TRANSBOUNDARY CORRIDOR ATLAS FOR THE SOUTHERN KENYA-NORTHERN TANZANIA (SOKNOT) LANDSCAPE

MARCH 2026

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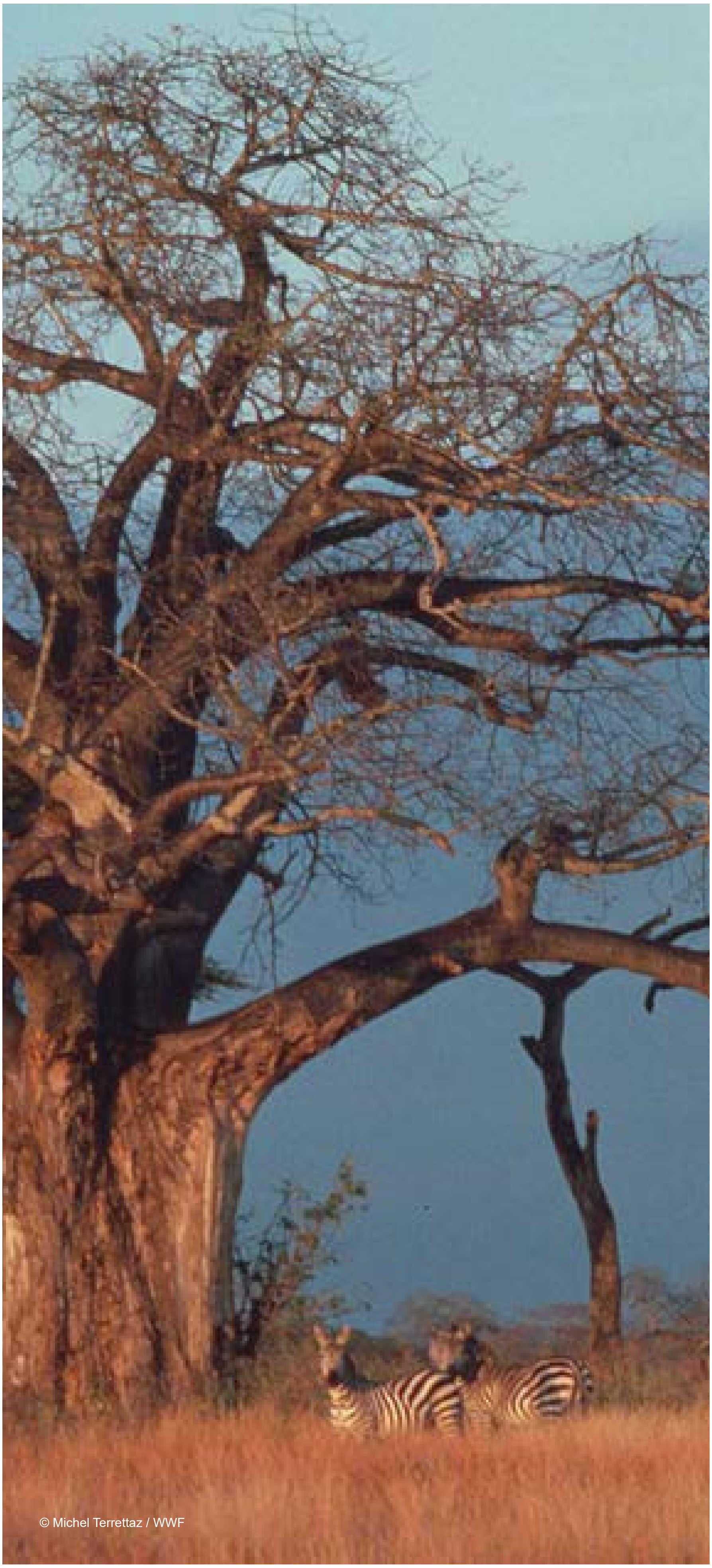
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March 2026

Suggested Citation:

Mtili, B., Creech, T., Oppler, G., Laur, A., and Keeley, A.T.H. (2025). Transboundary Corridor Atlas for the Southern Kenya-Northern Tanzania (SOKNOT) Landscape. Report prepared for WWF.

ACKNOWLEDGMENTS

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African Wildlife Foundation
Amboseli Ecosystem Trust
Amboseli Trust for Elephants
Big Life Foundation
Carleton College
Center for Large Landscape Conservation
Cheetah Conservation Initiative
College of African Wildlife Management-Mweka
Community Wildlife Management Consortium
Directorate of Resource Surveys and Remote Sensing
East African Community Think Tank
Enduimet Wildlife Management Area
Giraffe Conservation Foundation
Glasgow University - Serengeti Biodiversity Program
Grumeti Fund
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International Fund for Animal Welfare
Kenya Wildlife Conservancies Association
Kenya Wildlife Service
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Kope Lion
Maasai Mara Wildlife Conservancies Association
Maasai Steppe Carnivore Conservation Trust
Maasai Wilderness Conservation Trust
Makao Wildlife Management Area
Mara Predator Project of Kenya Wildlife Trust
Ngorongoro Conservation Area Authority
Oikos EA
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ACRONYMS

CBD	Convention on Biological Diversity
CLLC	Center for Large Landscape Conservation
CMS	Convention on Migratory Species
CWD	Cost Weighted Distance
ESA	European Space Agency
GBIF	Global Biodiversity Information Facility
GPS	Global Positioning System
HM	Human Modification
HWC	Human-Wildlife Conflict
INAT	iNaturalist
IUCN	International Union for the Conservation of Nature
LTI	Linear Transport Infrastructure
MNRT	Ministry of Natural Resources and Tourism
MOU	Memorandum of Understanding
NGO	Non-Governmental Organisation
OECMs	Other area-based Effective Conservation Measures
PAI	Protected Area Isolation Index
QECI	Quebec Ecological Corridors Initiative
RSF	Resource Selection Function
SOKNOT	Southern Kenya–Northern Tanzania Transboundary Landscape
TAWIRI	Tanzania Wildlife Research Institute
TFCA	Transfrontier Conservation Area
TNC	The Nature Conservancy
UNEP-WCMC	United Nations Environment Programme-World Conservation Monitoring Centre
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UTM	Universal Transverse Mercator
VIF	Variance Inflation Factor
WDPA	World Database on Protected Areas
WMA	Wildlife Management Area
WWF	World Wide Fund for Nature

EXECUTIVE SUMMARY


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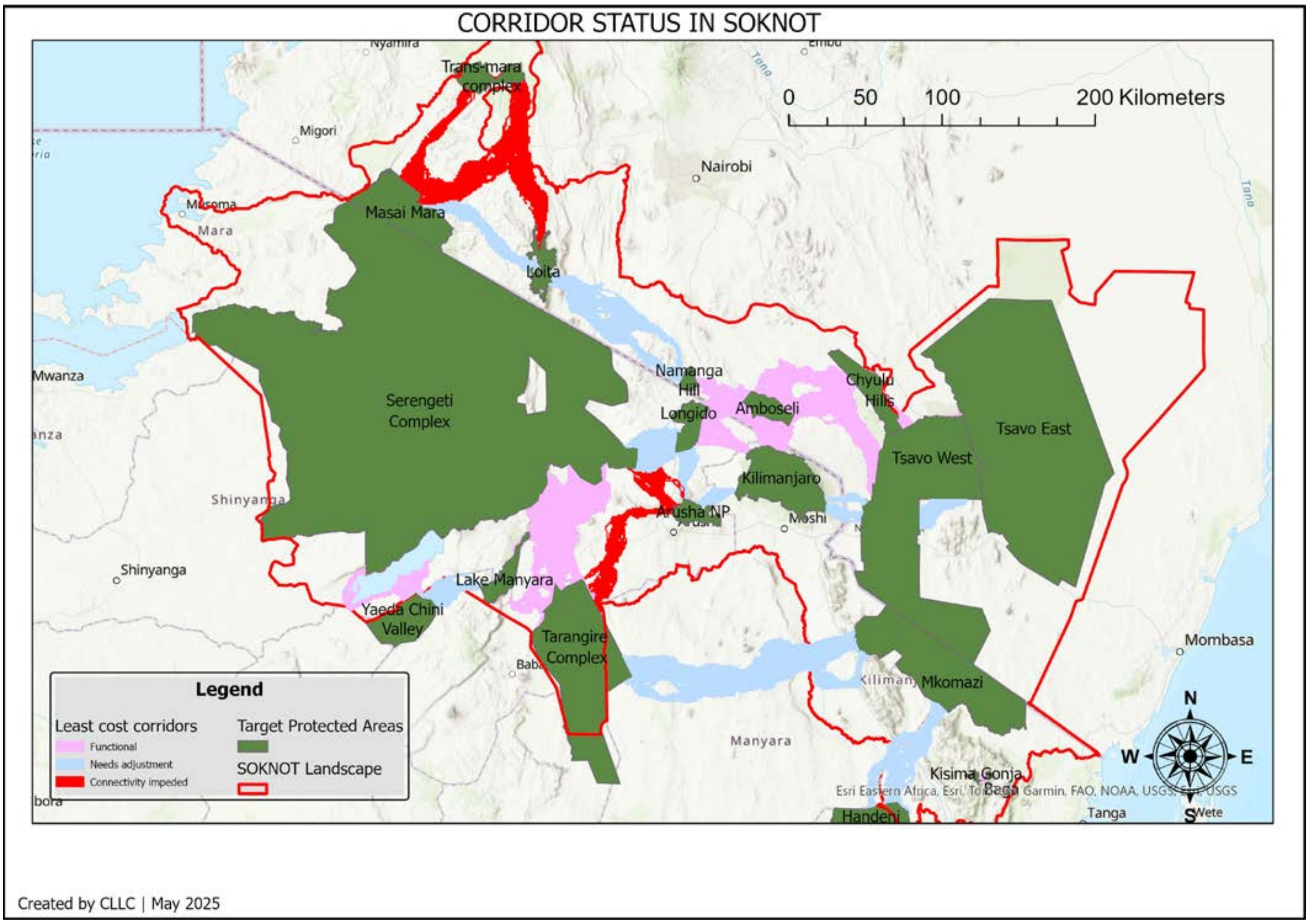
This report outlines the results of a consultancy focused on creating a Transboundary Corridor and Connectivity Atlas for the Southern Kenya–Northern Tanzania (SOKNOT) landscape, a vital step toward protecting the region's rich biodiversity. The objective of this initiative was to assess wildlife corridors comprehensively, establish baseline connectivity indicators, and identify the necessary conditions for effective governance and management, ultimately supporting evidence-based conservation planning.

The consultancy began with a Transboundary Workshop held in August 2024 in Arusha, Tanzania. The workshop brought key stakeholders in the region together to share past and ongoing connectivity planning and implementation programs and agree on additional information needed. Among the key outputs of the workshop were a consensus to develop indicators for monitoring and to build on existing corridor conservation efforts by assessing them for the functionality of a set of focal species, which are African savanna elephants, plains zebra, common wildebeest, Maasai giraffe, lion, cheetah, and African wild dog. These outputs provided a strong foundation for the consultancy and reinforced the importance of coordinated transboundary collaboration.

Tanzania had already mapped structural corridors, offering a critical starting point for the initiative. However, given the lack of similar data in Kenya, the next step involved modelling the structural corridors in Southern Kenya to complete and integrate the entire transboundary corridor network. Once the complete corridor set was established, connectivity indicators were developed to track and assess their functionality over time.

The final phase of the consultancy focused on assessing the structural corridors using focal species-specific datasets and landscape variables, combined with advanced GIS and remote sensing techniques. This involved using CircuitScape, a tool based on electrical circuit theory, to simulate species movement across diverse landscapes. Additionally, optimal movement routes taken by species were identified using the least-cost path algorithm. This approach provided a comprehensive understanding of the functionality of the wildlife corridors for the seven focal species and resulted in conclusions regarding the functionality of the corridors and recommendations about the corridor boundaries (Figure 1).



Created by CLLC | May 2025

Figure 1. *Map of structural wildlife corridors between protected areas in the Southern Kenya and Northern Tanzania (SOKNOT) landscape, located in areas of low human impact. Based on species-specific data, the corridors are classified as functional, needing adjustment, or impeded, to guide management and restoration efforts.*

The culmination of this work is the Transboundary Corridor and Connectivity Atlas, a comprehensive resource presented both as a detailed PDF report and data for an interactive online platform. This Atlas provides valuable visual representations of the mapped corridors, species movement patterns, and priority conservation areas, offering essential tools for decision-makers and conservation practitioners. It also examines enabling conditions for corridor conservation, highlighting the crucial role of corridor legislation, ongoing collaboration, adaptive management, and continuous monitoring in maintaining and enhancing ecological connectivity.

The findings underscore the importance of sustained transboundary collaboration, adaptive management, and data-driven decision-making, and the Atlas serves as a valuable resource for conservation planning and policy development to safeguard ecological connectivity and biodiversity in the SOKNOT region.

Based on the findings, the main conclusions for the corridors are as follows:

- 13 of the 24 corridors were considered functional for six or all seven focal species;
- In four cases, it is recommended that the corridor boundaries being changed to remove populated and farmed areas;
- For four corridors, the delineated structural corridor could be shifted to an area where the majority of the functional species movement is located;
- In two cases, the functional species data suggests it would be valuable to protect two separate corridors between a pair of protected areas;
- In four corridors, extensive human development has impeded connectivity to the point that it is greatly impeded or already lost; and
- For one corridor, its delineation overlaps greatly with protected areas and does not need any consideration.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Overarching recommendations for applying the Atlas include:

1. Corridor **delineations** in both countries should align with the outputs of the Atlas. The corridors assessed in this initiative are informed by diverse datasets from numerous conservation and science organisations, making them both scientifically reliable and representative of many stakeholders.

2. In Kenya, move towards official **legislation** which recognises corridors as a conservation tool to complement protected areas. Tanzania's corridor legislation provides a solid path towards corridor implementation. Similar laws and policies in Kenya will allow for more cohesive transboundary conservation for wide-ranging wildlife species.


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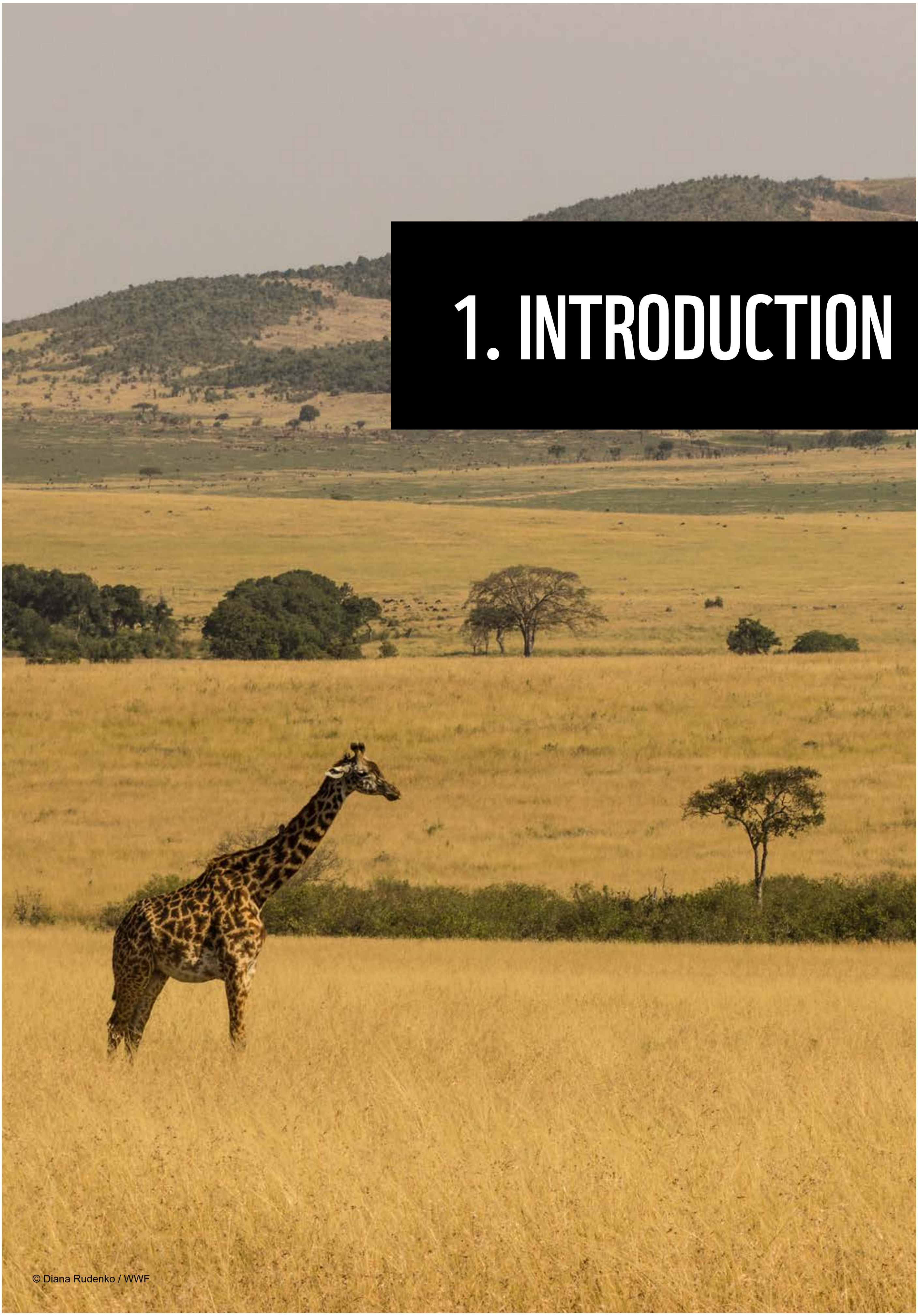
3. Support efforts to **monitor** the SOKNOT corridors with defined indicators. Monitoring is an essential component of adaptive management. Corridors must be assessed for long term functionality to allow authorities to track progress and adapt to changing conditions. Table 22 of the Atlas provides a monitoring framework for SOKNOT corridors, detailing Indicator name, Indicator description, Data source, Frequency of data updates, and Recommended frequency of indicator updates.

4. For each corridor, identify a corridor coordinator and engage stakeholders in developing a **governance structure** and a **management and monitoring plan.** A large-scale, transboundary vision for ecological connectivity is the first step in effectively conserving wildlife movement. The next steps focus on individual corridors and what is needed in each. The *Roadmap to Connected Landscapes and Seascapes* that accompanies the Atlas provides details on how corridor teams can be assembled and how they can apply a template for corridor management and monitoring plans.



1. INTRODUCTION

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1.1. IMPORTANCE OF THE LANDSCAPE

The Southern Kenya–Northern Tanzania (SOKNOT) transboundary landscape is one of the most iconic regions in the world and among the most ecologically and economically significant regions in East Africa (Tyrrell et al., 2022; Western et al., 2020), spanning approximately 160,077 sq km. It encompasses diverse ecosystems, including vast savannas, wetlands, forests, grasslands, and highland areas that support remarkable biodiversity. This landscape serves as a stronghold for globally significant wildlife populations, including African savanna elephants *(Loxodonta africana)*, black rhinoceros (*Diceros bicornis*), lions (*Panthera leo*), cheetahs (*Acinonyx jubatus*), African wild dogs *(Lycaon pictus*), Maasai giraffes (*Giraffa tippelskirchi tippelskirchi*), plains zebras (*Equus quagga*), and common wildebeests (*Connochaetes taurinus*).

The SOKNOT landscape is internationally recognised for its iconic conservation areas, including three UNESCO World Heritage Sites: Ngorongoro Conservation Area, Serengeti National Park, and Kilimanjaro National Park. It also includes several UNESCO Biosphere Reserves such as Amboseli, Lake Manyara, Serengeti National Park, and Ngorongoro Conservation Area. Additionally, the region contains a Ramsar site, Lake Natron, and four Important Bird Areas: Lake Natron, Loita, Amboseli, and West Kilimanjaro (WWF Tanzania, n.d.). These international designations reflect the landscape's exceptional ecological value and highlight its importance in global conservation efforts.

Beyond its ecological importance, SOKNOT provides critical ecosystem services that sustain both wildlife and local human populations. Major wetlands such as Lakes Natron, Magadi, Challa, and Jipe serve as essential breeding grounds for species such as the lesser flamingo (WWF Tanzania, n.d.), while river systems such as the Mara and Pangani provide water for agriculture, pastoralism, and domestic use (Turpie, 2008). These natural resources are vital for the livelihoods of communities that depend on livestock, farming, and eco-tourism.

Tourism is a major economic driver in SOKNOT (Peters, 2006), with millions of visitors drawn to the region's rich biodiversity and spectacular wildlife events, such as the annual Serengeti-Mara wildebeest migration. This natural phenomenon, often referred to as the 'seventh wonder of the natural world', involves more than 1.5 million wildebeests and hundreds of thousands of zebras and gazelles traversing the plains in search of grazing land. The tourism industry generates significant revenue for both Kenya and Tanzania, supporting conservation efforts and providing employment opportunities for local communities.

Despite its ecological and economic importance, SOKNOT faces significant challenges that threaten its connectivity and overall biodiversity. Habitat fragmentation, driven by land conversion for agriculture, infrastructure development, and human settlements, disrupts traditional wildlife migration routes and corridors (Hobbs, Reid, et al., 2008; Tyrrell et al., 2022). Increasing human-wildlife conflicts, competition over natural resources, impacts of climate change, and unsustainable land-use practices further exacerbate these threats (Ogutu et al., 2014). A strategy for SOKNOT (see it here) to address these challenges has been developed (WWF, 2024). Without strategic intervention, the degradation of these critical landscapes could have severe consequences for both wildlife and the communities that depend on them.

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1.2. IMPORTANCE OF CONNECTIVITY

Ecological connectivity is defined as “the unimpeded movement of species, connection of habitats without hindrance, and the flow of natural processes that sustain life on Earth” (CMS, 2024). It is crucial for maintaining the long-term health and functionality of the SOKNOT landscape. Connectivity allows wildlife to move freely between habitats, access critical resources, adapt to environmental changes, and maintain genetic diversity (Hilty et al., 2019). Ecological corridors are a key connectivity conservation tool. They are defined by the International Union for the Conservation of Nature (IUCN) as “clearly defined geographical spaces that are governed and managed over the long term to maintain or restore effective ecological connectivity” (Hilty et al., 2020). In SOKNOT, ecological corridors are usually referred to as ‘wildlife corridors’, and throughout this report, we will use the terms ‘wildlife corridor’ or just ‘corridor’. Wildlife corridors serve as linkages between key protected areas and as dispersal zones (Hilty et al., 2020; Stewart et al., 2019). They enable seasonal migrations, reduce human-wildlife conflicts, and ensure that fragmented habitats remain functional ecosystems. The loss of connectivity due to habitat fragmentation poses serious risks to wildlife populations (Ghoddousi et al., 2020). When natural movement routes are blocked by human settlements, infrastructure development, or agricultural expansion, wildlife populations become isolated, leading to increased competition for resources, inbreeding, and higher mortality rates. Disrupted movement patterns also force wildlife into human-dominated landscapes, escalating conflicts between people and animals, particularly in areas where agricultural activities encroach on traditional wildlife habitats (Ogutu et al., 2014).

Maintaining and restoring connectivity within SOKNOT requires a multifaceted approach, including:

- **Mapping and securing critical corridors:** Identifying key movement pathways and ensuring they remain open through land-use planning and conservation agreements.
- **Community engagement:** Working with local communities to implement conservation-friendly land-use practices, such as pastoralism with sustainable grazing management and wildlife-friendly agriculture.
- **Transboundary collaboration:** Strengthening cooperation between Kenya and Tanzania to create policies that support cross-border conservation efforts.
- **Sustainable infrastructure planning:** Designing roads, fences, and settlements in a way that minimises disruption to wildlife movement.

By prioritising connectivity, conservation efforts can enhance the resilience of the SOKNOT landscape, ensuring that its rich biodiversity continues to thrive while also supporting sustainable development and livelihoods for local communities.


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1.3. BENEFITS OF WILDLIFE CORRIDORS FOR LOCAL COMMUNITIES

Wildlife corridor implementation can pose social challenges because corridors often traverse regions where people live and work, particularly when they intersect with local land-use practices, agricultural expansion, or infrastructure development supported by governments. These tensions can create friction between conservation goals and the livelihood needs of local communities (Bollig, 2024). However, wildlife corridors also offer a range of benefits to local communities.

One key advantage of wildlife corridors is their role in enhancing ecosystem services. These corridors support vital ecological functions such as water purification, soil fertility, and carbon sequestration. For example, the Nyerere Selous–Udzungwa Wildlife Corridor in Tanzania has demonstrated significant benefits by increasing ecosystem service values, including improved carbon storage and water regulation. These benefits contribute not only to local livelihoods but also to broader climate resilience goals (Hilton et al., 2024).

Wildlife corridors contribute significantly to local economies. Community-managed conservancies within or near these corridors may attract ecotourism by offering wildlife viewing experiences, which generate income and employment for residents (Bollig, 2024). Additionally, conservation activities linked to corridor management, such as habitat restoration, ecological research, and environmental education, can further support job creation and community development.

Perhaps one of the most immediate benefits of wildlife corridors is their potential to mitigate human-wildlife conflict (HWC). As human populations grow and natural habitats become more fragmented, conflicts over resources such as crops, water, and livestock become increasingly common. Wildlife corridors help reduce these conflicts by providing animals with safe passage through human-dominated landscapes, thereby minimising encounters between humans and wildlife. In the Selous-Niassa Wildlife Corridor, for example, the use of early warning systems and farm-based mitigation strategies, such as chilli oil and beehive fences, have been shown to reduce crop damage by elephants (Montero-Botey et al., 2021, 2025; Montero-Botey, 2023; von Hagen et al., 2024). Importantly, involving local communities in the design and implementation of these measures ensures that solutions are practical and locally appropriate (Montero-Botey et al., 2021; Montero-Botey et al., 2022).

Beyond tangible benefits, wildlife corridors can also foster a deeper sense of environmental protection. When communities are empowered to manage natural resources and directly benefit from conservation efforts, it can strengthen local pride and long-term support for biodiversity initiatives (Boudreaux & Nelson, 2011).

Ultimately, the success of wildlife corridors hinges on careful planning and inclusive governance. Aligning ecological goals with economic and social priorities through community engagement, transparent decision-making, and the integration of local knowledge can ensure that local communities benefit from and therefore support wildlife corridors.

1.4. ECOLOGICAL NETWORKS

Ecological networks for conservation are defined by IUCN as "systems of core habitats (protected areas, other area-based Effective Conservation Measures (OECMs) and other intact natural areas), connected by ecological corridors. They are established, restored as needed, and maintained to conserve biological diversity in systems that have been fragmented" (Hilty et al., 2020). The IUCN Connectivity Conservation Guidelines provide essential guidance on conserving ecological corridors (Hilty et al., 2020; Box 1). They offer managers, policymakers, and experts best practices and recommendations for achieving more connected ecosystems. They specifically provide guidance for governments and conservation practitioners to plan and implement ecological corridors, including considerations for their delineation, governance, tenure, management, and long-term monitoring, evaluation, and reporting. In addition, the Guidelines detail the many ways in which ecological corridors and networks can provide communities with social and economic value.

BOX 1. FUNDAMENTAL PRINCIPLES OF ECOLOGICAL CORRIDORS

(based on Hilty et al., 2020)

Every ecological corridor should be founded on a set of objectives that concisely explains why the corridor is being designated and what the expected conservation outcomes are. Keeping a few fundamental principles in mind will be helpful.

1. Ecological corridors should be identified and established in areas where connectivity is required with the aim of building ecological networks for conservation.
2. Each corridor should have specific ecological objectives and be governed and managed to achieve connectivity outcomes.
3. Ecological corridors may consist partly or entirely of natural areas managed primarily for connectivity. Corridors can also cross highly managed areas – such as ranches or commercial forests – provided the area within the corridor is explicitly managed for connectivity. In some cases, a corridor can combine a natural area and an area managed for extraction. So long as their conservation objectives are supported, ecological corridors may include compatible human activities that practice sustainable resource use.
4. Ecological corridors should be differentiated from non-designated areas by the specific uses that are allowed or prohibited within them. Whereas surrounding lands may look similar, and have similar uses, the uses allowed inside a designated ecological corridor cannot harm its specified connectivity purposes.

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1.5. PAST AND ONGOING CONNECTIVITY WORK IN SOKNOT

Both nations, Kenya and Tanzania, have recognised the essential role of corridors for maintaining the movements of wildlife species, preserving genetic diversity, and ensuring ecosystem health. These efforts are particularly significant for the conservation of iconic species such as elephants, lions, and wildebeests, whose migratory and dispersal areas span across these regions.

Kenya's commitment to connectivity conservation is well documented through multiple initiatives, particularly the Kenya Vision 2030: Wildlife Migratory Corridors and Dispersal Areas report (Ojwang' et al., 2017). This report laid the foundation for understanding the connectivity needs of key wildlife species and the geographical areas that serve as critical migratory corridors and dispersal zones. The report utilised spatial data and expert input to map 6,226 kilometres of migratory routes, identifying 110 key movement routes. The Borderlands Conservation Initiative, which ran from 2012 to 2018, was a key project aimed at integrating connectivity into land use practices, especially in areas with overlapping human and wildlife populations. A key aspect of Kenya's ongoing connectivity efforts involves community-based conservation. Monitoring wildlife movements has been central to informing the connectivity conservation in Kenya. The Nature Conservancy is currently working on creating a workflow that can be updated regularly to inform future conservation planning within and beyond the existing conservation network. It aims to expand the number of wildlife species and taxa represented, integrate multiple data sources, account for seasonal variability, be expandable to include climate change scenarios, estimate and map high- and low-connectivity areas with open-source software, and evaluate the contribution of connectivity within and among conservancies (Anne Trainor, pers. comm.).

Tanzania's work on wildlife corridors can be traced back to the 2009 Wildlife Corridors Report by the Tanzania Wildlife Research Institute (TAWIRI), which identified and classified different types of corridors, including confirmed, unconfirmed, and potential corridors. In 2018, Tanzania passed regulations regarding the establishment and management of corridors, dispersal areas, buffer zones, and migratory routes. These regulations underline the government's commitment to enhancing landscape-level connectivity and maintaining the function of critical habitats. The Tanzania Wildlife Conservation Act cap. 283 defines wildlife corridors as essential for the seasonal movement of species between ecosystems in search of resources such as water, food, and space. The act emphasises the importance of wildlife corridors in maintaining ecological connectivity and lays out a framework for the long-term management and restoration of these areas.

As called for in the regulations, in the Tanzania Wildlife Corridor Assessment, Prioritisation, and Action Plan (Ministry of Natural Resources and Tourism, 2022), wildlife corridors across Tanzania, including critical transboundary corridors to protected areas in Kenya, were delineated, assessed, and prioritised, and a priority action plan was developed. A National Wildlife Corridors Forum and a National Wildlife Corridors Task Team have been formed to move the ambitious corridor plans forward. The National Wildlife Management Areas Strategy 2023-2033 includes provisions for integrating wildlife connectivity into land-use planning, infrastructure development, and broader conservation efforts. The strategy outlines clear actions for promoting wildlife corridors and dispersal areas and highlights the importance of community engagement in these efforts.

Several assessments and restoration efforts are ongoing in individual corridors. Examples of activities are biodiversity assessment in wildlife corridors, community conservation education, community support, participatory mapping, boundary identification and demarcation, and developing management Plans in Wildlife Management Areas that overlap with corridors. Corridor assessments are specifically taking place in the Yaeda Chini Wildlife Corridor and the Yaeda Chini-Dumbechand-NCAA Corridor. The Kwakuchinja Community-Based Landscape Connectivity Model is a cutting-edge, comprehensive approach to implementing an individual corridor.

Both Kenya and Tanzania's efforts align with international frameworks and commitments, particularly the Convention on Biological Diversity (CBD), the Convention on Migratory Species (CMS), and the Transfrontier Conservation Area (TFCA) initiatives, to which both countries are co-signers. These international agreements emphasise the need for cross-border cooperation in conservation where the movement of wildlife crosses national boundaries.

1.6. FOCAL SPECIES

The SOKNOT transboundary landscape supports a diverse range of wildlife species, many of which depend on connectivity for their survival. Our consultancy focuses on validating wildlife corridors for seven species: African savanna elephant, common wildebeest, plains zebra, Maasai giraffe, lion, cheetah, and African wild dog.

Throughout the report, we will refer to them simply as elephant, wildebeest, zebra, giraffe, lion, cheetah, and wild dog. These focal species were selected because they are known to occur within the SOKNOT landscape, and relevant data on their presence and movements is available from conservation partners.

1.7. OBJECTIVE/PURPOSE OF THE CONSULTANCY

The primary objective of this consultancy was to develop a comprehensive Transboundary Corridor and Connectivity Atlas based on the habitat and movement needs of a set of focal species within the SOKNOT landscape. This Atlas builds on previous connectivity efforts in the region and contains (1) spatial data relevant to connectivity conservation, (2) an assessment of wildlife corridors as to their functionality for a set of focal species, (3) baseline connectivity indicator values for continued monitoring of the state of corridors in SOKNOT, and (4) a discussion of enabling conditions for successful corridor implementation.

KEY OUTPUTS

A shared wildlife and resource database:

This database will be a central repository, enabling seamless data sharing among partners, researchers, and stakeholders. It will facilitate the collection, management, and analysis of data related to wildlife populations, habitats, and patterns, ensuring that all involved parties have access to up-to-date and comprehensive information.

Assessment of corridor functionality:

We provide a detailed evaluation of the effectiveness and viability of wildlife corridors. This assessment will help identify areas where corridors are functioning well and those where improvements are needed, guiding targeted conservation actions.

Application of connectivity indicators to SOKNOT corridors as a baseline for regular monitoring:

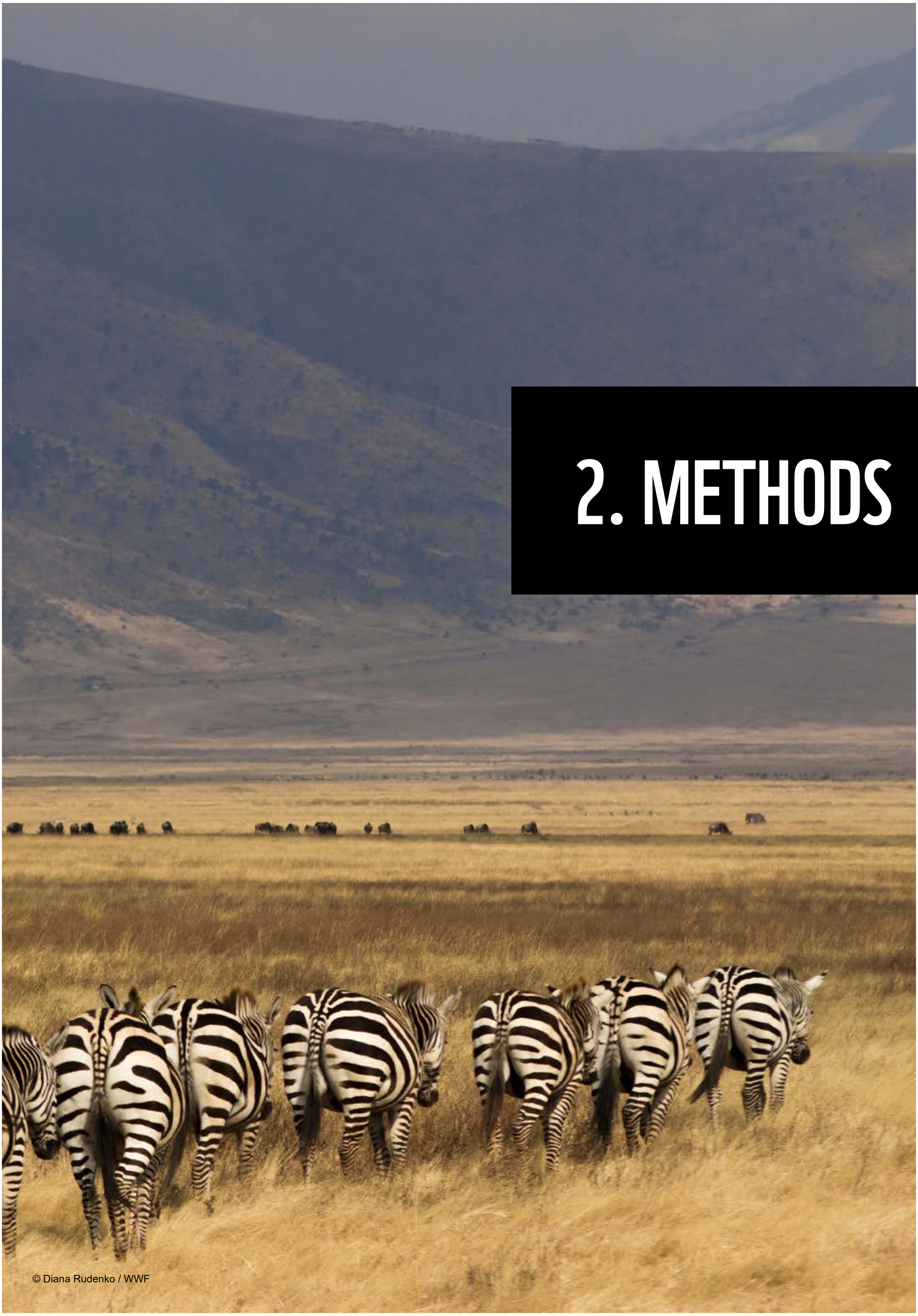
We selected informative connectivity indicators and computed them for the SOKNOT corridors, serving as a benchmark for ongoing monitoring efforts. This baseline will enable conservationists to track changes and trends over time, ensuring that the corridors continue to support wildlife movement and ecosystem health.

Enabling conditions for transboundary collaboration and adaptive management:

We identified enabling conditions necessary for effective transboundary collaboration, adaptive management, and the establishment of governance structures that support corridor management.

Transboundary corridor and connectivity atlas:

The final product of this consultancy is a transboundary corridor and connectivity atlas. This is presented both as this PDF document and an online platform to allow for ongoing updates. The atlas visually represents key corridors, species-specific movement data, and connectivity assessments, serving as a valuable resource for conservation planning and policy development in the SOKNOT landscape.



2. METHODS

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Here, we describe our approaches to modelling and assessing the functionality of structural corridors and developing a framework for monitoring wildlife corridors in SOKNOT.

2.1. STAKEHOLDER ENGAGEMENT WORKSHOP

An essential component of the project is engaging stakeholders at key stages of the process. This engagement was initiated with the Transboundary Multi-Species Functional Connectivity Workshop, held on 7-8 August 2024 in Arusha, Tanzania (Figure 2). The primary objective of the workshop was to collaboratively develop strategies for assessing and monitoring wildlife corridors in the SOKNOT landscape, focusing on the seven focal species.

Figure 2. *Participants of the Transboundary Multi-Species Functional Connectivity Workshop, held on 7-8 August 2024 in Arusha, Tanzania. Courtesy of Gladith Yoabu (WWF).*

2.2. MODELLING STRUCTURAL CORRIDORS FOR THE SOKNOT LANDSCAPE IN KENYA

Structural corridors have been mapped for Tanzania, including cross-boundary corridors that go into Kenya (MNRT, 2022). In Kenya, the Kenya Vision 2030 Flagship Project mapped wildlife dispersal areas and migratory pathways (Ojwang' et al., 2017) but stopped short of delineating corridors. To fill the gap of modelled corridors in southern Kenya, we applied the methodology used in the Tanzania study (MNRT, 2023) and developed structural corridors based on human modification (HM) (Theobald et al., 2025) and slope.

To ensure methodological consistency with the Tanzanian mapping approach, the input raster layers (HM and slope) were resampled to a 1km × 1km pixel size and reclassified to a 1:100 scale, where 1 represents low resistance to movement and 100 represents high resistance, reflecting the positive relationship of HM and slope values with resistance.
This means that as human modification values increase, resistance increases. Similarly, as the slope gets steeper, resistance increases. The positive relationship between HM and resistance leads to areas with high human modification, such as cities, towns, and agricultural areas, having higher resistance than natural areas. The positive relationship between slope and resistance leads to mountainous areas and escarpments having high resistance, and corridors tending not to go through mountains and up escarpments.

The transformations from input layers to resistance were performed using ArcGIS Pro's Resample and Reclassify tools. The reclassified HM and slope raster layers were then combined by adding their pixel values using the Raster Calculator tool in ArcGIS Pro to generate a resistance surface.

We conducted least-cost corridor modelling using the Linkage Pathways tool within Linkage Mapper (McRae and Kavanagh, 2011), a software module that operates in ArcGIS Pro (McRae, 2012). This tool was used to identify and map the most efficient linkages between neighbouring target areas, based on a resistance surface generated from the HM and slope rasters. The input files included the resistance surface and a layer containing the centroids of the target protected areas. Similar to the approach applied in Tanzania (MNRT, 2022), the target protected areas included core protected areas, such as national parks and other zones of ecological significance, which are not necessarily designated as protected areas.

To obtain landscape connectivity, we performed a limited network analysis, which connected each core area to its nearest neighbour (measured by cost distance) to minimise redundancy and prioritise the most critical movement pathways.

The Linkage Mapper analysis produces a continuous surface covering the entire study area. To focus on the most critical areas for connectivity, we applied a cost-distance threshold to narrow down the output to discrete, high-probability corridors. Specifically, we retained all pixels within a cost-distance value of 100,000, resulting in a more targeted set of corridors that can be prioritised for conservation actions. These least-cost corridors were then converted into shapefiles using the Raster to Polygon tool in ArcGIS Pro, facilitating further spatial analysis.

We visually compared the Kenya structural corridors we created to the wildlife movement routes mapped in the Kenya Vision 2030 Flagship Project (Ojwang' et al., 2017) and functional corridors modelled based on presence data of 15 species that are being developed by The Nature Conservancy (TNC) but have not been published yet (Anne Trainor, pers. comm.).

Finally, we merged the least-cost corridors we modelled for southern Kenya with the existing corridors in northern Tanzania to obtain a comprehensive, transboundary corridor network for the entire SOKNOT landscape. In areas where boundaries did not align seamlessly, we assessed the differences between them, and non-overlapping sections were integrated to ensure a continuous and unified corridor network.

2.3. CORRIDOR CHARACTERISTICS

We measured the maximum width, area, and total length of rivers and streams for all structural corridors. Freshwater availability plays a crucial role in influencing wildlife movement, as access to water is essential for the survival of many species (Veldhuis et al., 2019). To evaluate the availability of freshwater resources within each corridor, we utilised Open Street Maps (OSM) data on water sources (Ramm et al., 2014). Specifically, we quantified key hydrological features, including:

- **Total length of rivers and streams (km):** We measured the cumulative length of natural watercourses within each corridor. Rivers and streams serve as vital water sources and natural movement pathways for many species, enhancing the ecological connectivity of the corridor.


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2.4. INDICATORS FOR MONITORING CONDITION OF CORRIDORS

To create a baseline of corridor condition, we selected a set of indicators that provide insights into habitat quality, hydrological features, human disturbances, and permeability of the corridor to wildlife movement. The indicators were selected based on their relevance to measuring corridor viability and the availability of remote-sensed data. While mining activities are recognised as a potential threat to connectivity, data on mining was not included in this analysis owing to limited availability and consistency.

We used the following data layers:

- Land cover data: European Space Agency (ESA) WorldCover dataset at a 10-metre resolution based on Sentinel-1 and Sentinel-2 data
- World Database on Protected Areas (WDPA)
- Fences: Landscape Dynamics (landDX) database
- Open Street Map
- WorldPop

2.4.1. HABITAT QUALITY

Habitat quality within each corridor was assessed by measuring the proportions of natural and converted land. To ensure high spatial accuracy, we utilised the ESA WorldCover dataset at a 10-metre resolution based on Sentinel-1 and Sentinel-2 data (Zanaga et al., 2022). It provides high-resolution land cover classification (Nasiri et al., 2022), allowing for detailed assessments of both natural and human-modified landscapes.

