

# Land-Use Planning as a Tool for Coexistence Between Humans and Wild Animals in the Mavinga and Luengue-Luiana National Parks

Eduardo Ferreira<sup>1</sup>

<sup>1</sup>Cuanza International University Research Department – UNIC The Halo Trust Angola (Department for the Environment) Menongue, Angola

<sup>1</sup>ORCID: <https://orcid.org/0009-0002-3540-3806>.

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**Abstract:** This article analyzes land-use planning as a tool for promoting coexistence between human populations and wildlife in the Mavinga and Luengue-Luiana National Parks, in southeastern Angola. The study draws on territorial monitoring conducted since 2008, under conditions marked by vast distances, difficult communication and institutional complexity. The research seeks to understand how the management of protected areas, humanitarian demining, community-based conservation, wildlife corridors, remote monitoring and tourism promotion can be integrated into a territorial model capable of reducing conflict and increasing local conservation benefits. Particular attention is given to the role of the Ministry of Environment and the national biodiversity institution in institutional consolidation, the importance of transboundary cooperation, the involvement of international organizations in mine clearance and wildlife monitoring, the attraction of tourism investment, the use of monitoring technologies, and community development projects. The article also refers to a zoning study as a reference for the spatial organization of the park; since a public version of this specific study could not be located in the consulted sources, it is cited without confirmed bibliographic attribution. It concludes that lasting coexistence requires integrating security, mobility, environmental education, agriculture, livestock farming, tourism, ecological connectivity, scientific monitoring and economic benefits for communities, with demining being a necessary but not sufficient condition.

**Keywords:** *Land-Use Planning; Human-Wildlife Coexistence; Community-Based Conservation; Wildlife Corridors; Nature Tourism.*

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## I. INTRODUCTION

Southeastern Angola presents one of the most complex and, at the same time, most promising situations for contemporary conservation in the country. The Mavinga and Luengue-Luiana National Parks comprise a landscape of immense ecological significance, linked to the Cuando and Okavango river systems and part of the Kavango-Zambezi Transboundary Conservation Area (KAZA-TFCA). At the same time, the region has been profoundly affected by war, landmines, the destruction of infrastructure, poaching, and the disruption of economic and social ties.

The central issue of this article is therefore not simply how to protect the animals. The question is broader: how can the territory be organized so that people, agriculture, livestock, infrastructure, tourism, and wildlife can coexist within the same regional space without generating

unsustainable levels of conflict? This question places land-use planning at the heart of conservation policy. In vast landscapes, where administrative boundaries do not correspond to animal movements, conservation depends on connectivity and the ability to anticipate where human presence and wildlife may come into competition.

The literature on elephants in southeastern Angola demonstrates that the region is important for the connectivity of elephant populations within KAZA. The study by Schlossberg et al. (2018), for example, showed that southeastern Angola constitutes an important link between elephant populations and that the loss of this connectivity would have consequences for regional conservation.

The issue becomes even more relevant because demining has progressed significantly within the Angolan component of KAZA, but this does not mean that the entire

territory is free of landmines. Recent data indicate that 150 minefields, covering approximately 17 million m<sup>2</sup>, were cleared between 2020 and October 2025 in the Angolan part of KAZA, with the removal of about 25,000 mines. However, high-risk areas persist outside this perimeter, including in parts of Mavinga and Cuito Cuanavale (Gira Notícias, 2026; The HALO Trust, n.d.).

This study is based on field monitoring conducted since 2008. The long observation period is important because it allows us to understand the transformation of the not as an isolated event, but as a process. The reality observed in 2008 cannot be directly compared with the situation in 2026 without considering the gradual opening of roads, the actions of conservation organizations, the recovery of some wildlife populations, the creation of management and enforcement structures, the expansion of the debate on tourism, and the improvement of spatial knowledge about the territory.

The overall objective is to analyze how land-use planning can contribute to a relationship of coexistence between humans and wildlife in the Mavinga and Luengue-Luiana National Parks. The specific objectives are: (a) to analyze the role of the Ministry of the Environment and INBAC; (b) to discuss the importance of KAZA-TFCA; (c) to assess the contribution of The HALO Trust and the current limitations of demining; (d) to examine the role of NGOs and communities; (e) to discuss the contribution of Elephants Without Borders; (f) to analyze the attraction of tourism investment; (g) to discuss ecological corridors and technological monitoring; (h) to identify community projects; and (i) to systematize the main methodological challenges of long-term research.

