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Original Article

Reconfiguring Conservation Finance and Governance: A Household-Centred Economic Model for Wildlife Corridor Sustainability in the KavangoZambezi Transfrontier Landscape

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Abstract: *Wildlife corridors are critical ecological infrastructures that sustain biodiversity, facilitate species movement, and underpin transboundary conservation systems. However, their persistence in human-inhabited landscapes remains constrained by governance fragmentation, livelihood dependence, and structural inefficiencies in conservation finance. This study investigates these dynamics across the 520,000 km² KavangoZambezi Transfrontier Conservation Area (KAZA TFCA)-Bwabwata National ParkZambezi Region (BNPZR) interface. Methods: A mixed-methods study using population-based spatial analysis, household surveys (n = 321), statistical testing and ARIMA time-series modelling was used to contextualise BRFSS estimates of the select health outcomes among Africans Americans in one Richmond neighbourhood. Our results show that 2,442 km² (14%) of the BNPZR landscape is potentially usable wildlife corridor area but that more than three-quarters of households farm among these potential corridors, and another 6.54% unwittingly occur within them a reflection of long-established reliance on agriculture for livelihoods. Agricultural production per household averages 852.81 kg hot water produced with maize takes up to 68% of the crops grown (7146 ha). Statistical analysis revealed a significant inter-zonal variation (p 99%), overwhelmingly favouring combined efforts provisioning for both conservation and livelihoods. The paper argues that securing long-term sustainable wildlife corridors will require transformative changes away from business as usual, toward economic and governance frameworks centred on households where effectively connecting conservation finance with local institutions and livelihood systems is critically important.*

Keywords: *Wildlife Corridors, Conservation Finance, Transboundary Conservation, Community-Based Conservation, Household Livelihoods, Governance, HumanWildlife Coexistence, KavangoZambezi Transfrontier Conservation Area (KAZA TFCA), Protected Area Management, Sustainable Conservation.*

I. INTRODUCTION

Wildlife corridors are critical to maintaining ecological flow between fragmented landscapes for species dispersal, gene exchange and ecosystem persistence (Hilty et al., 2020). Corridors are critical structural components for maintaining ecological integrity across national boundaries and supporting populations of wide-ranging species (such as the elephant [Loxodonta africana]) within large transboundary conservation systems such as the KavangoZambezi Transfrontier Conservation Area (KAZA TFCA) (Chase et al., 2016).

Furthermore, corridors in many African landscapes are rapidly being degraded by land-use changes associated with agricultural expansion and human settlement (Laurance et al., 2014). These pressures can be particularly exacerbated in regions where conservation landscapes intersect with rural livelihoods based on subsistence agriculture.

This dilemma is illustrated by the Bwabwata National ParkZambezi Region (BNPZR) landscape. Wildlife corridors here are interspersed and embedded within complex socio-economic systems that have customary land tenure at their core with significant reliance on both crop production and natural resources.

This paper makes a case for the proposition that economic incentives, governance and institutional design — not ecologyare what undermine corridor sustainability. The scientific framework presented herein describes the Inverted Pyramid of Resource Allocation to illustrate systemic inefficiencies in conservation finance that might explain such low accountability incentives, and a locality-centred approach for corridor stewardship.

II. LITERATURE REVIEW

A) Conservation Economics and Opportunity Costs

The economic incentives and opportunity costs of land use are central drivers for conservation outcomes. Ferraro and Hanauer (2014) show that conservation programmes are often unsuccessful when they do not compensate local communities

well enough. As such, land is a productive asset in agrarian systems and offers an important buffer against risk (Barrett et al., 2011), thereby rendering its allocation extremely sensitive to livelihood needs.

While payments for ecosystem services and conservation incentive schemes have been advanced to help align ecological and economic interests, they require both local institutional capacity and sustained financial flows in order to be effective (Wunder 2007).

B) Governance and Institutional Alignment

In this sense, institutional theory offers an important lens through which to view conservation outcomes. According to Ostrom (2009), sustainable management of common-pool resources requires governance systems that match between rules, incentives and local participation. Customary institutions, especially Traditional Authorities, are still important in land allocation and resource governance for many African contexts (Ribot et al., 2006).

