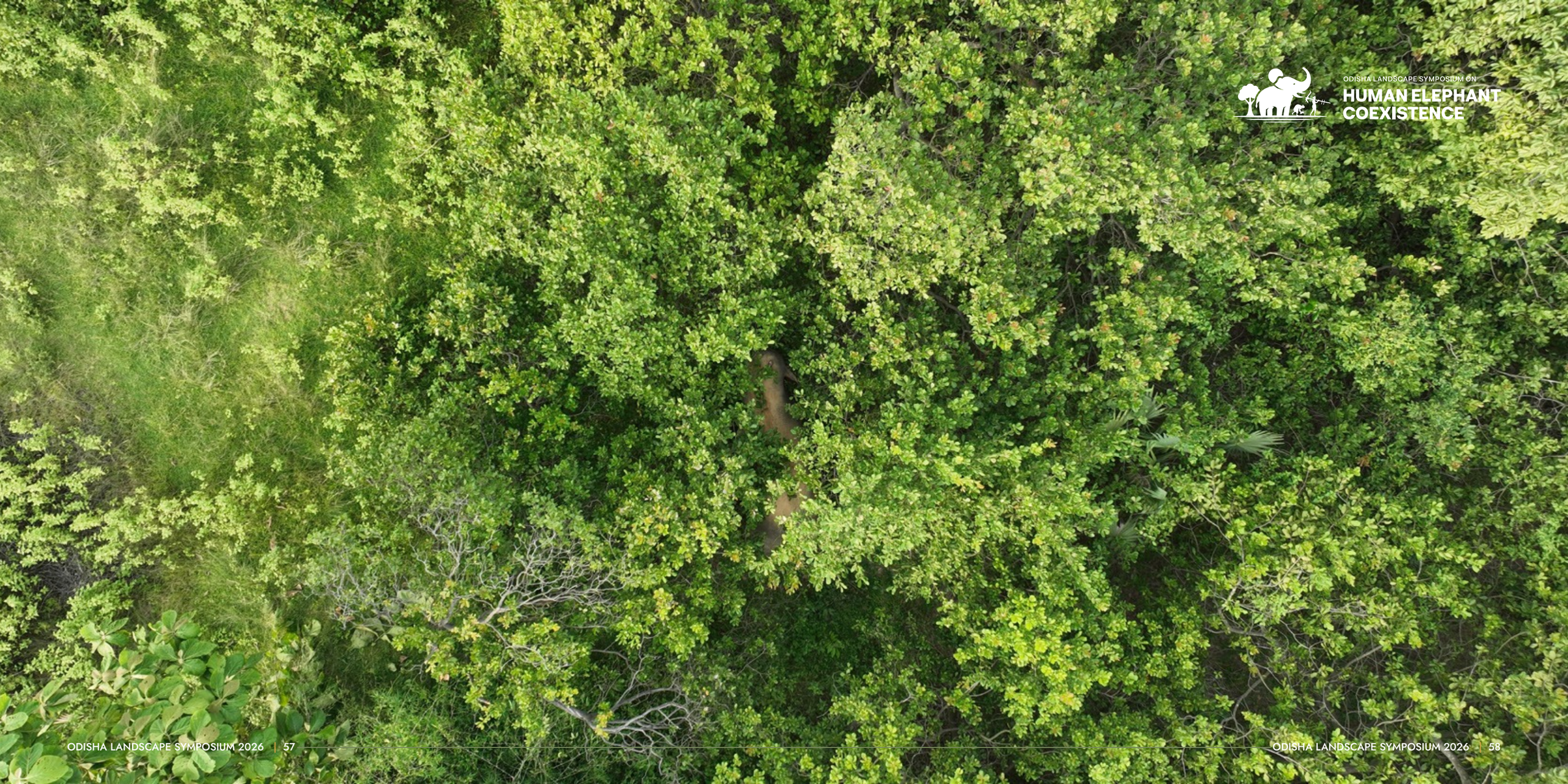
Strategic Defragmentation through Compensatory Afforestation

Summary:

Sri Bhat presented a field-driven perspective on managing human–elephant conflict in industrial landscapes, emphasising the role of habitat connectivity and scientific land-use planning. He highlighted how fragmented afforestation practices contribute to conflict and proposed a shift towards GIS-based, strategic interventions that prioritise ecological continuity and facilitate safe elephant movement.

Key Insights:

- Elephants in fragmented, industrial landscapes often become disoriented and aggressive, increasing the risk of human–elephant conflict.
- Small forest patches act as critical "stepping stones", helping elephants navigate through disturbed landscapes and stabilise behaviour.
- Current compensatory afforestation practices are often fragmented and non-strategic, limiting their ecological effectiveness.
- GIS-based integration of elephant movement data with cadastral maps enables scientific identification of priority areas for habitat connectivity.
- Shifting focus from "area afforested" to "habitat connectivity and landscape functionality" can significantly enhance conservation outcomes.