The central argument is that coexistence does not occur spontaneously. It must be planned, negotiated, monitored, and adjusted. An elephant corridor that crosses an agricultural area, for example, cannot be treated solely as a matter of enforcement. It is necessary to understand animal movements, agricultural calendars, water sources, livestock routes, community trails, and high-risk areas. Similarly, a tourism venture should not be located solely where the landscape is beautiful: it must be compatible with ecological sensitivity, safety, wildlife corridors, and the rights and interests of communities.

## II. THEORETICAL FRAMEWORK

### ➤ *Land-Use Planning and Conservation*

Land-use planning can be understood as the process of spatially organizing different functions, activities, and rights within a territory, while simultaneously considering ecological, economic, social, and institutional factors (Pressey & Bottrill, 2009). In conservation areas, this planning takes on an additional function: ensuring that human uses do not eliminate the ecological conditions necessary for the maintenance of species and ecosystems.

The approach proposed in this article moves away from a rigid conception of a national park as an empty space intended exclusively for wildlife. In the territories of Mavinga and Luengue Luiana, there are communities that have traditionally inhabited the area, productive activities, traditional trails, fishing grounds, grazing areas, and cultural ties to the landscape. The issue is not to deny this reality, but to create mechanisms for reconciliation. Community-based nature management (CBNRM) is particularly relevant because it seeks to link conservation with benefits, participatory rights, and local responsibilities.

Land-use planning must therefore work with different zones: strict conservation areas, breeding and refuge zones, ecological corridors, community-use zones, agricultural areas, livestock zones, tourist areas, infrastructure zones, and ecological restoration areas. Zoning does not eliminate conflicts, but it makes them visible and allows for the creation of rules to manage them.

The need for a spatial approach is reinforced by the size of the parks. Official and institutional sources describe Mavinga and Luengue-Luiana as conservation areas on a continental scale. This scale implies that on-site enforcement alone is insufficient, making monitoring technologies and geographic information systems indispensable.

### ➤ *Coexistence Between Humans and Wildlife*

Coexistence between humans and wildlife is different from the mere absence of conflict. Coexistence means creating conditions for people and animals to use a landscape without the costs of conservation being borne solely by local populations, and this is what we seek to encourage in these parks, since we have identified more than 20 villages within them—from the 11 de Novembro neighborhood to Tchowana, from Kataha and Mbambangandu to Licua, and from Licua to Mucusso. International literature on human-wildlife conflict shows that conflicts tend to increase when large animals enter agricultural areas, when they compete for water, or when the presence of predators threatens livestock.

In southeastern Angola, the elephant is a particularly important species. Its movements can span long distances and cross park boundaries and national borders, as is the case in these parks. Therefore, conservation requires corridors and mechanisms for connectivity between different areas. The study by Schlossberg et al. (2018) demonstrated the importance of southeastern Angola for elephant connectivity within KAZA and highlighted the effects of poaching and human expansion on habitats.

Coexistence also requires local knowledge. Communities that have lived in the landscape for decades possess information about rivers, foraging areas, seasonal movements, migration routes, and animal behavior. This knowledge must be combined with scientific data, not simply replaced by it. This process has been carried out by national and international researchers in Luengue Luiana National Park with the involvement of community rangers and the use of local guides.



Fig 1 Planning meeting for multi-use zones in Luengue Luiana National Park, attended by Park Consultants Dr. Miguel Xavier and Roland, Park Administrator Miguel Kambundu, community representatives, and field technicians Eduardo Ferreira and Usona David Kawika in Jamba/Luiana in 2018.

Source: Author of the Study

In this regard, environmental rangers occupy a strategic position. They should not be viewed merely as law enforcement officers. They are also mediators, educators, observers of the territory, and conveyors of information. A ranger who knows a community, explains the park's rules, identifies wildlife signs, and quickly reports the presence of elephants can defuse a conflict before it occurs.

#### ➤ *KAZA-TFCA and Ecological Connectivity*

The KAZA-TFCA constitutes one of the main territorial foundations of this research. It is a transboundary conservation area that encompasses Angola, Botswana, Namibia, Zambia, and Zimbabwe. Its importance stems from the ability to treat ecosystems, rivers, wildlife populations, and movement corridors as regional systems, rather than fragmenting them along national borders.

For Angola, KAZA is particularly important because the southeastern region serves as a link between wildlife populations located to the west and east. The article by Schlossberg et al. (2018) considers southeastern Angola a key component for the connectivity of elephant populations and for linking habitats across the KAZA countries.

KAZA also creates economic opportunities. A visitor can view the region not as a single park, but as a cross-border destination combining nature, culture, and adventure, Knight & Cowling (2003). This approach makes it possible to combine tourism products across different countries and extend the length of visitors' stays.

