



## SUMMARY REPORT

# Transboundary Landscape Connectivity propels a robust wildlife economy: Modelling with African lion



GODFREY MTARE: 38193-1

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## **PREAMBLE**

Securing connectivity within the Hwange-Kazuma-Chobe WDA is therefore essential in maintaining the integrity of the broader landscape of the KAZA TFCA. However, a number of anthropogenic pressures could threaten this connectivity. Little is known about how connectivity improves animal populations, movement patterns and human-wildlife conflicts as well as access and opportunities for resident communities and tourists; hence my desire to carry-out this study. Rufford Foundation provided timely funding support in order to conduct my fieldwork (April – May 2023). Thus, am very much indebted to Rufford Foundation and extremely grateful for the generous financial support rendered. The fieldwork also benefited from productive engagements with local communities and other partners operating in this landscape who became very interested in the project and quite resourceful.

Accessibility of certain areas was highly challenging due to poor road network and rugged terrain. Nonetheless, the team had to be innovative and focused due to limited time in logical planning and execution. Further to study work done so far, I propose to incorporate in this project work that would assist in disentangling the economic value of African lion and human-lion conflict mitigation. This is largely because an understanding of local socio-economic factors in HKC WDA is envisioned to result in tangible conservation gains within the landscape.

## **BACKGROUND**

Sustainable and inclusive wildlife economies are critical to align wildlife conservation with economic development in Africa (Ferreira, 2018). However, according to Snyman (2014) our knowledge of wildlife economies and what is needed to enhance their contribution to sustainable development is limited. This may be attributable to a mis-match in scale between communities and the ability to create wildlife economies through incorporating landscape connectivity.

Increasing human footprint and unregulated land use has resulted in declining and fragmented space for many species, particularly carnivores such as African lion. However, while transboundary landscapes such as the KAZA TFCA have been established to maintain and conserve regional wildlife populations, little is known about how connectivity improves animal populations, movement patterns and human-wildlife conflicts as well as access and opportunities for resident communities and tourists. Unquestionably, landscape of interconnected protected areas is an important requirement for healthy and viable wildlife populations, ecosystems and landscapes (Cushman, 2011). Indeed, studies show that interconnected protected areas provide viable wildlife areas critical for tourism, one of the main

contributors to GDP in many African countries (WBCSD, 2016). As such, management of shared landscapes across international boundaries has the potential to meaningfully contribute in a robust way to conservation of biodiversity/wildlife and the socioeconomic development of rural communities. Therefore, creating more resilient landscapes by increasing connectivity should be a widespread aspiration in national and international planning and transboundary conservation guidance (Kettunen et al., 2007).

The overarching goal of the study is to maintain a large carnivore habitat network across KAZA where African lions are secured within and outside protected areas, can co-exist with people, move freely among protected areas, which provides an enabling environment for tourism development; hence a robust and thriving wildlife economy. As such, it is assumed that this realization will hugely assist policy-makers in making interventions that enhance the goals of KAZA TFCA as a conservation and development landscape in the context of African lion, seamless movement of tourists and ultimately rural socio-economic livelihoods.

Therefore, it is not an understatement to recognize that the future of KAZA TFCA, as a wildlife-based economy, relies on the long-term survival of key species such as African lion and intact ecosystems, at a landscape scale, and vice versa. Thus, Wildlife Dispersal Areas (WDAs) that offer critical linkages between Protected Areas (PA) across the KAZA TFCA landscape should be promoted, and focusing investments in these areas would maintain connectivity, which is a fundamental premise for the establishment of all TFCAs.

## **INTRODUCTION**

Landscape connectivity is the degree to which the landscape facilitates movement of species. Connectivity may occur at different hierarchical levels including linkages among resource-use patches within an individual's home range, linkages that allow individuals to disperse among populations, and seasonal migration routes. Connectivity at these different levels has been shown to increase the movement of individuals, which contributes to gene flow, promotes population recolonization or establishment in unoccupied areas, and maintain genetically viable and healthy populations (Hilty et al. 2012; Fletcher et al. 2016).