- **Percentage of natural vegetation cover:** We calculated the proportion of the corridor covered by natural vegetation types, including forests, shrublands, and grasslands. A higher percentage of natural cover indicates a corridor with higher ecological integrity and greater potential for supporting wildlife movement.
- **Percentage of converted land cover:** We also assessed the extent to which the corridor has been altered by human activities, including agriculture, settlements, and infrastructure development. A higher proportion of converted land within a corridor can negatively impact its functionality by increasing habitat fragmentation, introducing physical barriers, and altering species' behavior due to human disturbance.


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2.4.2. LENGTH AND DENSITY OF EXISTING LINEAR TRANSPORT INFRASTRUCTURE

Linear transport infrastructure (LTI), such as roads and railways, can significantly impact wildlife movement by fragmenting habitats, increasing mortality risks, and creating barriers to dispersal and migration (Papp et al., 2022). To assess the extent of LTI within each corridor, we used roads and railways data from Open Street Map (Ramm et al., 2014) to calculate the following metrics.

- **Total length of linear infrastructure (km):** We measured the cumulative length of roads and railways in each corridor.
- **Breakdown of infrastructure by type and class:** We categorised the linear infrastructure based on its classification. For example, for roads we included the following categories: primary and secondary roads, highways, unpaved roads.
- **Density of linear transport infrastructure in the corridor:** We calculated the density of LTI within each corridor.

This information is essential for identifying priority areas where interventions, such as road underpasses, overpasses, or speed bumps, may be needed to enhance wildlife movement, and reduce human-wildlife conflicts.

2.4.3. LENGTH AND DENSITY OF FENCES

Fences can act as a significant barrier to wildlife movement, fragmenting habitats and restricting access to essential resources (Tyrrell et al., 2022). To assess the extent of fences within the corridors, we measured fence density in areas where data was available. Currently, fence data is only available for parts of Kenya and northern Tanzania (Tyrrell et al., 2022 and Peter Tyrrell, pers. comm.).

We measured the following metrics:

- **Total length of fences (km):** We measured the cumulative length of fences within each corridor.
- **Fence density:** The density of fences was calculated by dividing the total length of fences by the area of the corridor.

By monitoring the density of fences within each corridor, corridors can be targeted for management interventions such as fence removal or modification.

2.4.4. HUMAN POPULATION DENSITY

Human population density is a key factor in understanding the anthropogenic pressures that affect wildlife corridors (Ghoddousi et al., 2021). Areas with higher population densities tend to experience more land conversion, habitat destruction, and human-wildlife conflicts, which can significantly hinder wildlife movement. To assess the impact of human presence on wildlife corridors, we used a population density raster layer for Tanzania and Kenya (WorldPop & CIESIN, 2018) clipped to the extent of SOKNOT to quantify human population density within each corridor. We extracted the population density values from the raster layer within each corridor and calculated minimum, mean, and maximum population density.

2.4.5. HUMAN MODIFICATION

Human modification (HM) is an indicator for assessing the level of anthropogenic influence in each wildlife corridor (Theobald et al., 2025). This indicator helps to quantify the degree to which human activities, such as urbanisation, agriculture, infrastructure development, and resource extraction, have modified the natural environment. Higher HM values reflect greater human-induced changes, which can pose significant challenges to wildlife movement and corridor functionality. To calculate the HM indicator, we used a Human Modification raster layer (Theobald et al., 2025), which provides spatial data on human-induced changes across the landscape. Based on the layer we calculated mean HM values in each corridor.

2.4.6. HUMAN-WILDLIFE CONFLICT

Currently, there is insufficient data on human-wildlife conflict (HWC) incidents within the corridors to allow for comprehensive quantitative analysis. To address this, we recommend establishing a standardised and continuous monitoring system to reliably record HWC events. The key focus should be on collecting data on:

- Number of retaliatory killings of wildlife species,
- Number of domestic animals lost due to predation, and
- Area (in hectares) of crops damaged by large mammals.

This would involve setting up community-based monitoring networks that enable timely and accurate reporting using simple tools, supported by training residents, wildlife scouts, and conservation officers. All incident reports should be compiled into a centralised database and spatially analysed using GIS to identify conflict hotspots and temporal trends.

Given the current lack of comprehensive HWC data, no quantitative results can be presented at this stage. However, preliminary evidence suggests that retaliatory killings, livestock predation, and crop damage do occur sporadically and threaten both wildlife and local livelihoods. Implementing this monitoring framework will enable accurate quantification of conflict incidents, support targeted mitigation efforts, and contribute to the sustainable management of wildlife corridors.

2.4.7. LEVEL OF PROTECTION

We calculated the percentage of each functional corridor that overlaps with various categories of legally designated protected areas by overlaying the corridor network with spatial data layers representing national reserves, forest reserves, forest plantations, Wildlife Management Areas (WMAs), Game Controlled Areas (GCAs), sanctuaries, and conservancies (both private and communal). For these analyses, we used protected area shapefiles from UNEP-WCMC (2023). To ensure accuracy and comprehensive coverage, we also incorporated a revised and validated shapefile of conservancies in Kenya provided by Sustain East Africa. The resulting overlap percentages provide an assessment of the extent to which existing corridors are covered and safeguarded under current legal conservation frameworks, with higher values indicating stronger protection.

2.4.8. HABITAT FRAGMENTATION

Habitat fragmentation refers to the process by which large, continuous natural habitats are broken into smaller, isolated patches due to land-use changes, infrastructure development, or natural disturbances (Fahrig, 2003; Haddad et al., 2015; Hobbs, Galvin, et al., 2008; Hobbs, Reid, et al., 2008; Lindenmayer & Fischer, 2006). This fragmentation can negatively impact wildlife by reducing available habitat, increasing edge effects, and limiting movement between patches (Fahrig, 2003; Hobbs, Galvin, et al., 2008). We focused on patches of natural habitat (grassland, shrubland, and forested areas combined) in the corridors. To quantify fragmentation, we applied key landscape metrics using the R package *landscapemetrics*. This tool reimplements commonly used metrics from FRAGSTATS (https://www.fragstats.org/) and incorporates additional indices from recent landscape ecology literature, enabling a robust, tidy workflow for evaluating landscape patterns. We selected the following metrics:

- **Number of patches:** Counts distinct habitat fragments, with higher numbers indicating increased fragmentation.
- **Total core area:** A key landscape metric that measures the combined area of all core habitat patches within a landscape. Core patches are defined as habitat areas that are sufficiently distant from habitat edges and thus experience reduced edge effects. This metric provides an estimate of the amount of interior habitat available for wildlife areas that are generally more stable and less disturbed than edge environments. In our analysis, the core area was identified using the rook's case method, where a cell is considered part of the core if none of its adjacent (horizontally or vertically) neighbours has a different land cover classification. The metric captures both patch size and shape: larger and more compact patches (e.g., square-shaped) typically contain more core area than smaller or irregularly shaped ones.
- **Percentage core area:** The proportion of the corridor covered by core areas.
- **Proximity index:** Assesses how isolated habitat patches are from one another; lower values indicate greater fragmentation.
- **GIS frag:** A general landscape measure of fragmentation, derived from GIS-based spatial analysis, which quantifies the extent and pattern of habitat fragmentation.
- **Connectance:** This metric shows how well patches in a landscape are connected by calculating the proportion of potential links (based on proximity) between habitat patches that are realised. It indicates whether species or ecological processes can move through the landscape.
- **Edge density:** Measures the total length of edge (boundary between different land cover types) per unit area in a landscape. It quantifies the extent of edge habitats, which are often more vulnerable to disturbances and have different ecological characteristics compared with interior habitats.
- **Shannon entropy:** Measures the diversity and evenness of the distribution of patch types in a landscape. It quantifies the degree of heterogeneity by calculating the randomness in the landscape's composition, with higher values indicating a more complex and varied landscape, and lower values indicating a more homogeneous landscape.

2.4.9. CURRENT FLOW

To assess the functional connectivity of the wildlife corridors, we extracted current flow values in the structural corridors from the species-specific current flow maps generated using CircuitScape models for seven focal wildlife species (explained further in Section 3.4.2.2). The current flow maps model species movement across the landscape, with higher values indicating areas more conducive to movement of the focal species (e.g., Naidoo et al., 2018).

For each corridor, the mean current flow values represent the average accessibility across the entire corridor, providing an indication of how well the corridor supports movement of the focal species. The results indicate which corridors better support movement of the focal species, and which ones may require restoration to improve their role in supporting wildlife movements.

2.4.10. EFFECTIVE RESISTANCE

To assess the effective resistance of structural corridors, we modified the species-specific resistance surfaces by masking out all cells outside the delineated structural corridors, setting these to NoData. This ensured that connectivity analyses were constrained exclusively within the corridors. We then ran Circuitscape, which models electrical current flow across the landscape, restricting flow to the defined corridors. The resulting outputs provided effective resistance values for each structural corridor, reflecting their relative ease or difficulty for species movement based on landscape resistance. Because we are interested in monitoring the change in the corridors we did not compute the Protected Area Isolation Index (PAI) which looks at effective resistance in the entire landscape between two protected areas.

2.4.11. PRONET

To assess the structural connectivity of the SOKNOT protected area network, we used the Protected Network (ProNet) metric, which quantifies the spatial cohesion of protected areas based on ecological distance. First, we generated a structural resistance surface by combining slope and human modification data, representing the cost of movement across the landscape. Protected areas were then grouped into clusters based on whether they were within 10km ecological distance of one another, using this resistance surface to model cost-weighted proximity. ProNet was calculated as the sum of the squared areas of all protected areas within each cluster, divided by the square of the sum of areas for all protected areas in the landscape. This metric ranges from 0 (completely disconnected network) to 1 (fully connected network) and provides a normalised measure of protected area connectivity that is independent of total landscape size.

2.5. ASSESSING CORRIDOR FUNCTIONALITY FOR FOCAL SPECIES

Modelling structural corridors based on the degree of human modification is a coarse-filter approach. It assumes that species are sensitive to human activities and are more likely to move through areas with lower human impact. However, implementing these modelled structural corridors can be resource and time intensive. Therefore, assessing their functionality for species of high conservation interest is essential to ensure that efforts are focused on conserving the right areas for connectivity.

To assess and validate the functionality of the structural corridors for the focal species, we applied two general approaches: (1) evaluation of the overlap of species occurrence points between the corridor and buffer; (2) comparison of structural corridor models with species-specific connectivity models. The second approach consisted of three methods: (a) comparison of current flow values in the corridor to those in the buffer; (b) comparison of cost-weighted distance (CWD) values in the corridor to those in the buffer; and (c) calculation of the amount of overlap between the structural and species-specific functional corridors.

Notably, the first and second methods under Approach 2 (2a, b) required the establishment of a buffer around each corridor. We set the buffer width to half the maximum width of the respective corridor (Figure 3). This buffer zone represents the adjacent landscape through which species might move while en route to target protected areas, but it is not considered part of the corridor itself.


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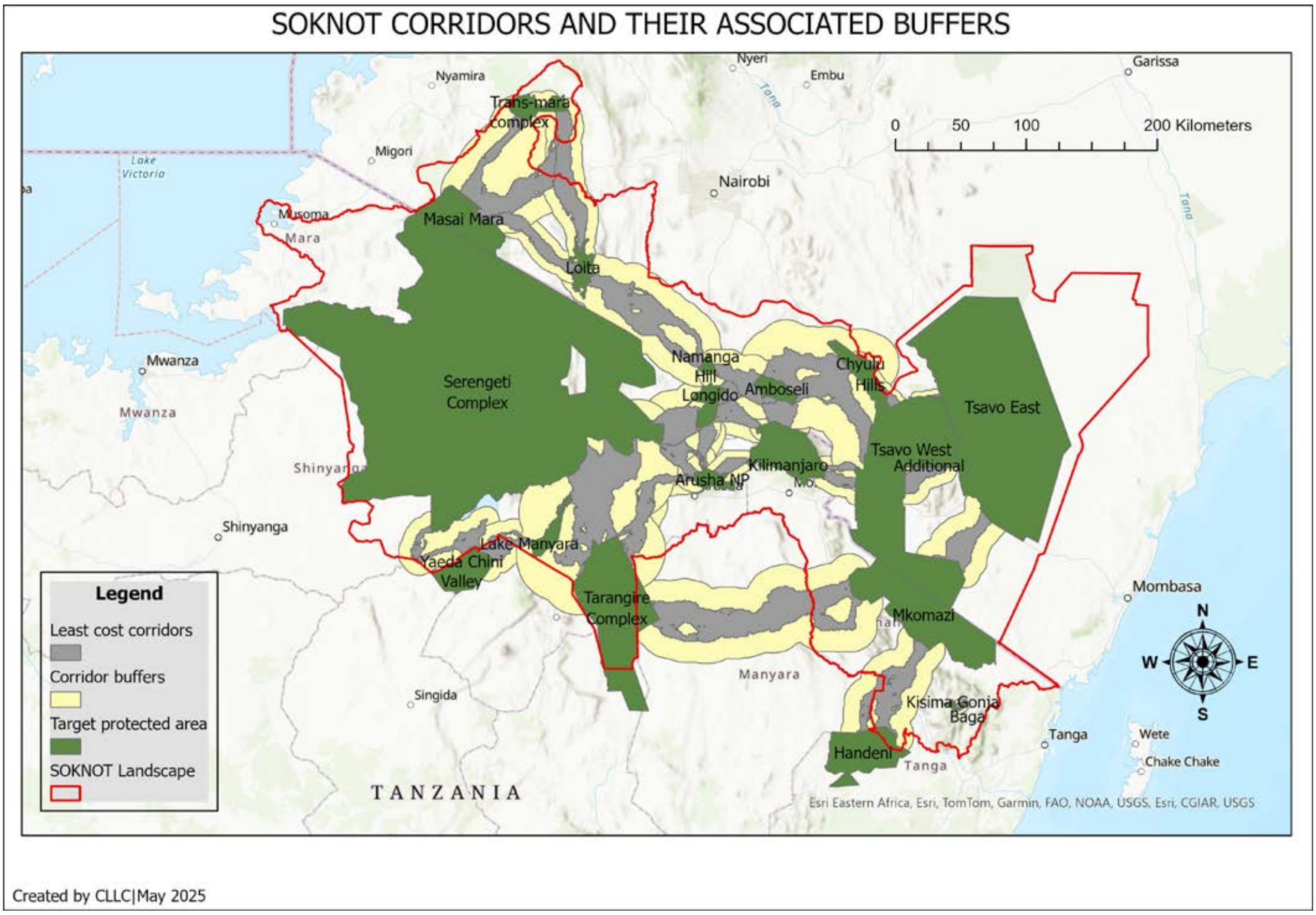

Figure 3. *Structural corridors in SOKNOT with the buffer width set to half the maximum width of the respective corridor. Note: the buffer size on each side is 1/2 the maximum width of the corridor.*

2.5.1. OVERLAP OF SPECIES OCCURRENCE POINTS IN CORRIDORS AND BUFFERS

We evaluated the overlap of species occurrence points with the structural corridors and their buffers (Creech et al., 2024). The fundamental idea behind this approach is that when more occurrence points fall into the corridor the species are more likely to move through it than through adjacent areas. If a similar number of occurrence points fall into the corridor and the buffer, species don't have a preference, but if most occurrence points fall into the buffer, species may be avoiding the corridor.

In this approach, we first mapped occurrence points for each focal species using data provided by partners working within the SOKNOT landscape (see Section 8). These points were then overlaid on the structural corridor network and associated buffers. We counted the total number of occurrence points in a corridor and its buffer and reported the percentage of points that are in the corridor.

A key limitation of this approach is that it relies heavily on the availability and accuracy of species occurrence data. In areas where data is limited or spatially biased because of geographic variation in sampling effort, the overlap analysis may not fully capture the true movement patterns of species, potentially leading to an incomplete or skewed understanding of corridor functionality. This highlights the need for additional approaches of corridor validation.

2.5.2. COMPARING STRUCTURAL CORRIDOR MODELS WITH SPECIES-SPECIFIC CONNECTIVITY MODELS

Complementary to the first approach, we utilised the available species data to create species-specific functional connectivity models, as described below (Figure 4).

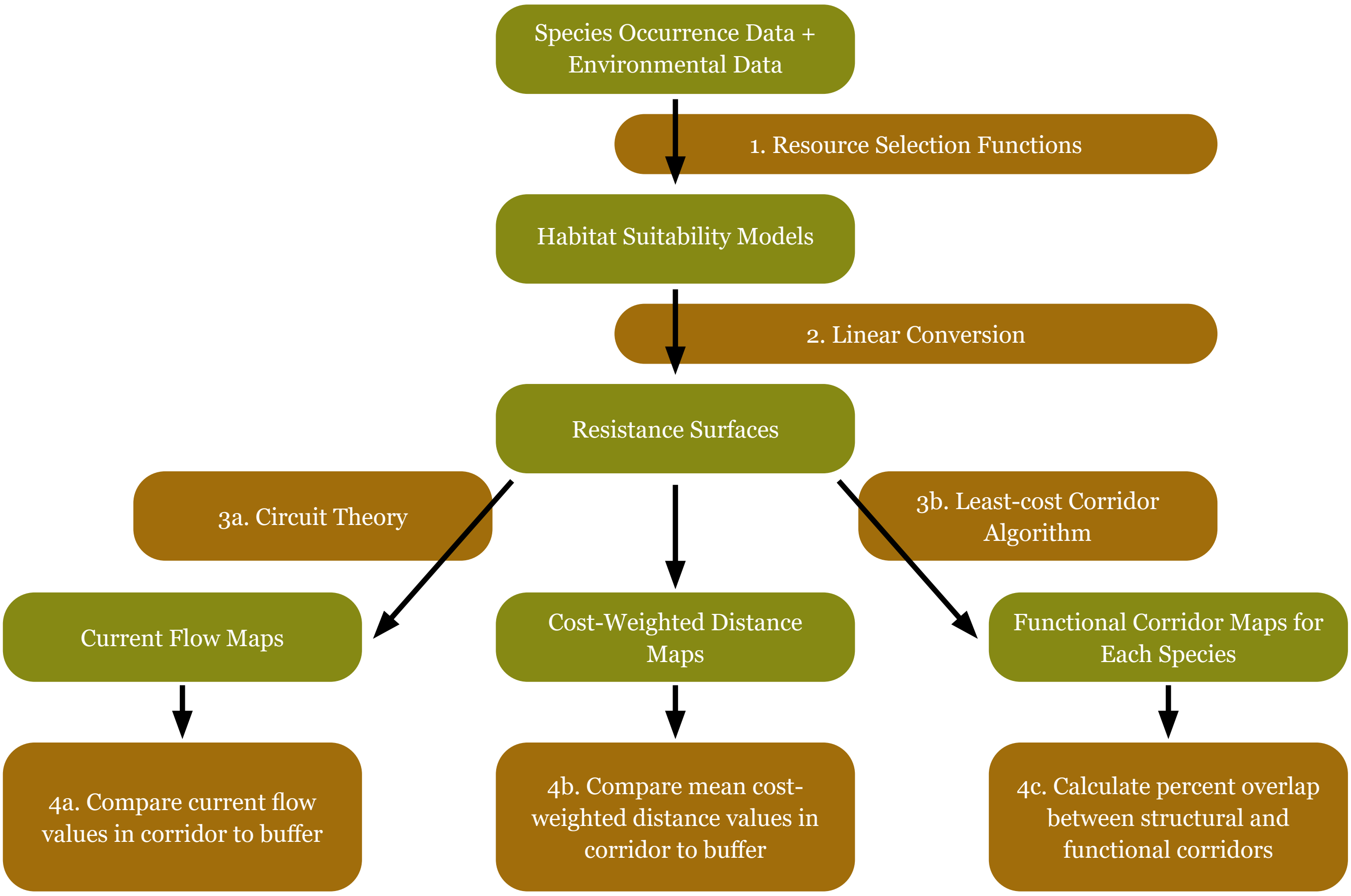

Figure 4. *Workflow comparing structural corridor models with species-specific connectivity models.*

2.5.2.1. HABITAT SUITABILITY MODELS

To create suitability models for all focal species, we applied Resource Selection Function (RSF) models, which compare environmental conditions at species observation locations with random background points to estimate habitat preferences. The key environmental predictors included: land cover types (such as cropland, grassland, shrubland, and tree cover), slope, fence density, and other anthropogenic factors summarised by a human modification layer. This human modification layer effectively integrates multiple human impact variables, including population density, railways, and roads, thereby reducing the need to include these variables separately. Fence density was modelled separately from the other variables because the layer used was developed recently and provides updated information distinct from the other factors.

Each landscape variable was transformed into the Universal Transverse Mercator (UTM) Zone 36S coordinate system to maintain spatial consistency and was cropped to a predefined spatial extent covering all mapped structural corridors. To ensure uniformity across all layers, the spatial layers were resampled to a common resolution of 1000 m with pixel alignment.

For each species, we compiled available occurrence data from multiple sources spanning 2014-24, including census records, data from the Global Biodiversity Information Facility (GBIF), iNaturalist, species movement datasets, and presence/sighting records where applicable. This 10-year period was selected to represent recent ecological conditions while assuming minimal major landscape-altering developments that could significantly shift habitat use. Prior to modelling, the occurrence data was thoroughly cleaned to remove duplicates, errors, and spatial biases, ensuring data quality and reliability. We gratefully acknowledge all the partners who contributed data for this project (see Section 9).

For elephants, we faced a specific challenge. Most of the movement data, comprising hundreds of points, were collected in the northern part of the study area. Including the full dataset would have disproportionately weighed the habitat suitability model toward how elephants interact with landscape features in that region. To address this imbalance and ensure a more representative model across the broader SOKNOT landscape, we randomly selected 5,000 GPS collar points. This subset was chosen to roughly align with the number of points from other occurrence data sources available across the rest of the landscape.

For each species independently, we generated 50 times more random points than the number of occurrence points to ensure robust parameter estimation, as recommended by Fieberg et al. (2021). This approach helped stabilise model parameters and provided a comprehensive representation of habitat conditions across the landscape, reducing potential biases associated with an uneven distribution of occurrence data. The statistical modelling process utilised the values for the landscape variables extracted at the species' occurrence points and at the randomly generated points, providing a balanced view of habitat preferences and facilitating the creation of accurate resistance layers for each focal species.

To mitigate potential issues arising from collinearity among landscape variables, we conducted a Variance Inflation Factor (VIF) analysis, excluding variables with a VIF score greater than 5 to ensure model stability and interpretability (Owoyemi & Bolakale, 2024). We then employed logistic regression models to estimate the probability of species presence as a function of the selected landscape variables. A stepwise selection procedure was used to identify the most significant predictors, refining the model to retain only those variables that contributed meaningfully to species distribution patterns. The resulting coefficients from the logistic regression models were then applied to the landscape variables to generate spatially explicit predictions of habitat suitability across the study area, representing the relative probability of habitat use by each focal species.

2.5.2.2. RESISTANCE SURFACES

Resistance surfaces represent how different types of land cover or landscape features facilitate or inhibit species movement across the landscape. They are raster maps in which each grid cell is assigned a resistance value that indicates how difficult it is for a species to move through that cell (Spear et al., 2010).

To convert habitat suitability predictions into resistance surfaces, we applied transformation functions that define resistance as an inverse function of habitat suitability. We used a simple inverse transformation where resistance is calculated as Resistance = 1/ (Habitat Suitability), which assigns higher resistance values to areas with lower habitat suitability, ensuring that less favorable habitats impose greater movement costs. For habitat suitability values very close to zero, we applied a scaled transformation to improve sensitivity, where Resistance = (1 – Suitability) × 100 + 1, ensuring appropriate scaling and avoiding extreme resistance values that could distort movement modelling. The generated resistance surfaces serve as foundational layers for circuit theory-based connectivity modelling and least-cost corridor analyses.

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2.5.2.3. GENERATION OF CURRENT FLOW MAPS AND EXTRACTION OF VALUES FOR CORRIDOR FUNCTIONALITY ASSESSMENT

The principles of electrical circuit theory have been applied in landscape ecology to model species movement across a landscape; the CircuitScape software program is available to run connectivity models (McRae et al., 2013; Shah & McRae, 2008). We input our species-specific resistance layers as the resistance surface and used centroids of the target protected areas as focal nodes in the model. For the analysis, we applied the pairwise modelling option in CircuitScape. This allowed us to model movement between all pairs of core areas in the landscape, simulating the flow of current between focal nodes. The output of a CircuitScape run is a current flow map that visualises the patterns of potential movement across a landscape. We extracted all current flow values assigned to the pixels in both the corridors and corresponding buffers. To statistically assess the differences between these two areas, we performed a Kruskal–Wallis non-parametric test. This test was selected due to its appropriateness for non-normally distributed data, which is common in ecological studies. The Kruskal–Wallis test allowed us to compare the current flow values between the corridors and the surrounding buffers.

2.5.2.4. GENERATION OF COST-WEIGHTED DISTANCE MAPS AND EXTRACTION OF VALUES FOR CORRIDOR FUNCTIONALITY ASSESSMENT

The least-cost-path algorithm generates cost-weighted distance (CWD) maps and finds the optimal route between two points. A CWD map represents the cost of moving between different points on the landscape, considering both the resistance values and the distance between points. To generate a CWD map for each focal species, we used the Linkage Pathways tool in the Linkage Mapper toolkit in ArcGIS Pro. Species-specific resistance layers, and the centroids of the targeted protected areas were used as input layers for the model. Subsequent steps followed a similar process to the one applied for the current flow maps, with the key assumption being that lower CWD values within a corridor, compared with the buffer, indicate that the corridor is facilitating species movement effectively.

We compared both current values and CWD values between corridors and buffers, because the two associated connectivity models make different assumptions about the animals' knowledge of the landscape. While the least cost corridor approach assumes animals have complete knowledge of the landscape and the ability to identify the route with the least resistance, CircuitScape assumes animals only have knowledge of the immediate surroundings. Elephants have excellent knowledge of the landscape (Berti et al., 2025) and may move according to the assumptions of the least-cost corridor algorithms; dispersing lions may behave more like random walkers. Thus, which algorithm best reflects animal movement likely depends on the species and the life stage.

2.5.2.5. COMPARING SPECIES-SPECIFIC FUNCTIONAL CORRIDORS TO STRUCTURAL CORRIDORS FOR FUNCTIONALITY ASSESSMENT

One of the outputs from the Linkage Pathways tool in the Linkage Mapper toolkit (ArcGIS Pro) is Least-Cost Corridors (LCC). For each species, we extracted the LCCs and truncated them to a threshold of 100,000 cost units, a value also applied to delineate the structural corridors in Kenya. This truncation resulted in a set of corridors. The truncated LCCs were then converted to shapefiles using the Raster to Polygon tool in ArcGIS Pro, enabling further spatial analysis. Finally, we mapped and calculated the percentage overlap between each species' functional corridor and the structural corridors.


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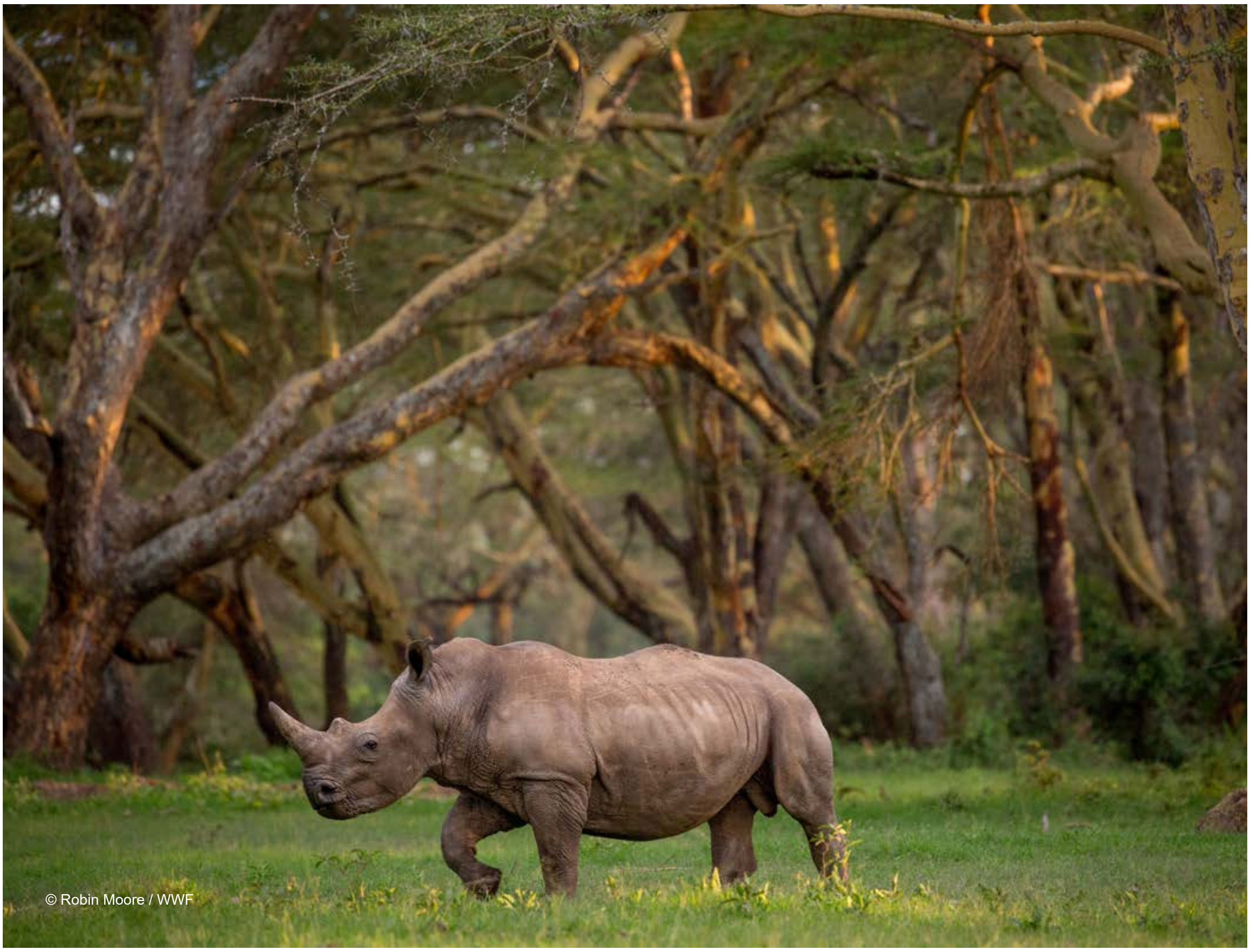

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2.6. IDENTIFYING MULTI-SPECIES CORRIDORS

To identify connectivity hotspots at the landscape level, we generated a multi-species functional corridor density map by stacking species-specific binary corridor rasters and summing their values on a cell-by-cell basis. Each input raster represented the modelled functional corridors for an individual species, with cells coded as 1 if they formed part of a corridor and 0 otherwise. The resulting cumulative map indicates, for each grid cell, the number of species for which that cell contributes to functional connectivity. This method highlights areas of overlapping corridor use, helping to prioritise zones that support movement for multiple species and are therefore critical for maintaining overall ecological connectivity across the landscape.

3. RESULTS

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3.1. STAKEHOLDER ENGAGEMENT WORKSHOP: IMPORTANT TAKEAWAYS

The workshop brought together 75 participants from Kenya and Tanzania, including government officials, representatives from NGOs, WMAs, community conservancies and research institutions. Please find the workshop report here. During the workshop, the discussions revolved around several key themes:

- **Connectivity Planning and Implementation:** One of the key objectives was to develop clear, actionable steps for advancing connectivity planning, implementation, and monitoring within the SOKNOT landscape. Participants examined the current state of wildlife corridors and identified specific actions needed to enhance connectivity across the region, such as addressing barriers to movement, land-use conflicts, and improving habitat quality.

- **Challenges and Opportunities:** Workshop participants discussed both challenges and opportunities in implementing wildlife corridor conservation in the SOKNOT landscape. Challenges included habitat fragmentation, land tenure issues, and human-wildlife conflict, while opportunities centered on cross-border collaboration, community-based conservation initiatives, and strengthening governance frameworks.

- **Indicators for Monitoring:** Another critical focus was to brainstorm specific, measurable, and achievable indicators for monitoring the effectiveness of wildlife corridors. These indicators will be essential for regularly assessing the state of wildlife movement, habitat quality, and social acceptance, ensuring that the corridors remain functional and sustainable in the long term.

- **Data Collection and Sharing:** A portion of the workshop was dedicated to identifying available data. Given the vast size of the SOKNOT landscape, data on species and landscape variables such as vegetation, land cover, and infrastructure are essential for corridor planning and management. The participants agreed to collaborate on data sharing for this consultancy. They supported the idea of a centralised, freely accessible data platform to house spatial environmental data that can support informed decision-making in connectivity conservation projects.

- **Sharing Knowledge of Wildlife Movements in SOKNOT:** Species experts shared important movement zones for the focal species (Appendix 1, Figures 34-40).

- **Collaborative Governance for Effective Conservation:** The workshop stressed the importance of inclusive governance that brings together various stakeholders, including government, NGOs, local communities, and the private sector. A collaborative approach is essential to manage and sustain wildlife corridors effectively.

- **Community Involvement in Conservation Efforts:** Engaging local communities in wildlife corridor initiatives is crucial for fostering a sense of ownership and addressing human-wildlife conflicts. Involving communities ensures the success of conservation strategies while aligning them with local livelihoods.

- **Data Sharing and Accessible Platforms:** A common data-sharing platform was highlighted as a vital tool for informed decision-making. Stakeholders agreed on creating a centralised repository for environmental data to support wildlife corridor planning and management.

- **Mitigating Human-Wildlife Conflicts:** Effective strategies to mitigate human-wildlife conflicts were discussed, with a focus on integrating wildlife corridors into human development plans to balance conservation needs with community development.

- **Monitoring and Adaptive Management:** Regular monitoring using clear indicators was emphasised to ensure the long-term success of wildlife corridors. Adaptive management strategies will be based on data-driven insights, allowing for timely adjustments to ongoing projects.

- **Sustainability of Conservation Efforts:** Long-term sustainability was identified as a key goal, requiring secured financial resources, strong management structures, and mechanisms for accountability to ensure continued conservation success.

- **Strengthening Partnerships and Expanding Networks:** The importance of expanding conservation networks was discussed, with a particular focus on building relationships with the private sector and international conservation groups to support the success of wildlife corridor projects.

- **Actionable Next Steps for Conservation:** Moving forward, the workshop emphasised establishing baseline data for monitoring, reinforcing governance frameworks, and continuing to build momentum through strengthened partnerships and ongoing stakeholder engagement.

These takeaways encapsulate the need for a holistic approach to wildlife corridor conservation, combined governance, community involvement, data sharing, and adaptive management to ensure the long-term success of these critical areas.

In summary, the Transboundary Multi-Species Functional Connectivity Workshop marked a significant milestone in the ongoing efforts to secure wildlife corridors in the SOKNOT landscape. Through collaborative discussions, stakeholders reached a consensus on strategies, indicators, and data-sharing mechanisms that will guide the next steps of the project. The workshop laid the groundwork for developing a Transboundary Corridor and Connectivity Atlas that will map and monitor these critical corridors, supporting the long-term conservation of the region's iconic wildlife species.

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3.2. STRUCTURAL CORRIDORS FOR KENYA AND THE WHOLE SOKNOT CORRIDOR NETWORK

Our modelling efforts identified nine structural corridors in southern Kenya based on human modification and slope. These corridors, which may serve as potential pathways for wildlife movement, include Maasai Mara–Trans Mara complex, Maasai Mara–Loita, Trans Mara Complex–Loita, Loita–Namanga, Namanga–Amboseli, Amboseli–Chyulu–Tsavo, Chyulu–Tsavo East, Tsavo East–Tsavo West (North), Tsavo East–Tsavo West (South) (see Figure 5). A visual comparison of the structural corridors with the wildlife movement routes mapped in the Kenya Vision 2030 Flagship Project (Ojwang' et al., 2017) indicates that while several of the movement routes are contained in the corridors, there are others that the corridors are not capturing.

A visual comparison of the Kenya structural corridors with the functional corridors modelled based on presence data of 15 species that are being developed by The Nature Conservancy suggested that the two sets coincide in most areas. Differences appear to exist mostly for the corridors going north from Maasai Mara.

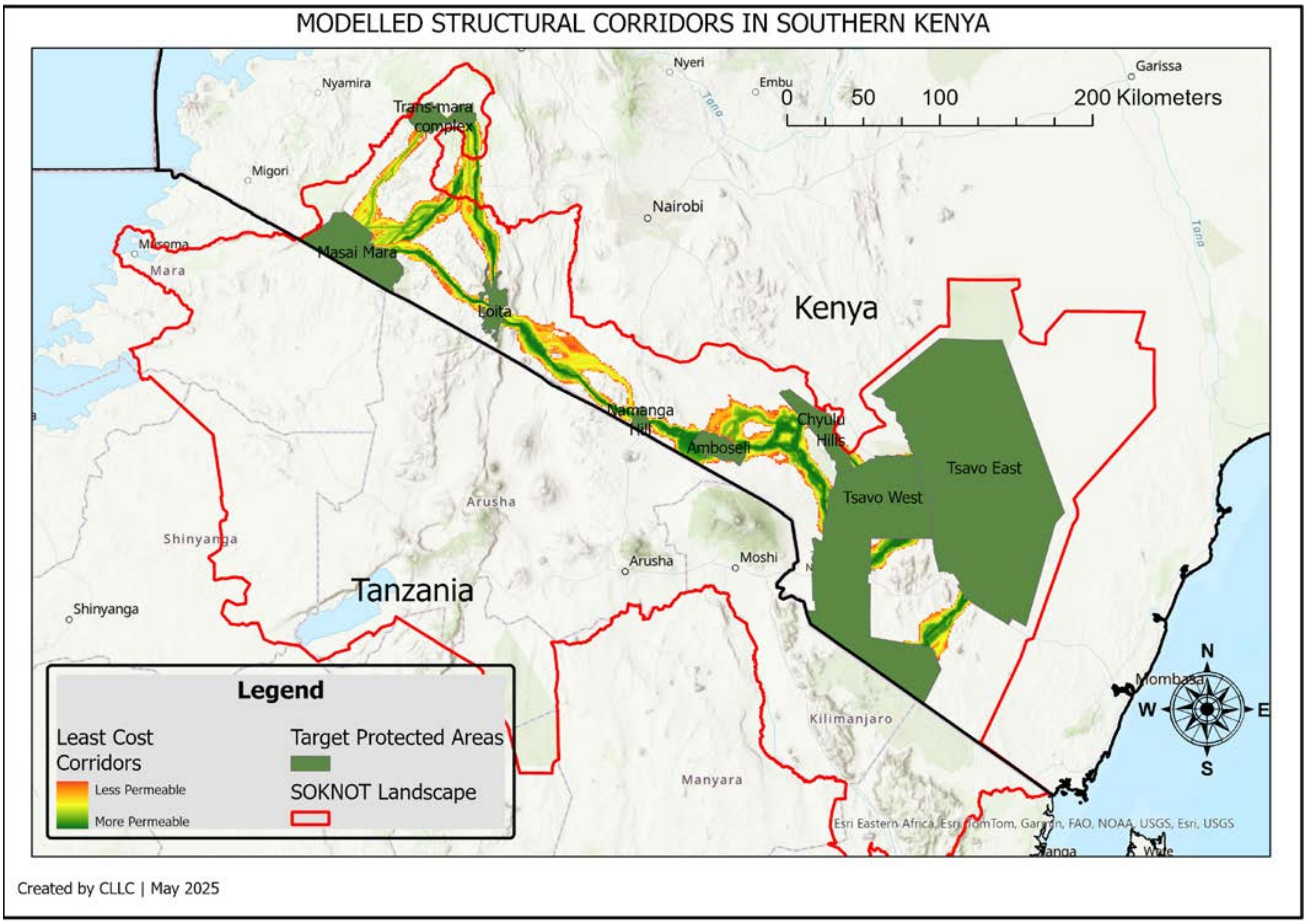

Figure 5. *Modelled structural corridors in southern Kenya that were assessed for their functionality for seven focal species.*

The SOKNOT landscape hosts a wide range of protected area types (Figure 6), including 10 National Parks, three National Reserves, one Ngorongoro Conservation Area, 121 Conservancies, five Wildlife Management Areas, three Game Reserves, 118 Forest Reserves, 19 Forest Plantations, 10 Game Controlled Areas, two Ranches, and four Open Areas, reflecting the region's diverse management approaches and conservation priorities.


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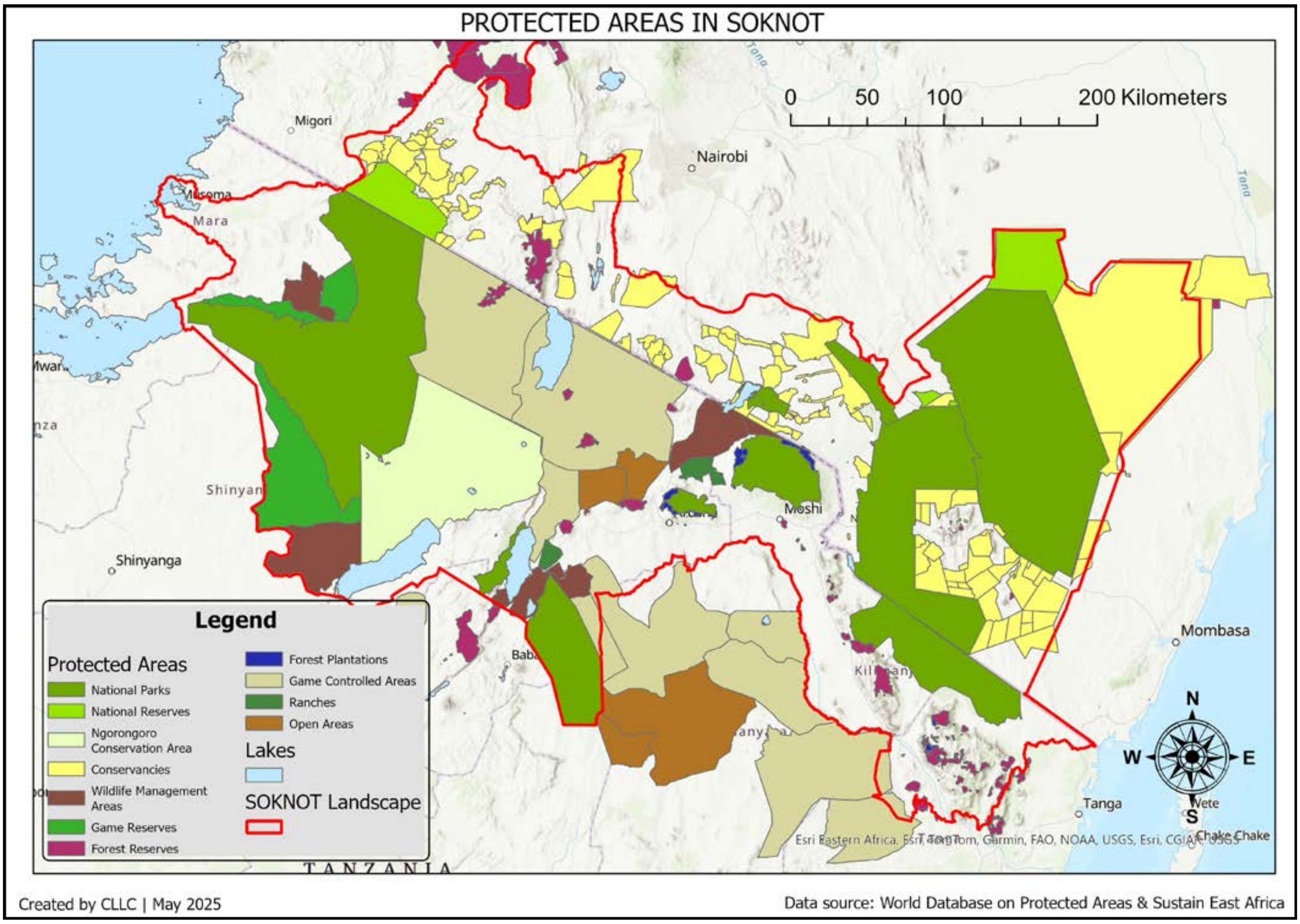

Figure 6. *Protected areas in SOKNOT.*

Combining the structural corridors modelled for Tanzania with the structural corridors modelled for Kenya yields a map of an ecological network for conservation in SOKNOT (Figure 7). Each of the most important wildlife corridors in this landscape has been assigned a numerical identifier, as listed here: Maasai Mara–Trans Mara complex (1), Maasai Mara–Loita (2), Trans Mara Complex–Loita (3), Loita–Namanga (4), Namanga–Amboseli (5), Amboseli–Chyulu–Tsavo (6), Chyulu–Tsavo East (7), Tsavo East–Tsavo West (North) (8), Tsavo East–Tsavo West (South) (9), Serengeti Complex–Manyara–Tarangire Complex (10), Serengeti Complex–Longido (11), Serengeti Complex–Arusha (12), Serengeti Complex–Yaeda Chini (13), Tarangire Complex–Arusha (14), Tarangire Complex–Mkomazi (15), Kilimanjaro–Amboseli (16), Kilimanjaro–Arusha (17), Kilimanjaro–Longido (18), Kilimanjaro–Tsavo (19), Lake Manyara–Yaeda Chini (20), Arusha–Longido (21), Longido–Amboseli (22), Mkomazi–Handeni (23), and Baga–Kisima Gonja (24).

