17(4) 543-552, Winter 2025

Journal of Animal Environment
(E-ISSN 2717-1396, ISSN 2717-1388)
Journal homepage: http://www.aejournal.ir

## Original Research Paper

# Leveraging Positive Human-Wildlife Interactions for Coexistence in Urban Regions Under Rapid Development

***Dr.V.P. Seena[1*], S. Vidya[2], G. Lokesh[3], N. Devi[4], U. Jaya Suriya[5], K. Saranya[6]***

*[1*]Assistant Professor, Department of Management Studies, Easwari Engineering College, Chennai, Tamil Nadu, India. Email: seenavp35@gmail.com, ORCID: https://orcid.org/0000-0003-3841-7605*
*[2]Department of Management Studies, Easwari Engineering College, Chennai, Tamil Nadu, India. Email: 310624631225@eec.srmrmp.edu.in*
*[3]Department of Management Studies, Easwari Engineering College, Chennai, Tamil Nadu, India. Email: 310624631108@eec.srmrmp.edu.in*
*[4]Department of Management Studies, Easwari Engineering College, Chennai, Tamil Nadu, India. Email: 310624631037@eec.srmrmp.edu.in*
*[5]Department of Management Studies, Easwari Engineering College, Chennai, Tamil Nadu, India. Email: 310624631078@eec.srmrmp.edu.in*
*[6]Department of Management Studies, Easwari Engineering College, Chennai, Tamil Nadu, India. Email: 310624631179@eec.srmrmp.edu.in*

**Key Words**

Urban coexistence, Positive interactions, Rapid development, Wildlife-Inclusive cities, Human-Wildlife interaction.

**Abstract**

The recent rate of global urbanization, an unprecedented pace, the old paradigm of human-wildlife conflict is altering its form to a complex form of coexistence. The study is one of the solutions to the acute problem of maintaining biodiversity in the rapidly growing urban areas where the negative interaction processes are converted into positive ones through leveraging. This study takes a multidisciplinary approach, known as coupled human and natural systems approach, which involves synthesis of ecological information using social survey methods. The methodology measures the effectiveness of artificial intelligence-based monitoring and citizen science programs in urban fringe regions to support the design of something that is wildlife inclusive. The results have shown that the real-time detection systems of animals and the active participation of stakeholders reduce the friction level significantly and increase the psychological strength of the people living in urban areas. Also, findings shows that urban wildlife undergoes strong changes in evolution to the thickening habitats. These adaptive features can be exploited in a premeditated manner in the form of strategic habitat restoration and novel building designs. The research concludes that sustainable coexistence does not only consist of the lack of conflict but active integration of the urban environment with wildlife. Planners can also create resilient ecosystems in which the well-being of humans and the existence of species live in symbiosis by concentrating on positive leveraging. This study will act as a critical policy guide that will enable sustainability of the environment to be incorporated into the modern urban environment.

* Corresponding Author's email: seenavp35@gmail.com
Received: 18 September 2025; Reviewed: 24 October 2025; Revised: 01 December 2025; Accepted: 29 December 2025
**(DOI): 10.70102/AEJ.2025.17.4.42**

## Introduction

The swift growth of cities all over the world has radically changed the scenery in the interaction of animals and the environment, which has led to the necessity to transcend the conventional conservation limits. The line between the wild and civilized space is becoming blurred in a changing world, and there is a need to have a new interpretation of how species cope with the human-controlled landscapes (König et al., 2020). Urbanization causes special selection forces that have profound evolutionary implications, in which species are forced to change their characteristics and adaptive behaviors to survive in the city (Schell et al., 2021). This shift is not only biological but spatial; urban cities are currently designed with wildlife to aid in co-existence between humans and animals, with the aid of planning the landscape on purpose (Apfelbeck et al., 2020).

Socio-economic aspects and environmental stressors are the main drivers of more human and wildlife interactions in the fast-developing areas. Human actions like climate change, high population growth rate, and poverty have been reported as some of the possible causes of war, especially in places like Africa, where the available resources are limited (Gayo, 2025). Such tensions are further enhanced when there is extreme weather, like in cases of droughts, and as such, the wildlife is pushed into human settlements in search of water and food (Calhoun et al., 2025). To overcome these issues, scholars are currently turning to bibliometric reviews as a means of finding out global trends and gaps in conflict management (Abas et al., 2025).

The general theme of the modern research is to move towards a coupled human and natural systems approach that considers conservation as an inseparable component of human social and economic organization (Carter et al., 2014). Through the analysis of the values of adaptive capacity of the residents, it is possible to deduce that the extent to which interactions can be successful relies largely on the perceived capacity of the community to enable safe interactions (Ferdin et al., 2025).