KEY TAKEAWAYS/ STRATEGIC OVERVIEW

The deliberations converged into the following key takeaways:

1. Human–Elephant Conflict is a Landscape-Level Challenge

Human–Elephant Conflict (HEC) is driven by fragmented habitats, disrupted corridors, and competing land-use pressures. Addressing the issue requires landscape-level planning that integrates ecological connectivity with development priorities.

2. Habitat Quality and Connectivity are Central to Coexistence

The quality and contiguity of habitats play a critical role in shaping elephant movement and conflict patterns. Strategic interventions such as corridor protection, habitat enrichment, and scientifically planned afforestation are essential for reducing conflict.

3. Individual Behaviour Influences Conflict Outcomes

A small proportion of elephants are responsible for a majority of conflict incidents. Understanding individual behaviour, social dynamics, and dispersal patterns enables more targeted and effective mitigation strategies.

4. Community Participation is Fundamental

Sustainable conflict mitigation depends on active community involvement. Behavioural change, local ownership, and community-led institutions are key to ensuring long-term success.

5. Livelihood Considerations Shape Coexistence

Mitigation strategies must align with local economic realities. Approaches such as alternative cropping, bio-fencing, and livelihood diversification can reduce conflict while supporting community resilience.

6. Technology is an Enabler, Not a Standalone Solution

Technological tools such as early warning systems, tracking, and electric fencing are effective when integrated with community engagement and institutional support systems.

7. Infrastructure Development Must be Wildlife-Sensitive

Linear infrastructure such as roads, railways, and power lines significantly impacts elephant movement. Incorporating wildlife-friendly design and mitigation measures is essential to minimise conflict.

8. Strengthening Field Capacity is Critical

Effective management requires trained frontline staff, clear operational protocols, and strong coordination. Behavioural understanding and safety measures are essential for reducing risks during field operations.

9. Multi-Stakeholder Convergence Enhances Impact

Addressing HEC requires collaboration across government agencies, corporates, NGOs, and communities. Convergence platforms enable better coordination and scaling of solutions.

10. Shift from Reactive to Preventive Approaches

There is a need to move beyond reactive measures towards proactive, data-driven, and preventive strategies that anticipate and reduce conflict risks over the long term.

POSTER COMPETITION OVERVIEW

The Poster Competition was organised as an integral component of the Odisha Landscape Symposium on Human–Elephant Coexistence to encourage knowledge sharing, innovation, and field-based insights among participants.

The competition provided a platform for students, researchers, practitioners, and field professionals to present their work on various aspects of human–elephant conflict and coexistence. The submissions reflected diverse perspectives, ranging from community-based interventions and technological innovations to ecological studies and policy approaches.

The competition aimed to:

- Promote evidence-based understanding of human–elephant interactions
- Encourage innovative and locally relevant solutions
- Facilitate exchange of ideas across disciplines and stakeholders
- Showcase field experiences and best practices

The quality and diversity of submissions highlighted the growing engagement and commitment towards addressing Human–Elephant Conflict through collaborative and multidisciplinary approaches.