However, regional integration depends on national conditions. Landmines, poor roads, a lack of adequate border crossings, limited enforcement capacity, and a lack of investment can limit the actual functioning of the corridors. KAZA provides the framework, but its effectiveness depends on implementation on the ground.

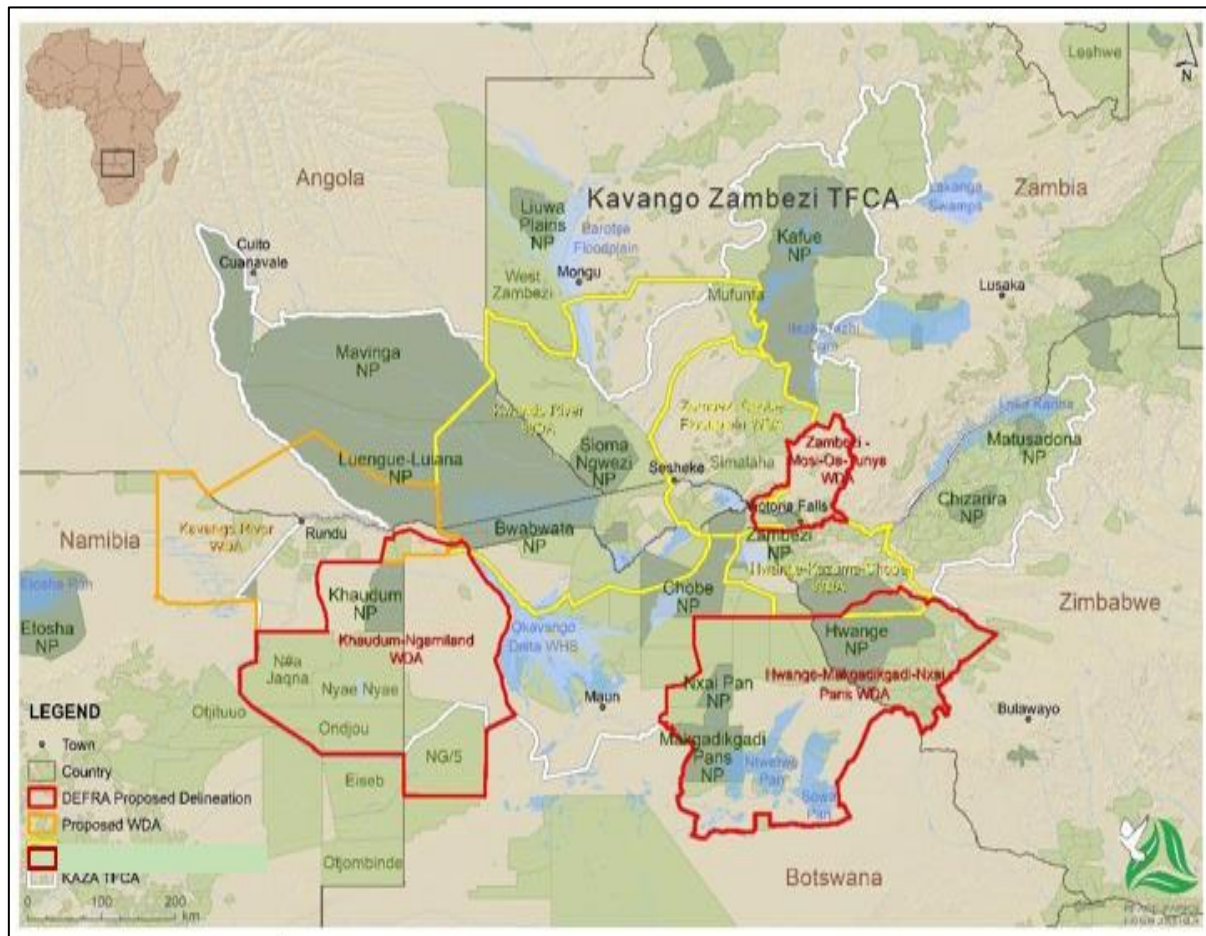


Fig 2 Shows the study area on the map of the KAZA region in southwestern Angola. It shows how important it is to support communities with sustainable knowledge and promote targeted programs to ensure the coexistence between humans and animals. So far, it is considered the area with the most wildlife corridors among the 5 KAZA member countries.

Source: Kaza-TFCA Files

### ➤ Demining as a Prerequisite for Land-Use Planning

In post-conflict territories, land-use planning begins with safety. It is not possible to decide whether a given area will be used for agriculture, tourism, or conservation if the exact location of the landmines is unknown. Humanitarian mine action, therefore, is not merely a safety measure: it is a step in territorial planning.