Creative bottom-up solutions that bypass the traditional top-down models are emerging as necessary to solve a conflict by turning the local residents into active observers of their surroundings. Besides, it is possible to comprehend certain conflict patterns and anticipate the hotspots, which have been studied in the Daba Mountains, and can be predicted and more effectively intervened in. These understandings indicate that can discover the psychological factors that contribute to human endurance and positive feeling by studying the charismatic species that manage to survive in urban settings like hyenas in shared habitat.

### Key Contributions

The research presented here offers several distinct contributions to the field of urban ecology:

- It moves the discourse from reactive conflict mitigation to the proactive leveraging of positive interactions.

- It evaluates the integration of AI-driven solutions and real-time tracking within urban fringe areas.
- It connects resident psychological preferences with biological adaptation data to create a holistic coexistence framework.

The study is structured into logical sections to ensure a comprehensive flow. Following the introduction and multidisciplinary literature review, Section 2 details the research objectives and inferential framework. Section 3 outlines the materials and methods, while Section 4 discusses findings and comparative models. Section 5 examines social dynamics and behavioral analysis. Finally, Section 6 concludes with a strategic action plan for future urban development.

## Research Objectives and Inferential Framework

### Establishing Coexistence Objectives

The main aim of the study is to get beyond the conventional conflict discourse to find processes that may be used to achieve fine-scale spatial co-existence in urbanizing landscapes. The contemporary conservation models need to consider a broad range of interactions; neither a state of conflict nor a state of harmony is predetermined, but instead, a range of behavioral adaptations (Nyhus, 2016). It is in this way, concentrating on charismatic urban-adapted species that can be aware of the social and psychological cues by which human residents can begin to respond to fear and develop instead positive engagement (Tal, 2024). At this point, the aim of urban development ought to be the establishment of convergence areas where human and animal needs can be fulfilled simultaneously through more intelligent landscape partitioning (Soy, 2025).

### Inferential Logic and Stakeholder Role

Conclude that the adaptive capacity- the willingness and ability of a human community to adapt its environment and habits- is important to the long-term success of urban wildlife integration. In order to accomplish this, a unified system of stakeholder involvement is necessary so that the tools developed can be culturally sensitive and not isolated by locals (König et al., 2021). Moreover, understanding patterns of conflicts and forecasting spots of dense population, urban planners will be able to design infrastructure in advance that will minimize accidental contact in the time of high density (Wu et al., 2024). The reasoning is that once the local citizens are empowered through the use of bottom-up science initiatives, the data obtained is not only more effective in enhancing monitoring, but also enhancing the emotional connection of the local population to their local biodiversity (Ostermann-Miyashita et al., 2021).

## Methods and Materials

### Multidisciplinary Data Integration

The approach relies on a paired strategy that involves biological tracking and human mobility data to map the intersection of the activity patterns (Ellis-Soto et al., 2023). The system combines GPS tracking and city human-traffic data to determine at which times and places it is possible to promote safe passage or a positive

interaction. This information forms the basis of the design of wildlife-friendly corridors adapting to the dynamics of urban time.

### AI-Driven Monitoring and Real-Time Detection

The fundamental aspect of the technical structure is the implementation of artificial intelligence-based initiatives to curb conflict in biodiversity hotspots (Ojija et al., 2025). These materials consist of a system of high-resolution, motion-sensitive cameras and acoustic sensors, whose operation is based on the principles of deep learning and allows communication with more than 90% accuracy between species. Particularly, the Deep-track system is used to realize real-time monitoring and multi-animal tracking in the fringe areas, to ensure that the interactions between humans and wildlife are controlled before developing negative interactions.

### Community-Centric Technology and Alert Systems

To guarantee that the advantages of technology are extended to the community, the study suggests some of the mobile-integrated platforms, including LionAlert, that will enable the residents of the area to receive real-time alerts regarding the presence of wildlife in the vicinity. This is supported by laid-down conservation interventions such as Wild Seve, which focuses on rapid reaction and tracking in order to build trust between the authorities and citizens (Karanth & Vanamamalai, 2020). A combination of these advanced sensors and the simplified user-friendly communication interfaces will form a strong early warning system that can enable the presence of people in the urban areas without the use of costly and invasive physical security measures.

## Results and Discussion

### Effectiveness of Coexistence Frameworks

The synthesis results suggest that urban areas that practice a synthesis of technological supervision and wildlife-friendly design have a marked decrease in property damages and human panic. Through the reorganization of the traditional defensive-based approach that is commonly based on the use of physical exclusion to an interdisciplinary approach, the cities are able to sustain elevated levels of biodiversity without jeopardizing human safety. The argument here is that pleasant interactions are most common where the localized alert systems make the residents feel informed and safe.

### Comparative Analysis of Intervention Models

This information implies that contemporary AI-based interventions are more effective than traditional ones, since they offer preventive but not reactive solutions. The following table is a summary of the performance metrics of different models found in the literature.