It is important to note that the Serengeti Complex–Manyara–Tarangire Complex in this document represents a combination of the Serengeti Complex–Lake Manyara, Serengeti Complex–Tarangire Complex, and Tarangire Complex–Lake Manyara corridors, which were initially modelled separately for Tanzania. Owing to the high degree of overlap among these corridors, they have been merged, and the naming in this document has therefore been updated accordingly.


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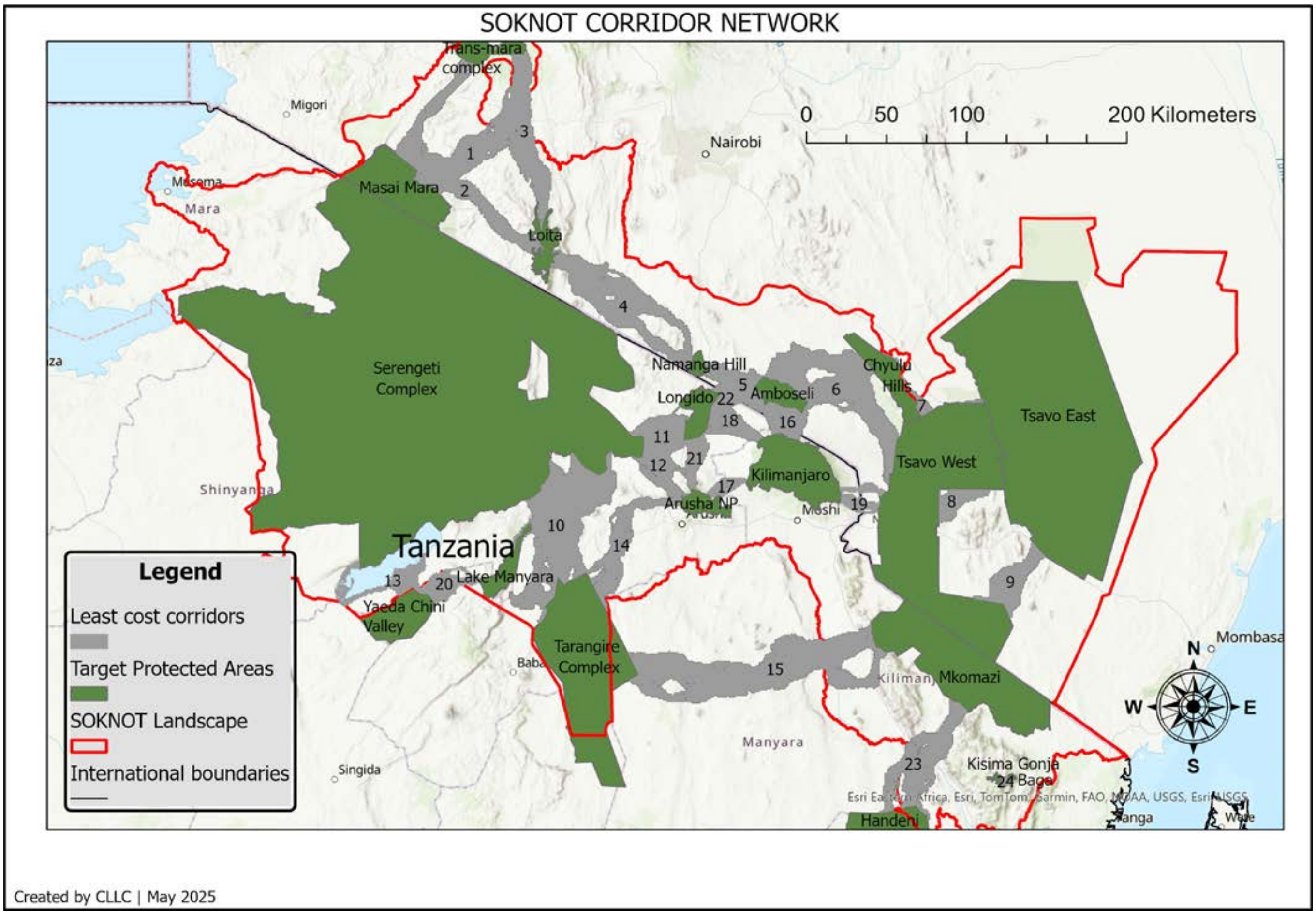

Figure 7. *An ecological network for conservation in SOKNOT. This map shows land likely important to wildlife movement between protected areas in the Southern Kenya and Northern Tanzania (SOKNOT) landscape. For Kenya, the corridors were mapped using the Human Modification dataset, which provides a cumulative measure of human modification of terrestrial lands. For Tanzania, the corridors were adopted from the "Tanzania Wildlife Corridors Assesment, Prioritization, and Action Plan". This map is part of the remote-sensing corridor monitoring Baseline for 2024.*

3.3. CORRIDOR CHARACTERISTICS

This section provides an overview of the general characteristics of all structural corridors identified across the SOKNOT landscape. Key attributes summarised include the corridor name, unique identifier, corridor width, and area (Table 1). In addition, the presence of freshwater features, particularly rivers, is examined. We calculated the total river length within each corridor, with longer rivers indicating greater water availability. This data provides a foundation for further analyses, including assessing the role of freshwater features in maintaining ecological connectivity (Table 2).


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3.3.1. CORRIDOR WIDTH AND AREA

The structural corridors across the SOKNOT landscape vary considerably in width and area (Table 1). Corridor widths range from approximately 4.9km (Baga–Kisima Gonja) to 56.8km (Serengeti Complex–Manyara–Tarangire Complex), while corridor areas range from 23 sq km to 3,593 sq km.

The largest corridors, Tarangire Complex–Mkomazi, Serengeti Complex–Manyara–Tarangire Complex, and Amboseli–Chyulu–Tsavo, represent extensive zones of ecological connectivity. In contrast, smaller corridors such as Baga–Kisima Gonja and Chyulu–Tsavo East indicate more localised linkages that may be more vulnerable to fragmentation.

Table 1. *Corridor areas, identification number (ID) and associated maximum widths.*

CORRIDOR	CORRIDOR ID	MAXIMUM CORRIDOR WIDTH (KM)	CORRIDOR AREA (KM2)
Amboseli–Chyulu–Tsavo	6	41.5	2248
Arusha–Longido	21	13.4	298
Baga–Kisima Gonja	24	4.9	23
Chyulu–Tsavo East	7	7.8	112
Kilimanjaro–Amboseli	16	27.7	382
Kilimanjaro–Arusha	17	11.2	190
Kilimanjaro–Longido	18	19.1	453
Kilimanjaro–Tsavo	19	14.1	322
Lake Manyara–Yaeda Chini	20	17.5	461
Loita–Namanga	4	28.5	1851
Longido–Amboseli	22	14.7	183
Maasai Mara–Loita	2	12.4	693
Maasai Mara–Trans Mara complex	1	29.8	1801
Mkomazi–Handeni	23	24.8	1285
Namanga–Amboseli	5	22.2	580
Serengeti Complex–Arusha	12	17.7	669
Serengeti Complex–Longido	11	27.2	704
Serengeti Complex–Manyara–Tarangire Complex	10	56.8	2912
Serengeti Complex–Yaeda Chini	13	18.1	602
Tarangire Complex–Arusha	14	19.5	901
Tarangire Complex–Mkomazi	15	32.2	3593
Trans Mara Complex–Loita	3	16.1	1232
Tsavo East–Tsavo West (North)	8	16.2	325
Tsavo East–Tsavo West (South)	9	23.9	647

3.3.2. FRESHWATER FEATURES

River lengths within the SOKNOT corridors vary widely, reflecting differences in freshwater availability across the landscape (Table 2). The Tarangire Complex–Mkomazi (373.7km), Loita–Namanga (359.2km), and Serengeti Complex–Manyara–Tarangire Complex (343.9km) corridors have the longest river networks, indicating high freshwater potential and ecological importance. In contrast, several corridors, such as Chyulu–Tsavo East, Kilimanjaro–Longido, and Trans Mara Complex–Loita, do not have rivers flowing through them, suggesting limited surface water availability. Moderate river lengths were observed in corridors such as Amboseli–Chyulu–Tsavo (67.5km) and Namanga–Amboseli (68.0km), which may still provide critical resources within the landscape.


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***Table 2.** River length in each corridor (km).*

CORRIDOR	RIVER LENGTH (KM)
Amboseli–Chyulu–Tsavo	67.5
Arusha–Longido	6.8
Baga–Kisima Gonja	7.2
Chyulu–Tsavo East	0.0
Kilimanjaro–Amboseli	26.6
Kilimanjaro–Arusha	8.4
Kilimanjaro–Longido	0.0
Kilimanjaro–Tsavo	92.1
Lake Manyara–Yaeda Chini	0.1
Loita–Namanga	359.2
Longido–Amboseli	31.9
Maasai Mara–Loita	92.3
Maasai Mara–Trans Mara complex	7.5
Mkomazi–Handeni	154.8
Namanga–Amboseli	68.0
Seregeti Complex–Arusha	73.8
Serengeti Complex–Longido	21.7
Serengeti Complex–Manyara–Tarangire Complex	343.9
Serengeti Complex–Yaeda Chini	8.4
Tarangire Complex–Arusha	36.4
Tarangire Complex–Mkomazi	373.7
Trans Mara Complex–Loita	0.0
Tsavo East–Tsavo West (North)	3.2
Tsavo East–Tsavo West (South)	22.5

3.4. INDICATORS FOR MONITORING CONDITION OF CORRIDORS

This section summarises the indicator values of all identified corridors, presented across a series of tables. Analysis of land cover reveals that most corridors remain largely intact, with over 70% having less than 20% of their area converted. This indicates that many of the corridors experience minimal land-use transformation and maintain a high degree of natural cover across the landscape.

Linear infrastructure indicators reveal some corridors with notably high values, such as road lengths up to 863.8km, and fence lengths as high as 1,074.5km. Railway lines are present in only a few corridors, with a maximum length of 27.9km recorded. Densities of roads, fences, and railways (in km/sq km) vary across the corridors, with higher values generally clustering near major settlements.

Population density peaks at 10.3 people per sq km, though most corridors maintain relatively low densities, supporting their conservation value. Human Modification (HM) values range from 0 to a maximum of 0.3, indicating limited anthropogenic pressure in most areas. Fragmentation and current flow indicators suggest that ecological connectivity remains functional in many corridors, although certain corridors show signs of reduced flow due to the development of infrastructure and settlements.

3.4.1. HABITAT QUALITY

The composition of land cover within each SOKNOT corridor was assessed to evaluate habitat quality and the extent of human modification (see Section 2.4.1 for methodology). Specifically, we calculated the percentage of natural vegetation cover and the percentage of converted land cover. Higher proportions of natural cover indicate corridors with greater ecological integrity and potential for supporting wildlife movement, while higher proportions of converted land suggest increased fragmentation and disturbance. The results are presented in Table 3.

Overall, most corridors retain high levels of natural vegetation, with more than 80% natural cover observed in corridors such as Tsavo East–Tsavo West (North and South), Baga–Kisima Gonja, and Serengeti Complex–Longido. However, some corridors show notable human modification, particularly Kilimanjaro–Arusha (42.0%), Kilimanjaro–Tsavo (28.5%), and Tarangire Complex–Arusha (24.3%), indicating areas where agricultural expansion and settlement are likely reducing connectivity.

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Table 3. *The percentages of converted areas and natural cover in corridors.*

CORRIDOR	CONVERTED AREA (%)	NATURAL COVER (%)
Kilimanjaro–Longido	10.9	89.0
Mkomazi–Handeni	5.6	94.1
Tarangire Complex–Mkomazi	11.1	88.9
Tarangire Complex–Arusha	24.3	75.1
Kilimanjaro–Tsavo	28.5	71.5
Longido–Amboseli	5.0	95.1
Arusha–Longido	16.5	83.5
Serengeti Complex–Yaeda Chini	5.6	46.1
Serengeti Complex–Arusha	11.9	88.1
Lake Manyara–Yaeda Chini	15.7	82.0
Serengeti Complex–Longido	3.6	96.4
Kilimanjaro–Amboseli	16.6	83.4
Baga–Kisima Gonja	3.2	96.8
Kilimanjaro–Arusha	42.0	57.6
Serengeti Complex–Manyara–Tarangire Complex	16.2	75.6
Amboseli–Chyulu–Tsavo	13.6	86.4
Chyulu–Tsavo East	12.3	87.7
Tsavo East–Tsavo West (South)	0.3	99.7
Tsavo East–Tsavo West (North)	0.8	99.2
Loita–Namanga	4.6	93.3
Maasai Mara–Loita	2.0	98.0
Maasai Mara–Trans Mara complex	8.3	91.7
Namanga–Amboseli	19.4	80.6
Trans Mara Complex–Loita	12.9	87.1

3.4.2. LENGTH AND DENSITY OF EXISTING LINEAR TRANSPORT INFRASTRUCTURE

The extent of existing linear transport infrastructure within each SOKNOT corridor was assessed to evaluate potential impacts on wildlife movement and corridor connectivity (see Section 2.4.2 for methodology). Road and railway networks were quantified in terms of length and density. Table 4 summarises total road length and road density (km) for each corridor, while Table 5 breaks down the length of different road types within each corridor. Railway lengths are presented in Table 6, and Figure 8 provides a spatial visualisation of road density across the corridors. This data provides insights into how transport infrastructure may fragment habitats and affect ecological connectivity.

Road length and density varied considerably across the SOKNOT corridors (Table 4). The Kilimanjaro–Tsavo, Tarangire Complex–Mkomazi, and Tarangire Complex–Arusha corridors recorded the highest total road lengths, exceeding 690km, indicating significant infrastructure presence. In terms of density, Kilimanjaro–Tsavo (2.45km/sq km), Kilimanjaro–Arusha (1.80km/sq km), and Baga–Kisima Gonja (1.19km/sq km) exhibited the greatest road densities, suggesting higher potential for habitat fragmentation and restricted wildlife movement. Conversely, corridors such as Lake Manyara–Yaeda Chini, Tsavo East–Tsavo West (North and South), and Trans Mara Complex–Loita had minimal road development, with densities below 0.05km/sq km, indicating relatively intact connectivity and lower levels of disturbance.

Table 4. *Road length and density in each corridor (km).*

CORRIDOR	ROAD LENGTH (KM)	ROAD DENSITY (KM/SQ KM)
Amboseli–Chyulu–Tsavo	243.2	0.11
Arusha–Longido	126.1	0.42
Baga–Kisima Gonja	27.3	1.19
Chyulu–Tsavo East	32.1	0.29
Kilimanjaro–Amboseli	111.9	0.29
Kilimanjaro–Arusha	342.9	1.80
Kilimanjaro–Longido	86.7	0.19
Kilimanjaro–Tsavo	789.5	2.45
Lake Manyara–Yaeda Chini	4.2	0.01
Loita–Namanga	244.7	0.13
Longido–Amboseli	11.7	0.06
Maasai Mara–Loita	445.0	0.64
Maasai Mara–Trans Mara complex	8.7	0.00
Mkomazi–Handeni	464.5	0.36
Namanga–Amboseli	94.4	0.16
Seregeti Complex–Arusha	420.6	0.63
Serengeti Complex–Longido	201.0	0.29
Serengeti Complex–Manyara–Tarangire Complex	496.4	0.17
Serengeti Complex–Yaeda Chini	60.4	0.10
Tarangire Complex–Arusha	692.3	0.77
Tarangire Complex–Mkomazi	863.8	0.24
Trans Mara Complex–Loita	0.5	0.00
Tsavo East–Tsavo West (North)	7.3	0.02
Tsavo East–Tsavo West (South)	27.4	0.04

The distribution of road types across SOKNOT corridors shows that unclassified and tertiary roads are the most common, indicating widespread local access routes that may fragment habitats (Table 5). Primary and trunk roads occur less frequently but represent major potential barriers where they do exist. Paths and secondary roads are scattered across several corridors, reflecting varying levels of human accessibility and land use intensity. Overall, the dominance of lower-category roads suggests that while large-scale infrastructure is limited in many areas, smaller networks may still influence wildlife movement and corridor functionality.


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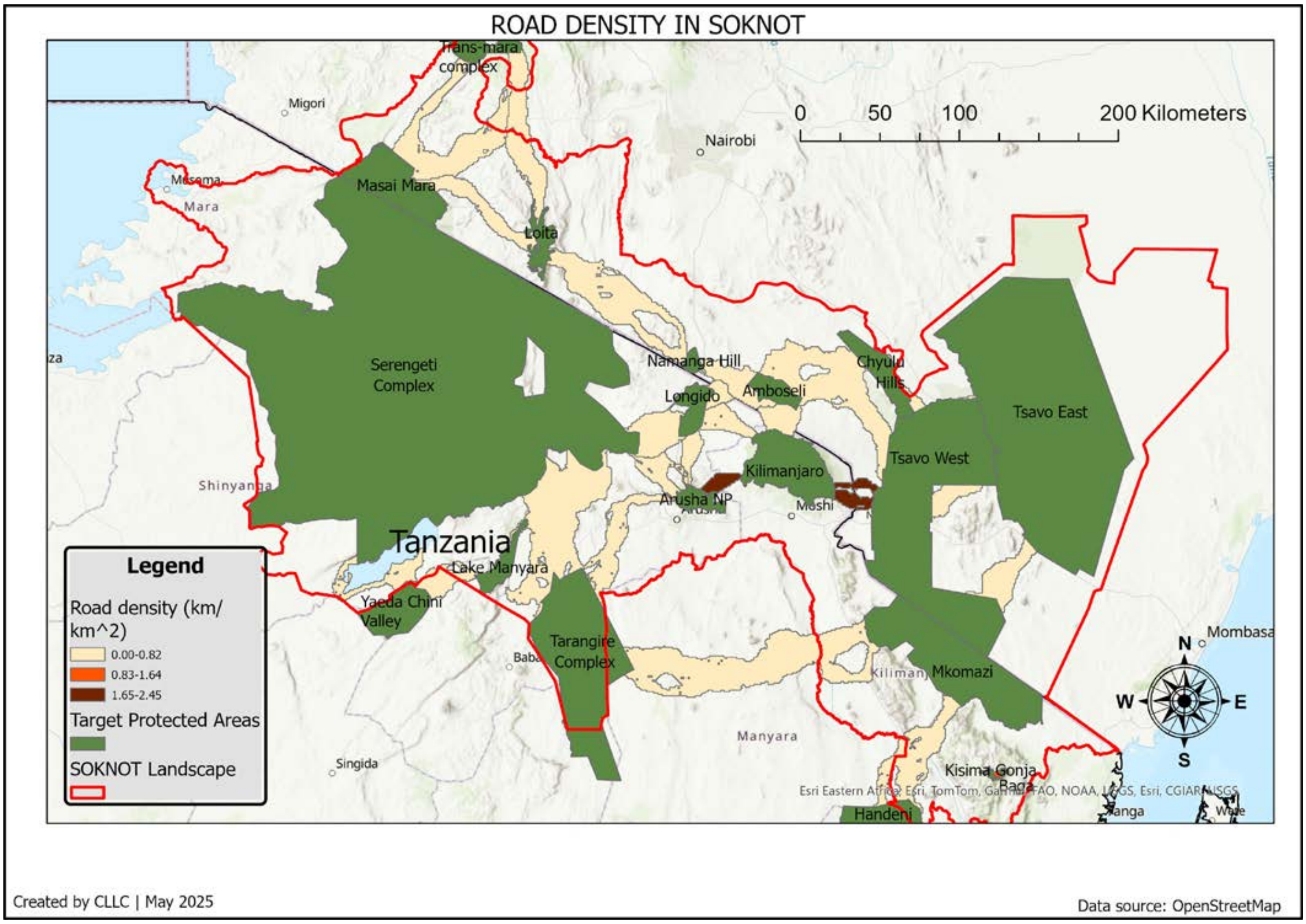
Table 5. *Length of different road types in each corridor (km).*

CORRIDOR	PATH	PRIMARY	SECONDARY	TERTIARY	TRUNK	UNCLASSIFIED
Amboseli–Chyulu–Tsavo	1.7	16.8	17.9	0.0	0.0	206.8
Arusha–Longido	24.2	0.0	0.0	6.4	0.0	95.5
Baga–Kisima Gonja	10.1	0.0	0.0	5.8	0.0	11.4
Chyulu–Tsavo East	0.3	0.0	0.0	12.7	0.0	19.1
Kilimanjaro–Amboseli	1.3	0.0	40.0	0.0	0.0	70.5
Kilimanjaro–Arusha	157.9	0.0	4.9	37.7	0.0	142.4
Kilimanjaro–Longido	0.3	0.0	13.4	5.9	0.0	67.1
Kilimanjaro–Tsavo	197.0	12.4	11.7	49.1	0.0	519.3
Lake Manyara–Yaeda Chini	0.0	0.0	0.0	0.0	0.0	4.2
Loita–Namanga	67.4	0.0	0.0	0.0	0.0	177.2
Longido–Amboseli	0.0	0.0	0.9	0.0	0.0	10.8
Maasai Mara–Loita	236.4	0.9	8.8	26.1	0.0	172.7
Maasai Mara–Trans Mara complex	7.2	0.0	1.5	0.0	0.0	0.0
Mkomazi–Handeni	265.6	0.0	51.4	34.0	21.2	92.3
omanga–Amboseli	0.3	0.0	32.4	0.0	6.5	55.1
Seregeti Complex–Arusha	163.9	0.0	0.0	39.7	12.5	204.5
Serengeti Complex–Longido	42.3	0.0	0.0	4.3	10.0	144.5
Serengeti Complex–Manyara–Tarangire Complex	76.3	40.5	49.0	0.0	48.1	282.4
Serengeti Complex–Yaeda Chini	25.8	0.0	27.4	0.0	0.0	7.2
Tarangire Complex–Arusha	294.4	0.0	5.0	20.5	18.8	353.6
Tarangire Complex–Mkomazi	245.2	0.0	23.5	70.9	26.1	498.0
Trans Mara Complex–Loita	0.5	0.0	0.0	0.0	0.0	0.0
Tsavo East–Tsavo West (North)	0.7	0.0	0.0	0.0	0.0	6.6
Tsavo East–Tsavo West (South)	0.0	0.0	0.0	0.8	0.0	26.6



ROAD DENSITY IN SOKNOT

Created by CLLC | May 2025

Data source: OpenStreetMap

Figure 8. *SOKNOT's ecological network for conservation: Road density in wildlife corridors. While roads are vital for economic development and human connectivity, they can significantly impede wildlife movements. Monitoring the road density is important for developint effective mitigation strategies to ensure that roads do not pose barriers to wlildlife movement through corridors. This map shows land likely important to wildlife movement between protected areas in the Southern Kenya and Northern Tanzania (SOKNOT) landscape. For Kenya, the corridors were mapped using the Human Modification dataset, which provides a cumulative measure of human modification of terrestrial lands. For Tanzania, the corridors were adopted from the "Tanzania Wildlife Corridors Assesment, Prioritization, and Action Plan". This map is part of the remote-sensing corridor monitoring Baseline for 2024.*

Railway infrastructure is limited within the SOKNOT corridors, with only a few corridors containing rail lines (Table 6). Mkomazi–Handeni, Tarangire Complex–Mkomazi, and Tsavo East–Tsavo West (South) have the highest rail lengths and densities, while Loita–Namanga has a minimal segment. Most other corridors have no railways.

Table 6. *Railway length in corridors. Corridors not included in the table do not contain any railway.*

CORRIDOR	RAILWAY LENGTH (KM)	RAIL DENSITY (KM/KM2)
Loita–Namanga	1.0	0.001
Mkomazi–Handeni	27.9	0.02
Tarangire Complex–Mkomazi	23.9	0.01
Tsavo East–Tsavo West (South)	22.4	0.03

3.4.3. LENGTH AND DENSITY OF FENCES

The length of fences within each SOKNOT corridor was quantified to assess potential barriers to wildlife movement (see Section 2.4.3 for methodology). The results for the length and density of fences in each corridor are summarised in Table 7 and visualised in Figure 9, highlighting corridors where fencing may pose significant challenges to ecological connectivity.

Fencing within SOKNOT corridors varies widely, with some corridors exhibiting high fence lengths and densities (Table 7). Maasai Mara–Loita (2.59km/sq km), Loita–Namanga (1.39km/sq km), and Maasai Mara–Trans Mara complex (1.40km/sq km) have the densest fencing, indicating substantial potential barriers to wildlife movement. Other corridors show minimal fencing or have insufficient data available.

Table 7. *Length of fences in SOKNOT Corridors. Corridors not included in the table had no available data on fences.*

CORRIDOR	FENCE LENGTH (KM)	FENCE DENSITY (KM/SQ KM)
Amboseli–Chyulu–Tsavo	490.8	0.22
Kilimanjaro–Amboseli	58.6	0.15
Kilimanjaro–Tsavo	86.8	0.27
Loita–Namanga	2575.7	1.39
Longido–Amboseli	9.1	0.05
Maasai Mara–Loita	1793.8	2.59
Maasai Mara–Trans Mara complex	2517.5	1.4
Namanga–Amboseli	558.7	0.96
Seregeti Complex–Arusha	1.5	0
Serengeti Complex–Longido	265.5	0.38
Trans Mara Complex–Loita	1074.5	0.87

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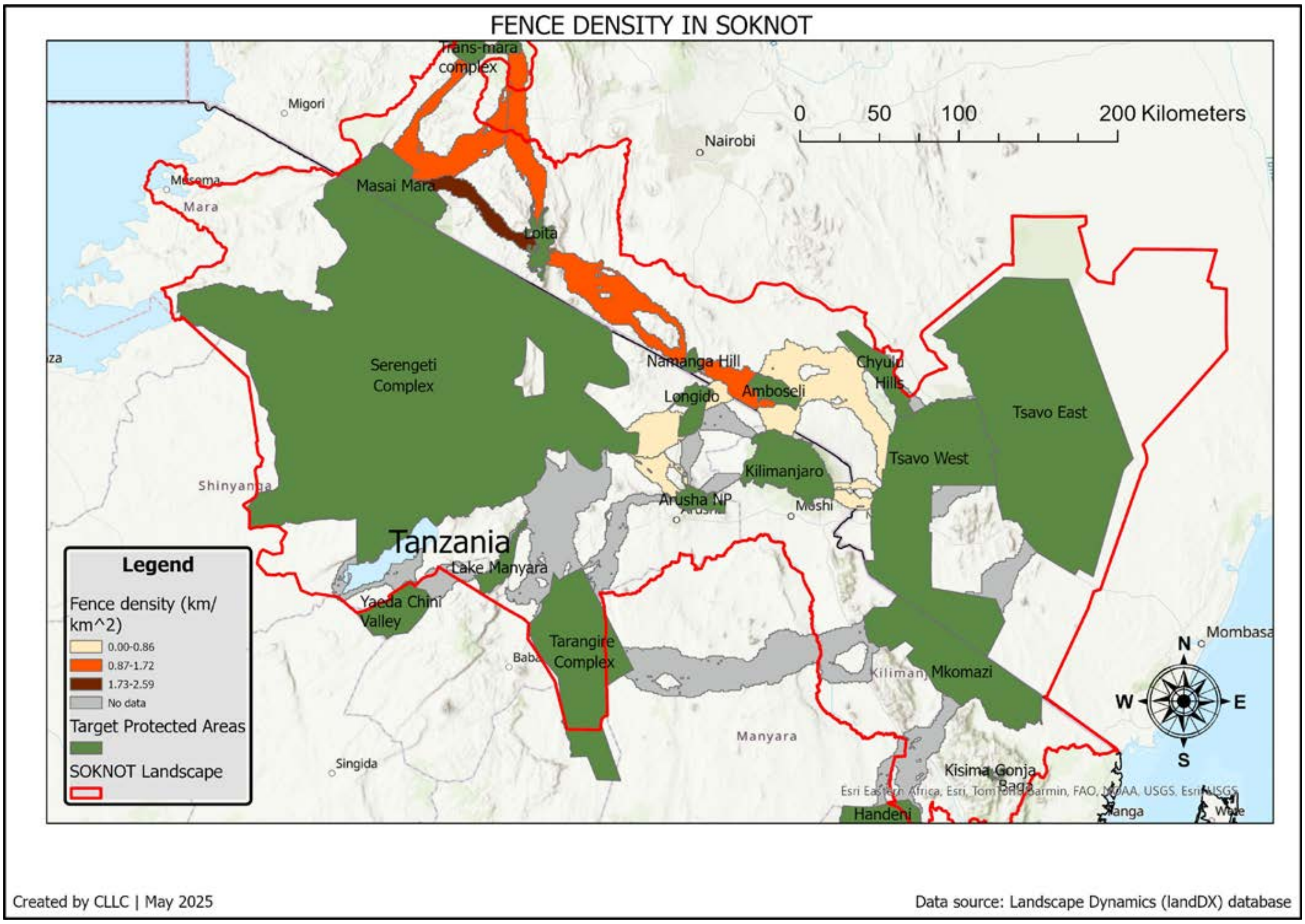

Figure 9. *SOKNOT's ecological network for conservation: Fence density in wildlife corridors. Fencing, while sometimes implemented to protect agricultural lands and mitigate human-wildlife conflicts, can impede wildlife movements, leading to habitat fragmentation. Monitoring fence density is important for informing adaptive management of wildlife corridors. This map shows lands likely important to wildlife movement between protected areas in the Southern Kenya and Northern Tanzania (SOKNOT) landscape. For Kenya, the corridors were mapped using the Human Modification dataset, which provides a cumulative measure of human modification of terrestrial lands. For Tanzania, the corridors were adopted from the "Tanzania Wildlife Corridors Assesment, Prioritization, and Action Plan". This map is part of the remote-sensing corridor monitoring Baseline for 2024.*

3.4.4. HUMAN POPULATION DENSITY

Population density within each corridor was assessed to evaluate potential pressure from human settlements and activities on corridor connectivity and integrity (see Section 2.4.4 for methodology). Higher population densities indicate greater potential for human–wildlife interactions and disturbance. The results are summarised in Table 8 and spatially illustrated in Figure 10.

Population density across SOKNOT corridors is generally low, with notable variation among corridors (Table 8). Loita–Namanga (10.3 people/km²), Kilimanjaro–Amboseli (8.6 people/km²), and Mkomazi–Handeni (8.6 people/km²) have the highest densities, indicating greater potential for human–wildlife interactions. Several corridors, including Baga–Kisima Gonja, Longido–Amboseli, Serengeti Complex–Longido, and Serengeti Complex–Yaeda Chini, and both Tsavo East–Tsavo West segments, recorded zero population density, suggesting minimal direct human pressure.

Table 8. *Population density in corridors.*

CORRIDOR	MEAN POPULATION DENSITY (PEOPLE/KM^2)
Amboseli–Chyulu–Tsavo	7.3
Arusha–Longido	3.6
Baga–Kisima Gonja	0.0
Chyulu–Tsavo East	2.6
Kilimanjaro–Amboseli	8.6
Kilimanjaro–Arusha	3.9
Kilimanjaro–Longido	7.2
Kilimanjaro–Tsavo	4.5
Lake Manyara–Yaeda Chini	5.7
Loita–Namanga	10.3
Longido–Amboseli	0.0
Maasai Mara–Loita	3.3
Maasai Mara–Trans Mara complex	3.9
Mkomazi–Handeni	8.6
Namanga–Amboseli	6.1
Seregeti Complex–Arusha	4.2
Serengeti Complex–Longido	0.0
Serengeti Complex–Manyara–Tarangire Complex	5.6
Serengeti Complex–Yaeda Chini	0.0
Tarangire Complex–Arusha	5.2
Tarangire Complex–Mkomazi	6.9
Trans Mara Complex–Loita	5.0
Tsavo East–Tsavo West (North)	0.0
Tsavo East–Tsavo West (South)	0.0

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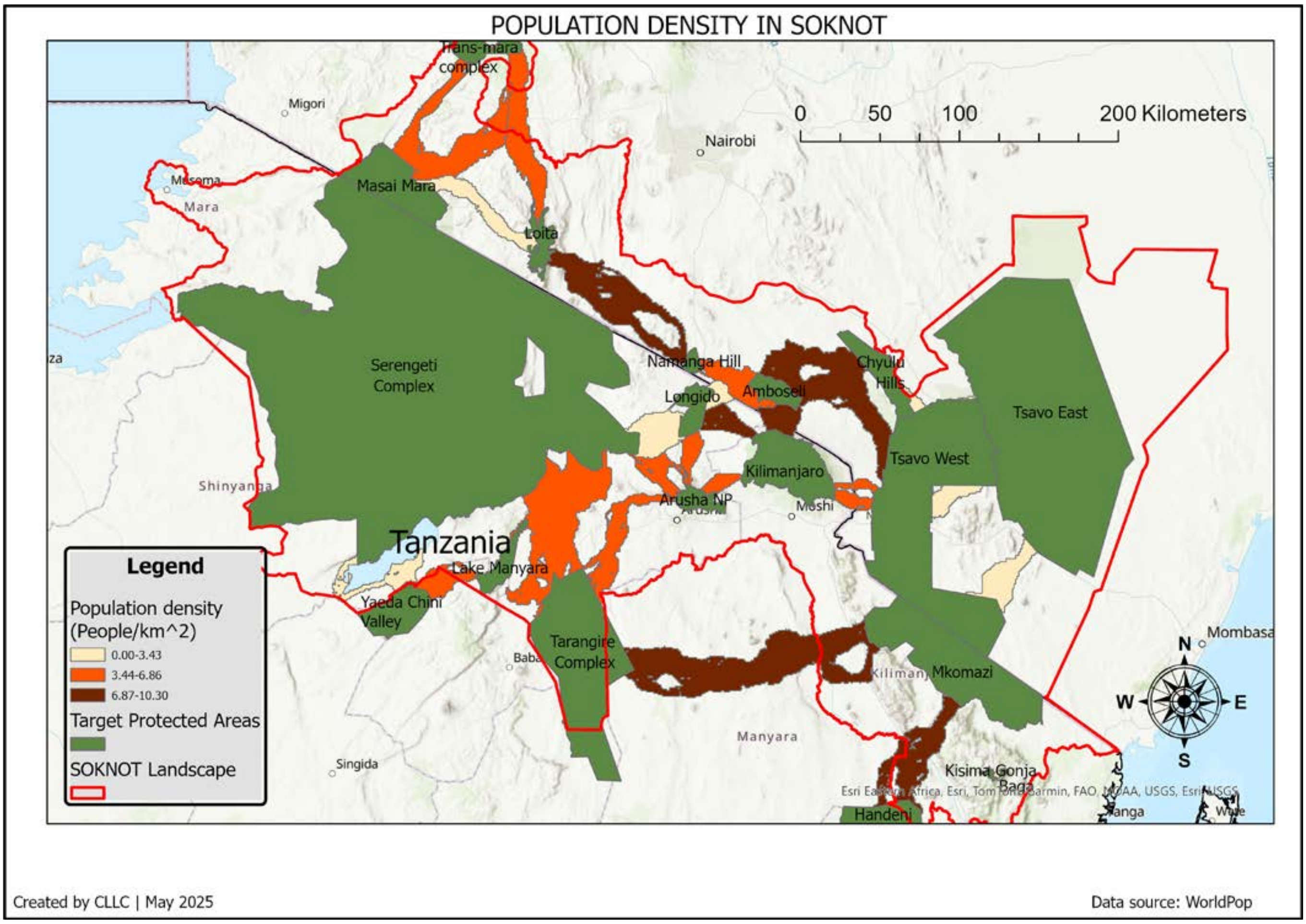

Figure 10. *SOKNOT's ecological network for conservation: Population density in wildlife corridors. Increasing human density within the corridors can lead to habitat fragmentation and increased human-wildlife conflict. Monitoring human density is important for informing adaptive management of wildlife corridors. This map shows lands likely important to wildlife movement between protected areas in the Southern Kenya and Northern Tanzania (SOKNOT) landscape. For Kenya, the corridors were mapped using the Human Modification dataset, which provides a cumulative measure of human modification of terrestrial lands. For Tanzania, the corridors were adopted from the "Tanzania Wildlife Corridors Assesment, Prioritization, and Action Plan". This map is part of the remote-sensing corridor monitoring Baseline for 2024.*


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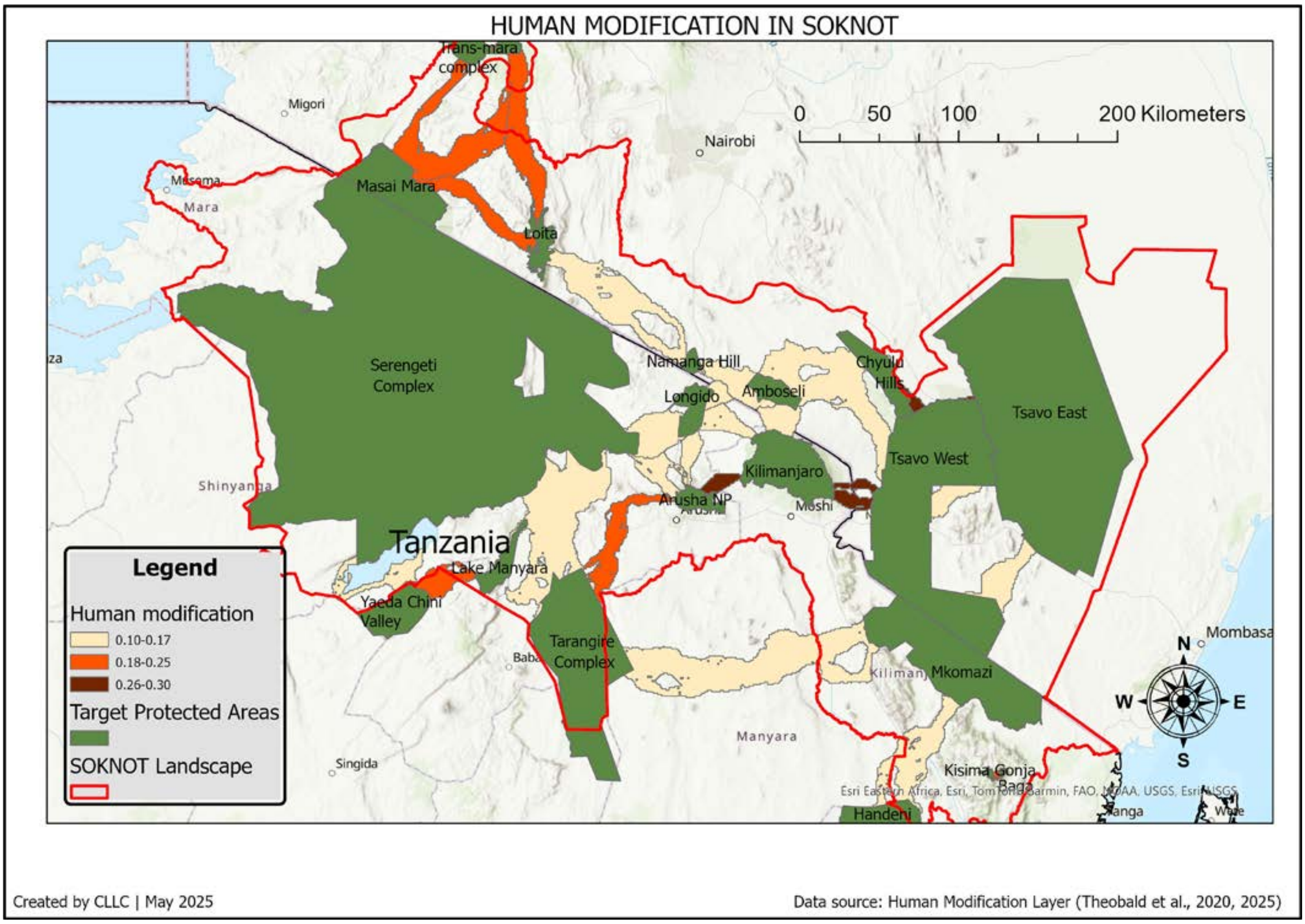
3.4.5. HUMAN MODIFICATION

Human modification (HM) within each corridor was quantified, with values ranging from 0 (least modified) to 1 (most modified) (see Section 2.4.5 for methodology). These values provide an indication of the extent of anthropogenic impact across the corridors, highlighting areas where human activities may reduce ecological integrity and connectivity. The results are summarised in Table 9 and visualised in Figure 11.

Human modification (HM) within SOKNOT corridors is generally low, with values ranging from 0.1 to 0.3 (Table 9). Corridors such as Chyulu–Tsavo East, Kilimanjaro–Arusha, and Kilimanjaro–Tsavo exhibit the highest HM values (0.3), indicating relatively greater anthropogenic impact. Most other corridors, including Serengeti Complex–Manyara–Tarangire, Loita–Namanga, and Tsavo East–Tsavo West, show minimal modification (0.1), suggesting largely intact landscapes with low human disturbance.

Table 9. *Human modification in each corridor. HM value ranges from 0 (least modified) to 1 (most modified).*

CORRIDOR	MEAN HUMAN MODIFICATION
Amboseli–Chyulu–Tsavo	0.1
Arusha–Longido	0.1
Baga–Kisima Gonja	0.2
Chyulu–Tsavo East	0.3
Kilimanjaro–Amboseli	0.1
Kilimanjaro–Arusha	0.3
Kilimanjaro–Longido	0.1
Kilimanjaro–Tsavo	0.3
Lake Manyara–Yaeda Chini	0.2
Loita–Namanga	0.1
Longido–Amboseli	0.1
Maasai Mara–Loita	0.2
Maasai Mara–Trans Mara complex	0.2
Mkomazi–Handeni	0.1
Namanga–Amboseli	0.1
Seregeti Complex–Arusha	0.1
Serengeti Complex–Longido	0.1
Serengeti Complex–Manyara–Tarangire Complex	0.1
Serengeti Complex–Yaeda Chini	0.1
Tarangire Complex–Arusha	0.2
Tarangire Complex–Mkomazi	0.1
Trans Mara Complex–Loita	0.2
Tsavo East–Tsavo West (North)	0.1
Tsavo East–Tsavo West (South)	0.1


HUMAN MODIFICATION IN SOKNOT

Created by CLLC | May 2025

Data source: Human Modification Layer (Theobald et al., 2020, 2025)

Figure 11. *SOKNOT's ecological network for conservation: Human modification in wildlife corridors. Human modification characterizes the extent of factors such as urbanization, agriculture, and linear transport infrastructure on the natural environment. Monitoring human modification is important for informing adaptive management of wildlife corridors. This map shows lands likely important to wildlife movement between protected areas in the Southern Kenya and Northern Tanzania (SOKNOT) landscape. For Kenya, the corridors were mapped using the Human Modification dataset, which provides a cumulative measure of human modification of terrestrial lands. For Tanzania, the corridors were adopted from the "Tanzania Wildlife Corridors Assesment, Prioritization, and Action Plan". This map is part of the remote-sensing corridor monitoring Baseline for 2024.*

3.4.6. LEVEL OF PROTECTION

The level of legal protection for structural corridors was assessed by calculating the percentage overlap of each corridor with different categories of protected areas (see Section 2.4.7 for methodology). Higher overlap percentages indicate stronger protection. Figure 12 presents a map categorising corridors into three protection percentage classes, providing a visual overview of relative protection levels. Figure 13 shows the percentage of protection for each corridor, allowing for direct comparison, and Table 10 summarises the overlap of each corridor with the different types of protected areas.