The HALO Trust has been active in Angola since 1994 and has carried out significant work in the southeast of the country. As part of the KAZA program, the organization received funding from the Angolan government and international support to clear minefields. The clearance of 150 minefields in the Angolan portion of KAZA between 2020 and October 2025 represents a land-use transformation of great significance (The HALO Trust, n.d.; Gira Notícias, 2026).

Mine clearance has three spatial effects. First, it increases people's safety. Second, it allows land to be reclaimed for agriculture, livestock, roads, and other uses. Third, it opens up space for conservation and tourism. However, it is essential to distinguish between a specific area declared clear and the general condition of the landscape. The

mine clearance of the Angolan portion of KAZA does not mean that the entire Cuando region is free of mines.

This distinction is especially important for Mavinga and Cuito Cuanavale, where high-risk areas remain. Human-wildlife coexistence therefore requires up-to-date risk maps, community outreach, and access regulations until new areas are technically verified.

## III. METHODOLOGY

The research adopts a qualitative, descriptive, and longitudinal approach, structured as a territorial case study. The focus of analysis is the processes of transformation in land use, conservation, security, community development, and tourism in the Mavinga and Luengue-Luiana National Parks and their immediate areas of influence. The research covers the period from 2008 to the present, based on the author's field monitoring experience.

The choice of a longitudinal approach stems from the need to observe changes that cannot be fully understood through a single field visit. Between 2008 and 2026, changes occurred in security, the access network, institutions, the presence of organizations, knowledge of wildlife,

enforcement, and investment expectations. The territory must, therefore, be analyzed as a process.

Data collection combined direct observation, professional and community expertise, interviews and informal conversations when available, document analysis, consultation of institutional sources, and monitoring of conservation initiatives. The previous study provided by the author also identifies institutional sources such as HALO Trust, ANAGERO, the Ministry of the Environment, the Ministry of Tourism, INBAC, and the Peace Parks Foundation.

An important methodological characteristic is the difficulty of access. Roads in poor condition, long distances, communication limitations, and limited availability of resources made it difficult to conduct continuous surveys. These difficulties are not merely limitations; they are themselves part of the phenomenon under study, as they help explain the challenge of managing a protected area of such vast size.

#### ➤ *Areas of Analysis*

The data were organized into nine main areas: environmental governance; the role of rangers; KAZA-TFCA; demining; community-based conservation; Elephants Without Borders; tourism and investment; corridors and monitoring; and community development. For each area, we sought to identify actors, actions, outcomes, limitations, and implications for land-use planning.

#### ➤ *Territorial Observation and Accumulated Knowledge*

The knowledge accumulated since 2008 is treated as a highly relevant qualitative source, but not as a substitute for scientific data. Field observations allow for the identification of landscape changes, accessibility, the presence of wildlife, the relationship between communities and protected areas, and the actual functioning of institutions. Whenever possible, these observations are cross-checked against institutional sources and scientific literature.

#### ➤ *Monitoring Technologies*

The analysis considers the use of camera traps, tracking collars, GPS, GIS, drones, and operations rooms. Official sources indicate that INBAC has been using tracking collars to monitor elephants and other animals and that monitoring can be conducted remotely from Luanda. In 2025, INBAC reported fitting 25 collars on elephants, giraffes, buffalo, zebras, and some carnivores, with objectives related to wildlife corridors, dispersal, and conflict mitigation (Ministry of the Environment, 2025).

#### ➤ *Limitations*

This research has limitations related to the availability of statistical time series, the continuity of observations, access to technical documents, and the difficulty of independently verifying some local information. For this reason, the text distinguishes between documentary evidence, the author's observations, and analytical interpretation.

## IV. RESULTS

#### ➤ *Ministry of the Environment, Creation of Protected Areas, and Training of Rangers*

The creation of the Mavinga and Luengue-Luiana National Parks represents a large-scale territorial decision. The transformation of reserves and other conservation areas into National Parks (Law 38/11 of December 29) means assigning the territory a priority conservation function, but it also requires institutional capacity to translate the legal designation into effective management.

The Ministry of the Environment, through INBAC, plays a central role in the management of conservation areas. The partnership established in 2026 between the Angolan government and the

Peace Parks Foundation to strengthen the management of Luengue-Luiana demonstrates the growing demand for collaborative management models and technical capacity-building (Peace Parks Foundation, 2026).