Landscape connectivity can be broadly viewed from two perspectives: structural and functional connectivity. Structural connectivity emphasizes the physical elements on a landscape and is therefore directly influenced by landscape features such as topography and land cover (Tischendorf and Fahrig,

2000b). By increasing the continuity between similar habitat patches, structural connectivity will increase. Functional considers not only the physical elements on a landscape but also how a species of interest interacts with and moves in response to those elements (Tischendorf and Fahrig, 2000b). Functional connectivity therefore requires a more nuanced understanding of how a landscape increases or decreases animal and tourist flow and how behaviors such as dispersal and foraging interplay with movement as well as tourism determinants such as accessibility, visa regimes and stochastic events (Cushman, 2006).

However, while transboundary landscapes such as the KAZA TFCA have been established to maintain and conserve regional wildlife populations, little is known about how connectivity benefits animal populations, movement patterns and human-wildlife conflicts as well as access and opportunities for resident communities and tourists. As these animals move through spatially complex landscapes, they respond to multiple biotic and abiotic factors to maximize access to resources and mates while minimizing fitness costs such as mortality risks (Cushman et al. 2011). On the other hand, these threats are not static as we have other two critical issues to contend with such as human population growth (and therefore consumption of resources/ need for agricultural land) and climate change.

Though increasing landscape connectivity is an intuitive and practical approach to countering habitat fragmentation and the associated decline in biodiversity, putting it into practice generally involves land owned, managed and used by many stakeholders. WBCSD (2016) recommends that efforts to improve connectivity in a given landscape require coordination between many parties, including governments, local and international organizations and, critically, private industry. According to Cushman et al. (2018), what is needed is more 'landscape-level planning' that takes into account the needs of wildlife, the environment, and farming communities. They argue that more locally based partnership arrangements, could help both farmers and species such as lions survive. As suggested, it should help unite the community, from smallholder farmers to tourism ventures, in the fight to conserve wildlife and manage natural resources, thereby helping to improve local livelihoods; hence a robust wildlife economy.

Movement of animals across these complex landscapes is critical for maintaining regional populations in the short term (Cushman 2006) and for species to shift their geographical range in response to future climate change (Heller and Zavaleta 2009) and other pressures such as land use change. As these animals move through spatially complex landscapes, they respond to multiple biotic and abiotic

factors to maximize access to resources and mates while minimizing fitness costs such as mortality risks (Cushman et al. 2011).

The functional landscape approach followed in KAZA has emphasised interconnectedness of protected areas in the TFCA by defining six Wildlife Dispersal Areas as coherent landscape units that create linkages between adjacent land use types and across international boundaries (KAZA Secretariat, 2015). Hwange-Kazuma-Chobe WDA is one of those six WDAs. The boundaries of WDAs in KAZA TFCA were finalised as a result of consultation with the KAZA TFCA stakeholders in September 2016, by mainly taking into account the corridors, routes or areas which diverse wildlife species utilize. As such, many researchers and practitioners contributed huge amounts of data and information though it can be argued that there is still much room to incorporate more data/information and make finer adjustments. These WDAs are focal areas for support to local communities and their livelihoods. They emphasise the interconnectivity of the various protected areas and were identified to prioritise development needs within more localised areas. Additionally, WDAs provide an agreed 'geographical scope' for directing investments and interventions, and play an important role in transboundary planning.

Nonetheless, the contribution of interconnected protected areas to local wildlife economies remain poorly understood. People in the KAZA landscape face poverty, human wildlife conflict (HWC) and increasing pressures from environmental variability exacerbated by climate change. According to recent data from World Bank (2020), 51.8% of the Angolan (2018), 14.5% of the Botswana (2015), 26.3% of the Namibian (2015), 58.7% of the Zambian (2015) and 33.9% of the Zimbabwean population (2017) are earning less than US\$1.9 a day. Conversely, this figure in 2022 might have further decreased, particularly for Zimbabwe. The rates for multi-dimensional poverty - which considers monetary poverty, education, and access to basic infrastructure - are even higher with 59.2%, 20%, 26.3% and 64.5% for Angola, Botswana, Namibia and Zambia respectively (World Bank, 2020). The poor in communal areas of KAZA TFCA depend disproportionately on biodiversity/wildlife for their subsistence needs and wildlife-based tourism can be a route out of poverty under some circumstances. The livelihoods of millions of people that live in and around TFCAs are intricately linked to the integrity of biodiversity, including ecosystems being conserved in the TFCAs. Nevertheless, increasing human footprint and unregulated land use has resulted in declining and fragmented space for many animals, particularly carnivores such as African lion.