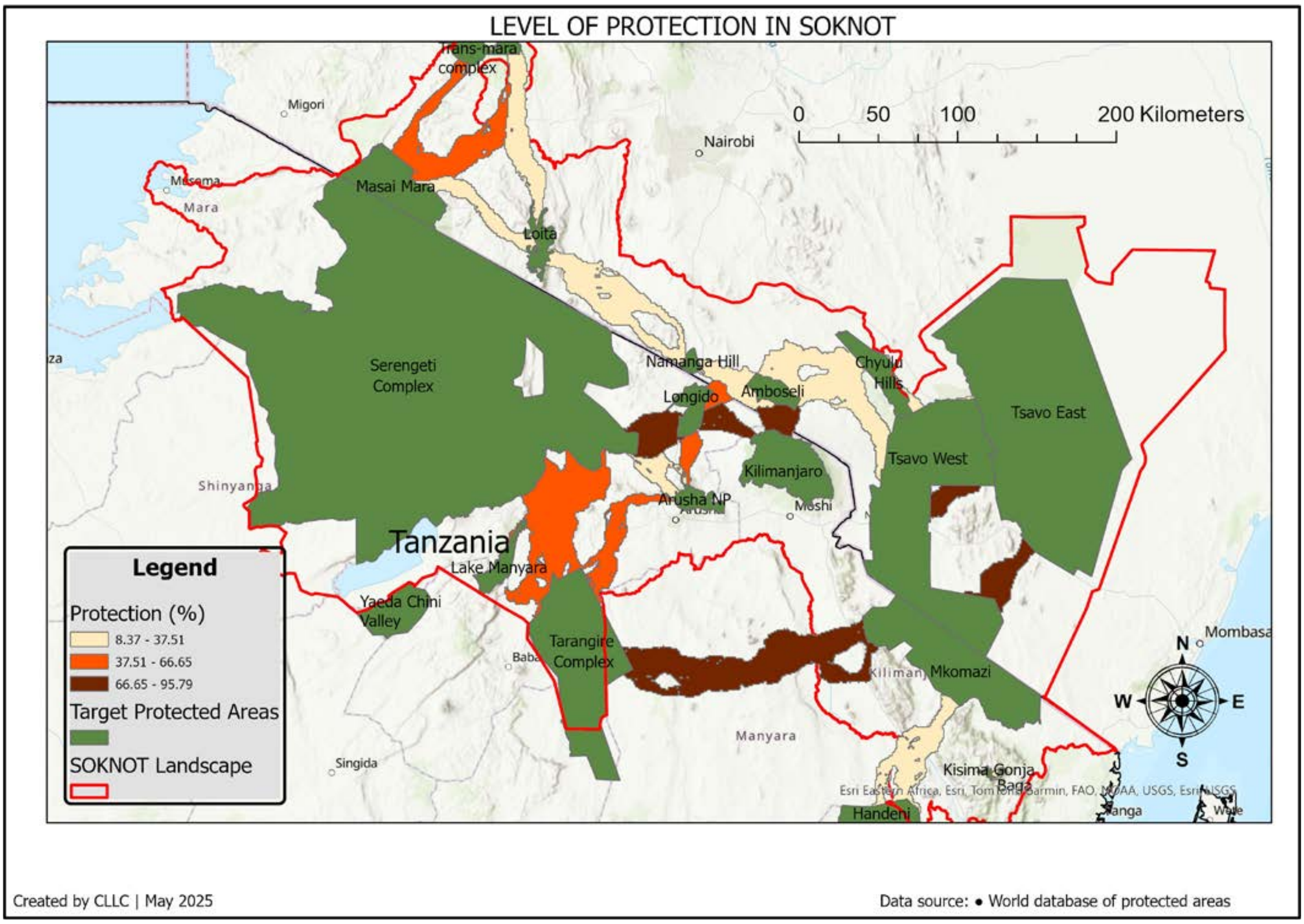


Figure 12. *Corridors in SOKNOT are partially protected by different land designations. The protection status of each corridor was determined by calculating the percentage overlap with existing conserved areas such as wildlife management areas and forest reserves. Monitoring the protection status is important for informing area-based conservation strategies to ensure the functionality of the wildlife corridors. This map shows lands likely important to wildlife movement between protected areas in the Southern Kenya and Northern Tanzania (SOKNOT) landscape. For Kenya, the corridors were mapped using the Human Modification dataset, which provides a cumulative measure of human modification of terrestrial lands. For Tanzania, the corridors were adopted from the "Tanzania Wildlife Corridors Assesment, Prioritization, and Action Plan". This map is part of the remote-sensing corridor monitoring Baseline for 2024.*

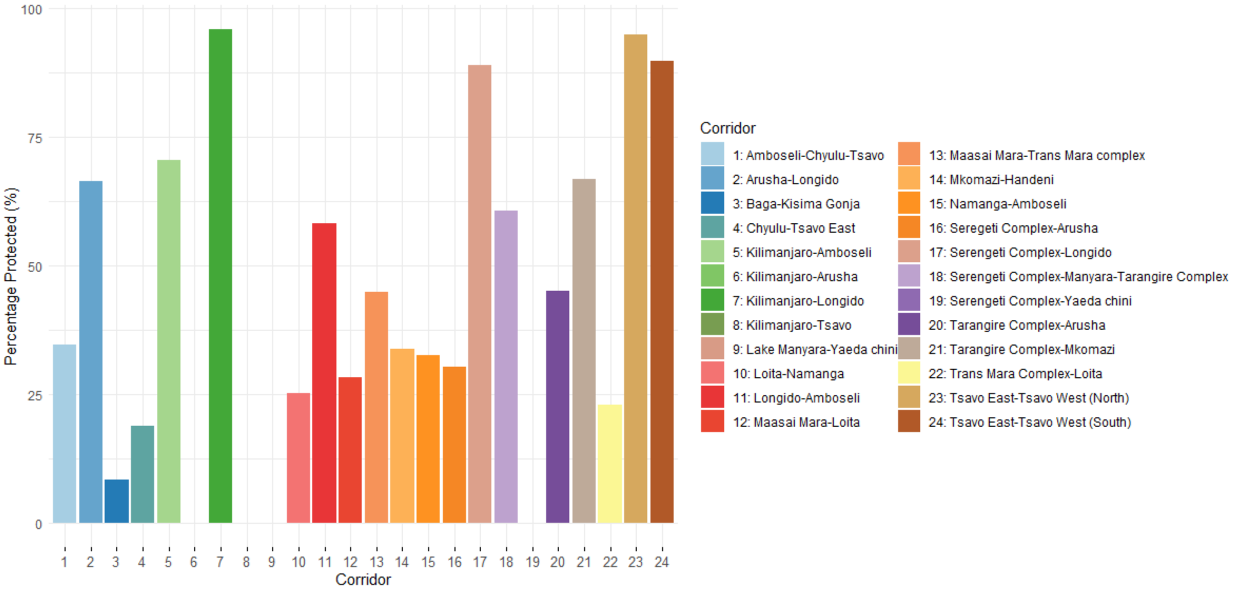


Figure 13. *The level of protection in the wildlife corridors.*

Protected area coverage varies widely across SOKNOT corridors (Table 10). Corridors such as Kilimanjaro–Longido (95.8%) and Tsavo East–Tsavo West (North 94.8%, South 89.7%) are well-protected, while Kilimanjaro–Arusha, Kilimanjaro–Tsavo, Lake Manyara–Yaeda Chini, and Serengeti Complex–Yaeda Chini have no protection. Several corridors show moderate protection, such as Tarangire Complex–Arusha (45.0%) and Serengeti Complex–Manyara–Tarangire Complex (60.5%), reflecting partial overlap with various protected area types.

Table 10. *Several categories of protected areas overlapping with corridors in SOKNOT.*

CORRIDOR	WILDLIFE MANAGE-MENT AREAS	FOREST	NATIONAL RESERVE	GAME CONTROLLED AREA	CONSERV-ANCY	TOTAL
Amboseli – Chyulu – Tsavo	0	0.07	0	0	34.5	34.57
Arusha – Longido	65.87	0.34	0	0.12	0	66.33
Baga – Kisima Gonja	0	8.37	0	0	0	8.37
Chyulu – Tsavo East	0	0.02	14.2	0	4.58	18.8
Kilimanjaro – Amboseli	28.93	0.06	0	0	41.33	70.32
Kilimanjaro – Arusha	0	0	0	0	0	0
Kilimanjaro – Longido	95.79	0	0	0	0	95.79
Kilimanjaro – Tsavo	0	0	0	0	0	0
Lake Manyara – Yaeda chini	0	0	0	0	0	0
Loita – Namanga	0	0	0	0	25.08	25.08
Longido – Amboseli	58.14	0	0	0	0	58.14
Maasai Mara – Loita	0	0	0	0	28.19	28.19
Maasai Mara – Trans Mara complex	0	0.34	0	0	44.5	44.84
Mkomazi – Handeni	0	0.23	0	33.46	0	33.69
Namanga – Amboseli	0.1	0	0	0	32.32	32.42
Seregeti Complex – Arusha	0.41	3.44	0	26.5	0	30.35
Serengeti Complex – Longido	0.75	0	0	88.08	0	88.83
Serengeti Complex – Manyara – Tarangire Complex	15.98	1.95	0	42.61	0	60.54
Serengeti Complex – Yaeda chini	0	0	0	0	0	0
Tarangire Complex – Arusha	0	9.86	0	35.17	0	45.03
Tarangire Complex – Mkomazi	0	1.67	0	65.08	0	66.75
Trans Mara Complex – Loita	0	19.37	0	0	3.58	22.95
Tsavo East – Tsavo West (North)	0	0	0	0	94.76	94.76
Tsavo East – Tsavo West (South)	0	0	0	0	89.68	89.68

3.4.7. FRAGMENTATION

Fragmentation within SOKNOT corridors shows substantial variation, as reflected in multiple landscape metrics (Table 11; see Section 2.4.8. for methodology). Corridors such as Tsavo East–Tsavo West (North and South) exhibit high connectance and low edge density, indicating more cohesive and less fragmented landscapes.

In contrast, corridors such as Tarangire Complex–Arusha and Kilimanjaro–Arusha show high edge density and moderate connectance, reflecting greater habitat fragmentation. Overall, these results highlight differences in landscape connectivity and fragmentation across the SOKNOT network.

Table 11. *Measures of fragmentation in the corridors.*

CORRIDOR	CONNECTANCE	EDGE DENSITY	PROXIMITY	SHANNON ENTROPY	NUMBER PATCHES	TOTAL CORE AREA	GIS FRAG
Amboseli–Chyulu–Tsavo	63.8	103.4	102.5	1.4	62979	145419.21	0
Arusha–Longido	55.8	139.9	NA	1.5	10701	15813.36	11.92
Baga–Kisima Gonja	55.1	141.1	117.5	1.4	797	1130.76	2.79
Chyulu–Tsavo East	57.1	127.5	114.5	1.5	3979	6234.48	4.94
Kilimanjaro–Amboseli	51.8	116.7	99.4	1.7	12485	23008.59	6.46
Kilimanjaro–Arusha	51.6	141.0	101.7	1.9	8029	10244.34	11.46
Kilimanjaro–Longido	63.8	108.3	98.4	1.3	13281	28532.25	10.1
Kilimanjaro–Tsavo	50.3	131.5	NA	2.0	13383	17937	9.23
Lake Manyara–Yaeda Chini	63.9	86.3	117.3	1.5	12390	32393.34	4.36
Loita–Namanga	65.1	86.5	110.1	1.4	40472	129251.61	0
Longido–Amboseli	64.5	87.6	118.9	1.2	4531	12682.71	7.74
Maasai Mara–Loita	65.5	94.9	116.8	1.4	16006	46326.24	4.29
Maasai Mara–Trans Mara complex	70.1	78.7	117.1	1.2	42853	132744.42	4.39
Mkomazi–Handeni	72.6	67.6	103.9	1.1	25022	99779.85	1.7
Namanga–Amboseli	60.0	102.9	NA	1.6	14873	37638.81	6.52
Seregeti Complex–Arusha	57.3	122.7	94.9	1.6	22468	39506.04	8.74
Serengeti Complex–Longido	67.2	101.2	98.5	1.2	19370	46126.26	6.18
Serengeti Complex–Manyara–Tarangire Complex	50.4	117.4	95.6	2.1	95982	177823.08	0
Serengeti Complex–Yaeda Chini	62.7	57.7	114.3	1.8	9453	47972.07	4.55
Tarangire Complex–Arusha	45.2	157.8	89.4	2.2	40214	44356.86	4.08
Tarangire Complex–Mkomazi	69.0	75.4	111.4	1.3	80664	267874.11	0
Trans Mara Complex–Loita	57.6	103.6	NA	1.9	37726	80303.22	0
Tsavo East–Tsavo West (North)	94.6	11.4	228.1	0.2	1272	31303.89	1.51
Tsavo East–Tsavo West (South)	92.1	16.5	196.1	0.3	2813	61245.63	0.85

3.4.8. CURRENT FLOW

Mean current flow values for focal species across SOKNOT corridors, calculated using Circuitscape, indicate variation in species-specific connectivity (Table 12; see Section 2.4.9. for methodology). Higher values reflect stronger potential movement and connectivity for the species. For example, Longido–Amboseli and Kilimanjaro–Longido show relatively high connectivity for most species, particularly elephants and wildebeest. In contrast, corridors such as Serengeti Complex–Yaeda Chini, Trans Mara Complex–Loita, and Tarangire Complex–Mkomazi exhibit low mean current values, suggesting limited connectivity and potential barriers to wildlife movement.

***Table 12.** Mean current values for focal species in each corridor.*

CORRIDOR	ELEPHANT	GIRAFFE	ZEBRA	WILDEBEEST	LION	CHEETAH	WILD DOG
Amboseli–Chyulu–Tsavo	0.55	0.57	0.54	0.62	0.53	0.69	0.47
Arusha–Longido	0.61	0.60	0.65	0.69	0.67	0.77	0.57
Baga–Kisima Gonja	1.58	1.59	1.61	1.57	1.54	1.50	1.37
Chyulu–Tsavo East	0.41	0.39	0.39	0.38	0.38	0.40	0.40
Kilimanjaro–Amboseli	0.65	0.63	0.68	0.65	0.76	0.75	0.65
Kilimanjaro–Arusha	0.70	0.70	0.68	0.79	0.77	0.89	0.54
Kilimanjaro–Longido	0.71	0.74	0.77	0.85	0.71	0.88	0.64
Kilimanjaro–Tsavo	0.48	0.48	0.51	0.53	0.56	0.56	0.45
Lake Manyara–Yaeda Chini	0.31	0.34	0.33	0.29	0.36	0.29	0.41
Loita–Namanga	0.36	0.37	0.33	0.32	0.34	0.33	0.40
Longido–Amboseli	0.75	0.82	0.76	0.89	0.88	1.01	0.62
Maasai Mara–Loita	0.41	0.51	0.38	0.44	0.46	0.47	0.46
Maasai Mara–Trans Mara complex	0.30	0.35	0.28	0.35	0.35	0.40	0.27
Mkomazi–Handeni	0.36	0.34	0.34	0.32	0.33	0.34	0.40
Namanga–Amboseli	0.71	0.81	0.69	0.82	0.75	0.85	0.67
Seregeti Complex–Arusha	0.49	0.48	0.53	0.56	0.60	0.65	0.47
Serengeti Complex–Longido	0.52	0.54	0.53	0.57	0.60	0.61	0.53
Serengeti Complex–Manyara–Tarangire Complex	0.38	0.38	0.39	0.45	0.41	0.45	0.35
Serengeti Complex–Yaeda Chini	0.28	0.28	0.29	0.34	0.26	0.23	0.27
Tarangire Complex–Arusha	0.37	0.36	0.38	0.39	0.41	0.44	0.35
Tarangire Complex–Mkomazi	0.30	0.29	0.29	0.27	0.31	0.29	0.31
Trans Mara Complex–Loita	0.28	0.31	0.26	0.30	0.31	0.33	0.25
Tsavo East–Tsavo West (North)	0.72	0.71	0.68	0.65	0.87	0.78	0.73
Tsavo East–Tsavo West (South)	0.41	0.42	0.38	0.38	0.43	0.41	0.41

3.4.9. EFFECTIVE RESISTANCE

Effective resistance values for focal species highlight how much corridors are facilitating wildlife movement (Table 13; methodology in Section 2.4.10). Lower effective resistance indicates that a species can move through a corridor relatively easily, while higher values suggest that moving through the corridor comes with challenges. Corridors such as Longido–Amboseli and Tsavo East–Tsavo West (North) generally show low resistance for most species, indicating high connectivity.

In contrast, Serengeti Complex–Yaeda Chini, Trans Mara Complex–Loita, and Mkomazi–Handeni exhibit very high resistance, reflecting that wildlife likely moves through the corridor with difficulty. These results, derived from species-specific resistance layers, provide insight into how protected areas are functionally connected and where conservation interventions may be needed to reduce isolation of the abutting protected areas.

Table 13. *Effective resistance values for focal species in each corridor.*

CORRIDOR	CHEETAH	ELEPHANT	WILDEBEEST	GIRAFFE	WILD DOG	LION	ZEBRA
Amboseli–Chyulu–Tsavo	44.8	37.9	36.0	44.9	34.7	44.5	36.0
Arusha–Longido	57.5	56.4	68.2	57.5	37.4	44.2	68.2
Baga–Kisima Gonja	35.7	37.5	61.2	35.6	19.3	22.7	61.2
Chyulu–Tsavo East	53.2	54.9	59.2	53.1	40.2	51.4	59.2
Kilimanjaro–Tsavo	62.2	65.3	72.8	62.1	40.3	48.3	72.8
Kilimanjaro–Amboseli	42.1	44.5	51.0	42.0	22.8	28.7	51.0
Kilimanjaro–Arusha	72.7	73.2	90.9	72.6	41.1	47.1	90.9
Kilimanjaro–Longido	52.7	56.3	64.1	52.6	31.4	38.6	64.1
Lake Manyara–Yaeda Chini	95.2	99.6	115.2	94.9	78.4	91.3	115.2
Loita–Namanga	86.3	72.4	88.1	90.7	55.9	95.1	88.1
Longido–Amboseli	36.2	33.5	27.4	36.2	32.8	41.1	27.4
Maasai Mara–Loita	75.7	47.1	45.1	79.7	56.6	89.8	45.1
Maasai Mara–Trans Mara complex	113.6	77.0	66.2	114.9	105.9	120.3	66.2
Namanga–Amboseli	54.7	45.6	51.9	56.7	40.2	61.3	51.9
Serengeti complex–Arusha	82.8	73.7	81.6	82.9	55.2	66.7	81.6
Serengeti complex–Longido	62.0	53.6	47.7	62.4	49.6	63.9	47.7
Serengeti complex–Manyara–Tarangire	69.0	56.5	43.2	68.9	58.6	72.0	43.2
Serengeti complex–Yaeda Chini	139.8	142.8	141.1	139.3	115.2	140.4	141.1
Tarangire complex–Arusha	90.6	83.5	87.5	90.4	65.3	76.6	87.5
Tarangire complex–Mkomazi	94.2	90.2	77.5	94.1	82.2	100.4	77.5
Trans–mara complex–Loita	134.4	95.2	97.4	138.2	113.6	146.1	97.4
Tsavo East–Tsavo West (North)	35.2	42.4	43.7	35.1	31.7	40.7	43.7
Tsavo East–Tsavo West (South)	46.3	41.6	32.5	46.2	43.5	54.3	32.5
Mkomazi–Handeni	123.1	140.0	158.4	122.7	85.1	104.4	158.4
Average effective resistance	73.33	67.53	71.16	73.90	55.71	70.41	71.16

The overall effective resistance value for all focal species is 69.03.

3.4.10. PRONET

Using structural resistance derived from a combination of human modification and slope, we assessed the landscape connectivity between core protected areas across the SOKNOT landscape. The ProNet connectivity value was 0.384 (on a scale from 0–1), indicating a moderate level of structural connectivity across the network of protected areas.

The connectivity analysis produced a network of habitat patches and linkages that were further organised into ProNet clusters (Figure 14). These clusters represent groups of areas that are functionally connected, indicating where wildlife can move freely within the landscape. Mapping these clusters helps visualise the spatial structure of connectivity and identify zones of strong ecological linkage as well as regions where fragmentation limits movement.

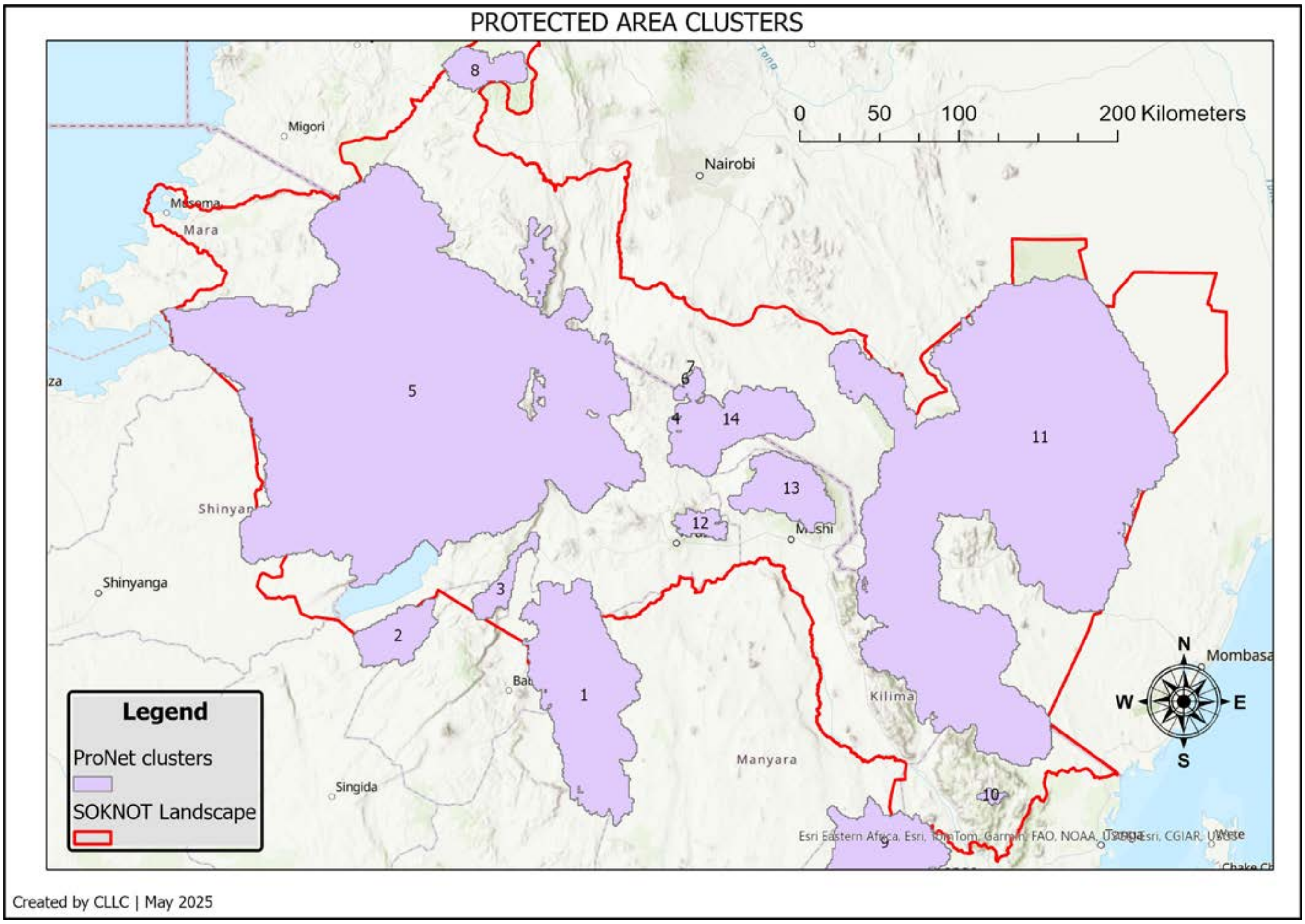
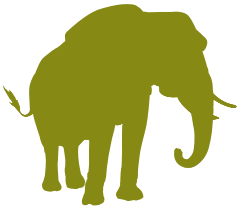


Figure 14. *Protected area clusters generated for the ProNet analysis.*

3.5. ASSESSING CORRIDOR FUNCTIONALITY FOR FOCAL SPECIES

3.5.1. OCCURRENCE POINTS

The following maps (Figures 15-21) illustrate the occurrence data points used in developing habitat suitability models for key focal species across the SOKNOT landscape. These datasets were compiled from multiple sources, including data from partners (see Section 9), GBIF, national wildlife censuses, and iNaturalist (INAT). The spatial distribution of records reveals noticeable variation in sampling intensity across the landscape. Some areas, such as the Mara ecosystem and the Amboseli region, are relatively well studied and contain dense clusters of species observations. In contrast, other regions, particularly the Tsavo landscape and adjoining community areas, show limited records, indicating data gaps and reduced sampling coverage. A large proportion of movement data is available for elephants, especially in the northern part of SOKNOT, reflecting extensive monitoring of this species. Conversely, in the southern and eastern parts of the landscape, most of the available records are derived from opportunistic sources such as iNaturalist, which tend to provide less systematic coverage. This uneven data distribution highlights spatial bias in sampling efforts and underscores the importance of integrating multiple data sources to achieve a more comprehensive understanding of species distributions across the transboundary landscape.



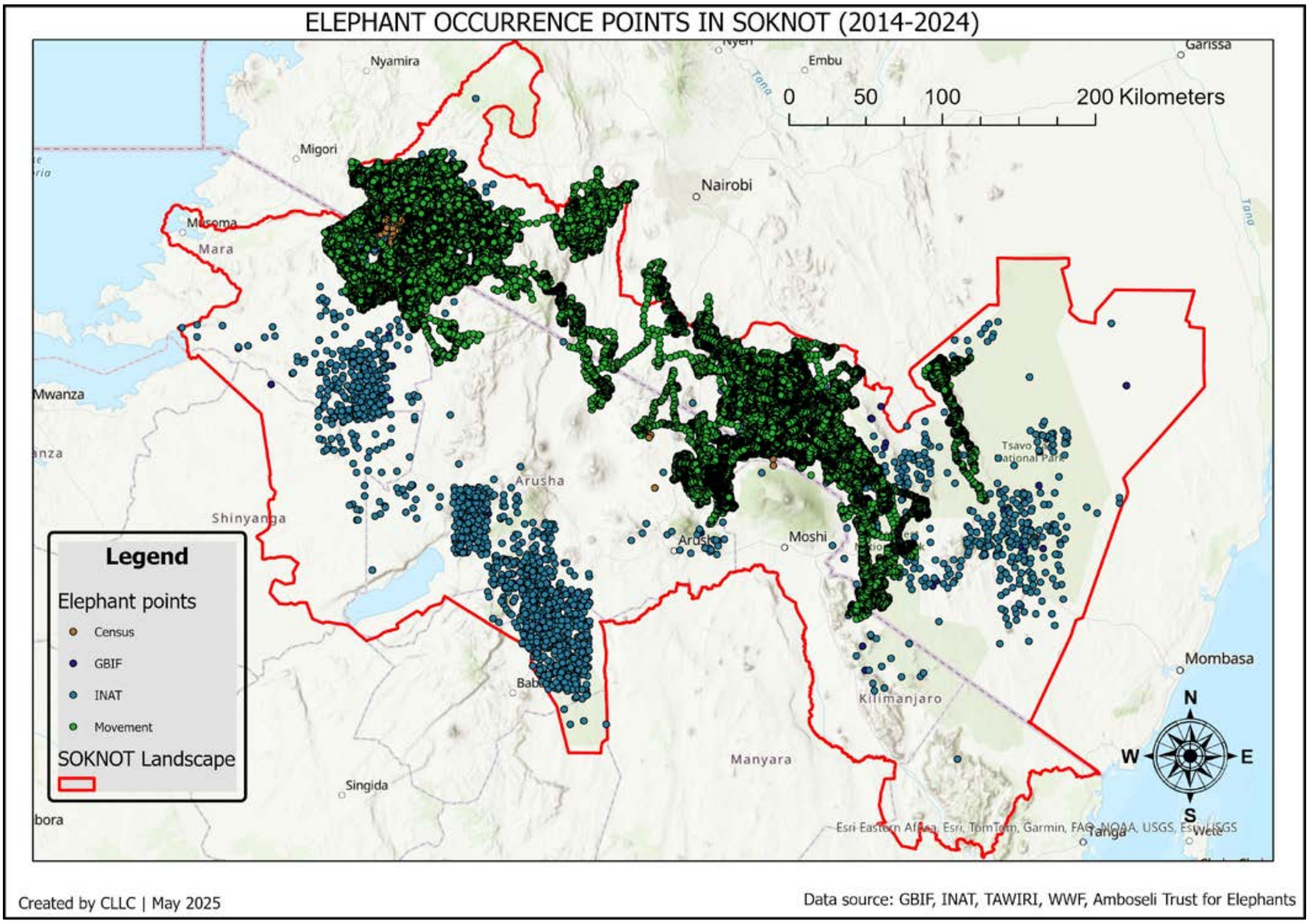


Figure 15. *Occurrence points for elephants.*

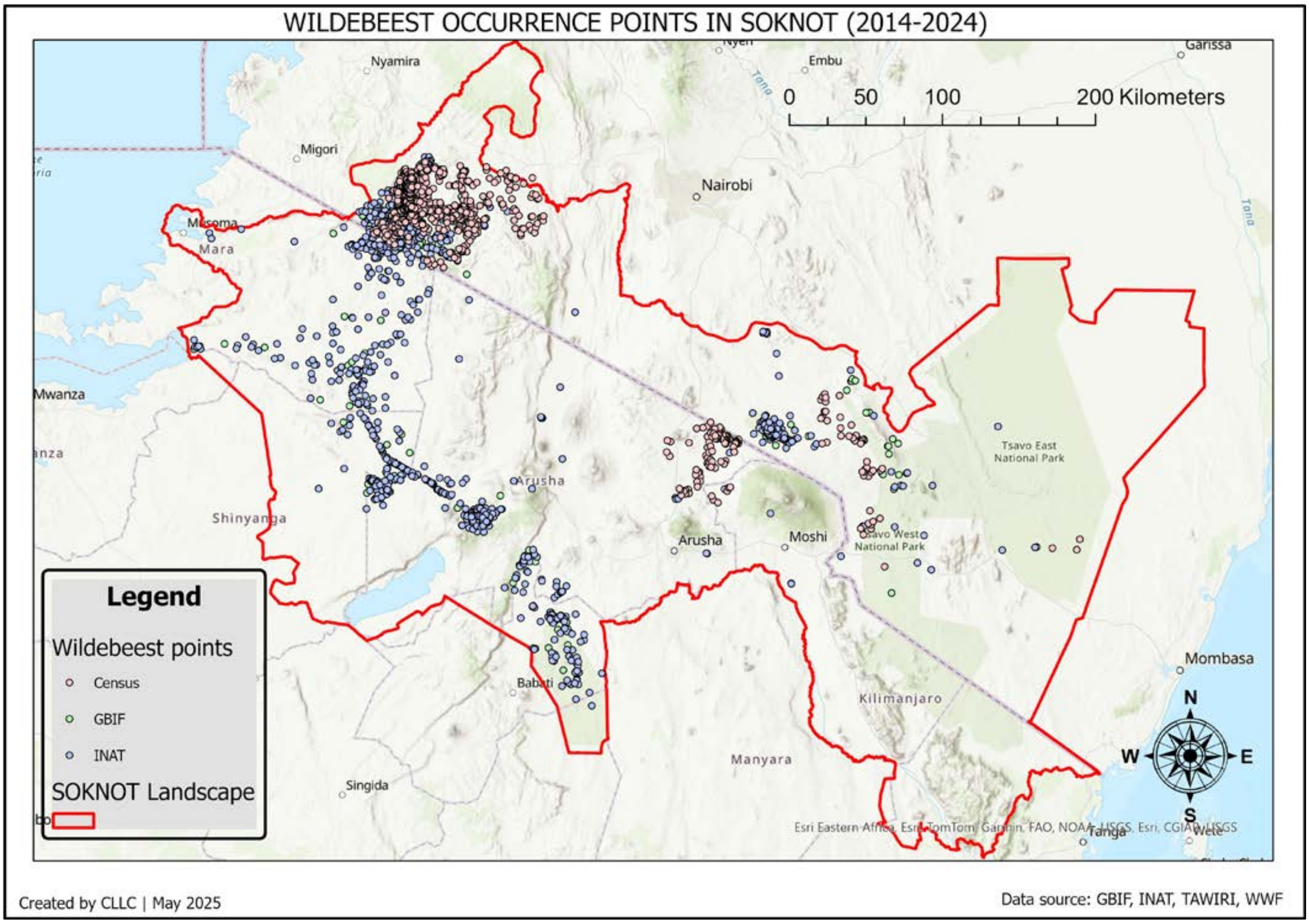
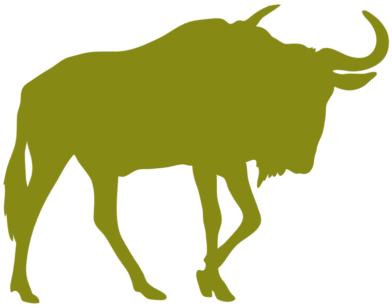
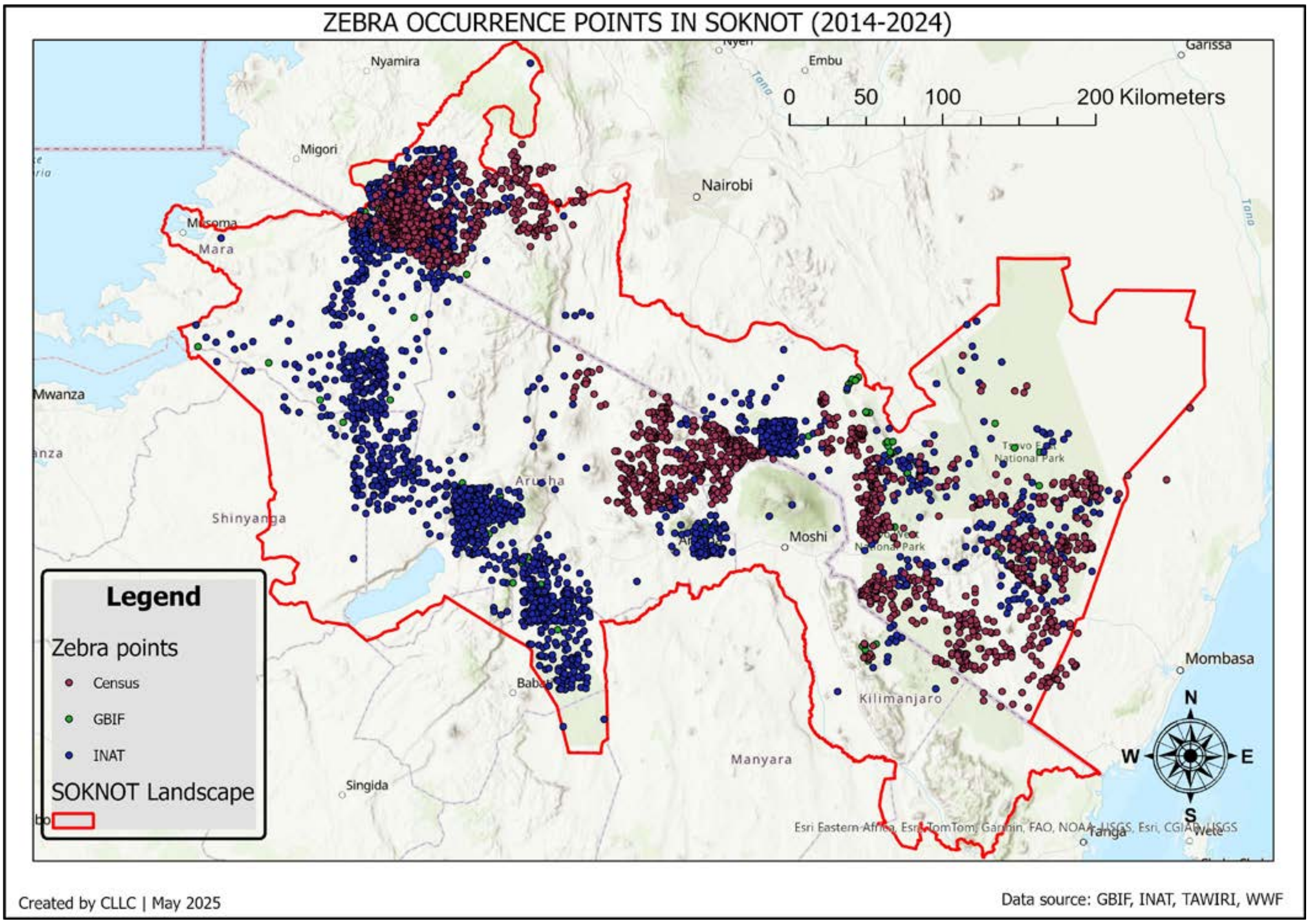


Figure 16. *Occurrence points for wildebeest.*

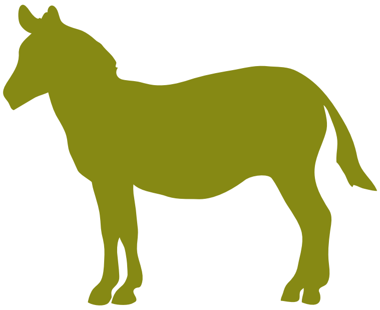




Created by CLLC | May 2025

Data source: GBIF, INAT, TAWIRI, WWF

Figure 17. *Occurrence points for zebra.*



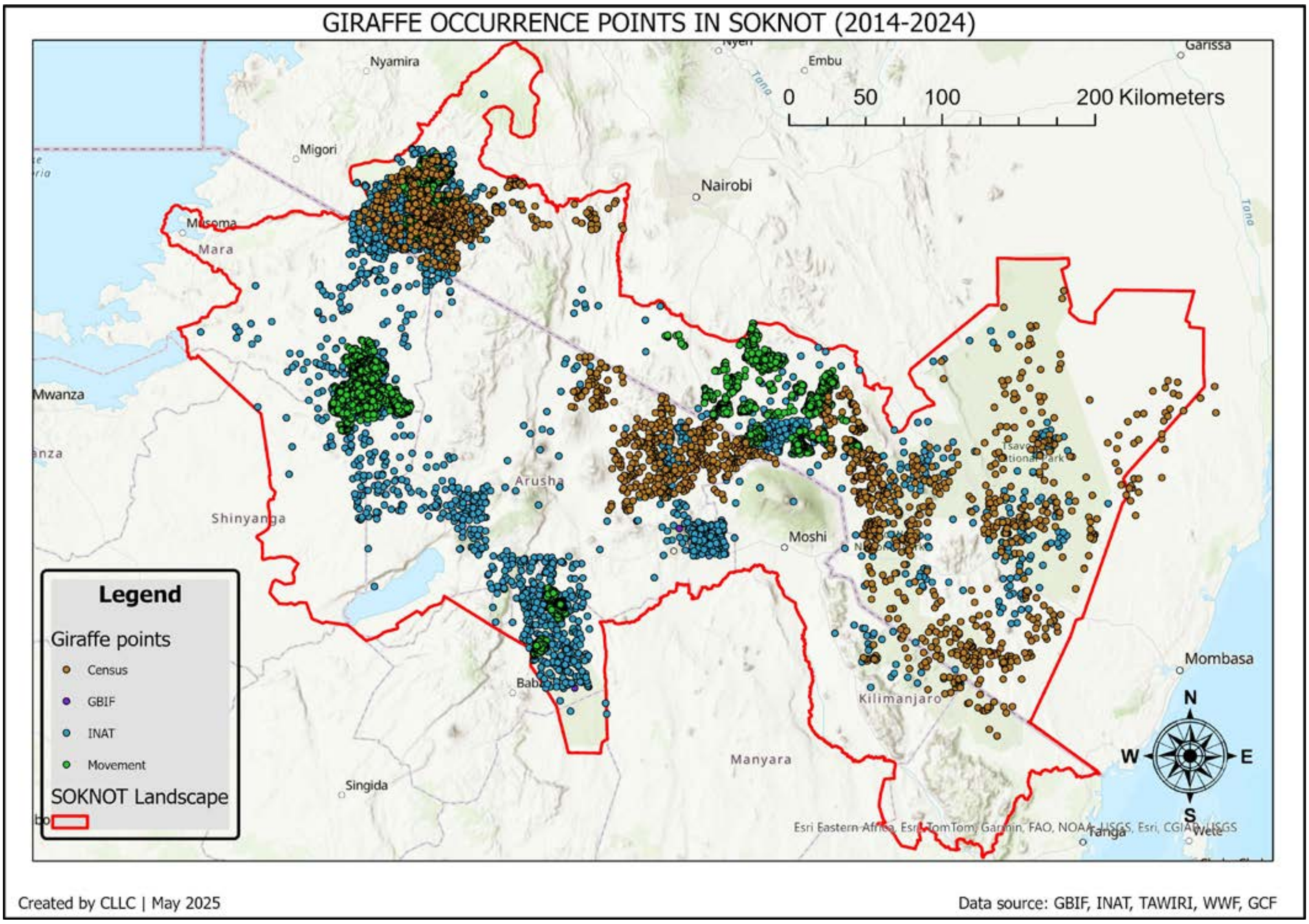
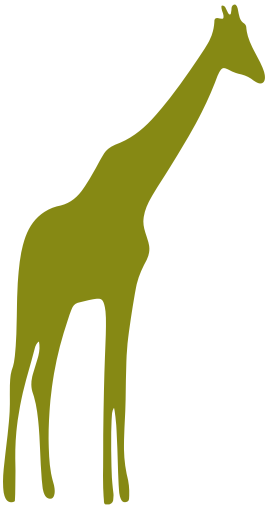
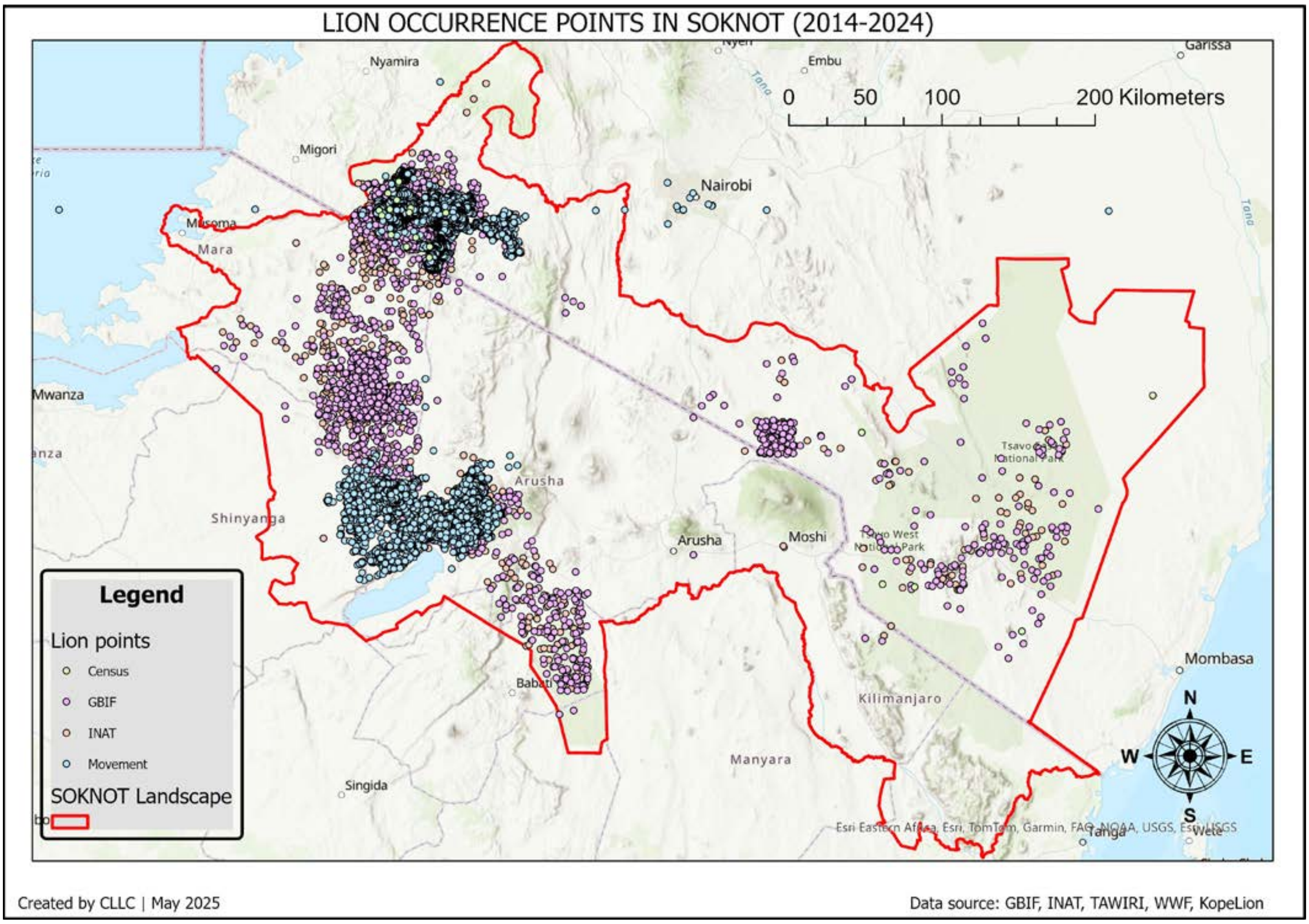