The park's existence on paper does not guarantee protection. Protection depends on people on the ground, transportation, communication, equipment, intelligence, training, and relationships with communities. In this regard, environmental rangers represent the most tangible presence of the state and conservation institutions in the landscape. And this is clearly defined within Luengue-Luiana National Park.

Ranger training should include species identification, tracking, first aid, navigation, GPS, environmental legislation, poaching prevention, community outreach, environmental education, conflict resolution, and the use of technology. Angola's membership in the Game Rangers Association of Africa and the associated training reinforce the importance of professionalizing this role (INBAC, 2024).



Fig 3 Rangers Undergoing Remote Monitoring Training in Luengue Luiana, Facilitated by the Halo Trust Angola.  
Source: Author of this Paper

➤ *The Role of Rangers in Environmental Protection and Education*

Enforcement is traditionally associated with the prosecution of environmental crimes. In Mavinga and Luengue-Luiana National Parks, however, the ranger's role must be broader a shift that has been taking place in these parks (Mavinga and Luengue Luiana). Rangers know the trails, identify signs of poaching, observe changes in vegetation, monitor wildlife movements, and build relationships with local communities. As a result, they can serve as agents of environmental education and as a bridge between park management and the local population.

Environmental education at the community level should start with local realities. Instead of presenting only abstract concepts of biodiversity, it can focus on species found in the community, water sources, the importance of trees, fire risks,

the effects of hunting, and the economic benefits of conservation. Community schools, traditional leaders, farmers' associations, livestock breeders, and youth groups can serve as channels for conveying this information.

Park rangers can also help explain zoning. If an area has been designated as a wildlife corridor, the community should know why. If a zone has been set aside for agriculture, it is necessary to explain the boundaries and environmental precautions. If a path is dangerous due to landmines, this information must be communicated clearly and repeatedly.

Environmental education also reduces the risk that communities will view the park solely as a source of restrictions. Conservation becomes more legitimate when residents understand its objectives and recognize concrete benefits.



Fig 4 Communities, Environmental Inspectors, and Partners Participate in a Wildlife Census at Luengue Luiana National Park in Angola.

Source: Author

➤ *The Importance of the KAZA-TFCA Project*

KAZA-TFCA serves as the primary regional framework for understanding the Mavinga and Luengue-Luiana parks. Its significance is ecological, economic, institutional, and diplomatic. Ecologically, it enables the planning of wildlife corridors that cross borders. Economically, it creates the potential for an integrated tourist destination. Institutionally, it fosters cooperation among governments, organizations, and communities.

For southeastern Angola, KAZA is particularly important due to elephant movements. Scientific research conducted in southeastern Angola has shown that the region serves as a link between KAZA populations and habitats (Schlossberg et al., 2018). This means that a land-use decision within Angola can have effects on wildlife populations in other countries.

KAZA also changes the logic of investment. A lodge in Angola can benefit not only from the Angolan market but also from a regional nature tourism circuit. Similarly, conservation efforts in Angola can benefit from regional knowledge, funding, and technical cooperation.

The importance of KAZA, however, should not lead to passive dependence. Angola needs to build national capacity to manage its territories, train technical staff, conduct research, establish concession rules, ensure community participation, and maintain monitoring systems—efforts that have been underway by the government since 2011. Regional cooperation should strengthen, not replace, national institutional capacity.



Fig 5 Meeting of the KAZA National Commission in Angola, led by the Secretary of State for Tourism, Dr. Augusto Laurindo Kalikemala; the Executive Director of the KAZA Secretariat, Dr. Nyambe Nyambe; the Chairman of the Board of ANAGERO, Dr. Rui Lisboa; the Director-General of the Management Office of the Okavango Basin Tourism Development Hub, Dr. João B. Gime Sebastia, Prof. PHD. Amélia Cazalma, and other members of this commission.

Source: Mintur2025.

➤ *The HALO Trust: Security, Demining, and Territorial Reclamation*

The HALO Trust plays a central role in the recent transformation of the landscape. The organization began operating in Angola in 1994 and has carried out demining operations in various regions of the country. In the southeast, its efforts reached a new scale starting in 2020 with funding allocated for the clearance of the Angolan portion of KAZA.

According to data released in 2026, 150 minefields in the Angolan part of KAZA were fully cleared between 2020 and October 2025, covering an area of approximately 17 million square meters, with the destruction of about 25,000 antipersonnel and antivehicle mines (Gira Notícias, 2026; The HALO Trust, n.d.). The significance of this achievement extends beyond the humanitarian sphere: it changes what is possible within the territory.