Therefore, the future of the KAZA TFCA, as a wildlife-based economy, relies on the long-term survival of key species such as African lion and ecosystems, at a landscape scale. Wildlife Dispersal Areas (WDAs) that offer critical linkages between Protected Areas (PA) across the KAZA TFCA landscape should be promoted. Focusing investments in these areas would restore connectivity, which is a fundamental premise for the establishment of the TFCA.

## **STUDY AREA**

The Kavango Zambezi (KAZA) Transfrontier Conservation Area (TFCA) is Africa's largest conservation landscape and the world's largest terrestrial transfrontier conservation area.

KAZA TFCA is therefore a critically strategic conservation landscape not just for southern Africa but globally. At the heart of KAZA TFCA initiative is the hope that associated ecosystem services, including nature-based tourism, will be an engine for sustainable rural economic development.

Transboundary conservation areas spanning two or more countries are one of the mechanisms to achieve connectivity between protected areas (SADC Protocol on Wildlife Conservation and Law Enforcement: 1999). The Kavango-Zambezi Transfrontier Conservation Area (hereafter KAZA TFCA) covering 520 000km<sup>2</sup> spanning Angola, Botswana, Namibia, Zambia, and Zimbabwe (KAZA TFCA Treaty: 18 August 2011) is massive and the largest terrestrial Transfrontier conservation and development landscape in the world (KAZA TFCA Master Integrated Development Plan: 2016 - 2021).

KAZA TFCA represents a bold initiative on the part of five countries who have entered into a partnership to conserve biodiversity at scale, and to market this biodiversity using nature based tourism as the engine for rural economic growth and development (KAZA Master IDP, 2015). It is home to approximately 70% of Africa's savannah elephants (*Loxodonta africana*), 25% of Africa's wild dogs (*Lycaon pictus*), almost 20% of the continent's lions (*Panthera leo*), and 15% of the world's wild cheetahs (*Acinonyx jubatus*). Over 70 % of the KAZA TFCA area is designated for wildlife management, integrating more than 20 National Parks, 85 Forest Reserves, 22 Conservancies, 11 Sanctuaries, 103 Wildlife Management Areas and 11 Game Management Areas (KAZA Secretariat, 2015). The remaining 30% of the KAZA area is home to a population of nearly 2.7 million people.