Figure 18. *Occurrence points for giraffe.*

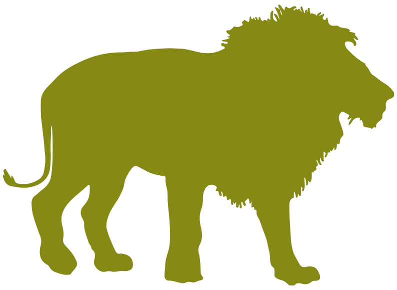




Created by CLLC | May 2025

Data source: GBIF, INAT, TAWIRI, WWF, KopeLion

Figure 19. *Occurrence points for lion.*



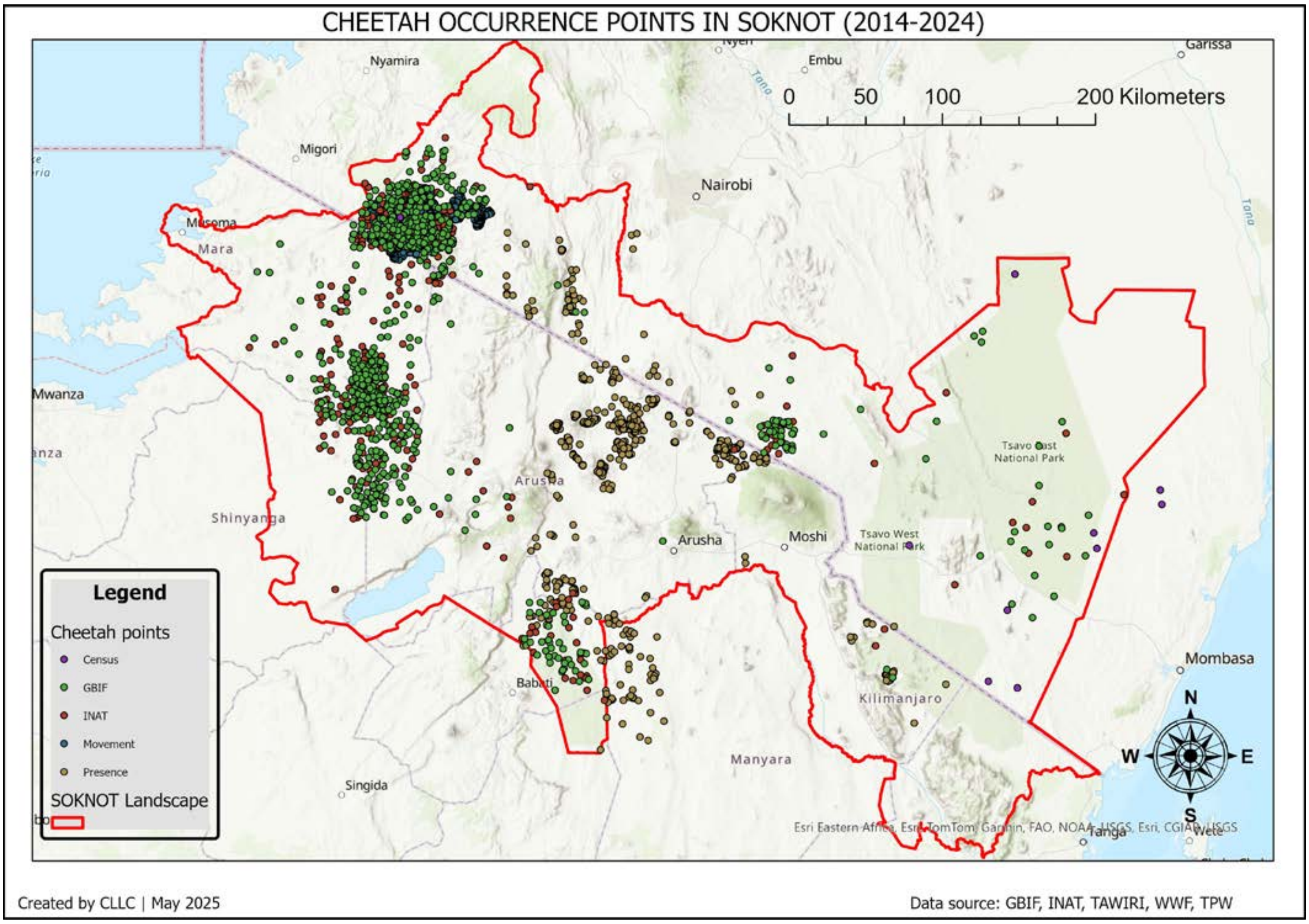


Figure 20. *Occurrence points for cheetah.*

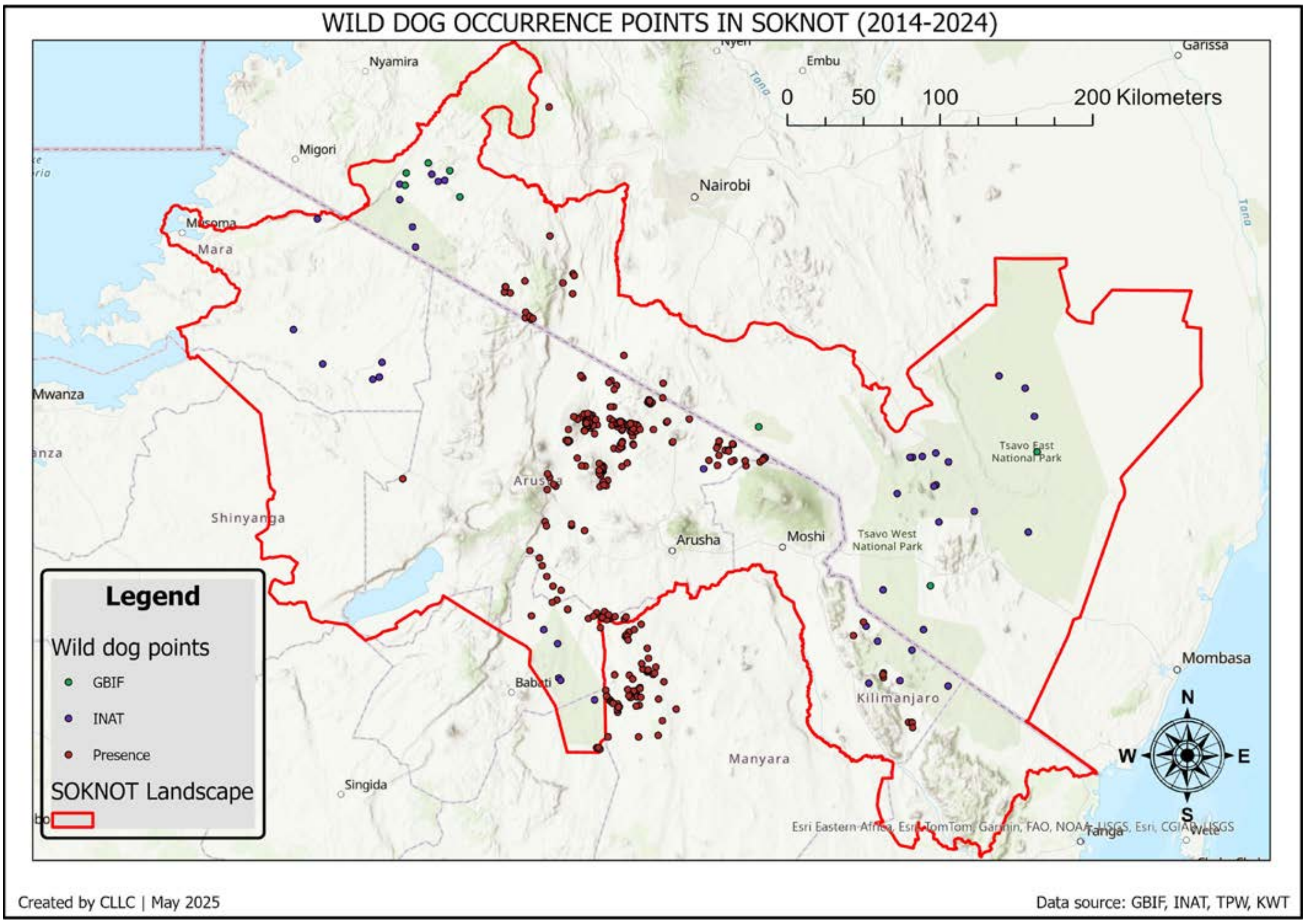
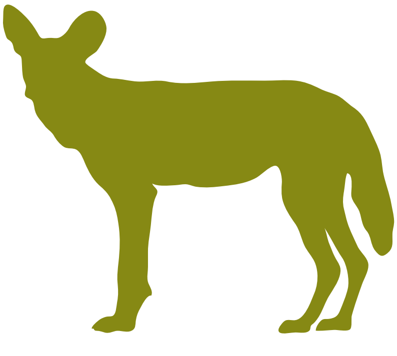


Figure 21. *Occurrence points for wild dog.*



3.5.2. HABITAT SUITABILITY MODELS

Tables 14-20 present the coefficient values of the environmental and landscape variables retained in the final habitat suitability models for each focal species. These coefficients describe the strength and direction of each predictor variable's influence on species occurrence probabilities. Positive coefficient values indicate a positive association between a variable and habitat suitability, whereas negative values reflect avoidance or lower suitability in relation to that variable.

Interpreting these coefficients helps identify the key ecological and environmental factors that drive habitat selection and distribution patterns for each species. Together, these results provide an understanding of the relative importance of different habitat features in determining suitable habitats across the SOKNOT landscape.

Table 14. *Logistic regression model output for elephants (Significance: $^{*} p \le 0.05$, $^{**} p \le 0.01$, $^{***} p \le 0.001$).*

	ESTIMATE	STD. ERROR	STATISTIC	P-VALUE
(Intercept)	−13.7	0.1	−214.3	$p < 0.05^{***}$
Fences	0.0	0.0	−1.6	0.1
Slope	-0.2	0.0	−6.1	$p < 0.05^{***}$
Human modification	−1.1	0.1	−12.8	$p < 0.05^{***}$

Table 15. *Logistic regression model output for giraffe (Significance: $^{*} p \le 0.05$, $^{**} p \le 0.01$, $^{***} p \le 0.001$)*

	ESTIMATE	STD. ERROR	STATISTIC	P-VALUE
(Intercept)	−14.2	0.0	−317.8	$p < 0.05^{***}$
Slope	−0.4	0.0	−20.9	$p < 0.05^{***}$
Human modification	−1.7	0.1	−30.3	$p < 0.05^{***}$

Table 16. *Logistic regression model output for zebra (Significance: $^{*} p \le 0.05$, $^{**} p \le 0.01$, $^{***} p \le 0.001$).*

	ESTIMATE	STD. ERROR	STATISTIC	P-VALUE
(Intercept)	−14.0	0.0	−450.9	$p < 0.05^{***}$
Fences	0.0	0.0	−3.6	$p < 0.05^{***}$
Grassland	1.2	0.0	40.8	$p < 0.05^{***}$
Human modification	−0.5	0.0	−16.3	$p < 0.05^{***}$

Table 17. *Logistic regression model output for wildebeest (Significance: $^{*} p \le 0.05$, $^{**} p \le 0.01$, $^{***} p \le 0.001$).*

	ESTIMATE	STD. ERROR	STATISTIC	P-VALUE
(Intercept)	−14.5	0.1	−268.8	$p < 0.05^{***}$
Fences	0.0	0.0	−2.5	$p < 0.05^{*}$
Grassland	2.1	0.1	37.7	$p < 0.05^{***}$
Slope	−0.6	0.0	−14.3	$p < 0.05^{***}$
Human modification	−0.1	0.0	−2.2	$p < 0.05^{*}$

Table 18. *Logistic regression model output for lion (Significance: * p ≤ 0.05, ** p ≤ 0.01, *** p ≤ 0.001).*

	ESTIMATE	STD. ERROR	STATISTIC	P-VALUE
(Intercept)	−13.6	0.0	−681.5	$p < 0.05^{***}$
Fences	−0.2	0.0	−11.3	$p < 0.05^{***}$
Slope	0.1	0.0	28.5	$p < 0.05^{***}$
Human modification	−0.8	0.0	−32.2	$p < 0.05^{***}$

Table 19. *Logistic regression model output for wild dogs (Significance: * p ≤ 0.05, ** p ≤ 0.01, *** p ≤ 0.001).*

	ESTIMATE	STD. ERROR	STATISTIC	P-VALUE
(Intercept)	−14.0	0.2	−68.3	$p < 0.05^{***}$
Fences	0.1	0.0	2.5	$p < 0.05^{*}$
Slope	0.1	0.0	3.4	$p < 0.05^{***}$
Human modification	−1.3	0.3	−5.1	$p < 0.05^{***}$

Table 20. *Logistic regression model output for cheetah (Significance: * p ≤ 0.05, ** p ≤ 0.01, *** p ≤ 0.001).*

	ESTIMATE	STD. ERROR	STATISTIC	P-VALUE
(Intercept)	−13.7	0.1	−214.3	$p < 0.05^{***}$
Fences	0.0	0.0	−1.6	0.1
Slope	−0.2	0.0	−6.1	$p < 0.05^{***}$
Human modification	−1.1	0.1	−12.8	$p < 0.05^{***}$

Figure 22 shows the resulting habitat suitability maps, and Figure 23 shows the resistance surfaces for the focal species. Resistance surfaces are the inverse of the suitability maps. Highly suitable areas have low resistance, and areas of low suitability have high resistance. Steep slopes pose a high resistance to most focal species, but not to lions and wild dogs.

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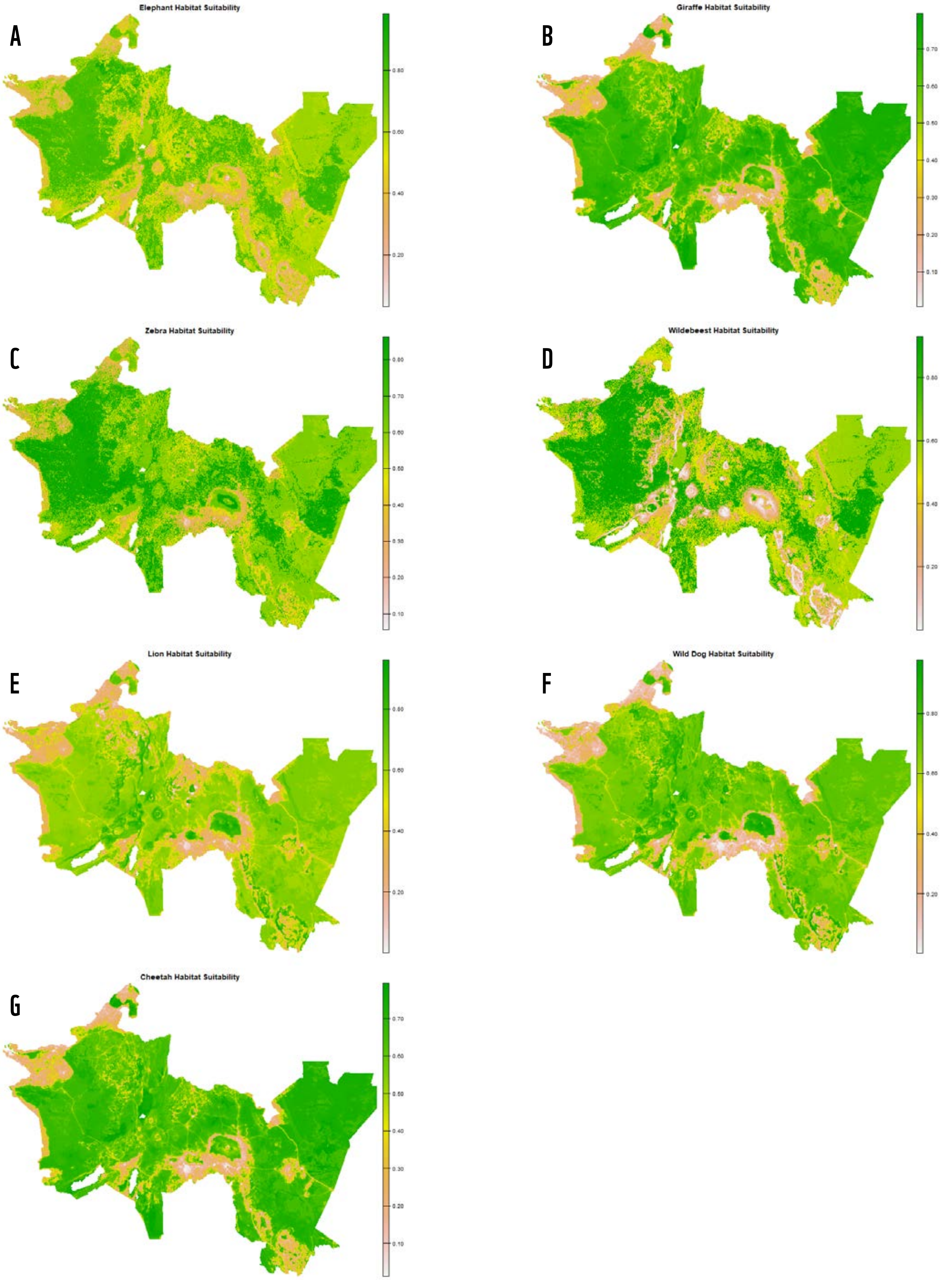


Figure 22. *Habitat suitability maps generated from resource selection function (RSF) models for key focal species: (A) Elephant, (B) Maasai Giraffe, (C) Zebra, (D) Wildebeest, (E) Lion, (F) African Wild Dog, and (G) Cheetah. Greener areas represent areas of high habitat suitability.*

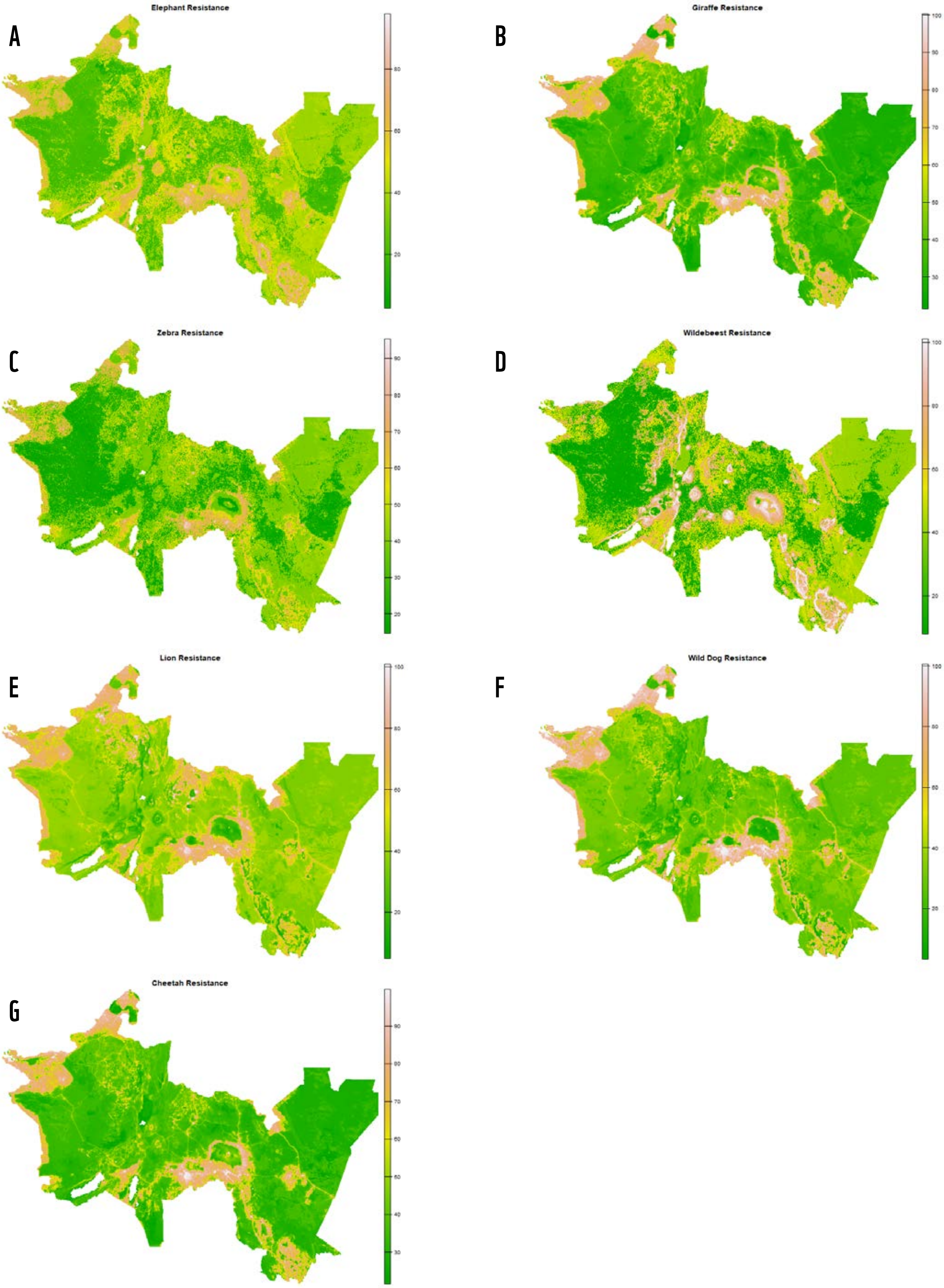


Figure 23. *Resistance surfaces generated from resource selection function (RSF) models for focal species: (A) Elephant, (B) Giraffe, (C) Zebra, (D) Wildebeest, (E) Lion, (F) Wild Dog, and (G) Cheetah. Greener areas represent regions of low resistance.*

3.5.3. COMPARISON OF CURRENT FLOW VALUES

We created current flow maps that show the likelihood of movement across the landscape (Appendix 2, Figures 41-47). Current was 'injected' in the centroids of the target protected areas. Therefore, there is a high likelihood of movement around the centroids. To compare current flow values between corridors and buffers we extracted the current flow values only from the corridors and the buffers; this minimised any effect of the high current flow values around the centroids on the results.

3.5.4. COMPARISON OF COST-WEIGHTED DISTANCE VALUES

We created cost-weighted distance maps that show the least-cost path distances from the protected area centroids across a landscape and indicate where movement costs vary based on the underlying resistance (Appendix 3, Figure 48).

3.5.5. MULTI-SPECIES CORRIDORS

We modelled the functional corridors individually and then overlaid them to detect areas where multiple functional corridors overlap (Figure 24).

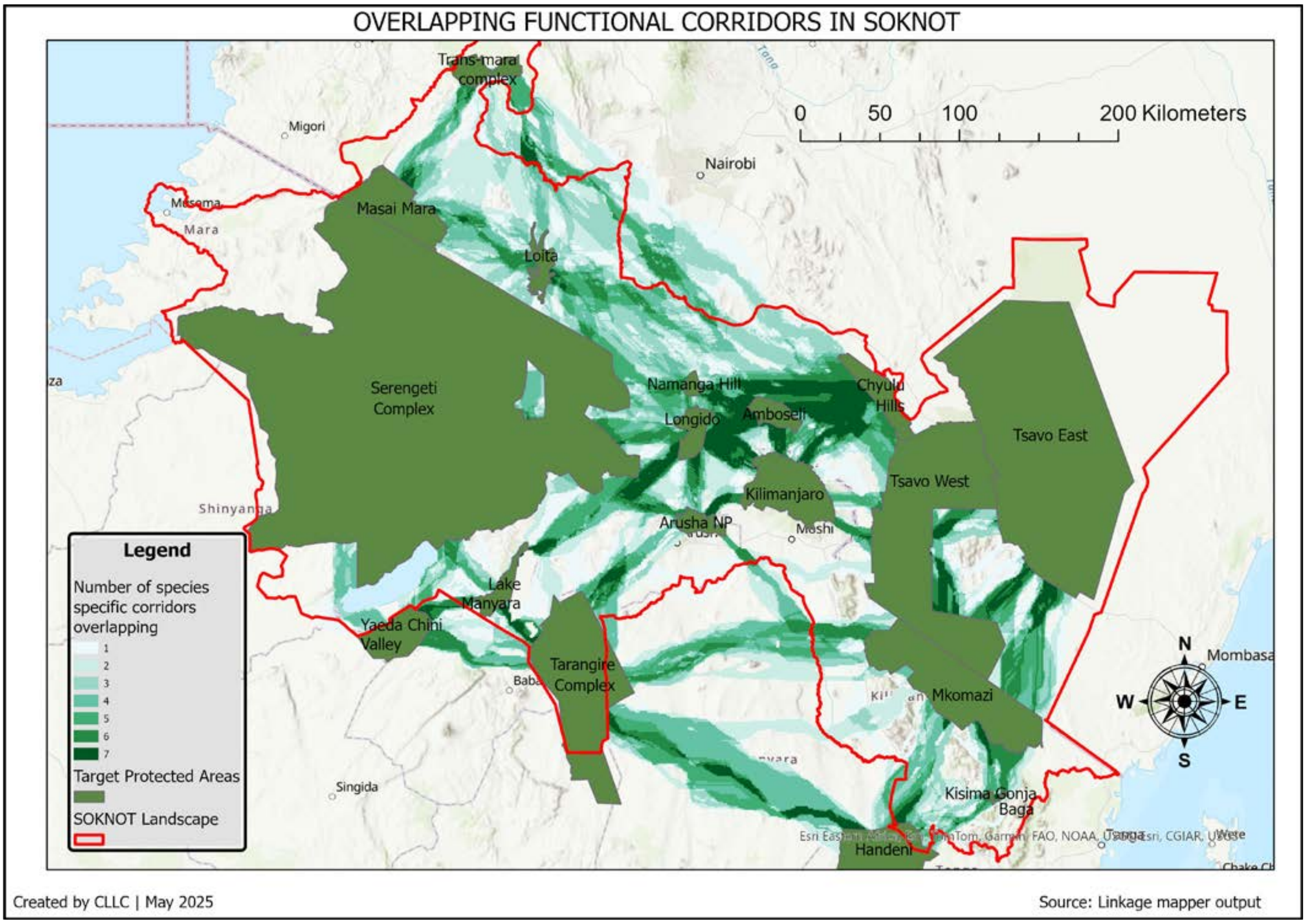


Figure 24. Overlap of functional corridors of seven species in SOKNOT.

3.5.6. OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS

The overlap between structural and functional corridors shows substantial variation across the landscape, depending on both the corridor and the species considered (Figures 25-31). Among the seven focal species analysed, some exhibited strong alignment between structural and functional connectivity, while others revealed notable mismatches, suggesting that physical habitat continuity alone does not always equate to ecological functionality or actual movement use.

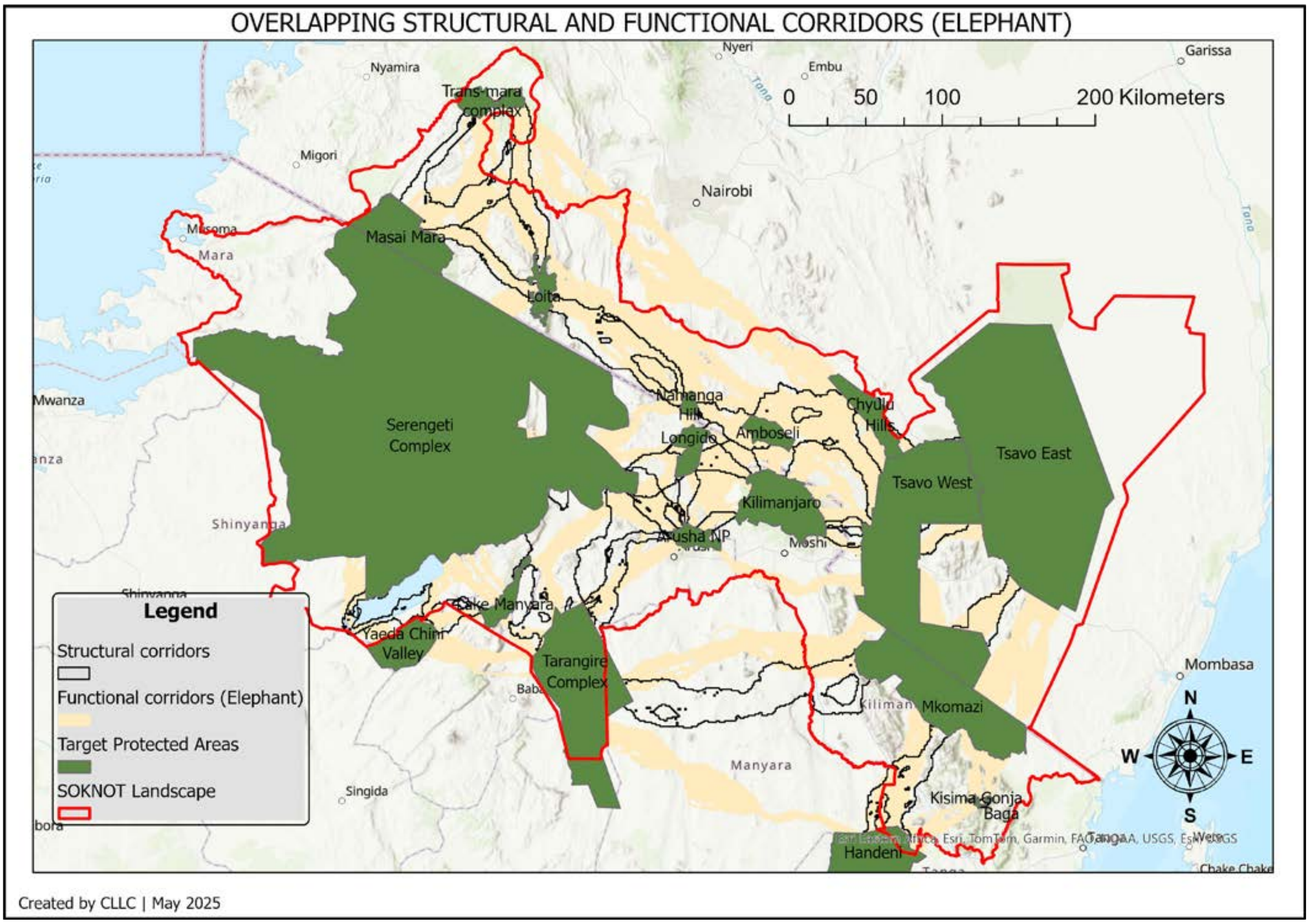
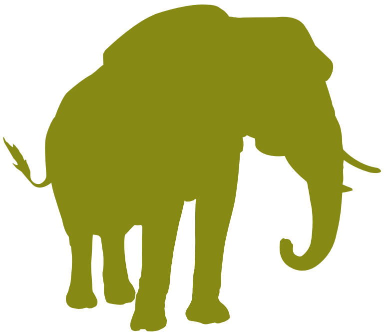


Figure 25. Overlap between structural and functional corridors for elephants.



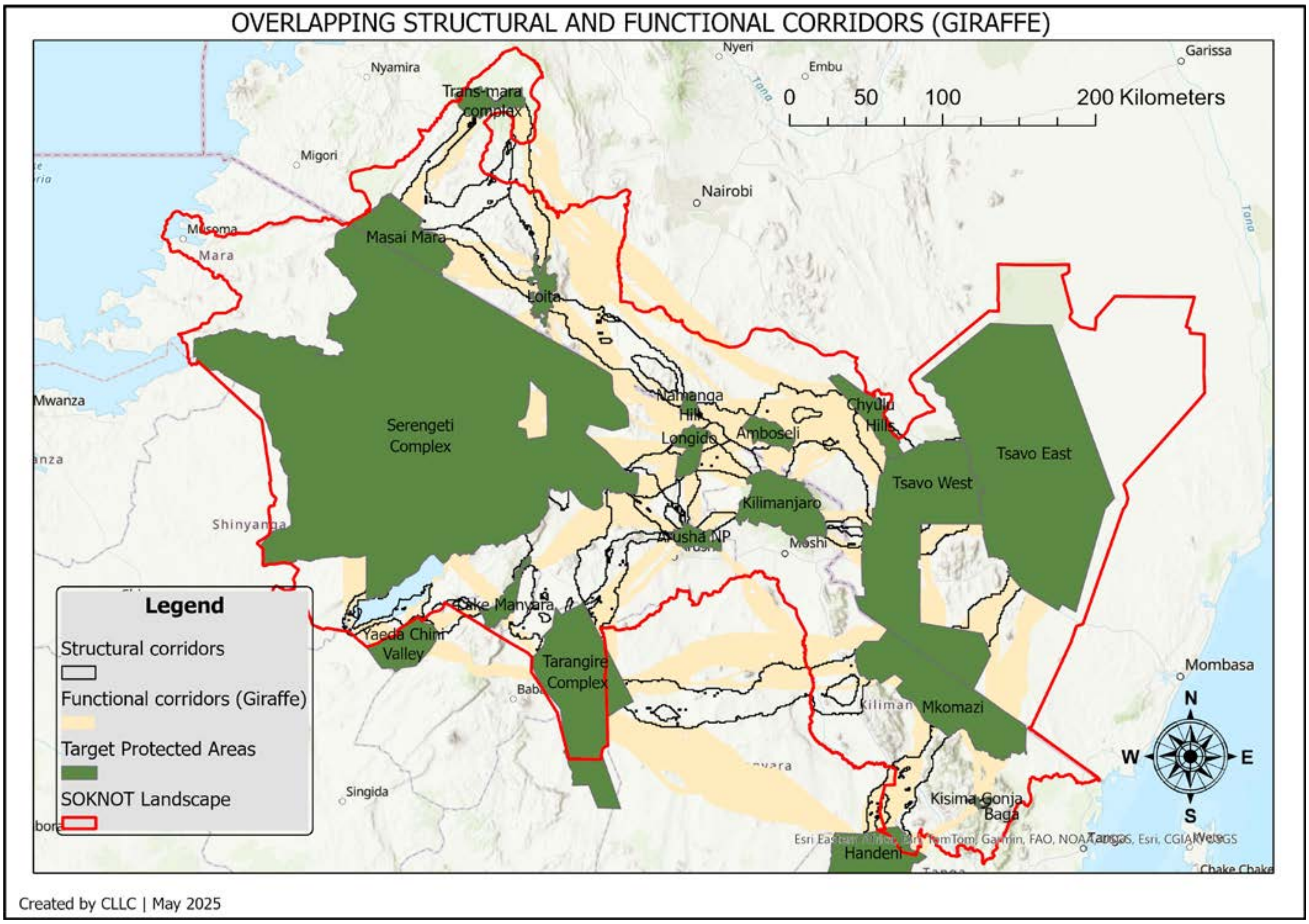
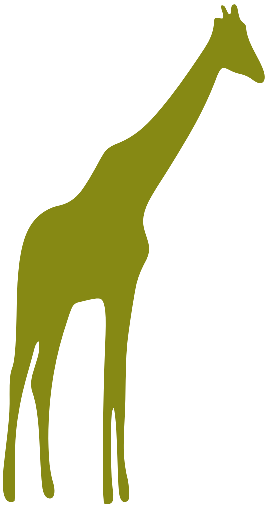


Figure 26. *Overlap between structural and functional corridors for giraffe.*



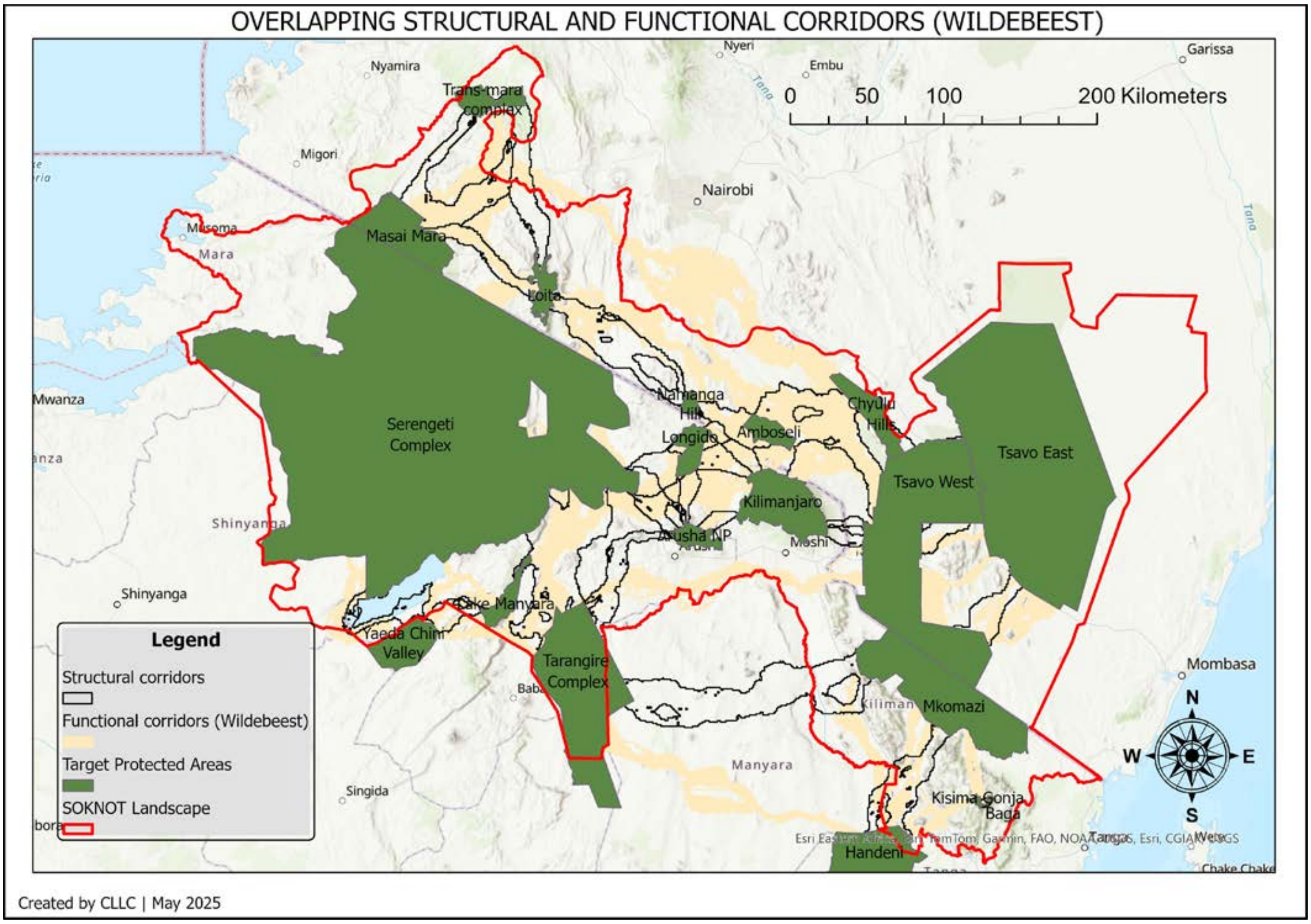
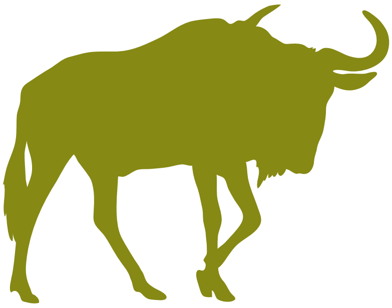


Figure 27. *Overlap between structural and functional corridors for wildebeest.*



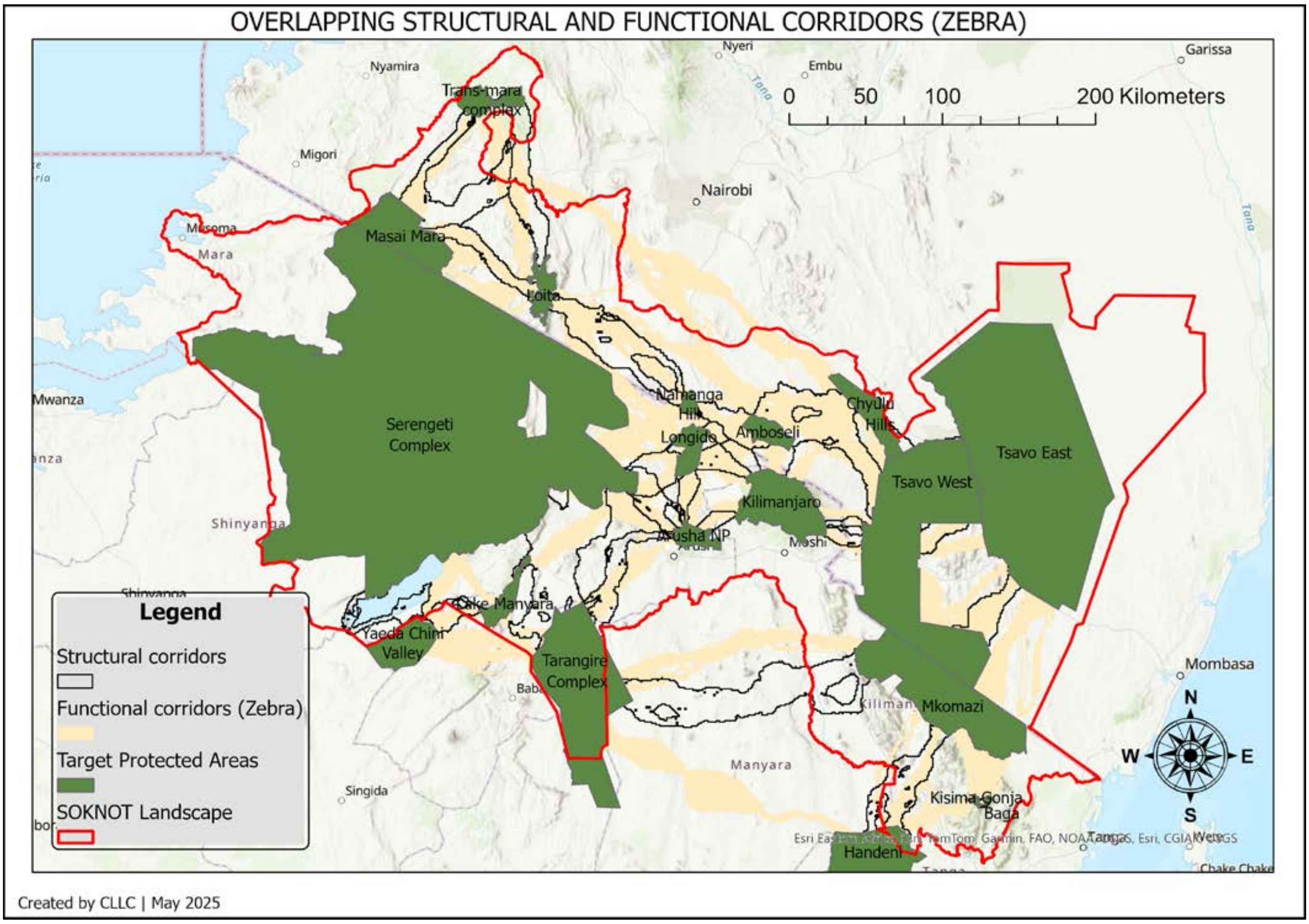
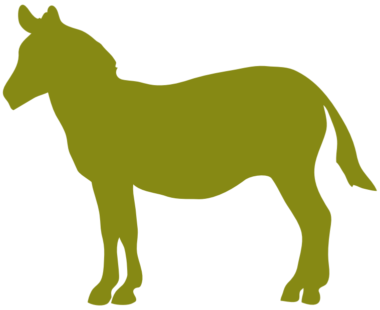