A demined road can be rehabilitated. A farm field can be put back into use. A bridge can resume its function. A conservation team can work more safely. A tourist can reach an area that was previously inaccessible. An animal can regain a migration route. Thus, demining must be integrated into land-use planning from the outset.

However, the situation remains incomplete. The presence of large high-risk areas in Mavinga and Cuito Cuanavale calls for caution. The cleared area must be mapped and clearly distinguished from areas still suspected of containing mines. Agricultural, tourism, or infrastructure expansion must be guided by up-to-date technical information on mine risk.



Fig 6 In landmine-free fields, red-and-white-painted stakes mark risk zones, where a female deminer can be seen carrying out clearance work; white-painted stakes mark areas that have already been cleared. In the image on the right, each stake represents the location where a mine was removed. Scene from the Lomba River region in Mavinga, 2024. Land-use planning as a tool for the coexistence of humans and wildlife PNM-LL26 - Página 11

Source: Archives of the Halo Trust Angola

#### ➤ Utilizing Cleared Areas for Various Purposes

Demining creates an opportunity but does not automatically determine the future use of the land. A cleared area can be designated for agriculture, livestock, conservation, tourism, infrastructure, or community use. The decision should depend on zoning, ecological suitability, proximity to water, community needs, and importance for wildlife movement.

In the context of Mavinga and Luengue-Luiana, an integrated approach could establish a decisionmaking sequence: first, verify safety; second, assess ecological suitability; third, map community uses; fourth, identify wildlife corridors and critical areas; fifth, define compatible uses; sixth, establish monitoring mechanisms.

Agriculture should be located in such a way as to minimize contact with frequent elephant routes. Livestock farming should take into account water sources and crossing zones. Tourism infrastructure should be concentrated in areas with lower ecological sensitivity and better accessibility. Breeding and refuge areas should receive enhanced protection.

This approach helps avoid a paradox: clearing an area for development while simultaneously creating new conditions for human-wildlife conflict. Demining must therefore be followed by planning. Security without land-use planning may simply displace the problem.

#### ➤ National and International NGOs and Local Communities

The transformation of the landscape cannot be attributed exclusively to the government. National and

international organizations have contributed to research, demining, training, conservation, monitoring, community development, and tourism. The diversity of actors is a strength, but it also requires coordination.

Local communities must play a central role. They are the ones who live with the consequences of the presence of elephants, buffalo, predators, and other animals. They are also the first to identify changes in the territory. Community participation can include natural resource committees, community rangers, guides, producer associations, fire prevention brigades, early warning systems, and participation in zoning decisions.

Community-based conservation works best when there are benefits. These benefits can include employment, tourism, access to water, agricultural support, education, health care, training, or conservation-related revenue. The absence of benefits can undermine the legitimacy of protected areas. The evidence gathered in the author's previous study shows that community projects in the region encompass agriculture, food security, livestock, water, education, and capacity-building all carried out exclusively by NGOs: ADPP, ACADIR, ACGAVS, THE HALO TRUST, and MBAKITA, to name a few. The most important principle is complementarity: conservation without development can generate resistance; development without conservation can degrade the natural environment; tourism without community involvement can produce external benefits.

Land-use planning as a tool for the coexistence of humans and wildlife PNM-LL26 - Página 12



Fig 7 Mine-cleared areas to be used for conservation agriculture: professors from UJES (José Eduardo dos Santos University) providing training to communities on sustainable agriculture, in partnership with TNC Angola, in the community of Liakongo.  
Source: Author

#### ➤ *The Role of Elephants without Borders*

Elephants Without Borders (EWB) is a key partner for understanding the spatial distribution of elephants. Studies conducted in southeastern Angola used aerial surveys and satellite telemetry to assess elephant populations and movements. Schlossberg et al. (2018) highlighted the region's importance for regional connectivity and documented pressures associated with poaching and human expansion.

More recently, INBAC reported collaborating with Elephants Without Borders on wildlife monitoring operations. Collars were fitted to animals of different species to identify migration corridors, mitigate human-wildlife

conflicts, and identify dispersal areas relevant to sustainable tourism (Ministry of the Environment, 2025).

Technology makes it possible to change the approach to management. Instead of waiting for elephants to appear in a village, managers can track their movements and identify risk areas in advance. This information can be used to alert communities, guide enforcement officers, protect crops, and update zoning plans.

Monitoring is also important for tourism. Knowing where animals are and which areas they frequent can help define low-impact tourist routes, avoiding breeding grounds or critical pathways.