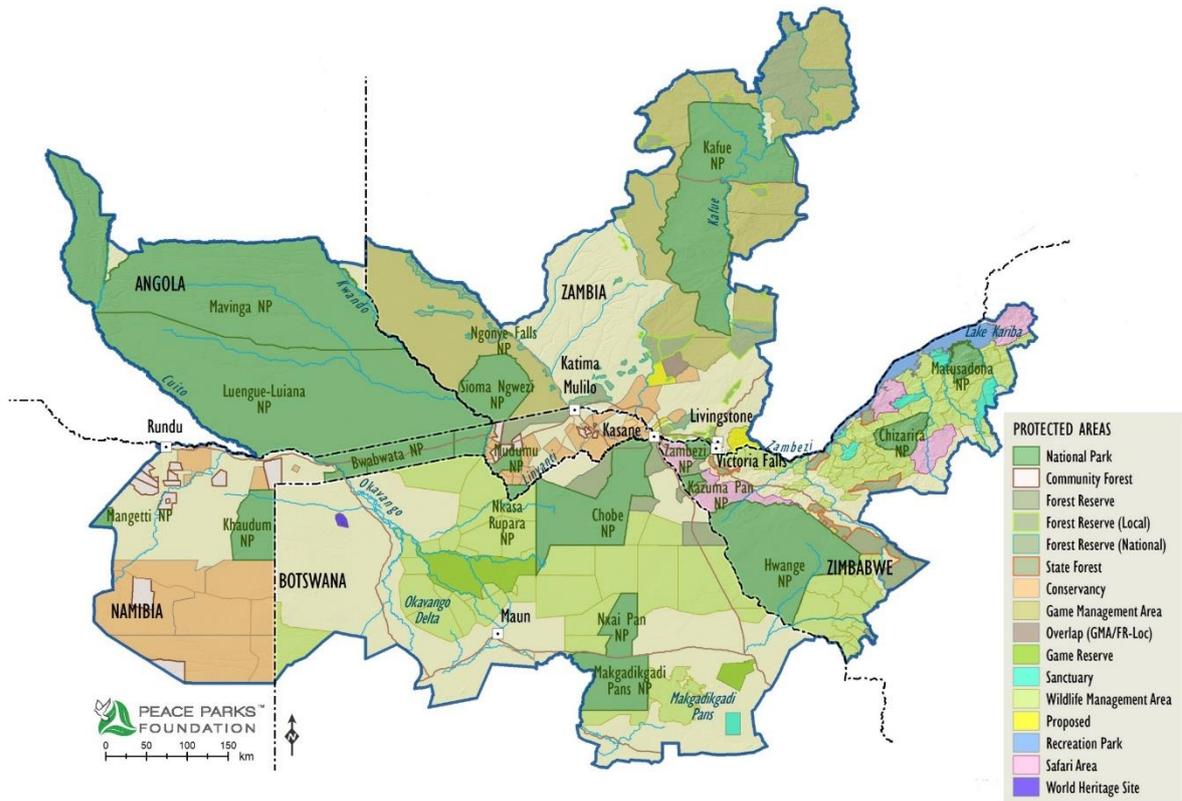


Figure 1: Map of KAZA TFCA

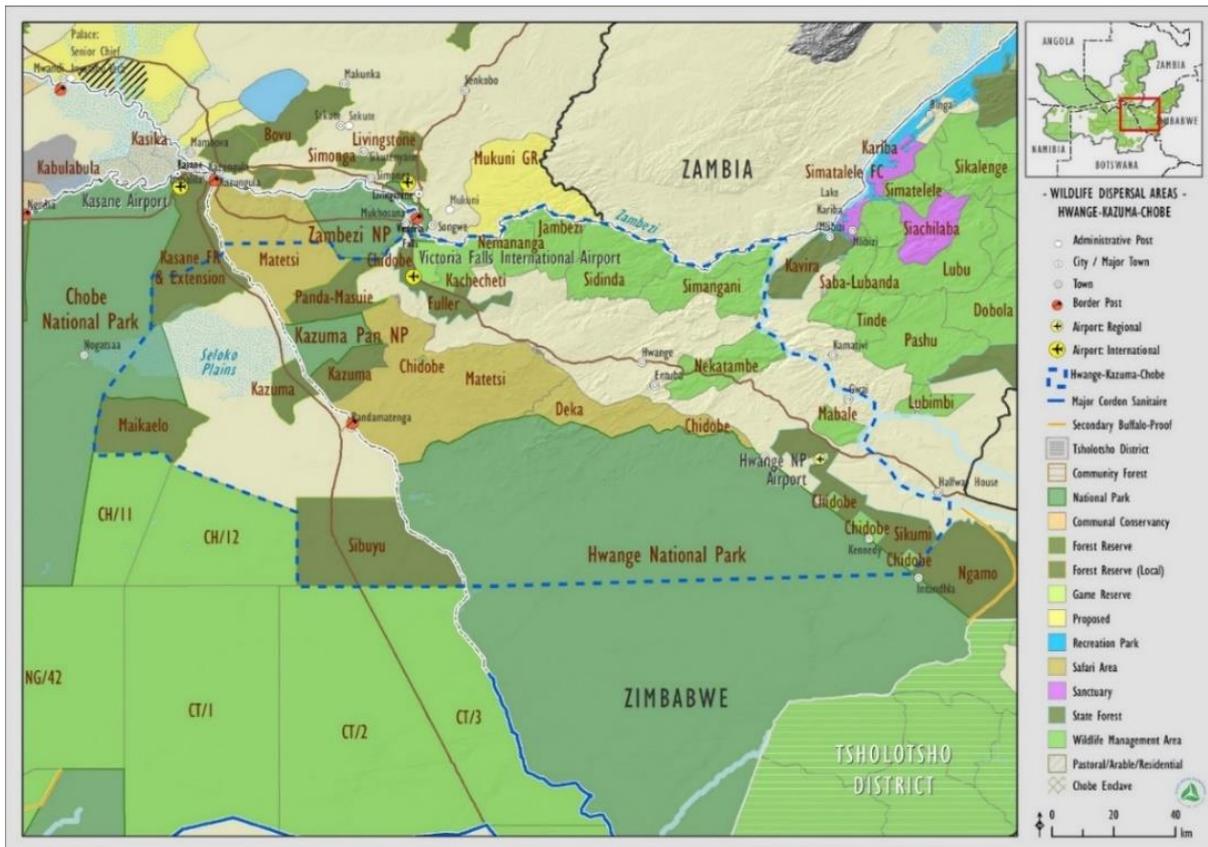


Figure 2: Map of Hwange-Kazuma-Chobe WDA

As a result, KAZA TFCA offers a unique opportunity to understand the value of a landscape level conservation and its contribution towards socio-economic benefit to local communities. Lions are an iconic African species and one of the Big Five that draws local and international tourists to KAZA TFCA (UNWTO Briefing Paper, 2015). According to Loveridge *et al.* (2009), large, charismatic species such as African lions, and wide-ranging animals are often employed as focal species for prioritizing landscape linkages in threatened ecosystems (i.e. 'connectivity conservation'). Thus, using current landscape connectivity modelling methods, a generalized understanding of African lions can be generated (Cushman, 2011) to facilitate more effective policy making, particularly related to the conservation and economic contribution of lions and challenges they face in KAZA TFCA.

KAZA has prioritised and progressively institutionalised Wildlife Dispersal Areas (WDAs) as a strategy for sustaining and restoring transboundary wildlife movements (KAZA Master IDP, 2015). WDAs have been designated as transboundary interventions and are at the heart of national IDPs and the Master IDP. Six WDAs have been identified: Kwando River; Zambezi-Chobe Floodplain; Zambezi-Mosi Oa Tunya; Hwange-Kazuma-Chobe; Hwange-Makgadikgadi-Nxai and Khaudum-Ngamiland. These WDAs provide critical linkages between protected areas at both national and regional levels. It is imperative to note that the Partner States are at various stages of incorporating WDAs into their planning processes and ensuring legal protection of key corridors.

Specifically, the study area will be one of the most critical areas for connectivity conservation and is called the Hwange-Kazuma-Chobe Wildlife Dispersal Area (HKC WDA), which provides a connection between the richly biodiverse Hwange/Kazuma and Chobe ecosystems. The HKC WDA stretches in a NW-SE direction, split by the international border between Botswana (to the west) and Zimbabwe (to the east). The 25,000 km<sup>2</sup> area encompasses woodland ecosystems, interspersed with acacia, mixed mopane and wooded grasslands. The HKC WDA comprises wildlife dispersal routes for lions, elephants, hyenas and other species, and is home to over 100 mammal and 400 bird species.

It is no doubt that findings of this study assist current conservation efforts, help to strengthen ecological integrity and prevent species loss (African lion). However, it will be of paramount importance to raise awareness of the benefits of increasing landscape connectivity and closing the gap between policy intent and what is happening on the ground. This will immensely assist in the design and implementation of policies aimed at improving connectivity, human-wildlife coexistence and tourism development.