Figure 28. *Overlap between structural and functional corridors for zebra.*



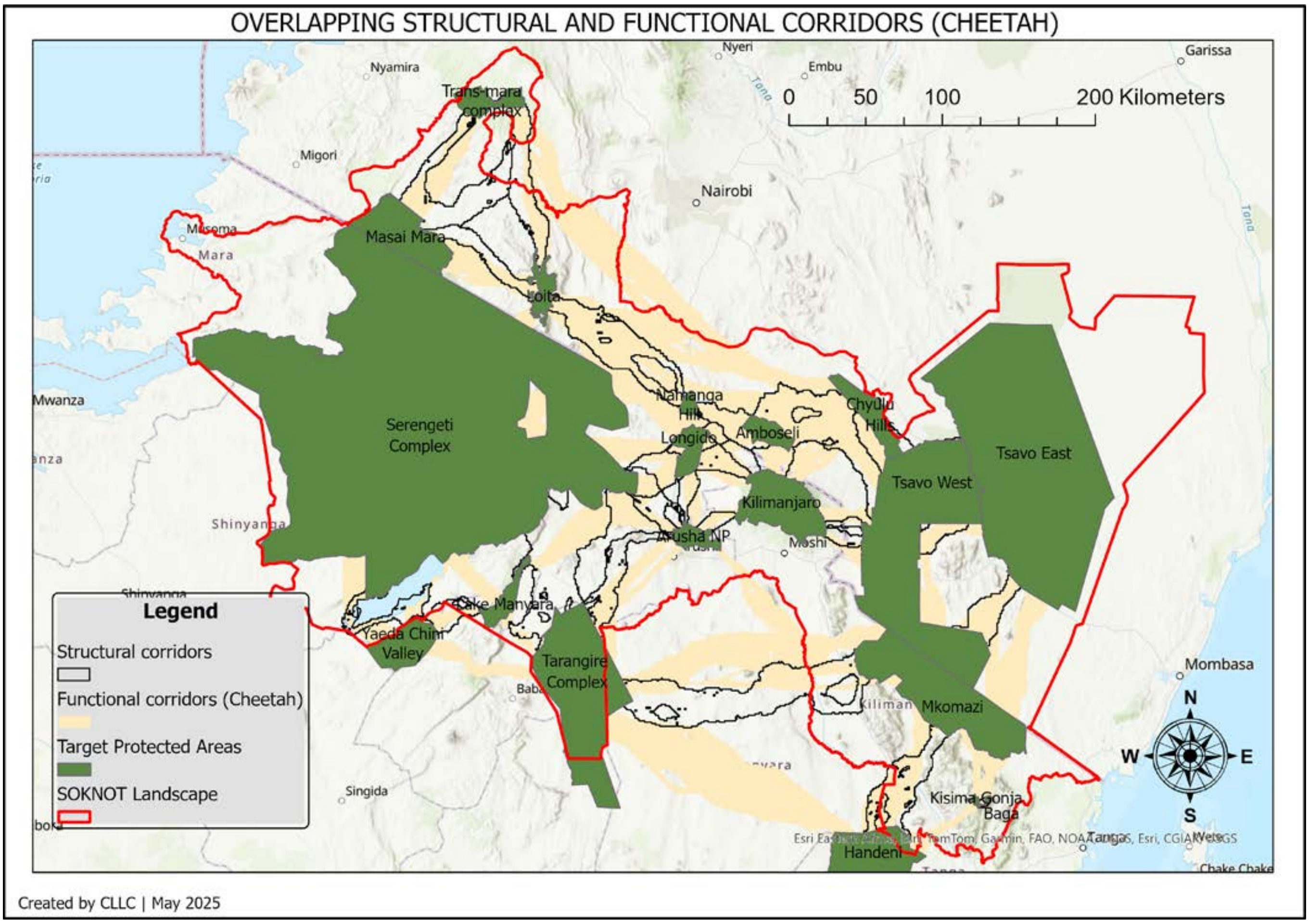


Figure 29. *Overlap between structural and functional corridors for cheetah.*

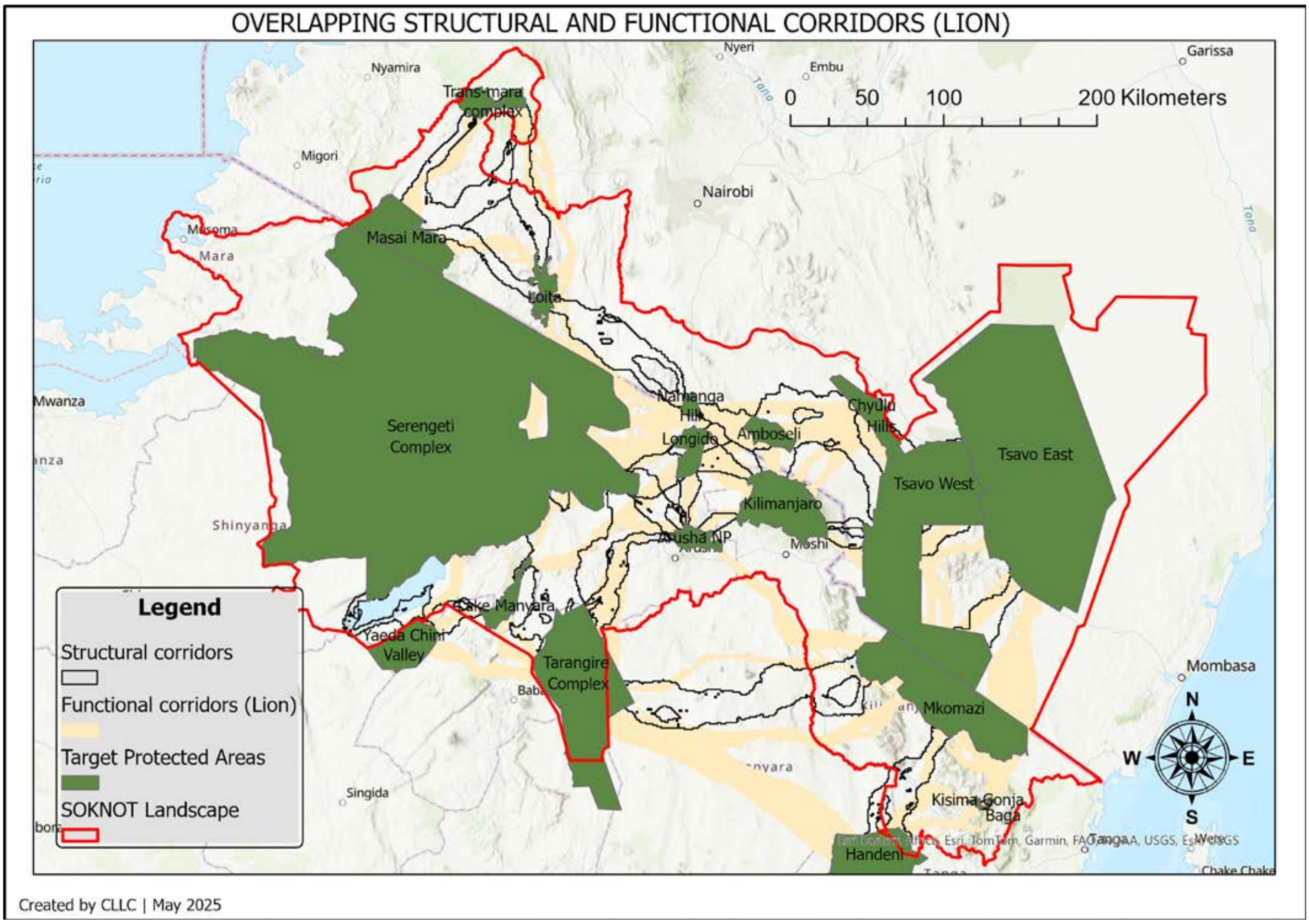


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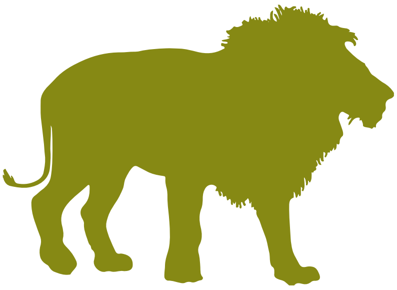
Figure 30. *Overlap between structural and functional corridors for lion.*



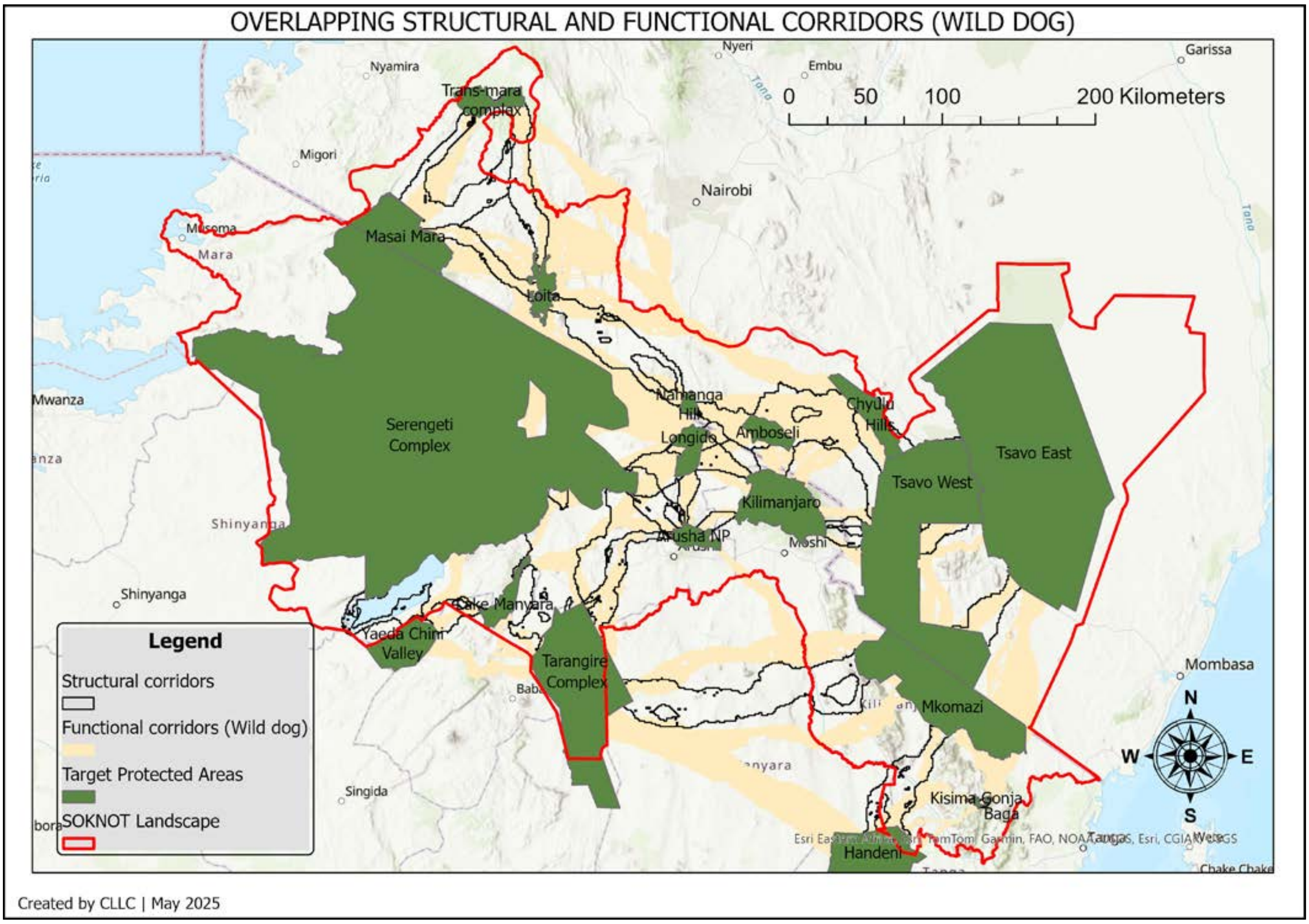


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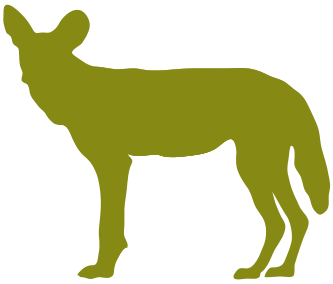
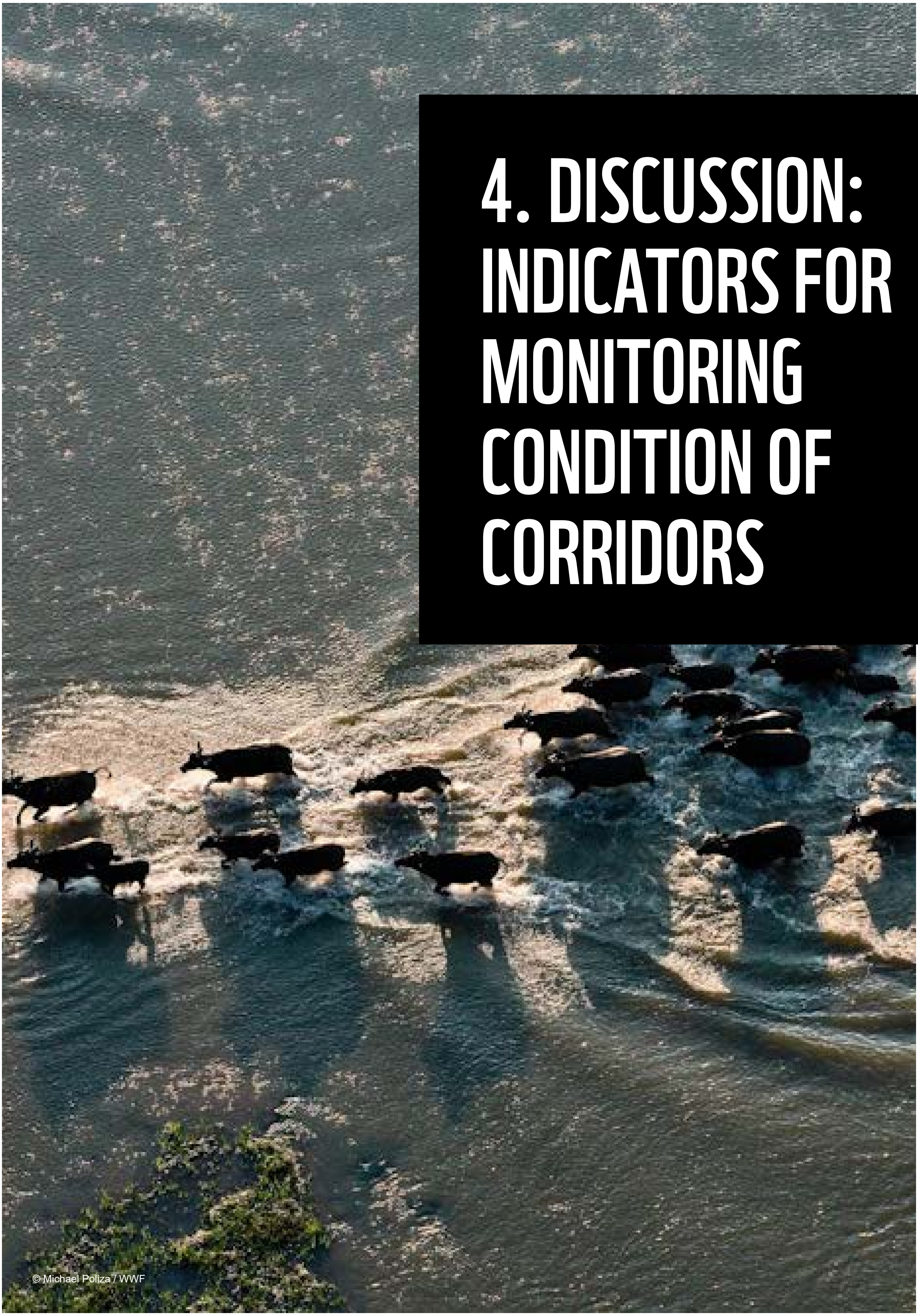
Figure 31. *Overlap between structural and functional corridors for wild dog.*





4. DISCUSSION: INDICATORS FOR MONITORING CONDITION OF CORRIDORS

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Monitoring ecological connectivity in the SOKNOT landscape is essential for evaluating the effectiveness of conservation efforts and understanding how changes in the landscape affect wildlife movement. To support this, structural and functional indicators based on remotely sensed data have been identified as key tools for long-term connectivity tracking (Table 21). These indicators provide a cost-effective and standardised approach to monitoring connectivity, offering valuable insights for conservationists, policymakers, and land managers. By relying on remote sensing, which enables consistent and repeatable data collection, large-scale assessments of habitat quality, human modification, and connectivity trends can be conducted. These indicators are instrumental in identifying both positive and negative changes in corridors, allowing for a clearer understanding of where conservation efforts have been successful and where further intervention may be needed.

It is recommended that the connectivity indicators be measured regularly. However, how often they can be measured depends on the frequency of updates to the input data layers. For example, the ESA landcover map is only being updated irregularly; the last version is from 2021. If input data layers permit, regular monitoring allows the identification of emerging threats, the adaptation of management strategies based on observed trends, and the assessment of the long-term impact of conservation actions.

The indicators will track both improvements and deteriorations in corridor conditions. Positive changes could include successful habitat restoration efforts, policy interventions that reduce land conversion, or the removal of physical barriers such as fences. Negative changes might result from human settlement expansion, infrastructure development, or habitat degradation, which can negatively impact the functionality of corridors. Systematically monitoring these indicators enables conservationists to document trends, evaluate the effectiveness of current strategies, and refine conservation actions to improve connectivity across the landscape.

A significant benefit of using structural and functional indicators is their ability to demonstrate the impact of conservation actions over time. For instance, if fences in key corridors in Kenya are removed or modified to allow for wildlife passage, this will be reflected in indicators measuring habitat permeability and species movement. Conversely, if settlements continue to expand within corridors in Tanzania, indicators related to habitat quality, human modification, and fragmentation will capture these changes, signaling potential threats to connectivity. This evidence-based approach strengthens conservation planning by providing measurable outcomes that guide decision-making and ensure that interventions remain responsive to emerging challenges.

While landscape-wide monitoring is essential, it is also recommended to develop corridor-specific monitoring plans. This localised approach will allow conservation practitioners to address unique challenges in each corridor, tailor interventions to the specific needs of different corridors and species, and assess whether conservation goals are being met. By engaging local communities in these monitoring efforts, conservation strategies can be aligned with local socio-economic conditions, improving their relevance and effectiveness. Combining landscape-scale indicators with targeted monitoring for individual corridors will help develop a comprehensive, adaptive strategy that enhances connectivity across the SOKNOT landscape.

Incorporating social factors into the monitoring process adds a crucial dimension often overlooked in ecological assessments (Mangun 1992; Ghoddousi et al., 2021; Niemiec et al., 2021). Monitoring local attitudes and beliefs regarding wildlife corridors can help adjust conservation planning and management approaches (Herrara et al., 2016). Understanding how corridors impact local livelihoods, cultural practices, and human-wildlife conflict is essential for building community support and ensuring that conservation efforts are socially acceptable (Obeng et al., 2019). Traditional social science methods such as surveys and interviews can be used to gather insights on these social dynamics, helping to create conservation strategies that are both environmentally effective and socially resilient (Hariohay and Røskaft 2015).

In conclusion, structural and functional indicators play a critical role in assessing, maintaining, and enhancing connectivity within the SOKNOT landscape. By leveraging remote sensing data and conducting regular monitoring, conservation efforts can be data-driven and evidence-based. The ability to capture both positive and negative changes in corridor conditions ensures that conservation actions remain dynamic and effective. Furthermore, developing monitoring plans tailored to individual corridors will allow for more precise and impactful conservation interventions, ultimately strengthening connectivity across this transboundary landscape.

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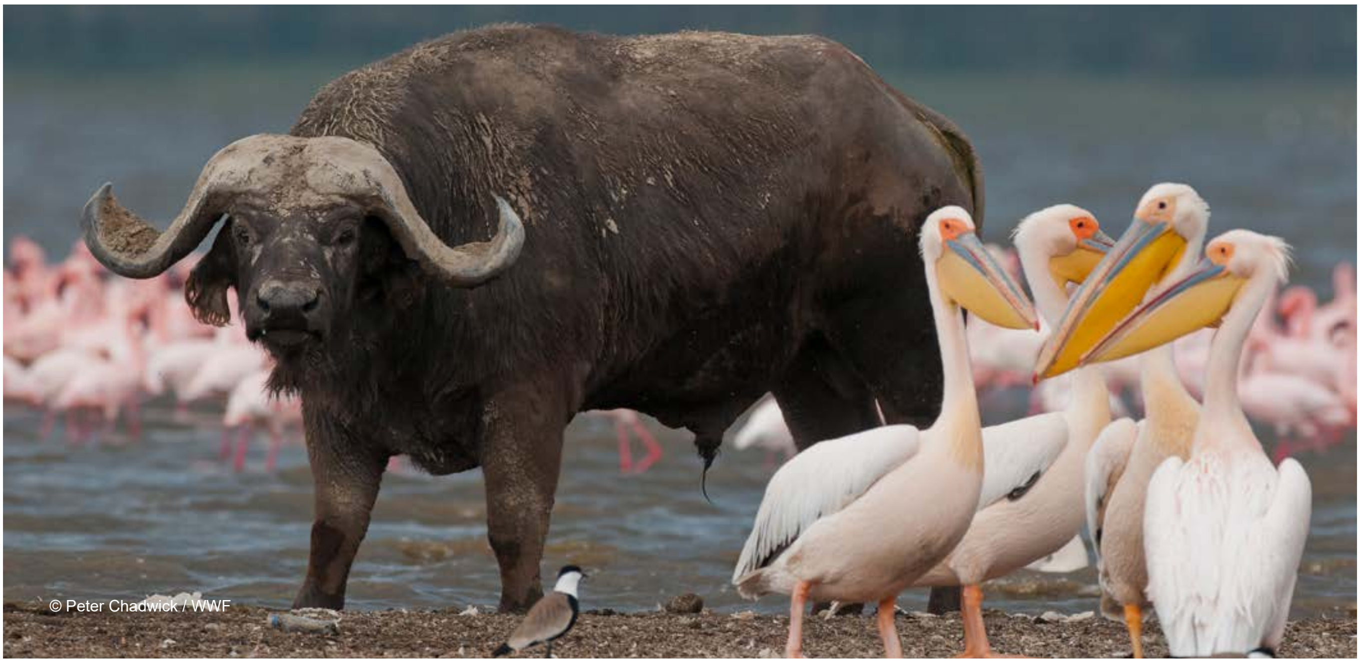
Table 21. *Overview of connectivity indicators to monitor change in corridors in SOKNOT, as well as relevant data, the frequency of data updates, and the recommended frequency of indicator updates.*

INDICATOR NAME	INDICATOR TYPE	INDICATOR DESCRIPTION	DATA	FREQUENCY OF DATA UPDATES	RECOMMENDED FREQUENCY OF INDICATOR UPDATES
Habitat quality	Structural	● Percentage of natural vegetation cover ● Percentage of converted areas	European Space Agency (ESA) WorldCover dataset at a 10-metre resolution based on Sentinel-1 and Sentinel-2 data.	Irregularly	When the layer has been updated
Density of existing linear transport infrastructure	Structural	● Road length ● Road density ● Railway length ● Railway density	Open Street Map	Annually	Every 3 years
Fence density	Structural	● Fence length ● Fence density	Landscape Dynamics (landDX) database	Irregularly	When the layer has been updated
Human population density	Structural	● Mean population density ● Minimum population density ● Maximum population density	WorldPop Kenya National Bureau of Statistics National Bureau of Statistics Tanzania	Decadal but can be interpolated	Every 3 years
Level of protection	Structural	● Percentage of corridors that are legally protected in the different categories (conservancy, wildlife management area, national parks, game reserves, village land forest reserves, forest reserves, private ranches)	World database of protected areas	Monthly	Every 3 years
Fragmentation	Structural	● Connectance ● Core area ● Edge density ● Proximity ● Shannon entropy ● Number of patches ● Total core area	European Space Agency (ESA) WorldCover dataset at a 10-metre resolution based on Sentinel-1 and Sentinel-2 data	Irregularly	Annually
Human modification	Structural	● Human modification index in the corridor as an estimate of intactness: ● Mean, Minimum, Maximum Human Modification Index	Human Modification Layer (Theobald et al., 2020, 2025)	Irregularly, but with the intention of annual updates	When the layer has been updated

INDICATOR NAME	INDICATOR TYPE	INDICATOR DESCRIPTION	DATA	FREQUENCY OF DATA UPDATES	RECOMMENDED FREQUENCY OF INDICATOR UPDATES
Frequency of human-wildlife conflict	Structural		KWS, WRTI, Amboseli Elephant Trust, ACC, Mara Elephant Program, Kenya Wildlife Trust and Conservancies in Kenya, Wildlife Division and District Authorities and TAWIRI	Continuous recording	Annually
Effective resistance (PAI)	Functional	● Permeability of landscape within corridor to animal movement, assessed by calculating the effective resistance with CircuitScape	Species occurrence data, European Space Agency (ESA) WorldCover dataset at a 10-metre resolution based on Sentinel-1 and Sentinel-2 data Landscape Dynamics (landDX) database Open Street Map WorldPop	Irregularly	When the layer has been updated. Note: the species resistance surfaces developed for this consultancy can be updated using updated land cover, fence, road, and human density data to monitor changes in effective resistance
Protected area network connectivity (ProNet)	Functional	● A connectivity measure of a region's protected area network taking into account the resistance of the matrix	Species occurrence data, European Space Agency (ESA) WorldCover dataset at a 10-metre resolution based on Sentinel-1 and Sentinel-2 data Landscape Dynamics (landDX) database Open Street Map WorldPop	Irregularly	When the layer has been updated. Note: the species resistance surfaces developed for this consultancy can be updated using updated land cover, fence, road, and human density data to monitor changes in ProNet



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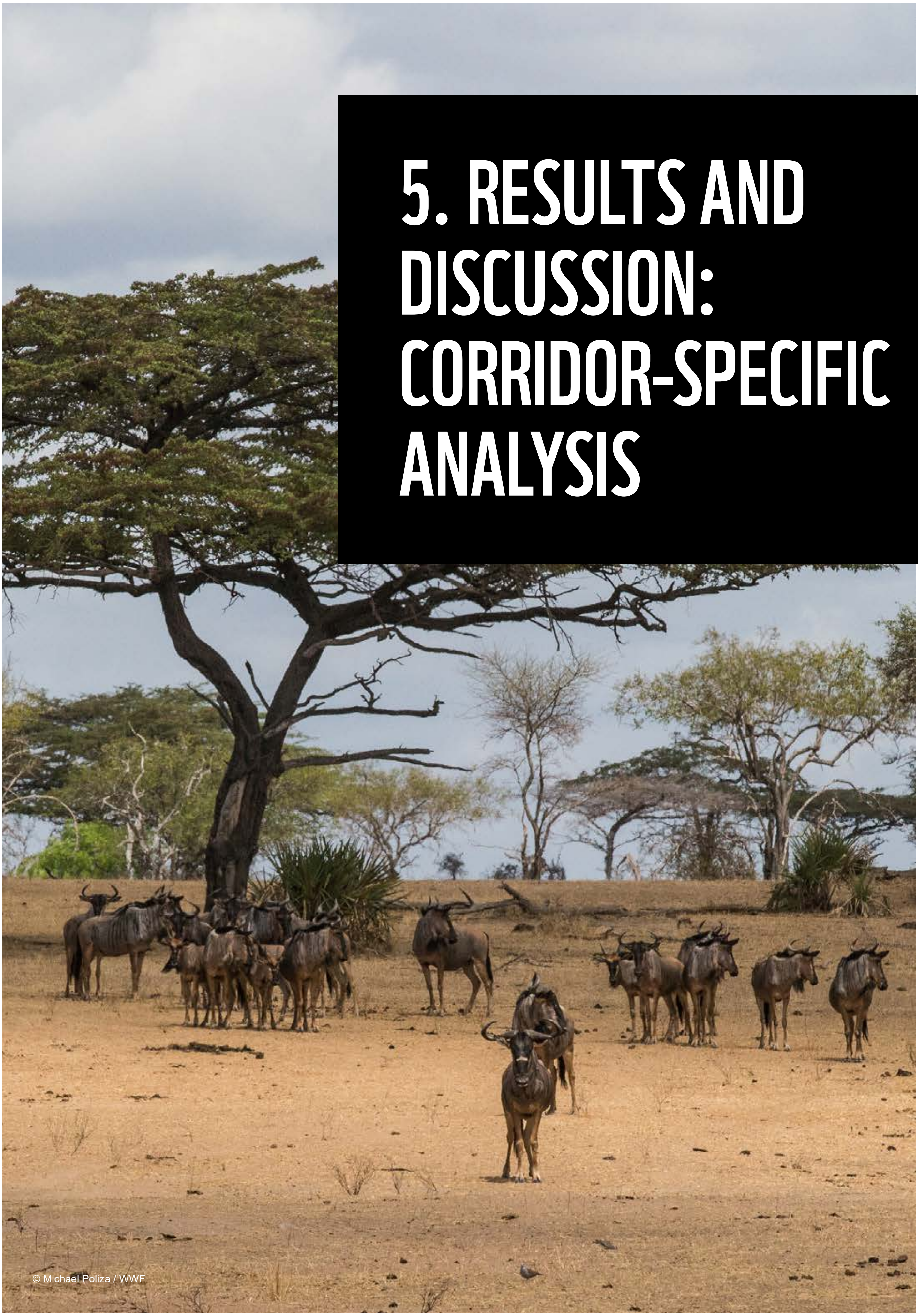

5. RESULTS AND DISCUSSION: CORRIDOR-SPECIFIC ANALYSIS

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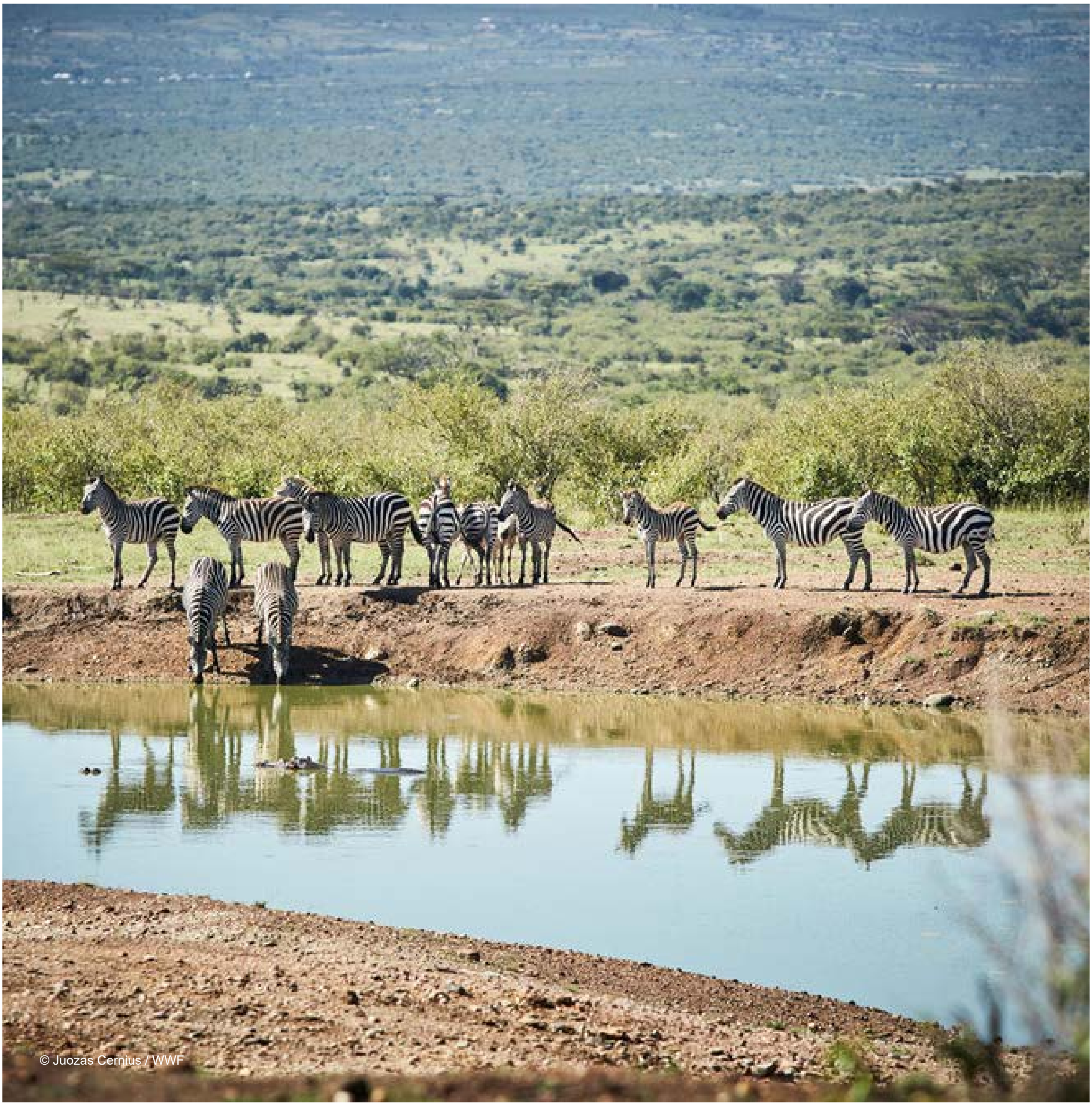
Summary tables presenting the results of all four validation methods for each corridor are provided below (Tables 22-45), with values indicating well-performing corridors color-coded in green. For the percentage of occurrence points in the corridor, we chose to highlight values above 50%, because that means that there are more occurrence points in the corridor than in the buffer. For current flow comparisons, good performance is determined by whether the average current flow value within the corridor is higher than in the buffer, and whether this difference is statistically significant, as indicated by an asterisk (*).

This method assumes that higher current flow indicates more functional connectivity. For cost-weighted distance (CWD) comparisons, if the average CWD in the buffer is greater than that in the corridor, and the difference is statistically significant (also marked by an asterisk (*)), it indicates a well-performing corridor. This assumes that lower resistance within the corridor reflects greater functional importance for species movement. To facilitate quick assessment, we highlighted in green any structural–functional corridor overlaps of 50% or more. However, in the accompanying text, we provide a more nuanced interpretation, categorising overlap as poor (0–39%), moderate (40–70%), and high (>80%). These categories emerged during our visual inspections and offer a more detailed perspective than a simple 50% threshold.



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5.1. AMBOSELI-CHYULU-TSAVO

Table 22. *Validation metrics for the functionality of the Amboseli–Chyulu–Tsavo Wildlife Corridor.*

	ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR	45.4% (n=1477)	71.4% (n=370)	69.7% (n=228)	32.1% (n=2425)	70.3% (n=74)	60.7% (n=28)	NA (n=0)
2. COMPARISON OF CURRENT FLOW VALUES BETWEEN CORRIDOR AND BUFFER	0.16*	0.25*	0.18*	0.15*	0.1*	0.14*	0.12*
3. COMPARISON OF CWD VALUES BETWEEN CORRIDOR AND BUFFER	289034*	228273.77*	327563.43*	350298.02*	322430.25*	346950.03*	295671.24*
4. PERCENTAGE OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS	94.8%	91.8%	91.3%	91%	60%	93.6%	78.4%

Percentage of occurrence points in the corridor:

There are more occurrence points in the corridor than in the buffer for wildebeest, zebra, lion, and cheetah. Elephants and giraffes have been documented in the corridor, but many occurrence points are in the buffer. Wild dogs have not been documented in either the corridor or the buffer.

Comparison of current flow values between corridor and buffer:

Current flow values are higher in the corridor than in the buffer with the differences being statistically significant for all species.

Comparison of CWD values between corridor and buffer:

CWD values are higher in the corridor than in the buffer with the differences being statistically significant for all species.

Percentage overlap between structural and functional corridors:

Overlap is moderate for lion and wild dog and high for all other species.

Discussion:

The functional corridors for lion and wild dog do not overlap with the southeastern segment of the structural corridor leading to Tsavo West. Instead, their movement routes follow an alternative path along the Chyulu Hills southward into Tsavo West. Nevertheless, both species are likely capable of utilising the structural corridor as well, given its ecological characteristics and connectivity potential

Conclusion:

Drawing from all four assessment approaches the evidence strongly supports the functionality of the Amboseli–Chyulu–Tsavo corridor for all seven focal species. While lions and wild dogs show a preference for an alternate route through Chyulu Hills, the structural corridor remains a viable option, underscoring the importance of maintaining multiple pathways to ensure ecological resilience. Overall, the corridor is functional and ecologically valuable, and its continued protection and management should be prioritised to sustain transboundary wildlife movements across SOKNOT.

5.2. ARUSHA-LONGIDO

***Table 23.** Validation metrics for the functionality of the Arusha-Longido Wildlife Corridor.*

ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR						
61.1% (n=36)	72.2% (n=18)	56.9% (n=58)	70.5% (n=44)	NA (n=0)	NA (n=0)	NA (n=0)
2. COMPARISON OF CURRENT FLOW VALUES BETWEEN CORRIDOR AND BUFFER						
0.05*	0.09*	0.07*	0.05*	0.03*	0.05*	0.05*
3. COMPARISON OF CWD VALUES BETWEEN CORRIDOR AND BUFFER						
73174.72*	106585.64*	27896.03*	69300.53*	–20685.06	69278.83*	3430.83
4. PERCENTAGE OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS						
46.7%	79.5%	98.1%	53.6%	69.7%	53.3%	84.4%

Percentage of occurrence points in the corridor:

For elephants, wildebeest, zebra, and giraffe, there are more occurrence points in the corridor than in the buffer. Data is lacking for lion, cheetah, and wild dog.

Comparison of current flow values between corridor and buffer:

Current flow values are higher in the corridor than in the buffer with the differences being statistically significant for all species, suggesting that the corridor offers a low-resistance route to movement.

Comparison of CWD values between corridor and buffer:

For elephant, wildebeest, zebra, giraffe, and cheetah, CWD values are higher in the buffer than in the corridor with the differences being statistically significant. For lion and wild dog, there is no significant difference between CWD values in the corridor and the buffer.

Percentage overlap between structural and functional corridors:

Overlap is moderate for most species and high for zebra.

Discussion:

The functional corridors of lion, wild dog, and zebra follow the structural corridor.

Elephant functional corridors go to the east and the west of the structural corridor, but there is little overlap with the structural corridor.

The wildebeest functional corridor overlaps with the northern 2/3 of the structural corridor. An eastern route that joins the Arusha–Kilimanjaro Corridor may be a better option because, on the northern edge of Arusha National Park, habitat suitability is very low for wildebeest.

Giraffe and cheetah functional corridors go straight north to south from Longido to Arusha National Park (NP), but narrow at the southern end, joining Arusha NP east of the structural corridor. According to the resistance map, an eastern corridor that joins the Arusha–Kilimanjaro Corridor may be better for giraffe and cheetah as well.

Conclusion:

Considering that for several species the area north of Arusha NP, which is quite populated and farmed, has high resistance, and an alternative route that joins the Arusha–Kilimanjaro corridor goes through low-resistance areas for all species, we recommend considering realignment of the official corridor.

5.3. BAGA-KISIMA GONJA

Table 24. *Validation metrics for the functionality of the Baga–Kisima Gonja Wildlife Corridor.*

ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR						
NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)
2. COMPARISON OF CURRENT FLOW VALUES BETWEEN CORRIDOR AND BUFFER						
0.73*	0.58*	0.48*	0.7*	0.55*	0.7*	0.63*
3. THE COMPARISON OF CWD VALUES BETWEEN THE CORRIDOR AND BUFFER						
113260.49*	150173.6*	63976.48*	107042.37*	36962.7*	107168.54*	42117.76*
4. PERCENTAGE OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS						
74.1%	44.2%	78.2%	76.6%	99.7%	76.6%	93.3%

Percentage of occurrence points in the corridor:

None of the seven species were documented in either the corridor or the buffer, indicating limited data collection in the region.

Comparison of current flow values between corridor and buffer:

Current flow values are significantly higher in the corridor than in the buffer for all species, suggesting that the corridor offers a low resistance route to movement.

Comparison of CWD values between corridor and buffer:

CWD values are significantly lower in the corridor for all species, indicating it offers an efficient path for movement.

Percentage overlap between structural and functional corridors:

There is moderate to high overlap between functional and structural corridors for all species. For all species, overlap is continuous, meaning that even if the overlap may be moderate the species could move between the target protected areas through the functional corridor without leaving the structural corridor.

Conclusion:

Based on the evidence from the four different assessment approaches and an inspection of the functional corridors, the Baga–Kisima Gonja corridor can be considered functional for the seven species.

5.4. CHYULU-TSAVO EAST

Table 25. *Validation metrics for the functionality of the Chyulu–Tsavo East Wildlife Corridor.*

ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR						
NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)
2. COMPARISON OF CURRENT FLOW VALUES BETWEEN CORRIDOR AND BUFFER						
0.03*	0	0.04*	0.04*	0.04*	0.04*	0.05*
3. COMPARISON OF CWD VALUES BETWEEN CORRIDOR AND BUFFER						
40199.31	−128485.75	92076.15	28951.32	115983.8	29050.96	116715.47
4. PERCENTAGE OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS						
67.6%	0%	0.8%	5.2%	2.8%	5.2%	1.1%

Percentage of occurrence points in the corridor:

None of the species was documented in either the corridor or the buffer.

Comparison of current flow values between corridor and buffer:

Current flow values are higher in the corridor than in the buffer with the differences statistically significant for all species except wildebeest, suggesting that the corridor does not offer a good route for movement.

Comparison of CWD values between corridor and buffer:

The difference in values between the corridor and buffer is not significantly different for any of the species, indicating no preference for the corridor or the buffer.

Percentage overlap between structural and functional corridors:

Overlap between structural and functional corridors is very low for all species except cheetah. For cheetah, there is moderate overlap.

Discussion:

The functional corridors go through Chyulu National Park and Tsavo East to Tsavo West, and not through the matrix north of Tsavo West.

Conclusion:

This corridor does not need any consideration.

5.5. KILIMANJARO-AMBOSELI

Table 26. *Validation metrics for the functionality of the Kilimanjaro–Amboseli Wildlife Corridor.*

	ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR	64.1% (n=521)	37.5% (n=24)	72.2% (n=183)	4.1% (n=782)	89.5% (n=76)	73.5% (n=49)	78.6% (n=14)
2. COMPARISON OF CURRENT FLOW VALUES BETWEEN CORRIDOR AND BUFFER	0.07*	0.02*	0.09*	0.1*	0.11*	0.1*	0.12*
3. COMPARISON OF CWD VALUES BETWEEN CORRIDOR AND BUFFER	225700.33*	142863.24*	170557.04*	302985.56*	234005.29*	302597.28*	204309.74*
4. PERCENTAGE OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS	79.8%	75.7%	56.6%	72.2%	44.5%	75.6%	72.6%

Percentage of occurrence points in the corridor:

For elephants, zebra, lion, cheetah, and wild dog, there are more occurrence points in the corridor than in the buffer. This is not the case for giraffes, because movement data with many observation points were collected in the buffer but not in the corridor. However, the data shows that giraffes have been documented throughout the corridor. Only a few occurrence points are available for wildebeest. While there are more occurrence points in the buffer, wildebeest still use the corridor.

Comparison of current flow values between corridor and buffer:

Current flow values are significantly higher in the corridor than in the buffer for all species, suggesting that the corridor offers a low-resistance route to movement.