Fig 8 Fitting Collars on Different Animal Species in Luengue Luiana National Park in Angola. A Program of the Ministry of the Environment Coordinated by INBAC.  
Source: Ministry of the Environment (INBAC)

### ➤ *Wildlife Corridors, Camera Traps, and Remote Monitoring*

Wildlife corridors are essential for preventing the isolation of populations. In the case of elephants, corridors should be defined based on actual movement data and not merely on lines drawn on maps. The combination of GPS, telemetry, field observations, camera traps, satellite imagery, and community knowledge allows for a much more accurate understanding of the landscape.

Camera traps are especially useful because they operate over long periods and record species that would be difficult to observe directly. They can identify presence, times of activity, movement patterns, and possible changes in the composition of the fauna. In large areas, the use of camera

networks allows for comparisons between conservation zones, community areas, and corridors.

Remote monitoring via collars adds another dimension: movement in near real time. INBAC reported that animal monitoring can be conducted from a operations room in Luanda, using geographic information systems. This capability can transform conflict management and enforcement.

The challenge is to turn data into decisions. A movement map is not enough. Protocols must be established: who receives the alert, who notifies the community, who mobilizes enforcement officers, what measures can be taken, and how the event is recorded. The true value of the technology lies in the decision-making chain it enables.



Fig 9 Technicians Setting up Camera Traps in Different Areas and at Different Times of the Year in Luengue Luiana National Park to Collect Data for Establishing Safe Wildlife Corridors and Facilitating the Planning of Other Activities for the Future.

Source: Author's Archives

### ➤ *Ministry of Tourism and Attracting Investors*

Conservation requires sustainable funding. The Ministry of Tourism and ANAGERO play an important role in promoting the region and attracting national and international investors. The Okavango Raids are one of the initiatives to promote the destination, bringing together operators, tourists, and local institutions (ANAGERO, 2024; Okavango Raid, 2024).

The opening of the Luiana Plains Expedition Camp in 2026 marks a milestone in the development of tourism infrastructure within the Luengue-Luiana National Park. Sources on the project indicate a capacity of more than twenty beds and the creation of direct jobs for the local population, in addition to safari and boating activities (Angola Tourism, 2026; Tourism Update, 2026; VerAngola, 2026).

Attracting investment, however, must adhere to the principle of low impact. Investors should be selected not only based on financial capacity but also on their experience in nature-based tourism, environmental commitment, waste management, water efficiency, local hiring, and contributions to conservation.

Land-use planning is essential for guiding concessions. Investments must be located in areas compatible with wildlife corridors and the needs of local communities. Tourism can fund conservation, but it can also cause fragmentation, excessive water consumption, disturbance of wildlife, and pressure on sensitive areas if poorly planned.



Fig 10 Participants in the 2nd Edition of the Okavango 2025 Raid at a Safety Briefing in Cuito Cuanavale, Cuando Province, Angola.

Source: Author

#### ➤ *Community Development Projects*

Community projects are an indispensable component of the coexistence model. In rural communities, conservation cannot be separated from food security, water, agricultural production, livestock farming, education, and income-generating opportunities. The previous study provided by the author identifies projects related to agriculture, food security, livestock farming, drinking water, education, and training for rangers and guides.

A community development strategy must be tailored to specific local contexts. Communities located near elephant corridors can benefit from specific crop protection measures. Communities in tourist areas can be trained to provide services. Communities in formerly mined areas can receive support for the safe and productive use of land. In all cases, community participation must occur before decisions are made, not just afterward.

The benefits of tourism may include direct employment, food supply to lodges, transportation, handicrafts, guiding services, road maintenance, community lodging, and fees earmarked for social projects. However, transparent mechanisms must be established to prevent the concentration of benefits.

Community development should also incorporate environmental education. Schools, traditional leaders, and youth groups can participate in programs on wildlife, fires, water, sustainable hunting, and conflict prevention.

#### ➤ *The Zoning Study Associated with Miguel Xavier*

Spatial planning for Luengue-Luiana must incorporate the knowledge accumulated by experts who have worked

directly in the territory. In this context, Miguel Xavier stands out; his experience in Luengue-Luiana National Park and his technical work related to zoning serve as a practical reference for understanding the need to organize conservation, enforcement, access, communities, and wildlife spatially. A public source identifies Xavier as the author of a book about his experience in the park, *Os Homens do Luengue-Luiana. O Parque das Terras do Fim do Mundo* (NCR Angola, n.d.).

This research does not attribute to the zoning study any quantitative or cartographic data that have not been made available. The reference to Miguel Xavier should, therefore, be understood as a technical contribution to be further explored and documented in future versions of the article. Nevertheless, his experience reinforces an important conclusion: in a large park, management depends on detailed spatial knowledge and a permanent presence in the territory.