While Namibia is known to be a pioneer in establishing community-based natural resource management (CBNRM) schemes that have positive conservation outcomes with devolved governance, statutory and customary land systems can vary widely, leading to institutional fragmentation where conservation objectives are concerned (Naidoo et al., 2016; Silva & Mosimane, 2013).

C) Corridor Ecology and Human-Dominated Landscapes

Corridor ecology has shifted from being a spatially-oriented science to one that appreciates land-use suitability and socio-economic context in its endeavours (Hilty et al., 2020). These corridors need to facilitate agricultural production, settlement and resource use dynamics through human-dominated landscapes.

Incorporation of human dimensions into corridor planning is essential, as failure to do so frequently contributes to functional degradation despite persistence in spatial connectivity (Keeley et al., 2019).

D) HumanWildlife Conflict and Coexistence

Humanwildlife conflict (HWC) is a critical determinant of conservation success in shared landscapes. Persistent conflict reduces tolerance for wildlife and can lead to retaliatory actions (Redmore et al., 2020). Effective coexistence strategies require both technical interventions and socio-economic incentives (Songhurst et al., 2016).

E) Livelihood-Integrated Conservation Models

Emerging conservation paradigms emphasise the integration of livelihoods into conservation strategies. Agroecological systems, value addition, and market access have been shown to reduce pressure on natural ecosystems while enhancing household resilience (Altieri & Nicholls, 2020; Western et al., 2015).

III. METHODOLOGY

The study used a mixed-methods research approach to investigate the ecological, socio-economic and institutional aspects of wildlife corridor dynamics in the BNPZR landscape, which is part of KAZA TFCA. Corridor extents were identified and measured through spatial analysis with Geographic Information Systems (GIS), approximately 2,442 km² of the overall landscape (~14% total area) being available for use by wildlife.

We conducted household surveys to collect primary socio-economic data from 321 respondents, using a stratified purposive sample across corridor zones and livelihood contexts. The survey instrument collated information about land-use practices, agricultural production (crop types, yields and fields sizes), corridor awareness and use information from the humanwildlife conflict experience data set, as well as governance mechanisms underlying land allocation.

Descriptive statistics were employed to assess spatial variation in key agronomic variables (field size, yield per hectare and total crop output), while non-parametric KruskalWallis tests were used on quantitative data. All the variables that were tested differed significantly between zoning units ($p < 0.001$), suggesting heterogeneity in each one of them across this landscape.

Conducted governance analysis on customary systems and their influence on land uses, mainly the impact of Traditional Authorities in the allocation of land from records/contexts derived from both household responses/processes. An AutoRegressive Integrated Moving Average (ARIMA) model was fitted to temporal patterns of human−wildlife conflict from 20012022 and used to predict future trends in conflict.

The combination of spatial, statistical and institutional analyses allowed a nuanced yet empirically rooted evaluation of the multiple drivers influencing wildlife corridor functionality in this complex socialecological system.

IV. RESULTS

A) Spatial Extent and Corridor Occupation

Spatial analysis of the Bwabwata National ParkZambezi Region (BNPZR) landscape established that approximately 2,442 km², representing 14% of the total landscape extent (17,739 km²), constitutes potential wildlife corridor territory. Notably, this corridor space is not ecologically vacant but is extensively utilised for agricultural production and settlement.

Household survey data (n = 321) reveal a pronounced degree of corridor occupation. In total, 255 households (79%) were aware that they cultivate in the defined areas of corridors; Meanwhile, a further 21 Hhs (6.54%) reported also cultivating within corridor zones but did not know their nature at all until participating in this study. A total of 45 households (14%) claimed that they knew about the presence of corridors but did not actively cultivate in these areas.

These findings illustrate that corridor use is neither incidental nor peripheral but structurally entrenched and practised through land-use decisions as well as institutionalised processes of land allocation.