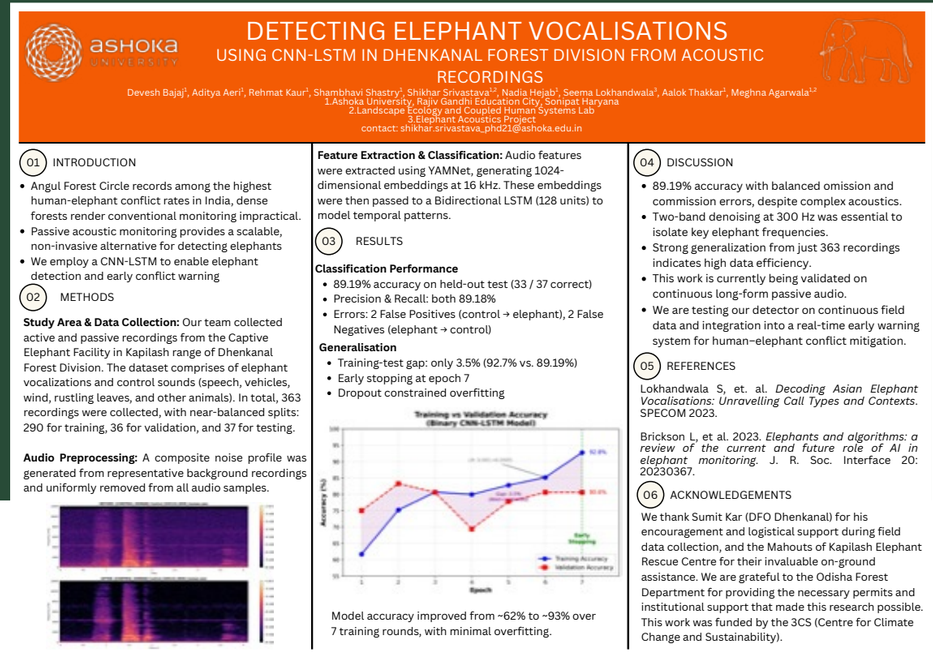
WINNING POSTERS

First Prize

S. Sarangi et al., CVSc & AH, OUAT, Bhubaneswar

This poster presented a forensic osteomorphological framework for determining sex, age, and height of Asiatic elephants from skeletal remains. Using skull morphology, molar lamellae counts, and forelimb bone measurements, the study offers forest officials and veterinary practitioners a systematic, field-applicable tool for resolving wildlife crime cases and legal proceedings involving elephant mortality.

WINNING POSTERS

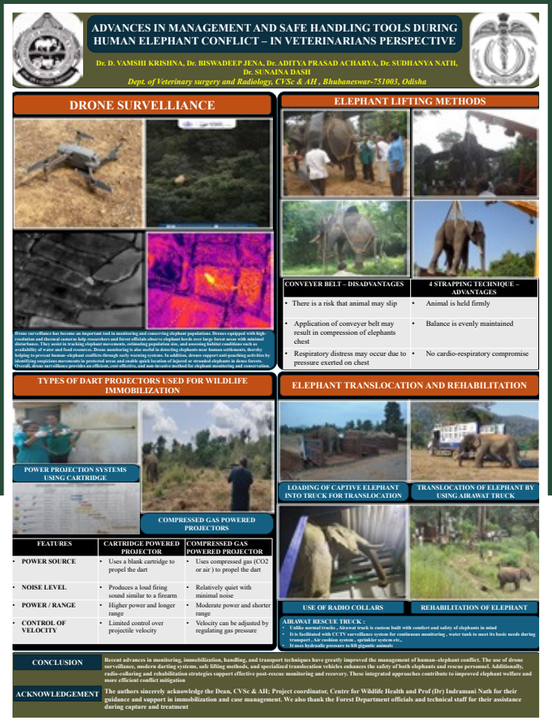


Second Prize

Shikhar srivastava et al., Ashoka University & Elephant Acoustics Project

This poster demonstrated a deep learning-based acoustic detection system that achieved 89.19% classification accuracy in identifying elephant vocalisations from passive field recordings. With strong generalisation from just 363 recordings, the model presents a scalable, non-invasive early warning solution for human—elephant conflict mitigation, with ongoing validation toward real-time deployment.

WINNING POSTERS



Third Prize

Dr. D. Vamshi Krishna et al., CVSc & AH, Bhubaneswar

This poster provided a practical veterinary overview of modern conflict management tools, covering drone surveillance, immobilisation equipment, safe elephant lifting techniques, and the specialised Airawat rescue truck for humane translocation. The integrated framework of radio-collaring and rehabilitation protocols offers a welfare-centred operational guide for frontline forest department response.

OTHER COMMENDABLE POSTER ENTRIES

The symposium featured a range of high-quality poster submissions that contributed valuable insights into the understanding and management of Human–Elephant Conflict. Selected entries are presented below:

ODISHA LANDSCAPE SYMPOSIUM ON
HUMAN ELEPHANT COEXISTENCE

SAND ANIMATION: A VISUAL NARRATIVE OF COEXISTENCE

As part of the Odisha Landscape Symposium on Human–Elephant Coexistence, a special cultural segment featuring a live sand animation performance was organised, offering a powerful visual interpretation of the complex relationship between humans and elephants.

Through a sequence of evocative imagery, the performance traced the evolving journey from traditional coexistence to present-day conflict, and ultimately towards a shared vision of harmony. The narrative depicted shrinking habitats, increasing human pressures, and the resulting tensions between people and elephants, while also highlighting the resilience of communities and the possibility of coexistence through understanding and adaptation.

The medium of sand animation, with its fluid transitions and ephemeral nature, symbolically reflected the fragile balance between human development and ecological integrity. Each frame served as a reminder of the interconnectedness of landscapes, livelihoods, and wildlife.

The performance resonated deeply with participants, transcending technical discussions and reinforcing the emotional and cultural dimensions of conservation. It underscored that coexistence is not only a scientific or policy challenge, but also a societal and ethical responsibility.

By integrating art into the symposium, the event highlighted the importance of communication, awareness, and cultural engagement in advancing conservation goals. The sand animation served as a compelling narrative bridge—connecting science, policy, and community perspectives—and leaving a lasting impression on the audience.

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