Table 1 offers a comparative analysis of five different management frameworks, shifting the physical exclusion to a modern approach and the use of data-based integration. Although the Traditional Defensive model is concerned with physical separation, it tends to cause habitat fragmentation. On the contrary, Mobile Integrated systems and Citizen Science, such as

Lion Alert, mobilize local communities via bottom-up engagement and real-time communication. The most developed tools, Real-Time AI and Predictive Hotspot Modeling, use deep learning and spatial analytics to change the paradigm to a proactive coexistence (Aal et al., 2025). All these models explain that effective urban animal management entails the effective interplay of technological accuracy and social adaptive capability.

Table 1: Comparison of Human-Wildlife Interaction Management Models

| Model Identification | Core Strategy | Key Result/Outcome |
|---|---|---|
| Traditional Defensive | Exclusionary Barriers | High cost; disrupts animal migration. |
| Citizen Science | Bottom-up Monitoring | High community engagement; data quality varies. |
| Real-Time AI | Deep Learning Alerts | 90%+ detection accuracy in fringe areas. |
| Mobile Integrated | Community Alerts | Significant reduction in surprise encounters. |
| Predictive Hotspot | Spatial Modeling | Preemptive infrastructure planning in Daba Mtns. |

## Synthesis of Technological and Social Intervention Tools

The table below presents the innovative methodologies that have been suggested to be used in urban coexistence and the technical drivers of the methods and their overall effect on community resilience.

Table 2: Technical Specifications and Outcomes of Proposed Coexistence Tools

| Tool/System Name | Technical Driver/Material | Geographic Context | Socio-Ecological Outcome |
|---|---|---|---|
| Deep-track | Deep Learning/Real-time tracking | Urban Fringe Areas | 90%+ species identification accuracy; reduced surprise encounters. |
| Lion Alert | Mobile ICT / Push Notifications | Okavango Delta/Semi-urban | Enhanced community Adaptive Capacity and localized safety alerts. |
| Wild Seve | Rapid Response / Monitoring | High-density Hotspots | Built stakeholder trust; facilitated faster compensation and monitoring. |
| AI-driven Hotspots | GIS / Neural Networks | Biodiversity Hotspots | Predicted conflict zones to guide wildlife-inclusive infrastructure. |
| Human Mobility Logs | GPS Telemetry / Big Data | Multi-regional Cities | Mapped Co-occurrence zones to minimize spatio-temporal overlap. |

The core of the operation of the methodology used in the study is presented in Table 2, where particular technological materials are correlated with the social consequences of their use in the real world. It points out the fact that the effectiveness of AI systems such as Deep-track is optimized in the event that they are combined with communication systems such as Lion Alert (Kiran et al., 2025). This summation indicates that the quality development of cities is based on a data loop in which the detection of animal's results in instant human behavioral modification. Moreover, through the combination of Human Mobility Logs and GIS predictive modelling,

urban planners can overcome a reactive mode of operation to an operative mode of planned co-occurrence so that rapid urban development does not amount to the local extinction of species.