## V. DISCUSSION

The results allow us to propose a four-tiered model of coexistence. The first tier is territorial security, involving demining and risk information. The second is zoning, which defines areas for conservation, corridors, agriculture, livestock, tourism, and infrastructure. The third is monitoring, utilizing inspectors, communities, and technology. The fourth is the local economy, ensuring that conservation and tourism generate benefits for local populations.

The main conclusion of the discussion is that none of these layers functions in isolation. Demining without zoning can lead to inappropriate land use. Zoning without enforcement results in rules that are not enforced. Enforcement without community benefits can generate

resistance. Monitoring without the capacity to respond turns data into information that has no effect. Tourism without proper planning can increase conflicts.

Of course. To reinforce the *\*Discussion\** and add greater academic depth to the article, you can add these four paragraphs after the two you already have:

Furthermore, the results show that the participation of local communities should be a cross cutting element in all layers of the coexistence model. People living near conservation areas possess important knowledge about the territories, natural resources, wildlife corridors, and environmental changes observed over time. Their participation can help improve the identification of risk areas, prevent conflicts between people and animals, and strengthen acceptance of conservation and measures. Thus, the community should not be viewed merely as a beneficiary of environmental policies, but as an active partner in the management and protection of natural resources.

Another important aspect concerns the role of environmental inspectors. Enforcement should not be limited to cracking down on illegal practices but should incorporate an educational and preventive dimension. Inspectors can act as awareness-raising agents within communities, explaining the importance of wildlife, flora, and ecological corridors, as well as the consequences of poaching and unregulated occupation of conservation areas. For this role to be effective, it is necessary to invest in ongoing training, transportation, communication equipment, safety, and working conditions for rangers. Professionalized enforcement that is close to the communities can help build trust between environmental institutions and local populations.

The discussion also highlights the importance of cross-border cooperation, particularly in areas that are part of conservation initiatives such as the Kavango-Zambeze Transboundary Conservation Area (KAZA). Wildlife does not recognize administrative borders, and its movements can span different countries and conservation areas. For this reason, combating poaching, managing wildlife corridors, sharing information, and training enforcement officers require mechanisms for cooperation among the countries involved. In this context, coordination among national authorities, communities, nongovernmental organizations, and international partners can significantly increase the effectiveness of conservation strategies.

Finally, the discussion highlights the need for a long-term approach to ensure the sustainability of the coexistence model. Mine clearance, land-use planning, enforcement, and local economic development should not be viewed as isolated or temporary interventions, but rather as components of an integrated development and conservation strategy. The creation of economic alternatives, the promotion of sustainable tourism, environmental education, support for agriculture and livestock farming compatible with conservation, and community participation can reduce dependence on activities that threaten biodiversity. In this way, conservation is no longer perceived merely as a

restriction on the use of natural resources but is instead understood as an opportunity to improve the living conditions of communities and ensure the protection of ecosystems for future generations.

## VI. CONCLUSION

Land-use planning is a fundamental tool for the coexistence of humans and wildlife in the Mavinga and Luengue-Luiana National Parks. The experience gained since 2008 shows that transforming the territory depends on long-term processes and coordination among the government, organizations, communities, and investors.

The Ministry of the Environment and INBAC must continue to strengthen park management and the training of rangers, while prioritizing enforcement, environmental education, and community mediation. KAZA should be utilized as a platform for ecological connectivity, cooperation, and regional tourism. The HALO Trust and other partners in mine action play an essential role, but demining must be accompanied by planning for the use of the cleared land.

Elephants Without Borders and INBAC's monitoring programs demonstrate the value of technology in understanding wildlife movements and anticipating conflicts. Camera traps, collars, GIS, drones, and community-based monitoring should be integrated into a land-use management system. The goal is not to accumulate technology, but to transform information into decisions.

Tourism should grow gradually, with responsible, low-impact investment and local participation. Community projects should be strengthened so that local populations perceive direct benefits from conservation. Finally, the zoning approach associated with Miguel Xavier's experience should be further developed and, if possible, made available as a technical or cartographic document to allow for rigorous scientific analysis and citation.

Coexistence does not mean eliminating all conflicts. It means building a territory where conflicts are predictable, monitored, and managed; where costs and benefits are shared; and where wildlife conservation is compatible with the dignity and needs of local communities. For Mavinga and Luengue-Luiana, this could serve as the foundation for a new model of territorial development in southeastern Angola.

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