### **Expected Outcomes (some)**

- Empirically generated lion landscape connectivity model for Hwange-Kazuma-Chobe WDA
- Ascertaining current connectivity and future threats that require mitigation to maintain landscape connectivity
- Production of a spatial map that models human-lion conflict in Hwange-Kazuma-Chobe WDA; hence improve scientific understanding required to mitigate these human-lion conflicts. Prioritization of human-lion conflict mitigation efforts will thus be made easier and effective.
- Identification and recommendation of critical policies, strategies, practices, approaches etc

### **Conservation Implications (some)**

KAZA is home to the largest geographically intact population of African lions and other carnivores remaining in the wild and is vital for genetic diversity within the region. Therefore, connectivity among protected areas surrounded by an increasingly human dominated landscape is important for KAZA's carnivore populations to remain both viable and genetically healthy.

Securing connectivity within the Hwange-Kazuma-Chobe WDA is therefore essential in maintaining the integrity of the broader landscape of the KAZA TFCA. However, a number of anthropogenic pressures could threaten this connectivity. Livestock depredation by predator species, particularly lion, continues to be a source of conflict with pastoral farmers in the WDA. Actions that would be undertaken to reach this end include alignment of existing land use plans across borders, support to interventions that seek to secure wildlife corridors and convening multi-sectoral, multi-stakeholder forums to negotiate and resolve existing and emerging land use conflicts.

The use of landscape connectivity modelling methods and GIS will greatly assist in understanding how such movement enhances knowledge on various existing bottlenecks, areas of concern and areas where increased protection could improve the effectiveness of wildlife dispersal areas.

As one of the world's most important region for lion conservation, KAZA could significantly contribute to maintaining lion populations and habitat. Globally, primarily because of habitat loss and fragmentation, as well as, human-wildlife conflict, lion numbers are estimated to have been reduced by more than 43% during the period 1993–2014 (being approximately three lion generations; Bauer et al., 2017).

Protected areas in KAZA serve as core habitat for lion – as well as other carnivores – but the conservation of Wildlife Dispersal Areas that serve as linkages between these key areas is equally crucial. Additionally, the understanding of key hotspots and reduction of human-wildlife conflict is essential to ensure that the Wildlife Dispersal Area will remain functional.

### **BUILD-UP TO FIELDWORK**

Shortly before departure for fieldwork, I had an opportunity to be in the organizing team for the International Conference on Human-Wildlife Conflict and Co-existence held in Oxford, UK from 29<sup>th</sup> March – 1<sup>st</sup> of April 2023. This was a very important and strategic platform which did not only provide myself with the prospect of networking and sharing ideas/experiences with diverse experts, but also enabled the unique occasion of interacting with Rufford Foundation team comprising of CEO (Stuart Paterson), Grants Manager (Simon Mickleburgh) and Grants Officer (Mariam Weston).



Rufford Foundation CEO Stuart Paterson and Godfrey Mtare International Conference on HWCC, Oxford, UK



International Conference on HWCC, Oxford, UK

## FIELDWORK ACTIVITIES (April – MAY 2023)

### Engagement of stakeholders



Dr Nyambe Nyambe (Executive Director – KAZA Secretariat)



Mr Malvern Karidozo (Director Connected Conservation)



Netsai Bollman (KAZA Secretariat & Farai Chimba (HAZ)



Mr Alan Sparrow (Mukusi Conservation Trust)