Table 1: Household Engagement with Wildlife Corridors (n = 321)

Category	Number of Households	Percentage (%)
Knowingly cultivating within corridors	255	79.0
Unknowingly cultivating within corridors	21	6.54
Aware but not cultivating within corridors	45	14.0
Total	321	100

B) Agricultural Production and Livelihood Dependence

All surveyed households (100%) engaged in crop production, confirming agriculture's centrality as the primary livelihood strategy within the BNPZR landscape.

The distribution of cultivated area across crops shows a strong dominance of maize, which accounts for 714.6 hectares (68%) of the total. Millet occupies 246.7 hectares (23%), while sorghum constitutes 96.4 hectares (9%).

Table 2: Crop Distribution by Area

Crop	Area (ha)	Percentage (%)
Maize	714.6	68
Millet	246.7	23
Sorghum	96.4	9
Total	1,057.7	100

Yield performance across crops indicates moderate productivity levels, with millet achieving the highest yield at 323 kg/ha, followed by maize (272 kg/ha) and sorghum (255 kg/ha).

At the household level, production averages further reinforce the economic importance of these systems. Mean production per household was recorded as 885.22 kg for maize, 814.02 kg for millet, and 750 kg for sorghum, yielding an overall average of 852.81 kg per household across all crops.

Table 3: Yield Performance and Household Production

Crop	Yield (kg/ha)	Mean Household Production (kg)
Maize	272	885.22
Millet	323	814.02
Sorghum	255	750.00
Average	—	852.81

Collectively, these results underscore that pericorridor and corridor landscapes function as **primary agricultural production zones**, rather than peripheral or marginal lands, thereby intensifying the inherent tension between conservation and livelihood imperatives.

C) Statistical Differentiation Across Corridor Zones

Inferential statistical analysis using the KruskalWallis test revealed significant variation across corridor zones for key agronomic variables, including field size, yield per hectare, total crop output, and bag equivalents.

All tested variables returned **p-values < 0.001**, indicating **highly significant differences across spatial zones**.

Table 4: Summary of KruskalWallis Test Results

Variable	Test Statistic (H)	p-value	Interpretation
Field size	—	<0.001	Significant variation

Yield per hectare	—	<0.001	Significant variation
Total crop output	—	<0.001	Significant variation
Bag equivalents	—	<0.001	Significant variation

These findings indicate that corridor landscapes are **heterogeneous socio-ecological systems**, characterised by differentiated productivity and livelihood conditions, thereby necessitating spatially nuanced management approaches.

D) Governance Structure

For the governance analysis, 100% of land in the study area is allocated via Traditional Authorities, making customary institutions primary decision-makers over access and use.

The fact that this expression was made by school officials, rather than informal or illegal representatives, further corroborates corridor occupation as an institutional practice. As a result, conservation outcomes in the BNPZR landscape are closely tied to customary governance systems.

Livestock presence in Bwabwata National Park is also well below figures reported elsewhere, with 52 cattle owners present within the protected area. This distribution means relatively few actors impose high ecological pressure on the functionality of corridors.

Table 5: Governance Characteristics

Governance Variable	Observation
Land allocation authority	100% Traditional Authorities
Nature of corridor occupation	Institutionally sanctioned
Cattle owners within the BNP Managed Resource Use Zone (BNP-MRUZ)	52 individuals
Governance implication	Concentrated ecological impact

E) HumanWildlife Conflict (HWC)

Time-series analysis using an **ARIMA (1,0,0)** model yielded the following functional relationship:

$$[Y_t = 1444 + 0.742Y_{t-1}]$$

The model projects approximately 1,440 humanwildlife conflict incidents annually through 2030, indicating that HWC is a persistent, structurally embedded phenomenon across the landscape.

Table 6: HWC Model Summary

Model Type	Equation	Annual Projection	Interpretation
ARIMA (1,0,0)	(Y_t = 1444 + 0.742Y_{t-1})	~1,440 incidents	Persistent structural conflict

F) Community-Derived Conservation Preferences

Survey results reveal an exceptionally high degree of consensus among respondents regarding conservation priorities. All 321 households (100%) supported interventions related to humanwildlife conflict mitigation, food security, and water provision.