Comparison of CWD values between corridors and buffer:

CWD values are significantly lower in the corridor for all species, indicating it offers an efficient path for movement.

Percentage overlap between structural and functional corridors:

The overlap of functional to structural corridors is moderate for all species.

Discussion:

All seven functional corridors continuously overlap the structural corridor. While the structural corridor is quite wide (28km at the widest point), the width of the area where all functional corridors overlap is much smaller, about 7km.

Conclusion:

Based on the evidence from the four different assessment approaches and an inspection of the functional corridors, the Kilimanjaro–Amboseli Corridor can be considered functional for the seven species. However, habitat suitability for most species is low in the south-eastern and south-western part of the corridor. Adjusting the boundaries of the corridor could be considered to remove the settled and farmed areas from the corridor.

5.6. KILIMANJARO-ARUSHA

Table 27. *Validation metrics for the functionality of the Kilimanjaro–Arusha Wildlife Corridor.*

	ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR	9.1% (n=22)	0% (n=0)	38.7% (n=31)	19.1% (n=21)	NA (n=0)	NA (n=0)	NA (n=0)
2. COMPARISON OF CURRENT FLOW VALUES BETWEEN CORRIDOR AND BUFFER	0.11*	0.22*	0.09*	0.05*	0.01*	0.05*	0.01*
3. COMPARISON OF CWD VALUES BETWEEN CORRIDOR AND BUFFER	166837.54*	97616.47*	129539.53*	140987.29*	37557.65	141309.32*	23088.47
4. PERCENTAGE OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS	82%	63.9%	77.6%	74.7%	70%	74.7%	64.6%

Percentage of occurrence points in the corridor:

Minimal species data is available for this corridor. For the three species with limited available data, there are more occurrence points in the buffer than in the corridor. Data is lacking for wildebeest, lion, cheetah, and wild dogs.

Comparison of current flow values between corridor and buffer:

Current flow values are significantly higher in the corridor than in the buffer for all species, suggesting that the corridor offers a low-resistance route to movement.

Comparison of CWD values between corridor and buffer:

CWD values are significantly lower in the corridor than in the buffer for all species except lion and wild dog, suggesting that the corridor offers a low-resistance route to movement for the five species. There is no significant difference between the CWD values for lions and wild dogs.

Percentage overlap between structural and functional corridors:

The overlap between functional and structural corridors is high for elephants and moderate for all other species.

Discussion:

Overlap between structural and functional corridors is only moderate because a relatively large area in the southern part of the structural corridor is populated and farmed, and the wildlife is avoiding this area. For all species except wildebeest, the functional corridors overlap continuously with the structural corridor. Wildebeest should also be able to use the structural corridor.

Conclusion:

Based on the evidence from the four different assessment approaches and an inspection of the functional corridors, the Kilimanjaro–Arusha Corridor can be considered functional for the seven species. However, at the eastern end where the corridor joins Kilimanjaro, there is a lot of recent agricultural activities that include fencing. There are also settlements in other parts of the corridor including close to Arusha National Park. Changing the delineation to remove the populated and farmed area in the southern part of the corridor is recommended. Immediate measures need to be taken to ensure that the corridor will remain viable.

5.7. KILIMANJARO-LONGIDO

Table 28. *Validation metrics for the functionality of the Kilimanjaro–Longido Wildlife Corridor.*

ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR						
23.1% (n=169)	47.2% (n=53)	40% (n=125)	30.6% (n=134)	NA (n=0)	77.3% (n=88)	68.4% (n=13)
2. THE COMPARISON OF CURRENT FLOW VALUES BETWEEN THE CORRIDOR AND BUFFER						
0.11*	0.21*	0.11*	0.09*	0.07*	0.09*	0.06*
3. THE COMPARISON OF CWD VALUES BETWEEN THE CORRIDOR AND BUFFER						
132214.83*	98183.93*	97119.54*	175316.1*	91478.2*	175124.73*	63984.53*
4. PERCENTAGE OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS						
93.6%	90.4%	93%	99.8%	98.2%	99.8%	98.3%

Percentage of occurrence points in the corridor:

For cheetah and wild dog, there are more occurrence points in the corridor than in the buffer. There are more occurrence points in the buffer for elephants, wildebeest, zebra, and giraffes, but all species are occurring in the corridor. There are no occurrence points of lions in either in buffer or the corridor.

Comparison of current flow values between corridor and buffer:

Current flow values are significantly higher in the corridor than in the buffer for all species, suggesting that the corridor offers a low-resistance route to movement.

Comparison of CWD values between corridor and buffer:

CWD values are consistently lower in the corridor than in the buffer for all species, suggesting that the corridor provides a less resistant route for movement compared with the buffer.

Percentage overlap between structural and functional corridors:

There is a high overlap of functional corridors with the structural corridor for all species.

Conclusion:

Based on the evidence from the four different assessment approaches and an inspection of the functional corridors, the Kilimanjaro–Longido Corridor can be considered functional for the seven species. While the area abutting Kilimanjaro is mostly farmed and is not suitable habitat for the focal species, these species are likely to be able to move through the corridor to reach Kilimanjaro.

5.8. KILIMANJARO–TSAVO

Table 29. *Validation metrics for the functionality of the Kilimanjaro–Tsavo Wildlife Corridor.*

ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR						
NA (n=0)	NA (n=0)	38.5% (n=13)	NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)
2. COMPARISON OF CURRENT FLOW VALUES BETWEEN CORRIDOR AND BUFFER						
−0.01	0.01	0	−0.01*	0	−0.01*	−0.01*
3. COMPARISON OF CWD VALUES BETWEEN CORRIDOR AND BUFFER						
−7030.44	71269.56	−33833.3*	−101987.95*	−12040.13	−101961.0*	−48045.53*
4. PERCENTAGE OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS						
69.1%	1.5%	55%	41.2%	26.5%	46.1%	23.1%

Percentage of occurrence points in the corridor:

No data is available for any of the species except zebra, for which there are only 13 occurrence points, most of them in the buffer.

Comparison of current flow values between corridor and buffer:

Current flow values are significantly lower in the corridor than in the buffer for giraffe, cheetah, and wild dog. There is no significant difference between the values for the other species.

Comparison of CWD values between corridor and buffer:

CWD values are significantly higher in the corridor than in the buffer for zebra, giraffe, cheetah and lion. There is no significant difference for elephant, wildebeest, and lion.

Percentage overlap between structural and functional corridors:

There is low to moderate overlap of functional corridors with the structural corridor for all species.

Discussion:

The two-stranded structural corridor is densely populated and farmed. South of the structural corridor, six of the functional corridors overlap, indicating a potentially better route. North of the structural corridor, five of the functional corridors overlap, indicating a good location for a second strand or an alternative corridor route. Only wildebeest may not be able to move directly between Kilimanjaro and Tsavo West. Furthermore, the established electric fence, intended to reduce human–wildlife conflict, may further impede corridor functionality. While fencing can be effective in protecting farms and settlements from crop damage or livestock predation, it often creates unintended barriers to wildlife movement. In the case of the Kilimanjaro–Tsavo corridor, the fence, if functioning as intended, likely restricts seasonal migrations, limiting access to critical dry-season resources and isolating wildlife populations.

Conclusion:

Considering that the functional corridors all suggest better routes for the Kilimanjaro–Tsavo Corridor, we recommend considering realignment of the official corridor.

5.9. LAKE MANYARA–YAEDA CHINI

Table 30. *Validation metrics for the functionality of the Lake Manyara–Yaeda Chini Wildlife Corridor.*

ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR						
NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)
2. COMPARISON OF CURRENT FLOW VALUES BETWEEN CORRIDOR AND BUFFER						
−0.02*	−0.03*	−0.03*	−0.01	−0.02*	−0.01	−0.01
3. COMPARISON OF CWD VALUES BETWEEN CORRIDOR AND BUFFER						
−4916.37	78259.23*	−18375.6	−5334.54	−80946.84*	−5610.85	−35354.13
4. PERCENTAGE OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS						
58.5%	50.5%	66.2%	54.6%	64.7%	55.2%	73.2%

Percentage of occurrence points in the corridor:

No data is available for any of the species.

Comparison of current flow values between corridor and buffer:

Current flow values are significantly lower in the corridor than in the buffer for elephant, wildebeest, zebra, and lion, suggesting that a different corridor route may be better for the focal species. There is no significant difference in values for giraffe, cheetah, and wild dog.

Comparison of CWD values between corridor and buffer:

CWD values show mixed results. Values are significantly lower in the corridor only for wildebeest. For elephant, zebra, giraffe, cheetah, and wild dog, there is no significant difference between CWD values in the corridor and the buffer. For the lion, the CWD values are significantly higher in the corridor than in the buffer.

Percentage overlap between structural and functional corridors:

Overlap is moderate but continuous for all species.

Discussion:

Overlap between structural and functional corridors is only moderate because the functional corridors are narrower than the structural corridors, avoiding more populated and farmed areas. For all species except wildebeest, the functional corridors overlap continuously with the structural corridor.

Conclusion:

Based on the evidence from the four different assessment approaches and an inspection of the functional corridors, the Lake Manyara–Yaeda Chini Corridor can be considered functional for six of the seven species. Changing the delineation to exclude some of the populated and farmed areas can be considered.

5.10. LOITA-NAMANGA

Table 31. *Validation metrics for the functionality of the Loita–Namanga Wildlife Corridor.*

ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR						
72% (n=25)	NA (n=0)	18.2% (n=33)	10% (n=50)	80% (n=10)	40% (n=95)	8.7% (n=23)
2. COMPARISON OF CURRENT FLOW VALUES BETWEEN CORRIDOR AND BUFFER						
−0.03*	−0.02*	−0.02*	−0.01	−0.03*	−0.02*	−0.05*
3. COMPARISON OF CWD VALUES BETWEEN CORRIDOR AND BUFFER						
−203171.24*	−222877.43*	−131749.63*	−171558.27*	−177008.41*	−180557.64*	−170078.33*
4. PERCENTAGE OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS						
77.2%	39.4%	66.8%	50.7%	11%	95.8%	43.5%

Percentage of occurrence points in the corridor:

For elephant and lion, there are more occurrence points in the corridor than in the buffer. For zebra, giraffe, cheetah, and wild dog, there are more occurrence points in the buffer than in the corridor. Data is lacking for wildebeest.

Comparison of current flow values between corridor and buffer:

Current flow values are significantly lower in the corridor for all species except giraffe, indicating the corridor may not efficiently facilitate movement.

Comparison of CWD values between the corridor and buffer:

For all species, CWD values are significantly lower in the buffer, indicating that the corridor may not be in the best location for the focal species.

Percentage overlap between structural and functional corridors:

Overlap is high for cheetah, but low to moderate for all other species. Only for elephant, zebra, and cheetah is there a continuous swath where the functional corridors overlap with the structural corridor.

Discussion:

The giraffe, lion, and wild dog functional corridors go through the southernmost part of the structural corridor, between the structural corridor and the border between Kenya and Tanzania and extend into Tanzania.

One of the challenges to maintaining or restoring connectivity between Loita and Namanga is the extensive construction of fences which disrupt wildlife movements.

Conclusion:

Comprehensive planning, supporting policies, and extensive funding will be necessary to maintain connectivity between Loita and Namanga in the future. One recommendation is the creation of a Loita–Magadi–Suswa ecosystem plan that is intended to ensure those corridors have legal backing, and procuring financial and legal support for the Plan implementation committees.

5.11. LONGIDO–AMBOSELI

Table 32. *Validation metrics for the functionality of the Longido–Amboseli Wildlife Corridor.*

ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR						
21.7% (n=60)	48.7% (n=37)	41.9% (n=43)	23.3% (n=73)	NA (n=0)	NA (n=0)	NA (n=0)
2. COMPARISON OF CURRENT FLOW VALUES BETWEEN CORRIDOR AND BUFFER						
0.04*	0.07*	0.07*	0.08*	0.07*	0.07*	0.03*
3. COMPARISON OF CWD VALUES BETWEEN CORRIDOR AND BUFFER						
−84726.99*	−22348.14*	−76243.33*	−8595.81*	−15456.11	−15721.88*	−39601.99
4. PERCENTAGE OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS						
51.3%	90.9%	84.2%	100%	100%	100%	84.8%

Percentage of occurrence points in the corridor:

For elephant, wildebeest, zebra, giraffe, there are more occurrence points in the buffer than in the corridor, but all species have been documented in the corridor. Data is lacking for lion, cheetah, and wild dog.

Comparison of current flow values between corridor and buffer:

Current flow values are significantly higher in the corridor than in the buffer for all species, suggesting that the corridor offers a low-resistance route to movement.

Comparison of CWD values between corridor and buffer:

For all species except wild dog and lion, CWD values are significantly higher in the corridor than in the buffer, indicating that the corridor offers more resistance for movement. For lion and wild dog, the difference is not significant.

Percentage overlap between structural and functional corridors:

Overlap was moderate for cheetah, and high for all other species.

Discussion:

With habitat suitability being quite uniform across the buffer and corridor area, no preference for the corridor is detected by the overlap of occurrence points and the CWD value comparison approaches. The current flow comparison indicates that the corridor provides a low-resistance route for all species. Most convincing is the high overlap between structural and functional corridors.

Conclusion:

The Longido–Amboseli Corridor can be considered functional for the seven focal species.

5.12. MAASAI MARA-LOITA

Table 33. *Validation metrics for the functionality of the Maasai Mara-Loita Wildlife Corridor.*

ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR						
56.8% (n=417)	46.9% (n=64)	62.4% (n=109)	87.2% (n=234)	83.2% (n=6464)	67.7% (n=272)	25% (n=12)
2. COMPARISON OF CURRENT FLOW VALUES BETWEEN CORRIDOR AND BUFFER						
0.08*	0.14*	0.05*	0.02*	0*	0.03*	0.02*
3. COMPARISON OF CWD VALUES BETWEEN CORRIDOR AND BUFFER						
102414.07*	123592.6*	123282.06*	91560.29*	85661.4*	81102.56*	11449.44
4. PERCENTAGE OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS						
91.6%	85.9%	90.9%	58.5%	19.9%	48.2%	89.6%

Percentage of occurrence points in the corridor:

For zebra, giraffe, lion, cheetah, and wild dog, most occurrence points are in the corridor. For wildebeest, the distribution of points between the corridor and the buffer is almost even. More wild dog occurrence points are in the buffer than in the corridor.

Comparison of current flow values between corridor and buffer:

For all species, current flow values are significantly higher in the corridor than in the buffer, indicating that the corridor supports efficient movement.

Comparison of CWD values between corridor and buffer:

For all species except wild dog, CWD values are lower in the corridor than in the buffer, suggesting that the corridor provides a less resistant route for movement.

Percentage overlap between structural and functional corridors:

Overlap is high for elephant, wildebeest, zebra, and wild dog. It is moderate for cheetah and giraffe, and low for lion.

Discussion:

Based on the evidence from the four different assessment approaches and an inspection of the functional corridors, the Maasai Mara–Loita Corridor can be considered functional for six of the seven species. However, as discussed before, the least cost corridor algorithm will result in a corridor, even if in reality connectivity has been blocked off. The area just west of Loita is extensively fenced, which likely prohibits wildlife from reaching Loita. The updated LandDX data shows that the Mara–Loita corridor has almost entirely been closed, with more than double the number of fences and buildings having been built in the last few years. Efforts are underway to protect a narrow corridor along the Sand River (Peter Tyrrell, pers. comm.). To the north in the Loita Plains, it has also been closed off with fences and large-scale conversion. Based on the giraffe, lion, and wild dog functional corridor models, an option for a corridor could be through the Loita Hills.

Conclusion:

Changing the delineation of the corridor to the only pathway still open to wildlife movement may be the only option.

5.13. MAASAI MARA–TRANS MARA COMPLEX

Table 34. *Validation metrics for the functionality of the Maasai Mara–Trans Mara Complex Wildlife Corridor.*

ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR						
43.7% (n=1538)	71.6% (n=619)	51.7% (n=573)	71.4% (n=5536)	88.9% (n=46941)	95.5% (n=6625)	9.5% (n=127)
2. COMPARISON OF CURRENT FLOW VALUES BETWEEN CORRIDOR AND BUFFER						
0.07*	0.1*	0.05*	0.03*	0.02*	0.04*	0.04*
3. COMPARISON OF CWD VALUES BETWEEN CORRIDOR AND BUFFER						
192748.86*	206500.13*	217204.55*	83822.1*	824.06	79929.03*	153298.79*
4. PERCENTAGE OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS						
62.7%	71.4%	45.7%	26.4%	17.8%	29.5%	25%

Percentage of occurrence points in the corridor:

For all species except elephant and wild dog, the majority of occurrence points are in the corridor. While there are more occurrence points in the buffer, elephant and wild dog still use the corridor.

Comparison of current flow values between corridor and buffer:

For all species, current flow values are significantly higher in the corridor, suggesting that the corridor supports efficient movement.

Comparison of CWD values between corridor and buffer:

For all species except lion, CWD values are lower in the corridor, implying that the corridor provides a less resistant route for movement. The difference was not statistically significant for lion.

Percentage overlap between structural and functional corridors:

Overlap is low for most species, and only moderate for elephant, wildebeest, and zebra.

Discussion:

While the models created a structural and functional corridor between Maasai Mara and the Trans Mara Complex, the habitat suitability maps clearly show that the area south of the Trans Mara is unsuitable for the focal species due to the development of large wheat fields, fencing and human settlement.

Conclusion:

Connectivity is impeded between Maasai Mara and the Trans Mara Complex. The conservancies north of Maasai Mara, however, are important dispersal areas for the focal species.

5.14. MKOMAZI-HANDENI

***Table 35.** Validation metrics for the functionality of the Mkomazi–Handeni Wildlife Corridor.*

ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR						
NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)
2. COMPARISON OF CURRENT FLOW VALUES BETWEEN CORRIDOR AND BUFFER						
0*	−0.01	0*	0.01*	0.02*	0.01*	0.04*
3. COMPARISON OF CWD VALUES BETWEEN CORRIDOR AND BUFFER						
−89465.21*	−87430.71*	−77505.51*	−31172.8*	−23386.68*	−31541.19*	−16092.15*
4. PERCENTAGE OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS						
74.1%	54.3%	52.3%	72.2%	32.9%	72.1%	38.1%

Percentage of occurrence points in the corridor:

No data is available for any of the species.

Comparison of current flow values between corridor and buffer:

For all species except wildebeest, current flow values are significantly higher in the corridor than in the buffer, suggesting that the corridor supports efficient movement. For wildebeest, the differences in current flow values are not significant between the corridor and the buffer.

Comparison of CWD values between corridor and buffer:

For all species, CWD values are significantly higher in the corridor, indicating that the corridor provides higher resistance to movement than the buffer.

Percentage overlap between structural and functional corridors:

Overlap is low for lion and wild dog and moderate for the other species.

Discussion:

The structural corridor goes through the plains, avoiding the Usambara Mountains to the south and the South Pare Mountains to the north. For all species, the functional corridors have at least two strands, with one going through the Usambara Mountains through the Kisima Gonja and Baga Forest Reserves.

The structural corridor captures the functional corridors well, however, in the northern part where it narrows down before meeting Mkomazi National Park, four of the functional corridors go just west of the structural corridor.

Conclusion:

We recommend considering a realignment of the Mkomazi–Handeni Corridor in the northern part and exploring the potential of protecting a second corridor between Mkomazi and Handeni that goes through the Usambara Mountains.

5.15. NAMANGA-AMBOSELI

Table 36. *Validation metrics for the functionality of the Namanga–Amboseli Wildlife Corridor.*

	ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR	57.8% (n=277)	NA (n=0)	34.3% (n=105)	75.5% (n=1137)	72% (n=25)	24% (n=25)	NA (n=0)
2. COMPARISON OF CURRENT FLOW VALUES BETWEEN CORRIDOR AND BUFFER	0.09*	0.16*	0.07*	0.1*	0.05*	0.09*	0.04*
3. COMPARISON OF CWD VALUES BETWEEN CORRIDOR AND BUFFER	43755.26*	120706.51*	50347.51*	138172.73*	93685.37*	129519.96*	52854.93*
4. PERCENTAGE OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS	93.1%	88.8%	88.9%	93.3%	93.5%	93.4%	94.8%

Percentage of occurrence points in the corridor:

For elephant, giraffe, and lion, the percentage of occurrence points is higher in the corridor than in the buffer. For zebra and cheetah, it is higher in the buffer. Data is lacking for wildebeest and wild dog.

Comparison of current flow values between corridor and buffer:

For all species, current flow values are higher in the corridor than in the buffer with the differences being statistically significant. This suggests that the corridor provides a more efficient movement path than the buffer.

Comparison of CWD values between corridor and buffer:

For all species, CWD values are higher in the buffer than in the corridor with the differences being statistically significant, indicating the corridor offers a less resistant route for movement than the buffer.

Percentage overlap between structural and functional corridors:

All functional corridors greatly overlap with the structural corridor.

Conclusion:

Based on the evidence from the four assessment approaches and an inspection of the functional corridors, the Namanga–Amboseli Corridor can be considered functional for the seven species.

5.16. SERENGETI COMPLEX-ARUSHA

Table 37. *Validation metrics for the functionality of the Serengeti Complex–Arusha Wildlife Corridor.*

ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR						
NA (n=0)	NA (n=0)	61% (n=105)	47.1% (n=68)	NA (n=0)	NA (n=0)	NA (n=0)
2. COMPARISON OF CURRENT FLOW VALUES BETWEEN CORRIDOR AND BUFFER						
0.03*	0.05*	0.04*	0.03*	0.02*	0.03*	0.03*
3. COMPARISON OF CWD VALUES BETWEEN CORRIDOR AND BUFFER						
105984.49*	160261.03*	3750.73	55789.03*	−88397.73*	55266.74*	−51453.49*
4. PERCENT OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS						
80.8%	68.6%	70.7%	61.1%	49.9%	60.7%	57.7%

Percentage of occurrence points in the corridor:

For zebra, there are more occurrence points in the corridor than in the buffer. For giraffes, the distribution between corridor and buffer is almost even. Data is lacking for elephants, wildebeest, lion, cheetah, and wild dog.

Comparison of current flow values between corridor and buffer:

For all species, current flow values are higher in the corridor than in the buffer with the differences being statistically significant. This suggests that the corridor provides a more efficient movement path than the buffer.

Comparison of CWD values between corridor and buffer:

For elephant, wildebeest, giraffe, and cheetah, CWD values are higher in the buffer than in the corridor with the differences being statistically significant, indicating the corridor offers a less resistant route for movement than the buffer. For zebra, the difference in values between the corridor and buffer is not significant. For lion and wild dogs, CWD values are higher in the corridor than in the buffer, indicating that resistance is higher in the corridor.

Percentage overlap between structural and functional corridors:

Overlap is quite high for elephant and moderate for all other species.

Conclusion:

While the models created structural and functional corridors between the Serengeti Complex and Arusha National Park, and there is even overlap between several of the functional corridors, the habitat suitability maps clearly show that the area around Arusha National Park is mostly unsuitable for the focal species. Connectivity in the Serengeti Complex–Arusha Corridor is impeded. The only corridor that could remain viable and prevent isolation of Arusha NP is the Kilimanjaro–Arusha Corridor.

5.17. SERENGETI COMPLEX-LONGIDO

Table 38. *Validation metrics for the functionality of the Serengeti Complex–Longido Wildlife Corridor.*

ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR						
25% (n=16)	NA (n=0)	36.8% (n=125)	45.2% (n=164)	NA (n=0)	NA (n=0)	4.2% (n=24)
2. COMPARISON OF CURRENT FLOW VALUES BETWEEN CORRIDOR AND BUFFER						
0.01*	0.01	0.02*	0.03*	0.01*	0.03*	0.01*
3. COMPARISON OF CWD VALUES BETWEEN CORRIDOR AND BUFFER						
230753.54*	183982.04*	179227.33*	286860.87*	41315.74	273064.64*	77039.71*
4. PERCENTAGE OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS						
58.9%	50.9%	63.1%	78.7%	59.7%	75%	91%

Percentage of occurrence points in the corridor:

For elephants, zebra, giraffe, and wild dog, the number of points is higher in the buffer compared with the corridor. Data is lacking for wildebeest, lion, and cheetah.

Comparison of current flow values between corridor and buffer:

For all species, current flow values are higher in the corridor than in the buffer with the differences being statistically significant. For wild dogs, current flow values are significantly lower in the corridor than in the buffer.

Comparison of CWD values between corridor and buffer:

For all species except lion, CWD values are higher in the buffer than in the corridor with the differences being positive and statistically significant, indicating that the corridor offers a low resistant route for movement. For lion, the difference between CWD values is not statistically significant.

Percent overlap between structural and functional corridors:

For all species, overlap is moderate or high and, importantly, there is continuous overlap between the structural and functional corridors, meaning that animals could move between the protected areas through the structural corridor while also being in the functional corridor.

Conclusion:

Based on the evidence from the four different assessment approaches and an inspection of the functional corridors, the corridor can be considered functional for the seven species. There is extensive fencing in the northern part of the corridor, requiring adjustment of the official corridor.

5.18. SERENGETI COMPLEX-MANYARA-TARANGIRE COMPLEX

Table 39. *Validation metrics for the functionality of the Serengeti Complex–Manyara–Tarangire Complex Wildlife Corridor.*

ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR						
55.7% (n=657)	81.2% (n=122)	57.4% (n=394)	86.7% (n=1032)	49.7% (n=179)	57.1% (n=205)	46.3% (n=54)
2. COMPARISON OF CURRENT FLOW VALUES BETWEEN CORRIDOR AND BUFFER						
0.03*	0.07*	0.03*	0.02*	0.01*	0.02*	0.03*
3. COMPARISON OF CWD VALUES BETWEEN CORRIDOR AND BUFFER						
−353917.61*	15161.21*	−331316.03*	−392898.33*	−367650.18*	−395933.86*	−272692.09*
4. PERCENTAGE OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS						
40.9%	64%	31.8%	35.4%	25.4%	35.4%	33.4%

Percentage of occurrence points in the corridor:

For most species, there are more occurrence points in the corridor than in the buffer. For lion and wild dog, the distribution of points between corridor and buffer is almost even.

Comparison of current flow values between corridor and buffer:

Current flow values are significantly higher in the corridor for all species, indicating that it offers the best movement route.

Comparison of CWD values between corridor and buffer:

CWD values are significantly higher in the corridor for all species, indicating greater resistance to movement within the corridor.

Percentage overlap between structural and functional corridors:

Overlap is moderate for elephant and wildebeest and low for all other species.

Discussion:

Most of the functional corridors do not go through the structural corridor but lead through the Kwakuchinja Wildlife Corridor (which connects Tarangire and Lake Manyara national parks) and from there north-east to the Serengeti Complex. However, for all species, habitat suitability is also quite high and resistance to movement low in the structural corridor, with the exception of the developed areas (e.g., Mto Wa Mbu) on the north-east end of Lake Manyara.

Conclusion:

Considering the importance of the Tarangire–Serengeti region for wildlife and the ongoing corridor conservation efforts, both routes should be secured for wildlife movements to continue into the future.

5.19. SERENGETI COMPLEX–YAEDA CHINI

***Table 40.** Validation metrics for the functionality of the Serengeti Complex–Yaeda Chini Wildlife Corridor.*

ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR						
NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)
2. COMPARISON OF CURRENT FLOW VALUES BETWEEN CORRIDOR AND BUFFER						
0.06*	0.03*	0.05*	0.1*	0.08*	0.1*	0.09*
3. COMPARISON OF CWD VALUES BETWEEN CORRIDOR AND BUFFER						
937.38	–95235.98	2616.34	36049.26	40005.57	36166.74	35906.57
4. PERCENTAGE OVERLAP OF FUNCTIONAL CORRIDORS TO STRUCTURAL CORRIDORS						
33.3%	24.7%	4.4%	46.1%	8.4%	47.7%	10.5%

Percentage of occurrence points in the corridor:

No data is available for any of the species.

Comparison of current flow values between corridor and buffer:

For all species, current flow values are higher in the corridor than in the buffer with the differences being positive and statistically significant.

Comparison of CWD values between corridor and buffer:

None of the CWD values are statistically different between the corridor and buffer.

Percent overlap between structural and functional corridors:

For all species, the percentage overlap is low to moderate.

Discussion:

Yaeda Chini Valley is about 9km south of Lake Eyasi, which borders the Serengeti Complex. The structural corridor goes from Yaeda Chini Valley to the lake and then along the western end towards the Serengeti Complex. The elephant, wildebeest, giraffe, and cheetah functional corridors overlap with the structural corridor, but encompass more land between Yaeda Chini and Lake Eyasi. The zebra, lion, and wild dog functional corridors start at the north-east end of Yaeda Chini and along the east side of Lake Eyasi. However, the habitat suitability and resistance maps indicate that these species could just as easily follow the structural corridor.

Conclusion:

The Serengeti Complex–Yaeda Chini Corridor can be considered functional for the seven species.

5.20. TARANGIRE COMPLEX-ARUSHA

Table 41. *Validation metrics for the functionality of the Tarangire Complex–Arusha Wildlife Corridor.*

ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR						
38.2% (n=34)	NA (n=0)	NA (n=0)	21.1% (n=19)	NA (n=0)	6.7% (n=15)	78.1% (n=32)
2. COMPARISON OF CURRENT FLOW VALUES BETWEEN CORRIDOR AND BUFFER						
0.01*	0.01	0.00*	0.01*	0.01*	0.01*	0.02*
3. COMPARISON OF CWD VALUES BETWEEN CORRIDOR AND BUFFER						
−7870.36	67189.32*	−32811.71	−48829.11	−138177.7*	−49623.01	−72519.42*
4. PERCENTAGE OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS						
47.3%	18.7%	53.7%	45.2%	82%	45.2%	68.8%

Percentage of occurrence points in the corridor:

Only a few occurrence points are available for this corridor. For wild dog, the number of occurrence points is higher in the corridor than in the buffer. For elephant, giraffe, and cheetah, the number of occurrence points is higher in the buffer. There is no data available for wildebeest, zebra or lion.

Comparison of current flow values between corridor and buffer:

For all species except wildebeest, current flow values are higher in the corridor than in the buffer with the differences being statistically significant.

Comparison of CWD values between corridor and buffer:

For wildebeest, CWD values are significantly lower in the corridor, indicating that the corridor provides lower resistance to movement for this species. For lion and wild dog, CWD values are significantly lower in the buffer than in the corridor, suggesting higher resistance to movement in the corridor for these species. For elephant, zebra, giraffe, and cheetah, there is no significant difference between CWD values in the corridor and buffer.

Percentage overlap between structural and functional corridors:

Overlap varied between 18% and 82%, with most of the overlap being moderate. Unlike the other functional corridors, the lion and wild dog functional corridors follow the structural corridor quite closely.

Conclusion:

As discussed above, resistance to movement is high for all focal species around most of Arusha National Park. Therefore, we expect the Tarangire Complex–Arusha Corridor not to be functional for any of the species.

5.21. TARANGIRE COMPLEX–MKOMAZI

Table 42. *Validation metrics for the functionality of Tarangire Complex–Mkomazi Wildlife Corridor.*

ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR						
0% (n=0)	0% (n=0)	0% (n=0)	0% (n=0)	0% (n=0)	20% (n=90)	40% (n=50)
2. COMPARISON OF CURRENT FLOW VALUES BETWEEN CORRIDOR AND BUFFER						
−0.01*	−0.02*	−0.02*	−0.01*	−0.01*	−0.01*	−0.02*
3. COMPARISON OF CWD VALUES BETWEEN CORRIDOR AND BUFFER						
−218994.11*	−225075.45*	−213372.65*	−217544.67*	−172083.93*	−218224.26*	−164050.74*
4. PERCENTAGE OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS						
14.5%	2%	4.7%	32.6%	12%	32.6%	11.6%

Percentage of occurrence points in the corridor:

For wild dog and cheetah, the number of occurrence points are higher in the buffer compared with the corridor. No occurrence points were recorded for elephants, wildebeest, zebra, giraffe, or lion in either the corridor or the buffer.

Comparison of current flow values between corridor and buffer:

For all species, current flow values are significantly lower in the corridor than in the buffer, indicating that the corridor provides higher resistance to movement.

Comparison of CWD values between corridor and buffer:

For all species, CWD values are significantly higher in the corridor than in the buffer, indicating that the corridor provides higher resistance to movement.

Percentage overlap between structural and functional corridors:

Overlap was low for all species.

Discussion:

All but the wildebeest functional corridors are located just north of the structural corridor with four to six of them overlapping along the entire length between Tarangire and Mkomzi. The reason for the minimal overlap with the structural corridor is the presence of villages and farmed land.

Conclusion:

We recommend newly delineating the Tarangire Complex–Mkomazi Corridor based on the species models, and expert and Indigenous knowledge.

5.22. TRANS MARA COMPLEX-LOITA

Table 43. *Validation metrics for the functionality of the Trans Mara Complex–Loita Wildlife Corridor.*

ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR						
NA (n=0)	48.9% (n=43)	59% (n=83)	87% (n=23)	3.74% (n=107)	NA (n=0)	NA (n=0)
2. COMPARISON OF CURRENT FLOW VALUES BETWEEN CORRIDOR AND BUFFER						
0.01*	0.01*	-0.01*	0	−0.02*	0	−0.01
3. COMPARISON OF CWD VALUES BETWEEN CORRIDOR AND BUFFER						
−143616.91*	16055.86*	−208308.19*	−345727.47*	−408732.03*	−322375.52*	−269695.12*
4. PERCENTAGE OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS						
89%	19.1%	42.8%	55.1%	29.6%	62.1%	47.2%

Percentage of occurrence points in the corridor:

The number of occurrence points for zebra and giraffe is higher in the corridor than in the buffer, suggesting that the corridor facilitates movement for these species. In contrast, for wildebeest and lion there are more occurrence points in the buffer, suggesting that the species use the buffer more than the corridor. There is no data available for elephant, cheetah, and wild dog.

Comparison of current flow values between corridor and buffer:

Current flow values are significantly higher in the corridor than in the buffer for elephant, wildebeest, and zebra; significantly lower for lion; and statistically not different for giraffe, cheetah, and wild dog.

Comparison of CWD values between corridor and buffer:

CWD values are significantly higher in the corridor for all species except wildebeest, suggesting that the corridor provides greater resistance to movement than the corridor. For wildebeest, CWD values are significantly lower in the corridor than in the buffer.

Percentage overlap between structural and functional corridors:

Overlap varied from 19% to 89% with most values being low to moderate.

Discussion:

The resistance maps show that, for all species, resistance to movement is high between the Ol-Pusimoru Forst Reserve and the area around Narok. Fence density is also very high north of Loita.

Conclusion:

Connectivity is likely already impeded between the Trans Mara Complex and Loita.

5.23. TSAVO EAST-TSAVO WEST (NORTH)

Table 44. *Validation metrics for the functionality of the Tsavo East-Tsavo West (north) Wildlife Corridor.*

ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR						
36.36% (n=11)	NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)	NA (n=0)
2. COMPARISON OF CURRENT FLOW VALUES BETWEEN CORRIDOR AND BUFFER						
0.25*	0.21*	0.22*	0.33*	0.25*	0.33*	0.3*
3. COMPARISON OF CWD VALUES BETWEEN CORRIDOR AND BUFFER						
189731.84*	52722.74*	144033.03*	264356.25*	209240.87*	265153.68*	190499.26*
4. PERCENTAGE OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS						
79.7%	39.6%	85.6%	92.5%	84.1%	92.5%	88.7%

Percentage of occurrence points in the corridor:

For elephants, the number of occurrence points is higher in the corridor than in the buffer. Data is lacking for all other species.

Comparison of current flow values between corridor and buffer:

For all species, current flow values are higher in the corridor than in the buffer, with the differences being statistically significant. This suggests that the corridor provides a more efficient movement path than the buffer.

Comparison of CWD values between corridor and buffer:

For all species, CWD values are higher in the buffer than in the corridor with the differences being statistically significant, indicating the corridor offers a less resistant route for movement than the buffer.

Percent overlap between structural and functional corridors:

Overlap was high for all species, except wildebeest.

Conclusion:

Based on the evidence from the four different assessment approaches and an inspection of the functional corridors, the Tsavo East–Tsavo West (north) corridor can be considered functional for the seven species.

5.24. TSAVO EAST-TSAVO WEST (SOUTH)

Table 45. *Validation metrics for the functionality of the Tsavo East–Tsavo West (south) Wildlife Corridor.*

ELEPHANT	WILDEBEEST	ZEBRA	GIRAFFE	LION	CHEETAH	WILD DOG
1. PERCENTAGE OF OCCURRENCE POINTS IN THE CORRIDOR						
12% (n=50)	NA (n=0)	25.4% (n=59)	29.8% (n=47)	4.6% (n=22)	NA (n=0)	NA (n=0)
2. COMPARISON OF CURRENT FLOW VALUES BETWEEN CORRIDOR AND BUFFER						
0.03*	0*	0*	0.08*	0.03*	0.08*	0.05*
3. COMPARISON OF CWD VALUES BETWEEN CORRIDOR AND BUFFER						
32325.71*	−16116.21	−4601.4	168200.39*	138579.68*	168599.06*	150875.85*
4. PERCENTAGE OVERLAP BETWEEN STRUCTURAL AND FUNCTIONAL CORRIDORS						
92.7%	56.4%	90.7%	94.8%	60%	94.8%	71.9%

Overlap of points between the corridor and buffer:

The number of occurrence points is higher in the buffer than in the corridor for elephant, zebra, giraffe, and lion, suggesting that the corridor may not effectively facilitate movement. Data is lacking for wildebeest, cheetah and wild dog.

Comparison of current flow values between corridor and buffer:

For all species, current flow values are higher in the corridor than in the buffer, with the differences being statistically significant. This suggests that the corridor provides a more efficient movement path than the buffer.

Comparison of CWD values between corridor and buffer:

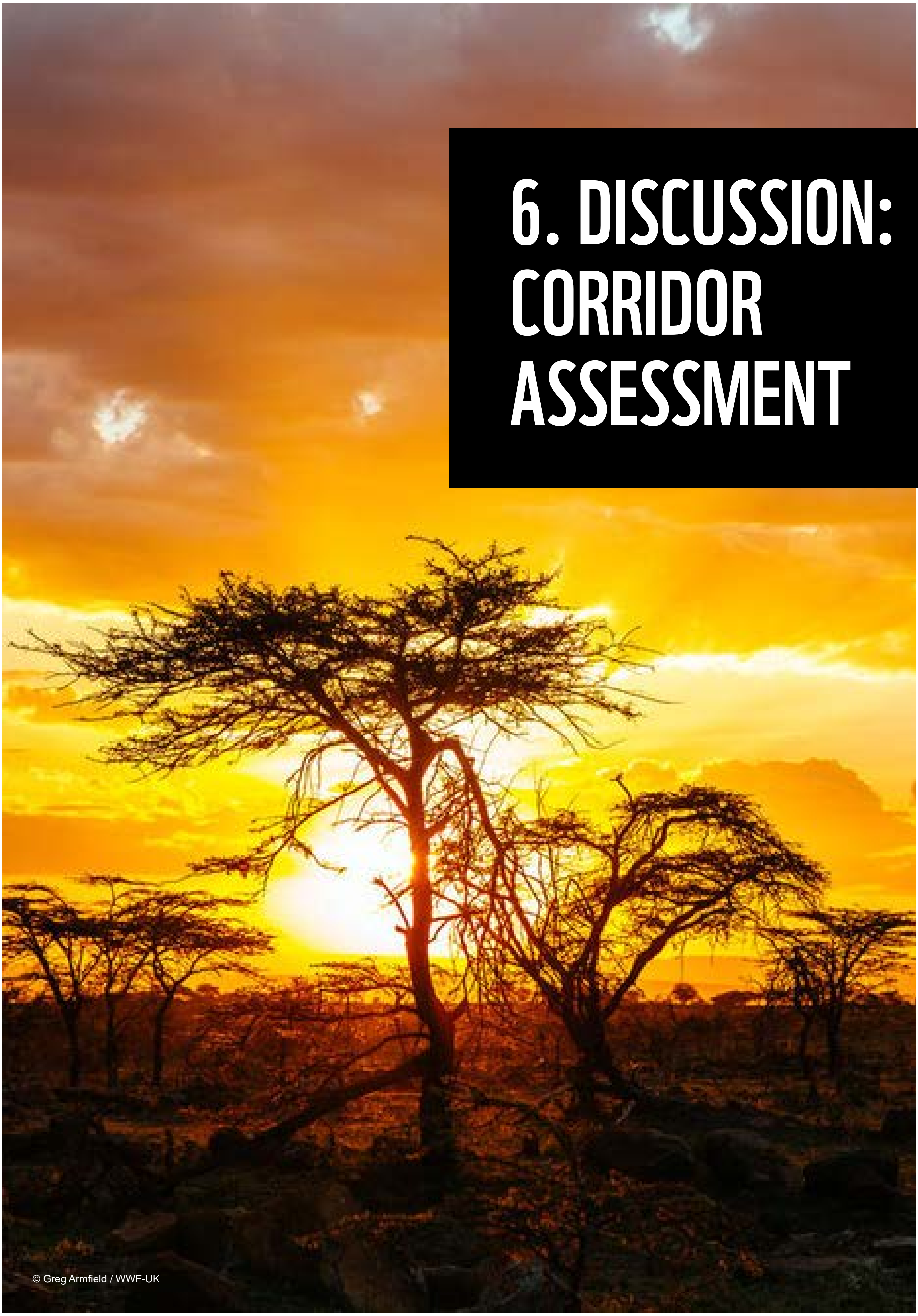
For all species except wildebeest and zebra, CWD values are higher in the buffer than in the corridor with the differences being statistically significant, indicating the corridor offers a less resistant route for movement than the buffer. The difference is non-significant for wildebeest and zebra.

Percent overlap between structural and functional corridors:

Overlap is moderate for wildebeest, lion, and wild dog, and high for all other species.

Conclusion:

Based on the evidence from the four different assessment approaches and an inspection of the functional corridors, the Tsavo East–Tsavo West (south) corridor can be considered functional for the seven species.



6. DISCUSSION: CORRIDOR ASSESSMENT

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6.1. APPROACHES TO ASSESSING THE FUNCTIONALITY OF CORRIDORS

We undertook four different approaches to assessing the functionality of the structural corridors for seven focal species. We looked at (1) the percentage of occurrence points in the corridor compared with the buffer; (2) differences in mean current flow values; (3) differences in cost-weighted distance values; and (4) the percentage overlap between structural and functional corridors. While the first approach theoretically is the best because it uses independent data directly, it greatly depends on data availability and the distribution of the data in the landscape. The percentage of occurrence points in the corridor compared with the buffer would be most meaningful for corridor validation if a study would intentionally collect data to answer that question. However, using all the data that was available to us, there is still important information in the results of the approach with respect to focal species use of the corridors.

Another approach of using independent species data directly would have been to analyse species movement trajectories collected using GPS collar data to examine whether individuals actually move from one protected area to another through the corridors (Naidoo et al., 2024). Because these types of data were only available for a few species in a small part of the landscape, we did not include this approach in this study. We recommend this as a follow-up study, especially for elephants due to the richness of movement data for this species.

The other three approaches are based on models. While we can compare one model to another model (which can be quite informative), if the two models agree, it does not per se validate the first model (Creech et al., 2024). When developing the functional models, we used global datasets as input layers, in addition to a few local datasets (especially fence data). Global datasets are advantageous when working in a trans-boundary landscape because the same dataset is available for all countries involved. In addition, some global data is updated more regularly than local data, which is important in a quickly changing landscape. For example, the global human modification data (Theobald et al., 2025) are based on data from 2022, whereas the latest local dataset is, as far as we know, from before 2015 (van Breugel et al., 2015). Finally, obtaining local datasets can take more time than available for a project.

In the SOKNOT region, wildlife move quite differently during the dry and wet seasons. While we considered creating separate resistance surfaces and functional corridors for the dry and wet seasons, the data available to us did not allow for that approach because information on the month were missing for many data points.

It is obvious in the results for the individual corridors that not all approaches tell the same story for a particular corridor. The reason for this is likely because the different models make different assumptions. For example, while the least-cost corridor algorithm assumes the animals to have perfect knowledge of the landscape, CircuitScape treats animals as random walkers.