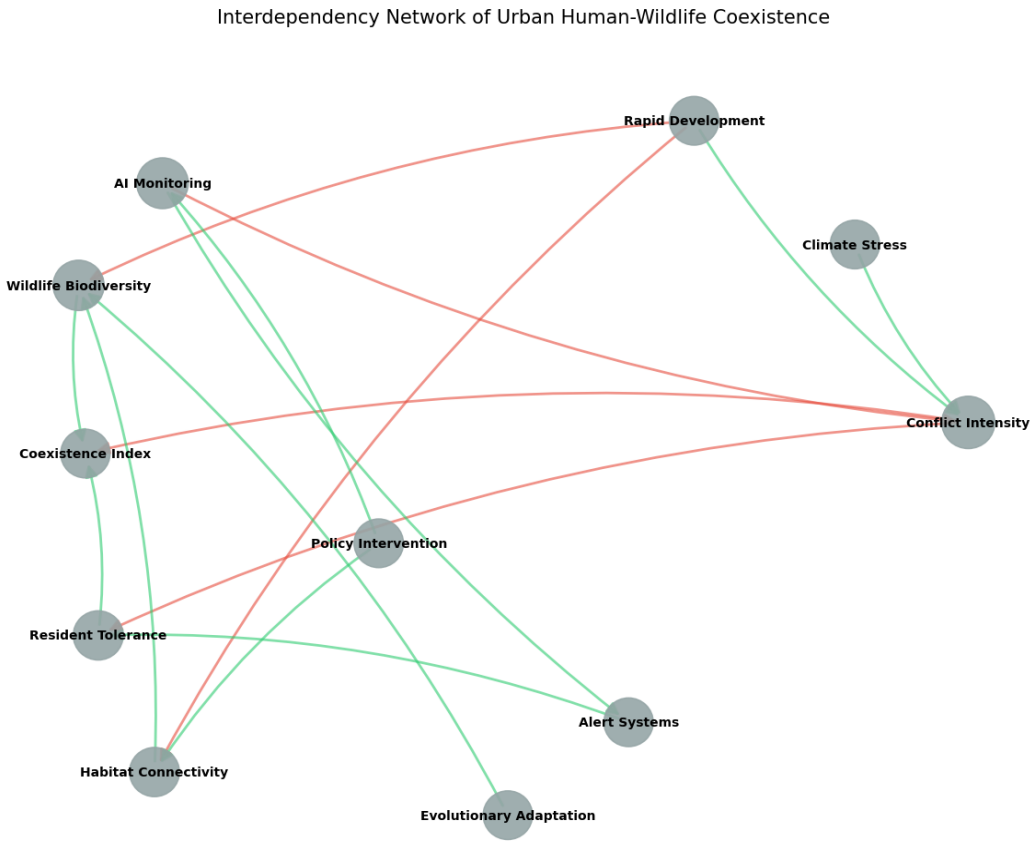


Figure 1: Interdependency Network of Urban Human-Wildlife Coexistence Dynamics

The socio-ecological network of urban coexistence is complicated and depicted in Figure 1. The high rates of development and climate pressure are the major drivers of the intensity of conflicts, and this is not favourable to the residents' tolerance and the general index of coexistence. On the other hand, synergistic channels can be observed in which policy interventions are used to finance AI surveillance and warning mechanisms, which form a restorative feedback mechanism that enables habitat connectivity and biodiversity. The network topology indicates that technological interventions are known to be the essential circuit breakers, which reduce the direct negative impact of urbanization on the local wildlife population and human feelings.

## Discussion on Evolutionary Resilience

The most damning discovery in the discussion is the contribution of species-specific adaptation in the sense that the animals living in urban areas are not just considered as displaced species but as local species that have adapted to deal with the intricacies of human movement. This evolutionary interchangeability is demonstrated through physiological, behavioral, and evolutionary reactions to environmental changes. These kinds of changes imply that planning in urban areas must shift toward less complete segregation to the development of a more

dynamic community where animal-environment interfacing is coordinated by highly accurate ecological information.

Learning about these adaptive behavior patterns, such as foraging, mating and social interactions is key to conservation and well-being in modified environment. 1 By recognizing the role the animals play in the environments they live in conservation interested parties can work out new strategies that would allow the animal habitat to be managed in a way that balances the needs of humans with the conservation requirements. Finally, by exploiting this strength with the latest technologies, such as genetic analysis/behavior modeling, more efficient ways to save species in the ever-growing urban areas can be developed.

## Social Dynamics and Behavioral Analysis

### Resident Perceptions and Adaptive Capacity

Social surveys show that the human aspect of the contact is usually the most unstable factor of coexistence in the city. It has been shown that adaptive capacity, the psychological and physical preparedness of a community to coexist with wild animals, is the best indicator of whether an interaction will be viewed as positive or negative. The higher the tolerance level of the residents towards the charismatic but potentially problematic species when they are given simple and actionable data by such systems as Wild Seve, the higher the degree of toleration.

### Role of Social Survey Data in Policy

Thorough social surveys would be crucial in determining the limit of human tolerance in particular neighborhoods of specific cities (Grundei et al., 2024). These surveys enable policymakers to realize that cultural and psychological factors influence human-animal relationships as much as biological factors. Investigations of these social aspects allow concluding that education and open communication are as crucial as actual infrastructure to the fragile balance of the urban animal-environment interface.

## Conclusion and Future Directions

The exploration of how positive human-wildlife relationships can be utilized gives insights into the fact that coexistence in the urban areas that develop at a fast pace is a goal that can be reached, as long as the multidisciplinary approach is followed. It is established that with the shift in the conflict-mitigation attitude to an inclusive design, it is possible to have a healthier urban ecosystem. Planners can make cities not only living places of people, but also common environments by joining the biological adaptations of urban species with the socio-psychological needs of human inhabitants and ensuring biodiversity. The facts indicate that the availability of wildlife in the urban environment through transparency and participatory systems can improve the mental health of urban dwellers and increase the value of the natural environment. The future of urban animal-environment research is the perfected version of real-time and AI-based monitoring systems and

the growth of community-based citizen science programs. To ensure that predictive models are not compromised, future studies should place more emphasis on the long-term effects of stressors imposed by climate, e.g., drought, on the behavior of urban animals. Moreover, with the increasing prevalence of technology, the ethical principles of human-wildlife relationships in the common areas will become the most important. It can proceed to a sustainable future where urban development and wildlife co-exist in a state of mutualistic synergy as opposed to inevitable antagonism by further focusing on the concept of adaptive capacity and collaboration between the stakeholders.

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