ZimParks Personnel

### Community engagement



Community meeting – Hwange communal

### Tourism potential

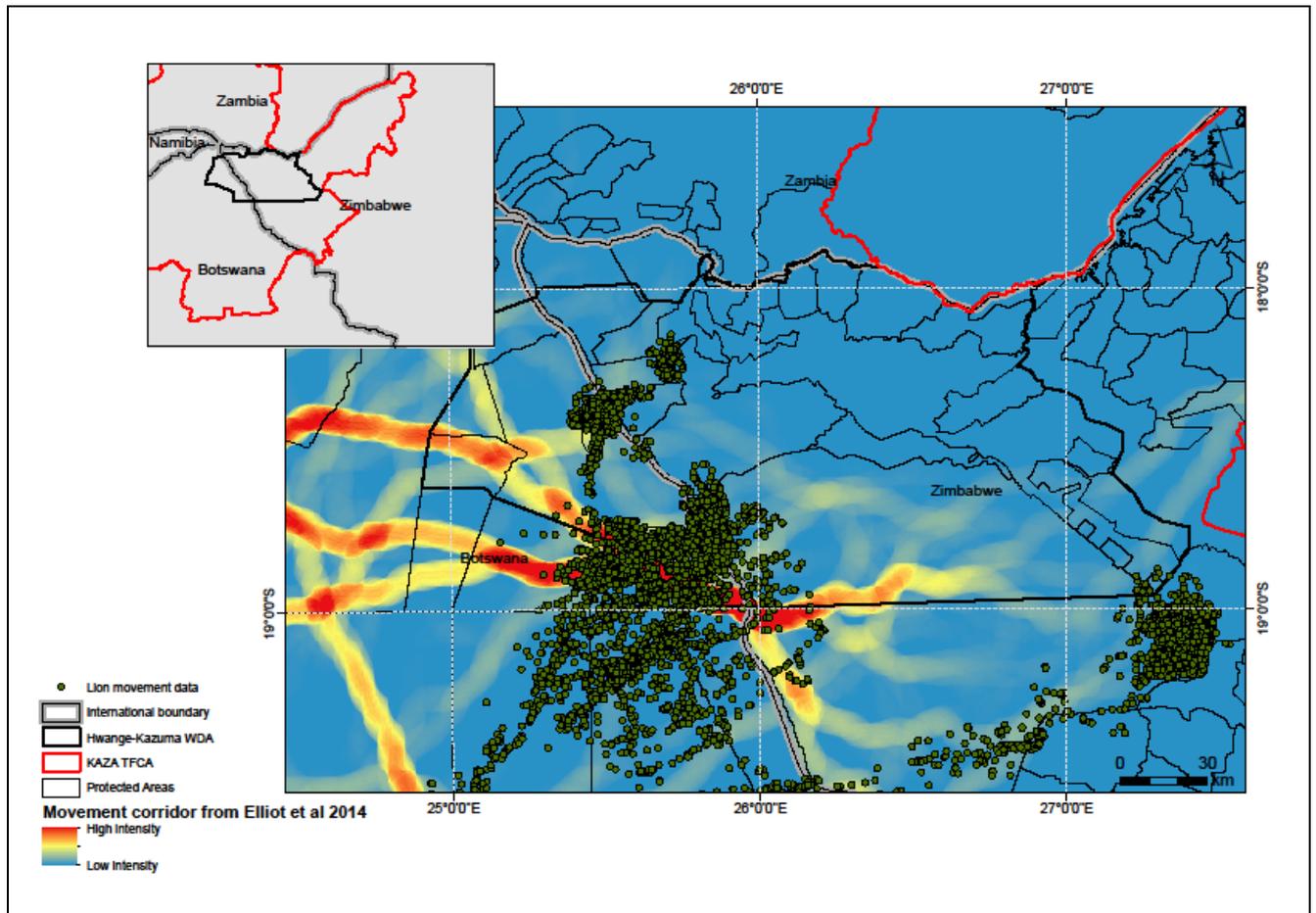


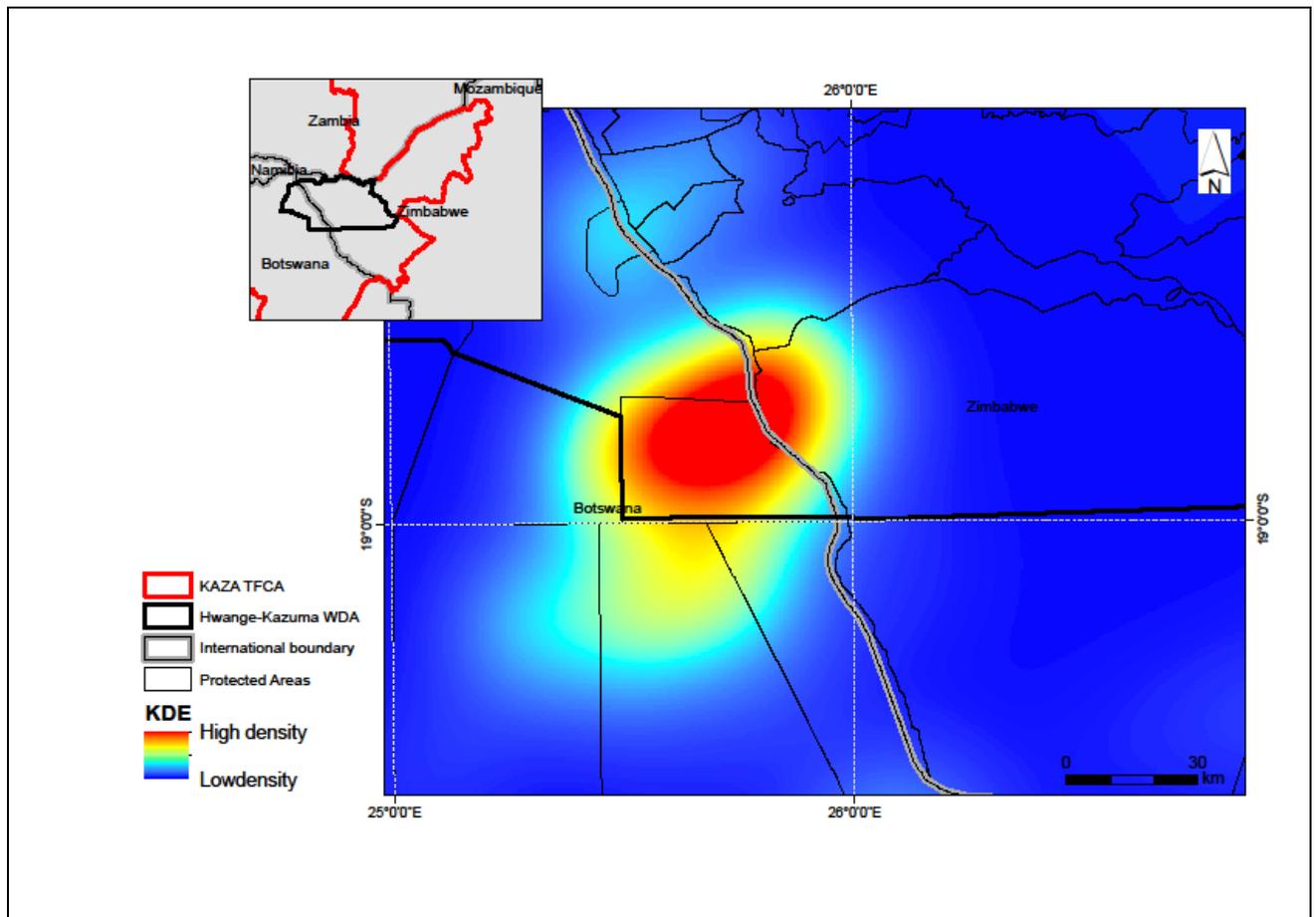
Booming tourism in Hwange National Park



Victoria Falls Rainforest and Zimbabwe Tourism Authority Office

## Preliminary analyses on landscape connectivity utilizing African lion movement data





The two maps above are from the preliminary analyses on landscape connectivity utilizing some of African lion movement data. Remaining data shall be incorporated to provide a broader and clear fine understanding of how landscape connectivity within the HKC WDA is /not playing.

### Outcomes attained through fieldwork

- a) The study has played a crucial role in understanding the role of connectivity within the Hwange-Kazuma-Chobe Wildlife Dispersal Area. The data collected and preliminary analysis are quite insightful and is being used to empirically generate lion landscape connectivity model for Hwange-Kazuma-Chobe WDA (as demonstrated in preliminary analyses above).
- b) Preliminary evidence for socio-economic and ecological benefits for local communities and lions, respectively, due to connectivity.
- c) Identification of sound management policies that will facilitate free movement of African lions and also promoting seamless transboundary natural resources management.