These responses collectively convey a remarkably coherent and pragmatic position articulated by the respondents: that wildlife corridor conservation would cease to represent an opportunity cost—and instead become a viable and willingly upheld land-use pathway—if accompanied by targeted livelihood and institutional support. In essence, communities indicated that with appropriate enabling conditions, corridor protection and securitisation would not only be feasible but intrinsically aligned with their socio-economic interests.

Support for such enabling interventions was overwhelmingly high. Overall, 99.4% of respondents asserted donor-supported inputs as necessary; and moreover, a question on enterprise growth in addition to improved market access had personal attention from ninety-nine per cent. eighty one%, indicating the economic viability legacy centrality within conservation acceptance too [forty seven]. Additionally, 92.2% supported conservation and livelihood systems, with the perception that they play critical roles in household or living resources use management. Another major form was institutional legitimacy; 86.6% supported Traditional Authorities participating in governance, and 84.7% pushed for skills development/training to strengthen adaptive capacity.

Overall, these results suggest that communities are not resistant to conservation when it aligns with security of livelihoods, economic opportunities and governance legitimacy.

Table 7: Community Conservation Preferences (n = 321)

Intervention	Support (%)
HWC mitigation	100
Food security interventions	100
Water provision	100
Donor assistance	99.4
Enterprise and market development	99.1
Women inclusion	92.2
Traditional Authority governance	86.6
Skills training	84.7

These results demonstrate that conservation acceptance is conditional rather than absent, with communities expressing a strong willingness to participate in conservation systems that are aligned with livelihood enhancement and institutional legitimacy.

V. DISCUSSION

This study therefore has important implications because it fundamentally reframes wildlife corridor degradation in the Bwabwata National ParkZambezi Region landscape as a governance livelihood interface problem, rather than simply an ecological constraint a conclusion which is strongly supported by contemporary socio-ecological systems theory (e.g. Ostrom, 2009; Western et al., 2015). Although 2,442 km² (14% of the BNPZR landscape) still remains as biophysically viable corridor space, it almost completely overlaps with household land use, showing that ecological availability is not equivalent to a functionally connected site. What this signals is that, backed by global evidence (Hilty et al., 2020), these corridors do not persist unless the land uses adjacent to them remain compatible with their function.

Farming for corridors is that 79% of land owners know they are cultivating on corridors (6.54%) unknowingly, which means this kind of encroachment entails a structure that allows expanding farming to wherever customary allocation occurs. This is in line with Silva and Mosimane (2103), who believe that conservation results are often dictated by customary tenure systems, rather than statutory ones (Silva & Mosimane 2013). All households accessed land through Traditional Authorities, and the fact that those who controlled forests resided in municipalities reveals again how traditional governance institutions are central to all development initiatives (Rihoy & Maguranyanga 2010), pointing out whether these local conservation-oriented incentives work or not depending on the country context.

The socio-economic outcomes further reinforce this interpretation. Given that maize covers 68% of cultivated land and households produce an average of about 852.81 kg per year in staple crops, landscape utilisation corridors are not marginal but rather fundamental for food security. This result is in accordance with the literature on conservation across Africa, which warns that when tradeoffs are sharp, many rural households will place more value on immediate subsistence and resilience over longer-term ecological sustainability (Osofsky et al., 2005). The significant difference across corridor zones ($p < 0.001$) also suggests that livelihood systems are non-homogeneous, reinforcing our conclusion for spatially differentiated interventions rather than blanket conservation prescriptions.

Of particular note here is the opportunity provided by BNP-MRUZ, where a legally protected area has been illegally extracted of its cattle a compelling illustration of institutional misalignment in this case. This concentration of this impact across just 52 livestock owners illustrates the influence that a small group of actors can have on ecological outcomes at the landscape scale. This result aligns with conservation governance work identifying ‘critical control points’, which explains how targeted interventions can provide disproportionate ecological gain (Game et al., 2014). It also illustrates the shortcomings of enforcement-driven strategies in cases where legitimacy is contested or dispersed.

Humanwildlife conflict is a structurally intractable problem, and the ARIMA projections suggest there will be around 1,440 such incidents annually until at least 2030. This persistence chimes with regional analyses indicating that conflict remains among the most substantial impediments to community-based conservation in southern Africa (Naidoo et al., 2016; Songhurst et al., 2016). However, this reliance on deterrence methods with low efficacies, such as noise-making, further highlights the failure of current mitigation strategies and justifies calls for more technologically-, economically- and socially-upscaled coexistence systems (Redmore et al.)

However, most importantly, the community-generated strategies emerge as a complex and unified demand for conservation with incomes. The near universal rankings of food security, water access and conflict mitigation have strong affinities with the guiding principles behind integrated conservation and development projects (ICDPs), which are designed to align ecological and economic incentives in order to expedite poverty alleviation as well as biodiversity protection (Blom et al.,

2010). The high approval of stewardship agreements (86.9%) and Traditional Authority governance types 286(86.6%) likewise upholds the notion that conservation must be locally anchored to gain legitimacy.

Collectively, these findings reinforce an important conceptual insight: wildlife corridors within human landscapes are socio-ecological systems whose functioning relies on the compatibility of governance, livelihood and ecological objectives. This fits into the framework of social-ecological systems (Ostrom, 2009) in which institutional fit as well as local participation are fundamental to sustainability.

VI. RECOMMENDATIONS

The empirical and theoretical insights generated by this study point toward a set of strategic recommendations that are both context-specific and broadly applicable to transboundary conservation systems.

First, there is an urgent need to institutionalise co-governance frameworks that formally integrate Traditional Authorities into corridor management. As all land allocation happens through local customary systems, only conservation interventions that work within this system have a chance of widespread compliance over the long term. Such recommendations are backed by evidence from Namibia and beyond that increasing recognition of local governance institutions leads to greater conservation success (Rihoy & Maguranyanga, 2010; Silva & Mosimane, 2013).

Secondly, livelihood-based approaches to corridor conservation should always be central, specifically those oriented around agricultural productivity and water security, as well as income diversification. And as this example obviously illustrates, decisions at the local scale are best when they come with a financial return underpinning them (Western et al., 2015). Several alternative systems such as agroecological cluster farming and value addition can be explored in this regard.

Thirdly, we need a departure from reactive to predictive systems for humanwildlife conflict mitigation with planning that includes forecasting tools (such as ARIMA modelling). Anticipatory approaches have been found to reduce conflict intensity and enhance coexistence outcomes (Redmore et al., 2020), and integration of them into corridor management would be a major step.

Fourth, special efforts should ensure targeted interventions for high-impact but lower-number actors (like the 52 livestock owners inside BNP-MRUZ). These concentrated sources of ecological disruption can be cost-effectively addressed through strategic conservation planning approaches (Game et al., 2014) to restore the functioning of the BNP corridor over its extant length of ~170 km.

Fifth, there is an urgent need to consolidate conservation financing mechanisms so that they can encourage a higher flow of capital for household-level interventions and overcome the structural inefficiencies that often compromise environmental funding architectures. This is in agreement with emerging critiques of vertical conservation systems and reinforces the case for more equitable and effective resource distribution (Ferraro & Hanauer, 2014).

Furthermore, OECMs (Other Effective Area-based Conservation Measures) should be recognised and scaled to delineate conservation outcomes across landscapes which lie beyond conventional protected area systems. Such an approach is now widely acknowledged as necessary to achieve global biodiversity goals under the KunmingMontreal Global Biodiversity Framework (CBD, 2022).

VII. CONCLUSION

This study shows that the viability of wildlife corridors in Bwabwata National ParkZambezi Region landscape is not solely determined by ecological design but also represents a complex system incorporating governance, livelihoods and conservation incentives. Results indicate that corridor landscapes are both ecological and socio-economic systems, but also show how their functioning can depend on the alignment of these dimensions. The persistence of corridor obstruction, despite strong ecological justification and substantial conservation investment, underscores the limitations of approaches that do not adequately engage with local household realities. At the same time, the strong community support for livelihood-centred conservation strategies provides a clear pathway forward. In essence, the future of wildlife corridors in the KAZA landscape will depend on a paradigm shift, from externally driven, enforcement-based models to locally anchored, livelihood-enabled systems of stewardship. Such a shift is not merely desirable; it is necessary for ensuring that ecological connectivity is both socially legitimate and operationally sustainable.

VIII. REFERENCES

[1] Bussière, L., & Potgieter, D. (2023). *KAZA Elephant Survey 2022: Population estimates and distribution*. KavangoZambezi Transfrontier Conservation Area Secretariat.
[2] Cao, S., Foggin, M., & Xinquan, Z. (2022). [Retain exact thesis reference entry].
[3] Clevenger, A. P., & Waltho, N. (2000). [Retain exact thesis reference entry].
[4] Food and Agriculture Organisation. (2019). [Retain exact thesis reference entry].

[5] Garcia, M. (2020). [Retain exact thesis reference entry].
[6] Göttert, T., Mann, C., Zeller, U., & Stoldt, M. (2020). [Retain exact thesis reference entry].
[7] KavangoZambezi TFCA Secretariat. (2015). [Retain exact thesis reference entry].
[8] Katjingisiua, M., & Mauney, K. (2021). [Retain exact thesis reference entry].
[9] MEFT. (2020). *Land Use Plan for Bwabwata National Park*.
[10] MEFT. (2021). *Wildlife corridors of the Zambezi Region strategy*.
[11] Naidoo, R., Beytell, P., Brennan, A., et al. (2022). *Elephant connectivity challenges*. *Frontiers in Conservation Science*, *3*, 788133.
[12] Naidoo, R., Weaver, L. C., Diggle, R. W., et al. (2016). Tourism and hunting benefits. *Conservation Biology*, *30*(3), 628638.
[13] Namibia Statistics Agency. (2024). *Statistical report*.
[14] Osofsky, S. A., Cleaveland, S., Karesh, W. B., Kock, M. D., & Nyhus, P. J. (2005). [Retain exact thesis reference entry].
[15] Parks Canada. (2022). [Retain exact thesis reference entry].
[16] Randall, S., Coast, E., Antoine, P., Compaore, N., Dial, F. B., Fanghanel, A., Gning, S. B., Thiombiano, M. S., Golaz, V., & Wandera, S. O. (2015). [Retain exact thesis reference entry].
[17] Redmore, L., Stronza, A., Songhurst, A., & McCulloch, G. (2020). [Retain exact thesis reference entry].
[18] Rihoy, E., & Maguranyanga, B. (2010). Role of traditional authorities in conservation.
[19] Silva, J. A., & Mosimane, A. W. (2013). Conservation-based rural development in Namibia. *Journal of Environment & Development*, *22*(1), 2550.
[20] Songhurst, A., et al. (2016). [Retain exact thesis reference entry].
[21] Spierenburg, M., Wels, H., & Peires, J. (2019). Customary institutions in conservation. *Conservation and Society*, *17*(1), 4558.
[22] Taylor, R. D., & Martin, R. B. (2016). Transboundary resource management. *Biodiversity and Conservation*, *25*(6), 10171036.
[23] Thomson, G. R., Penrith, M.-L., Atkinson, M. W., Thalwitzer, S., Mancuso, A., Atkinson, L. P., & Osofsky, S. A. (2013). [Retain exact thesis reference entry].
[24] World Wildlife Fund. (2019). *In the footsteps of giants*.
[25] WWF. (2012). [Retain exact thesis reference entry].
[26] WWF. (2023). [Retain exact thesis reference entry].
[27] Yang, K. F., Gergel, S. E., et al. (2020). Forest edges and productivity. *Frontiers in Sustainable Food Systems*, *4*, 130.
[28] Zhang, W., Dawson, R., & House, J. I. (2010). Land use and soil carbon dynamics. *Environmental Management*, *45*(3), 393403.
[29] Zmelik, K., Schindler, S., & Wrbka, T. (2011). European Green Belt conservation. *Innovation Journal*, *24*(3), 273294.