As with all models, it is important to know their limitations. The least-cost corridor algorithm always finds the route with the least cost, no matter how high this least cost may be. This means that it will suggest a corridor even through swaths of pixels with high resistance where species would never be able to move through. This happened especially with corridors leading to Arusha National Park and the Trans Mara Complex (Section 5).

While we used multiple sources of evidence to interpret the model results, it will be important to also rely on expert and indigenous knowledge to further assess and potentially adjust the corridor boundaries.

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6.2. SUMMARY OF CORRIDOR FUNCTIONALITY ASSESSMENT

The results of the four structural corridor assessment approaches using focal species data led to different conclusions and recommendations regarding the structural corridors. Thirteen of the 24 corridors were considered functional for six or all seven focal species (Table 46). In four cases, we recommend changing the structural corridor boundaries to remove populated and farmed areas. For four corridors, we recommend considering shifting the corridor away from where the structural corridor was delineated to an area where a majority of the functional corridors overlap. In two cases, the species data suggests value in protecting two separate corridors between a pair of protected areas. Owing to extensive human development, connectivity in four corridors appears to be greatly impeded or already lost. And finally, one corridor overlaps greatly with protected areas and does not need any consideration.

Table 46. *Summary of recommendations for each corridor based on the assessment of functionality of structural corridors for seven focal species.*

	FUNCTIONAL 'AS IS' FOR 6-7 SPECIES	CHANGING THE BOUNDARIES TO REMOVE POPULATED AND FARMED AREAS	CONSIDER REALIGNMENT OF THE OFFICIAL CORRIDOR	CHANGE THE DELINEATION OF THE CORRIDOR TO THE ONLY PATHWAY STILL OPEN TO WILDLIFE	PROTECT TWO CORRIDORS BETWEEN THE PROTECTED AREAS	CONNECTIVITY IS IMPEDED	NO CONSIDERATION NEEDED
Amboseli– Chyulu–Tsavo	x						
Arusha–Longido			x				
Baga–Kisima Gonja	x						
Chyulu–Tsavo East	X						x
Kilimanjaro–Amboseli	x						
Kilimanjaro–Arusha	x	x					
Kilimanjaro–Longido	x						
Kilimanjaro–Tsavo			x				
Lake Manyara–Yaeda Chini	x	x					
Loita–Namanga				x			
Longido–Amboseli	x						
Maasai Mara–Loita				x			
Maasai Mara–Trans Mara Complex						x	
Mkomazi–Handeni			x		x		
Namanga–Amboseli	x						
Serengeti Complex–Arusha						x	
Serengeti Complex–Longido		x					

	FUNCTIONAL 'AS IS' FOR 6-7 SPECIES	CHANGING THE BOUNDARIES TO REMOVE POPULATED AND FARMED AREAS	CONSIDER REALIGNMENT OF THE OFFICIAL CORRIDOR	CHANGE THE DELINEATION OF THE CORRIDOR TO THE ONLY PATHWAY STILL OPEN TO WILDLIFE	PROTECT TWO CORRIDORS BETWEEN THE PROTECTED AREAS	CONNECTIVITY IS IMPEDED	NO CONSIDERATION NEEDED
Serengeti Complex–Manyara–Tarangire Complex	x				x		
Serengeti Complex–Yaeda Chini	x						
Tarangire Complex–Arusha						x	
Tarangire Complex–Mkomazi			x				
Trans Mara Complex–Loita						x	
Tsavo East–Tsavo West (north)	x	X					
Tsavo East–Tsavo West (south)	x						

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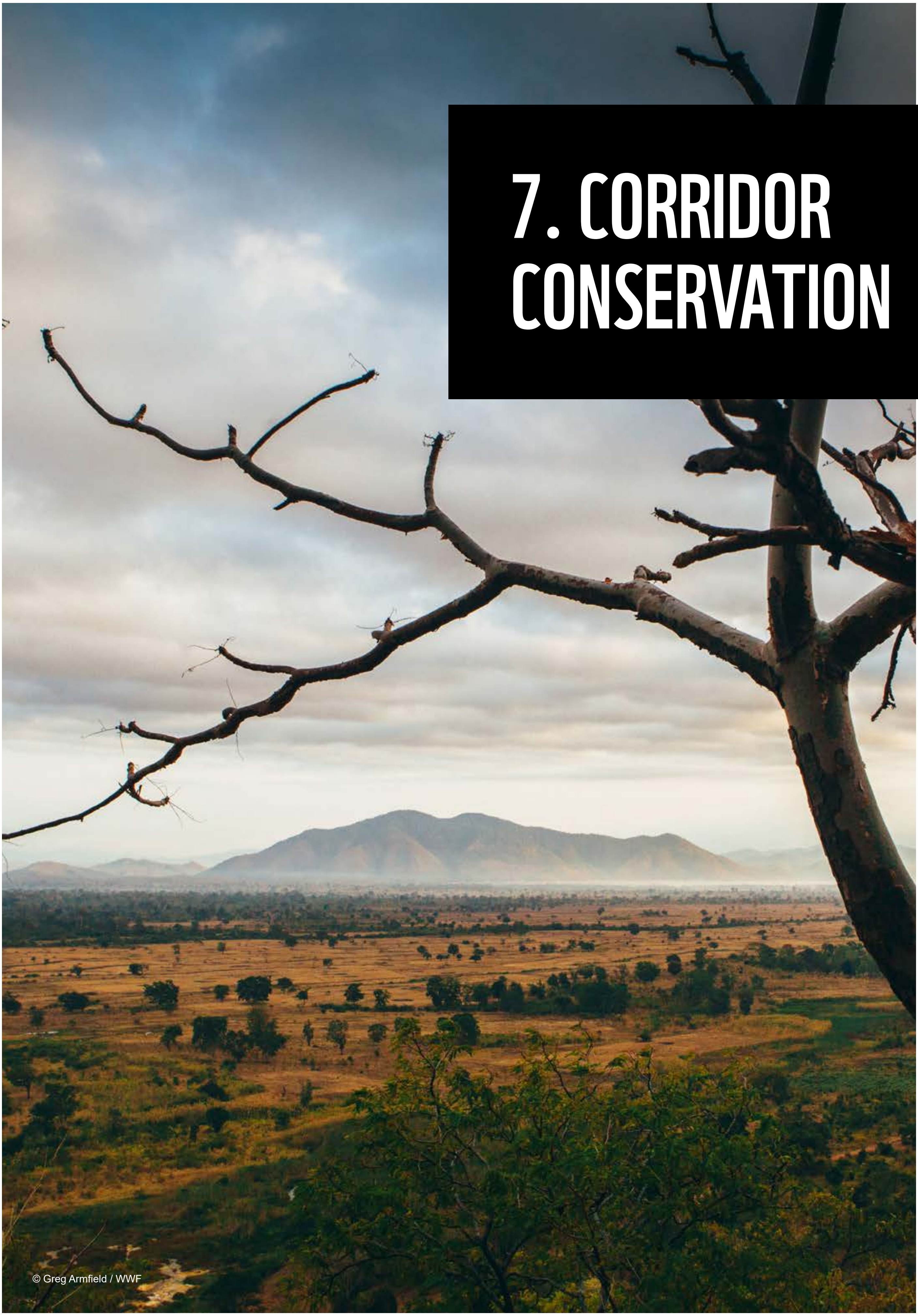

7. CORRIDOR CONSERVATION

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7.1. ENABLING CONDITIONS

Enabling conditions for connectivity conservation include enabling legislation and policy; establishing a common language for terms; a common vision of a connected landscape among diverse stakeholders; transparent, repeatable scientific approaches to connectivity planning; public outreach efforts; engagement of stakeholders and enduring partnerships among stakeholders; continuity of leadership; adequate funding; and incentive programs to promote private sector involvement (Keeley et al., 2018, 2019, Hilty et al., 2020).

While these enabling conditions are critical for successful connectivity conservation, challenges such as land ownership patterns, socioeconomic factors, and frequent human-wildlife conflict can complicate implementation efforts. Keeping corridors open can be costly when conservancies need to be effectively funded or areas leased to prevent conversion of natural habitat.

Addressing these challenges requires adaptive strategies that consider local contexts and stakeholder dynamics.

Many of the enabling conditions already exist in SOKNOT; however, based on presentations by Philip Muruthi, Peter Tyrrell, Paedar Brehony, and Gerson Fumbuka, as well as discussion during a session focused on enabling conditions during the 2024 connectivity workshop (Section 2.1), there is room for improvement. Actions called for included:

- Establish dedicated, funded corridor coordinator positions. Involve many types of stakeholders in corridor planning and management:
  - Determine and engage
    - who manages the resources,
    - who has rights to resources in the corridors,
    - who is impacted (positively or negatively) by conservation actions, and
    - who is interested in pursuing connectivity conservation.
  - Consider
    - Local communities: community-based organisations, NGOs, women and youth organisations,
    - Local government: regional representatives, district representatives, community-based organisations, NGOs,
    - National government: Ministry of Environment/ Natural Resources, Ministry of Agriculture, Ministry of Water, Ministry of Transportation,
    - African Union & regional bodies, e.g., Common Market for Eastern and Southern Africa,
    - Private sector,
    - Donors,
    - Media representatives.
- Engage Indigenous peoples and consider Indigenous knowledge.
- Increase engagement of leaders, youth, and decision-makers at all levels.
- Work toward ensuring that conservation becomes an established part of Africa's economic decision-making.
- Invest in education.
- Emphasise, for example through media campaigns, that corridors are important beyond wildlife: they provide ecosystem services and contribute to human well-being.
- Encourage private investment (e.g., conservation enterprises, sustainable tourism projects).
- Establish long-term monitoring, which is crucial for tracking ecosystem changes.
- Manage corridors to prevent land degradation and loss of ecological function.
- For transboundary connectivity conservation, take advantage of the many existing Memoranda of Understanding (MoUs) and create new ones where needed.
- Establish cross-border connectivity governance: Create or strengthen a formal SOKNOT coordination body to harmonise corridor planning, land-use policies, and biodiversity monitoring across Kenya and Tanzania.

Because connectivity-related legislation is a key enabling condition for effective corridor conservation, we list relevant laws and policies in Kenya and Tanzania in the next two sections.

7.1.1. CONNECTIVITY-RELATED LAWS AND POLICIES IN KENYA

The following are samples of relevant national laws and policies that address the conservation of ecological connectivity in Kenya:[1]

- The 2010 Kenya Constitution emphasises the right of all Kenyans to a clean and healthy environment and provides for the sustainable management and equitable distribution of natural resources and their benefits. The Constitution also establishes three different categories of land (public or state-owned, private, and community land) and four different kinds of tenure (freehold, leasehold, partial interest, and customary land rights). A significant aspect of the Constitution is its decentralising reforms providing for the devolution of political authority and government functions to 47 counties, each with a directly elected governor and legislative assembly. While the national government retains responsibility for the protection of wildlife and protected area management, for instance, counties are responsible for the development of County Integrated Development and Physical Plans, which have been considered nominally critical for corridor and habitat conservation on private and community lands.

- The 2000 Environmental Management and Coordination Act is the legal and institutional framework for managing the environment in Kenya that includes systems for environmental impact assessment, auditing and monitoring, and restoration, and establishment of the National Environment Management Authority as the principal authority charged with implementation, supervision, and coordination of all related policies. Part IX, section 112 of the Act details "Environmental easements and conservation orders" and provides in section 112(1) that "A court may, on an application made under this Part, grant an environmental easement or an environmental conservation order subject to the provisions of this Act and the Land Act". Read together with Section 112(4), it goes on to detail that "Without prejudice to the general effect of subsection (2), an environmental conservation order may be imposed on burdened land so as to – [...] (k) create or maintain migration corridors for wildlife".

- The 2013 Wildlife Conservation and Management Act is foundational for wildlife conservation in Kenya, and ecological connectivity conservation in particular. Its general principles include devolution of wildlife conservation and management; utilisation of an ecosystem approach; recognition of wildlife conservation as formal land use; benefits of wildlife conservation directed to land users to offset costs; and equitable distribution of benefits from wildlife. To achieve its stated goals, the act outlines numerous roles, responsibilities, and policy tools. Specifically:

    - Section 3 defines "corridor" as "...areas used by wild animals when migrating from one part of the ecosystem to another periodically."

    - Section 5 regarding the "National wildlife conservation and management strategy," states in paragraph 2 that the strategy shall particularly prescribe "(e) innovative schemes and incentives to be applied in securing identified critical wildlife migratory routes, corridors and dispersal areas for sustainable wildlife conservation and management."

    - Section 35 on "Declaration of a national reserve" provides that "(1) The Cabinet Secretary may, upon recommendation of the relevant county government and after consultation with the National Land Commission, by notice in the Gazette, declare any land under the jurisdiction of a county government to be a national reserve where the land is – [...] (c) an important wildlife buffer, zone, migratory route, corridor or dispersal area."

    - Section 38 regarding "Exchange of part of a national park" that "(2) The Service, in consultation with the National Land Commission and the Cabinet Secretary, may acquire by purchase any land suitable to be declared a national park, wildlife corridor, migratory route or dispersal area under this Act."

    - Section 65 on "Conservation orders and easements" includes "(4) Without prejudice to the generality of subsection (1), a wildlife conservation order or easement may be created so as to [...] create or maintain migration corridors and dispersal areas for wildlife."

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[1] Expanded on from excerpts from the working paper Integrated Policy and Planning for Connectivity Conservation: Lessons from Kenya, Romania, and Vermont, U.S.A.

- The National Land Commission can play a key role in the implementation of corridors through its mandate to determine changes to land ownership and land rights if in the public interest. The details of this mandate are drawn from a set of laws and policies. The 2012 National Land Commission Act specifies the functions and powers of the Commission for holding and managing all public land in trust for the people of Kenya, including section 5(1)(a) "to manage public land on behalf of the national and county governments." The 2009 National Land Policy, in section 3.2.1.1.47(d), provides for the Government to "Institute legal and administrative mechanisms for the exercise of the power of compulsory acquisition by the State through the National Land Commission". The 2012 Land Act aligns principles guiding the Commission to include section 4(2)(e) "conservation and protection of ecologically sensitive areas"; provides in 11(1) that "The Commission shall take appropriate action to maintain public land that has endangered or endemic species of flora and fauna, critical habitats or protected areas"; and provides in 11(2) that "The Commission shall identify ecological sensitive areas that are within public lands and demarcate or take any other justified action on those areas and act to prevent environmental degradation and climate change".

- The 2018 National Wildlife Conservation and Management Policy takes a cross-sectoral approach with the goal of sustainably managing Kenya's wildlife resources through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures. It includes policy statement 5.2(e) that the government shall "strengthen the landscape and seascape management approach to national parks, national reserves and national sanctuaries through innovative linking of the landscape such as gazettement of wildlife migratory corridors linking dispersal areas with protected areas."

- The State Department for Wildlife Strategic Plan (2023-2027) is focused on supporting achievement of The Kenya Vision 2030 with implementation of measures for ecosystem restoration, increasing afforestation, and increasing space and corridors for wildlife, including a project for "Securing the wildlife corridors and migratory routes." Recognising the key role of wildlife for the tourism sector, the strategic plan sets a goal of "increasing the secured migratory corridors and dispersal areas from 1 in 2021 to 5 in 2027." One of the main strategic objectives related to achieving this goal is to "Secure and manage wildlife migratory routes and dispersal areas" that will include an activity to review and update the 2016 Wildlife Migratory Routes and Dispersal Areas Report.

- The National Human Wildlife Coexistence Strategy and Action Plan (2024-33) states in the Executive Summary that "This strategy proposes taking prompt action in gazetting key wildlife movement and migration corridors and dispersal areas, completing and implementing ecosystem and county spatial plans, and strengthening conservancy initiatives in order to expand wildlife space and generate revenue for landowners." Additionally, the second-highest priority of the strategy is stated as "ii. Initiating innovative, effective, and affordable HWC [Human Wildlife Conflict] mitigation strategies: This is important to reduce wildlife impacts on communities and reduce retaliation against wildlife. Use of electric fences can help, but they need to be complemented by other strategies, practicing vigilance, avoiding human encroachment into wildlife habitats, allowing wildlife movement, maintaining migration corridors, and adhering to existing land-use guidelines." The need for securing migration corridors and dispersal areas with specific related actions feature prominently in a number of "Action Plans" in Chapter 13.

- While beyond the scope of this report, county integrated development plans and county spatial plans may contain information relevant to the proposed corridors.

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7.1.2. CONNECTIVITY-RELATED LAWS AND POLICIES IN TANZANIA

The following are samples of relevant national laws and policies that highlight the importance of ecological connectivity through the lens of biodiversity protection and climate change adaptation:[2]

- National Adaptation Programme of Action (NAPA) (2007) prioritises sectors vulnerable to climate change such as agriculture and food security, water, energy, forestry, health, wildlife, tourism, and industry. Each prioritised sector includes six priority areas or projects which can address climate change, for example enhancing the development of buffer zones and wildlife migratory routes.
- Tanzania National Development Plan (2016/17-2020/21) focuses on creating a high quality of life where all Tanzanians prosper in peace, stability, and unity. It highlights the creation of good governance practices and the transparent rule of law, so people are empowered to hold leaders and public servants accountable. It also increases the standard of education and works toward creating a competitive economy capable of producing sustainable growth and shared benefits from the country's abundant natural resources.
- Tanzania's Wildlife Conservation (Wildlife Corridors, Dispersal Areas, Buffer Zones and Migratory Routes) Regulations (2018) approve that, in consultation with local authorities, the designation and special management of wildlife corridors, dispersal areas, buffer zones, and migratory routes are allowed. The regulations also direct the Director of Wildlife to develop a priority corridor action plan that considers biological and ecological importance, wildlife populations, and the integrity of Tanzania's Protected Area System.


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- The Tanzania Wildlife Corridors Assessment, Prioritisation, and Action Plan was released in 2022 under the auspices of the Ministry of Natural Resources and Tourism. Therein, section 4.1 "Review of Policy and Legal Frameworks" states the following:

  Tanzania's policy and legal frameworks provide several options for community engagement to secure critical wildlife corridors. Most of these corridors are found in areas that are categorised as village or general land. Therefore, community engagement to address land use and tenure using the existing policy and legal frameworks is key to achieving corridor protection.

  From a policy perspective the National Land Policy 1995 (under review), National Environment Policy 1997 (revised in 2021), National Forest Policy 1998, National Water Policy 2002, National Wildlife Policy 2007, and the National Land Use Framework Plan 2013-2033, Guidelines for Participatory Village Land Use Planning 2013 (second edition), and National Forest Policy Implementation Strategy 2021-2023 all support corridor protection and maintaining connectivity. Other policies that have a critical but indirect impact on the protection of corridors include the National Human Settlements Policy 2000 and National Livestock Policy of 2006.

  [...]

  The existing legal framework also provides laws and institutional structures for the protection of corridors. These laws include the Local Government (District Authorities) Act 1982, Land Act 1999, the Village Land Act 1999, Forest Act 2002, Environmental Management Act 2004, Land Use Planning Act 2007, Wildlife Conservation Act 2009, Grazing Land and Animal Feed Resources Act 2009, Water Resource Management Act 2009 and the corresponding regulations. Whereas the Wildlife Conservation Act addresses wildlife conservation in general, these other acts have implications on the sustainability of wildlife corridors, dispersal areas and migratory routes. Most wildlife corridors are situated on village lands whereby village registration and administration are dispensed under the Local Government Act of 1982, while land surveys and demarcations are implemented under the Village Land Act No. 5 of 1999. Thus, demarcation, restoration and management of corridors in village lands need joint concerted efforts not only from the MNRT but also from other ministries, departments and agencies such as Regional Administration and Local Government Authorities and Ministry of Lands, Housing and Human Settlements Development, Agriculture, Livestock and Fisheries and Mining and Energy

  [...]

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[2] Expanded on from excerpts from the report Framing Opportunities for Conservation by Understanding Safeguards in The Belt and Road Initiative (FOCUS-BRI).

Most notably, the Wildlife Corridors Regulations of 2018 was developed to address Section 22(1) in the Wildlife Conservation Act, No. 5 of 2009 which required the Minister in consultation with local communities to designate wildlife corridors, dispersal areas, buffer zones and migratory routes (URT 2018). The Wildlife Corridor Regulations recognise that community survival depends greatly on the goods and ecosystem services provided by protected areas; and addresses the need to strike a balance between development and conservation of biodiversity. However, the Wildlife Regulations are not a "one size fits all" remedy for protecting corridors and ensuring that local communities benefit from their protection.

Collectively, the overarching policy and legal frameworks provide several mechanisms and tools to secure corridors while providing benefits to local communities. The other legal options and tools for securing and protecting corridors includes Certificate of Customary Right of Occupancy (CCRO), Wildlife Captive Facilities (Wildlife Farms, Ranches, Zoos, Breeding Facilities, Orphanage Facility, Sanctuary), Environmental/Conservation Easements and Joint Village Land Use Agreements (JVLUA), Village Land Forest Reserves and other Community Based Forest Management (CBFM) models. Some of these options are covered under section 4.2 of this report. To secure corridors and ensure proper benefits and incentives for the communities, different situations will require different approaches. However, land-use planning at the local, regional, and national level should be developed and implemented as the most effective approach to maintain connectivity at the landscape level.

- The National Climate Change Response Strategy (2021-26) includes plans to reduce deforestation, improve energy availability and diversification, and increase the efficiency of major energy-consuming sectors, including power generation, manufacturing, and transportation.

7.1.3. EXAMPLES FROM AROUND THE WORLD

A small but growing number of countries have adopted national-level legislation that provides the foundation for ecological corridors to receive formal designation. Most often, these laws direct the ministry, agency, or other government body responsible for protected areas to take actions in support of corridors. Specifics vary by country such as:

Ecuador: This megadiverse South American country adopted national legislation in 2020 that allows the Ministry of Environment, Water, and Ecological Transition to designate "connectivity corridors" that fulfill certain criteria. Corridors are eligible for designation once sufficient biological inventories and other scientific data have been produced; extensive stakeholder engagement has been conducted; and a management plan has been written in consultation with these stakeholders. Connectivity corridors are then recognised as Special Areas for Conservation of Biodiversity, under the jurisdiction of the Ministry and its National System of Protected Areas, but managed and governed in collaboration with provincial, regional, and local governments and representatives of relevant conservation bodies (i.e., universities, NGOs, water conservation districts).

Costa Rica: One of the first countries to designate ecological corridors at the national level, Costa Rica established its National Biological Corridors Program by law in 2006 and it is housed in the National System of Conservation Areas (SINAC) under the Ministry of Environment and Energy. In this Central American country stretching from volcanic mountains through tropical forests on both Pacific and Atlantic coasts, biological corridors are a cornerstone of biodiversity conservation. While the corridors program is managed by SINAC, governance of individual corridors is devolved to Regional Biological Corridor Programs and then to Local Biological Corridor Committees, a structure which was clarified in 2017 legislation.

Kazakhstan: Situated in the heart of Central Asia, Kazakhstan was another early adopter of corridor legislation. A 2006 law on specially protected natural areas provided authoritative definitions of 'ecological corridor' and 'ecological network' that parallel the IUCN definitions published in 2020. The legislation stipulates that ecological corridors are established to protect migratory routes and plant distribution; are scientifically justified and delineated by natural geography; and are shared landscapes. On this last point, Kazakh law dictates that landowners and land users are not to be removed from corridors. Corridors are established at local, regional or national levels and managed by the relevant wildlife management agency. To date, three corridors have been designated by regional governments.

7.2. ROADMAP TO CONNECTED LANDSCAPES

The Center for Large Landscape Conservation (CLLC) has developed a nascent roadmap to connected landscapes (Figure 32) that is based on the Open Standards for Conservation (CMP, 2020), insights shared by conservation practitioners and scientists (Beier et al., 2008; Hilty et al., 2020; Keeley et al., 2018, 2019, Figure 33), and experiences made while engaged in connectivity conservation projects (Paul Beier, Aaron Laur, Gabriel Oppler, Kristeen Penrod, pers. comm.). The roadmap consists of seven phases that are partially built on each other but do not have to or cannot be completed in a completely linear fashion.

PHASE 1 • CREATE A SHARED VISION AND ASSESS THE SITUATION AT THE COUNTRY OR REGIONAL SCALE

PHASE 2 • MODELLING, MAPPING, AND PRIORITISING

PHASE 3 • CREATE A SHARED VISION AND ASSESS THE SITUATION AT THE CORRIDOR SCALE

PHASE 4 • PLANNING AT THE CORRIDOR SCALE

PHASE 5 • IMPLEMENTATION

PHASE 6 • ANALYSIS AND ADAPTATION

PHASE 7 • SHARING

Figure 32. *General roadmap to achieving connected landscapes.*

Many of the roadmap's elements have been and are being implemented in SOKNOT; seeing this framework may help to strategically expand corridor conservation projects.

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Figure 33. *A proposed community-based landscape connectivity model for Kwakuchinja (Credit: Tanzania Natural Resource Forum).*

PHASE 1 - CREATE A SHARED VISION AND ASSESS THE SITUATION AT THE COUNTRY OR REGIONAL SCALE

In Phase 1, engagement of rightsholders, stakeholders, and interested parties to discuss the importance of connectivity for resilient landscapes, biodiversity conservation, and human well-being and listening to local insights and concerns is foundational to creating a shared vision of a connected landscape and making the decision to work toward maintaining and/or improving landscape connectivity (Keeley et al., 2018). This should result in a clear statement that a coordinated effort to maintain and/or improve landscape connectivity is needed.

To identify the project team, the rightsholders, interested parties, and technical experts should be identified and mapped and their capacity and expertise assessed. The project team can then work together to define the project's scope. Maps and spatial data can help with examining the landscape to decide on the project area.

The project team also needs to decide on the conservation and human well-being targets: For which species and/or processes should connectivity be maintained or improved? Which human well-being targets (e.g., ecosystem services) should be considered?

Once the targets have been decided on, it is important to identify the threats to connectivity and the related human well-being targets and assess the situation of the landscape with respect to connectivity. Questions to ask include: What are existing relevant policy, legislation, and legal tools for connectivity conservation? What is the land tenure pattern? What are social and economic values to consider? A situation model – a visual representation of a conservation project's context and observed and presumed causal relationships between targets, direct threats, contributing factors, and strategies – can provide a strong foundation for strategic planning and monitoring.

Because planning for connectivity conservation can occur at different scales – at the scale of an ecological network and at the scale of an individual corridor (Beier et al., 2011) – this phase may need to be repeated with different sets of actors.

In SOKNOT, Phase 1 has been worked through. A shared vision of a connected landscape exists among relevant government entities and conservation NGOs, and the situation of the landscape with respect to connectivity has been assessed (MNRT, 2022; Ojwang' et al., 2017).

PHASE 2 · MODELLING, MAPPING, AND PRIORITISING

Phase 2 focuses on modelling, mapping, and prioritising connectivity conservation actions. Modelled corridor maps are important tools to support decision-making. Structural corridors have been previously mapped and prioritised based on values and risks for Tanzania (MNRT, 2022); for this report, we mapped corridors for southern Kenya using the same approach. Assessing structural corridors with respect to their functionality for focal species – as done in this report – can further inform the best sites for connectivity conservation. While corridor models can suggest corridor borders (Beier et al., 2008), it is advisable to delineate them with input from rightsholders and interested parties.

PHASE 3 · CREATE A SHARED VISION AND ASSESS THE SITUATION AT THE CORRIDOR SCALE

Phase 3 needs to focus on the individual corridors, and the associated actions should be undertaken for each corridor. While in Phase 1 a shared understanding of the importance of connectivity was built at the level of the country or region, in Phase 3 this shared understanding should be built at the local level with representatives of local communities, relevant NGOs, and government representatives at a local, single-corridor level. Identifying rightsholders and interested parties and engaging them in the process is vital and can help build a local project team. In addition, in Phase 3, the local situation needs to be assessed: What are local threats to connectivity? Where are pinch points, barriers, and areas needed for restoration in the corridor? What are opportunities for connectivity conservation action? What are potential management strategies? TAWIRI is already conducting some corridor assessments (e.g., in the NCAA/ Lake Eyasi-Makao WMA-Matala-Yaeda Chini Corridor) using aerial photography and satellite images (Hamza Kija, pers. comm.). Conducting a workshop with local stakeholders and experts on connectivity conservation and focal species may also be an effective approach to tackling Phase 3.

PHASE 4 · PLANNING AT THE CORRIDOR SCALE

If indicated, the final delineation of corridors may need to be undertaken with the input of local rightsholders and interested parties. To motivate concerted action by all rightsholders and interested parties to manage a corridor, a management and monitoring plan that has been co-developed is crucial. See Box 2 for suggested sections of a comprehensive corridor management and monitoring plan, Box 3 for a case study of a group developing corridor management plans, and Box 4 for a case study of collaborative implementation of wildlife and livestock corridors in northern Kenya. Some information that needs to go into the management and monitoring plan will have been developed in Phases 1-3; additional workshops may be necessary to decide on a management plan and develop a monitoring table.

A management plan is a fundamental aspect of an ecological corridor as defined by the IUCN (Hilty et al., 2020) and will be a requirement for reporting an ecological corridor to the World Database on Ecological Corridors. We encourage the governments of Kenya and Tanzania to plan on providing basic documentation about corridors implemented following the IUCN guidelines to the World Database on Ecological Corridors. Basic documentation required for reporting ecological corridors includes the name of the corridor, a geographic description, a map of location using a polygon shapefile, the year of establishment, and contact information of the reporting organisation.

Monitoring corridor effectiveness is essential to gauge progress toward connectivity conservation objectives; it also fosters learning among diverse rightsholders and interested parties. While most conservation biologists focus solely on monitoring ecological outcomes, monitoring how social dynamics contribute to successful corridor conservation can enhance benefits to conservation and to local communities. By adapting to people's needs, corridor initiatives become socially acceptable and resilient to changing environmental and socio-economic conditions. Moreover, tracking public perceptions of corridors can inform adjustments in planning, management, governance, and outreach strategies. The Open Standards for the Practice of Conservation (Conservation Measures Partnership, 2020) provide a useful framework to set goals, establish objectives, select indicators, design monitoring activities, and set thresholds for triggering adaptive management. Please see Keeley et al. (2025) for an illustration of the application of this framework to develop corridor monitoring plans and a summary of options for monitoring ecological outcomes, enabling conditions, and human well-being to ensure the effectiveness and sustainability of corridor conservation initiatives.

BOX 2. SUGGESTED SECTIONS OF A CORRIDOR MANAGEMENT AND MONITORING PLAN

Sections highlighted in bold are the core plans.

A. Introduction
  i. Purpose of Connectivity/Corridor Management & Monitoring Plan
    - Vision Statement and Goals & Objectives
B. Corridor Governance
C. Existing Conditions of Corridor and Context of Larger Landscape
D. Conservation Targets
E. Human Well-being Targets
F. Threats to Conservation and Human Well-being Targets
G. Opportunities
H. Situation Model: Conceptual Model and Narrative
I. Theories of Change
J. SMART Goals and Objectives
K. Management Strategies
L. **Operational Plan**
M. **Monitoring Plan Table**
N. **Data Management Plan**
O. **Communications Plan**
P. Funding Sources
Q. References
R. Appendices
  i. Monitoring protocols: How to measure the indicators and analyse the results
  ii. Other potential appendices

PHASE 5 · CORRIDOR IMPLEMENTATION

In Phase 5, the development of a detailed, short-term work plan and timeline, as well as the development and refinement of a project budget, will aid in implementing the operational, monitoring, data management, and communication plans (Box 2). In Kenya, there are four instruments available for securing wildlife corridors: (1) land easement, (2) land lease, (3) outright procurement, and (4) development of wildlife conservancies.

PHASE 6 · ANALYSIS AND ADAPTATION

In Phase 6, the data gathered and managed according to the monitoring and data management plans should be analysed. Reflecting on the results can inform adaptations of the management plan.

PHASE 7 · SHARING

To foster a learning environment, it is important to document and share lessons learned within and beyond the local corridors.


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7.3. WHERE IS SOKNOT ON THE ROADMAP?

As indicated above, in SOKNOT, a strong vision of a connected landscape is shared among governments and conservation organisations at the country level. Corridors have been mapped and now assessed for their functionality for focal species. Tanzania is actively gazetting corridors. Elements of phases 3-7 are being worked on. For example, participatory mapping has informed corridor boundaries identification and demarcation, biodiversity assessments are done in wildlife corridors, community conservation education programs are taking place, communities are supported, and management plans have been developed for protected areas and WMAs (Hamza Kija, pers. comm.). A regularly updated inventory of SOKNOT corridor actions that have been completed or are in progress could inform next steps on the roadmap.

BOX 3. COLLABORATIVE CORRIDOR PLANNING IN QUEBEC, CANADA

Since April 2023, the Center for Large Landscape Conservation (CLLC) has been working alongside the Nature Conservancy of Canada (NCC) and partners of the Quebec Ecological Corridors Initiative (QECI) to advance planning for ecological corridors in Quebec.

Within the QECI, ecological corridors have varying objectives, rightsholders and stakeholders, and datasets available. QECI was launched in 2017 to accelerate learning and action among many local groups interested in conserving corridors throughout the province. The group offers a collective approach to land-use planning and advises provincial and municipal governments, woodlot owners, farmers, and other key stakeholders. The group also carries out mobilisation, capacity building, recognition, and support activities throughout southern Quebec.

Within the scope of the CLLC-QECI partnership, three pilot corridors were identified to undertake collaborative planning toward creation of management and monitoring plans: Gaspésie, Mauricie, and Plaisance-to-Tremblant.

- The **Gaspésie Corridor** seeks to link Forillon National Park and Gaspésie National Park on the wild Gaspé Peninsula, home to old growth forest, a thriving timber industry, and emblematic species such as the American marten.
- The **Mauricie Corridor** links Mauricie National Park with other intact habitats in south-central Quebec along the Saint Lawrence River, a complex mosaic of public, private, and developed land crisscrossed by wetlands and forests rich with species from wolves and bears to turtles and salamanders.
- The **Plaisance-to-Tremblant Corridor** traverses the Laurentians from Mont Tremblant National Park to Plaisance National Park – an expanse of land dotted with agriculture, timber, and smaller protected areas, and popular with recreationists.

In all three corridors, a two-phase approach is being taken. In Phase 1, local NGO and government partners are hosting workshops with a broad swath of stakeholders to gather input on the corridor's objectives, values, threats, and governance. (To see an example, click here and peruse the Phase 1 workshop report from Mauricie). Phase 2 focuses on specific management actions to achieve the corridors' objectives, and monitoring schemes to track certain indicators of progress.

The timing of this project is serendipitous. In December 2024, the New Quebec Government Guidelines for Spatial Planning (Orientations gouvernementales en aménagement du territoire) came into effect, which strengthen the policy mandate to identify ecological corridors and compatible uses in regional and municipal land-use plans. As corridor management and monitoring plans are published, they will be available to integrate into updated local land use plans.

BOX 4. SECURING CONNECTIVITY IN NORTHERN KENYA THROUGH MULTIPURPOSE CORRIDORS

Based on a presentation by Benson Okito

The Wyss Academy for Nature envisions a world where nature conservation and human well-being mutually reinforce each other. This vision drives its mission to create sustainable futures for both people and nature. By using the *solutionscape* approach, the academy works to address complex environmental challenges by considering both local and global contexts alongside scientific and community knowledge.

The Wyss Academy for Nature’s strategy emphasises the importance of working in partnership with local communities, governments, and other stakeholders to create solutions that are both context-specific and scalable globally. Their approach is centered on fostering collaborations and ensuring that the conservation of nature is linked with the well-being of people. This is achieved through innovative spatial planning, sustainable land-use practices, and the empowerment of local communities.

A notable example of the Wyss Academy for Nature’s impact can be seen in northern Kenya, where the Academy has been involved in cross-county collaborations for multipurpose use corridors. These corridors aim to improve the movement of wildlife and livestock, addressing the challenges posed by both climate change and human land use in the region.

Key components of the project include:

- Inventory of natural assets: Conducting comprehensive assessments of the region’s natural resources to guide planning and action.
- Rangeland restoration: Empowering youth to lead initiatives focused on restoring degraded rangelands, crucial for both wildlife and livestock.
- Laikipia spatial planning: Coordinating land use across multiple counties to ensure sustainability and resilience.
- Dual corridor initiative: Creating two interconnected corridors to facilitate wildlife and livestock movement, ultimately enhancing ecosystem health and resilience.

One of the most prominent projects in the region is the Oldonyiro wildlife-livestock corridor. The project focuses on creating a sustainable pathway for both elephants and livestock to travel, mitigating human-wildlife conflict while ensuring that local communities have access to resources for their livestock. Monitoring of elephant tracks helped inform the location of the proposed corridor, ensuring that it met the needs of both human and wildlife populations.

The success of these projects hinges on a broad array of collaborations between different stakeholders. Key partners in the initiative include Northern Rangelands Trust, county governments, the Center for Training and Integrated Research in Arid and Semi-arid Land Development, Save the Elephants, Kenya Wildlife Service, the National Land Commission, local communities, and development partners.

A key element of this initiative is collaborative spatial planning, which is led by Isiolo County in close partnership with the Kenya Institute of Planners. By breaking down institutional silos, this approach allows for a more integrated and holistic planning process that takes into account the needs of both wildlife and people.

The breaking of silos has been vital in creating synergies between different stakeholders and ensuring that all perspectives are considered. This collaborative effort helps to overcome the complex challenges that arise in areas with high biodiversity, limited resources, and competing land-use demands.

The impact of the project on local communities is profound. As the community begins to take ownership of the Oldonyiro wildlife-livestock corridor, it is not only protecting wildlife and promoting conservation efforts but also benefiting from increased access to resources and improved rangeland conditions. The project fosters a sense of ownership and pride, encouraging the community to continue playing a central role in conservation.

The projected outcomes of this initiative are significant, with the corridor designed to remain resilient through 2100 despite challenges such as climate change, human population growth, and land-use changes. This long-term resilience is critical in ensuring that both nature and human populations can thrive together in a rapidly changing environment.

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8. RECOMMENDATIONS

Based on past and ongoing work in SOKNOT, the results of this study, and lessons learned on effective corridor implementation strategies, we recommend the following:

1. Make changes in structural corridor delineations based on the outcomes of this assessment (Section 5 and Table 46).
2. In Kenya, move toward officially recognising corridors in addition to protected areas.
3. Monitor the SOKNOT corridors with the indicators as suggested (Table 21).
4. For each corridor, with the guidance of a corridor coordinator, engage stakeholders in developing a governance structure and a management and monitoring plan.
5. Set up a dedicated conservation trust fund to support long-term corridor management.
6. Establish a transboundary connectivity fund.
7. Leverage carbon and biodiversity credits.
8. Make use of the document for future activities such as fundraising.

9. ACKNOWLEDGEMENTS

We would like to express our sincere gratitude and appreciation to the governments of Tanzania and Kenya for their unwavering support and commitment to this project. We are also deeply thankful to the following organisations for generously sharing their valuable data, which have been instrumental in advancing our research and conservation efforts:

- African People & Wildlife
- Amboseli Trust for Elephants
- Big Life Foundation
- Giraffe Conservation Foundation
- Kenya Wildlife Trust
- KopeLion
- Maasai Steppe Carnivore conservation Trust
- OIKOS East Africa
- Smithsonian Conservation Biology Institute
- Sustain East Africa
- Tanzania Wildlife Research Institute (TAWIRI)
- World Wide Fund for Nature (WWF)

Additionally, we acknowledge and greatly appreciate the technical, financial, and organisational support provided by WWF and the Zoological Society of London's Africa Range-wide Cheetah Conservation Initiative, and the financial support provided by the German Ministry for Economic Cooperation and Development (BMZ) Unganisha project, funded through Engagement Global. Their contributions have been crucial to the success of this project. Without their collaboration and support, this project would not have been possible. We look forward to continued partnerships in the future to further our collective goals of wildlife protection and promoting ecological connectivity.

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APPENDIX 1: IMPORTANT MOVEMENT ZONES FOR THE FOCAL SPECIES, AS DRAWN BY SPECIES EXPERTS

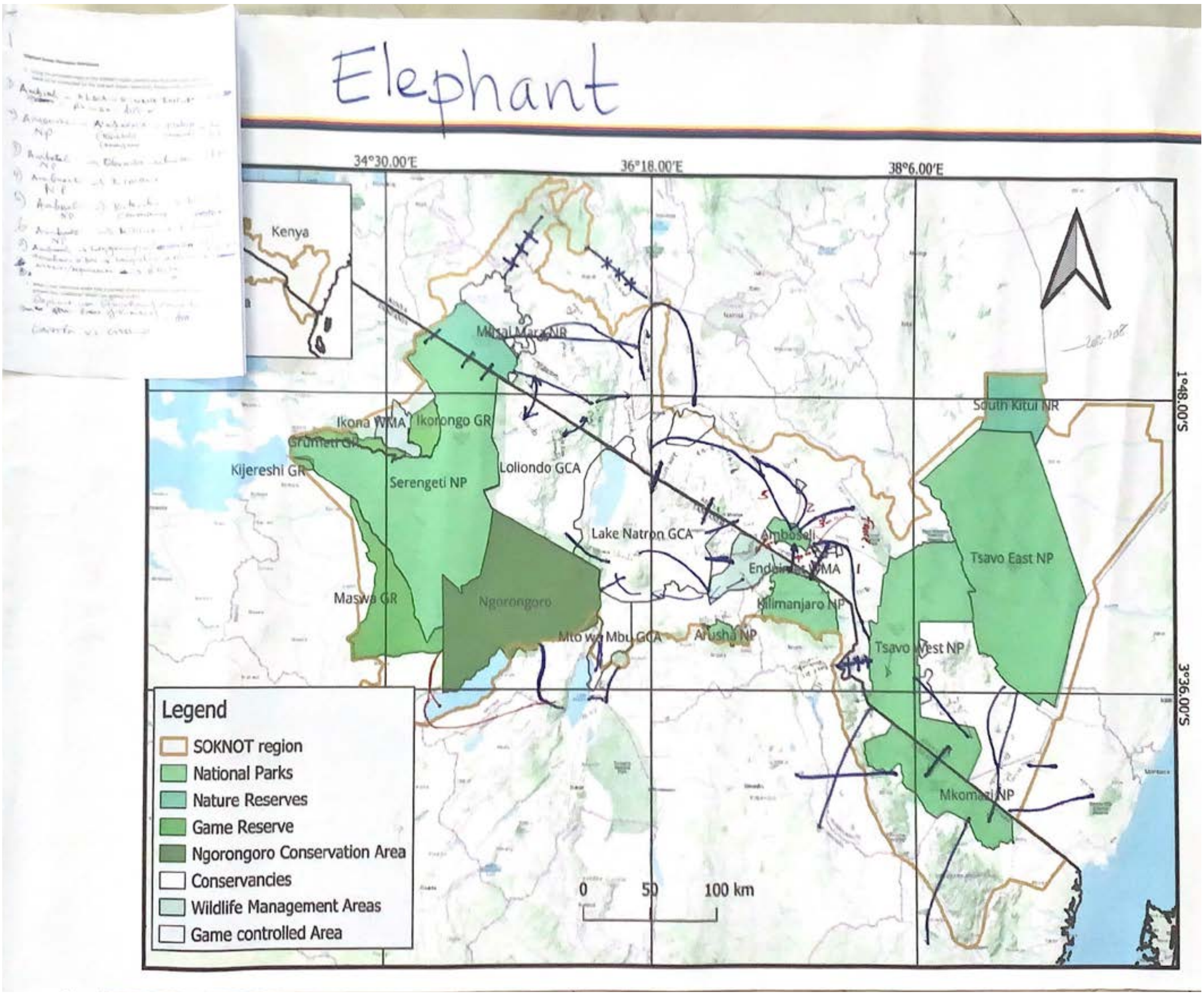
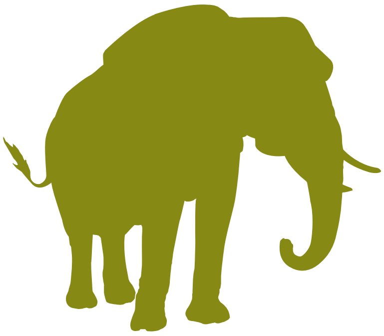


Figure 34. *During the workshop species experts indicated movement zones of elephants in SOKNOT.*



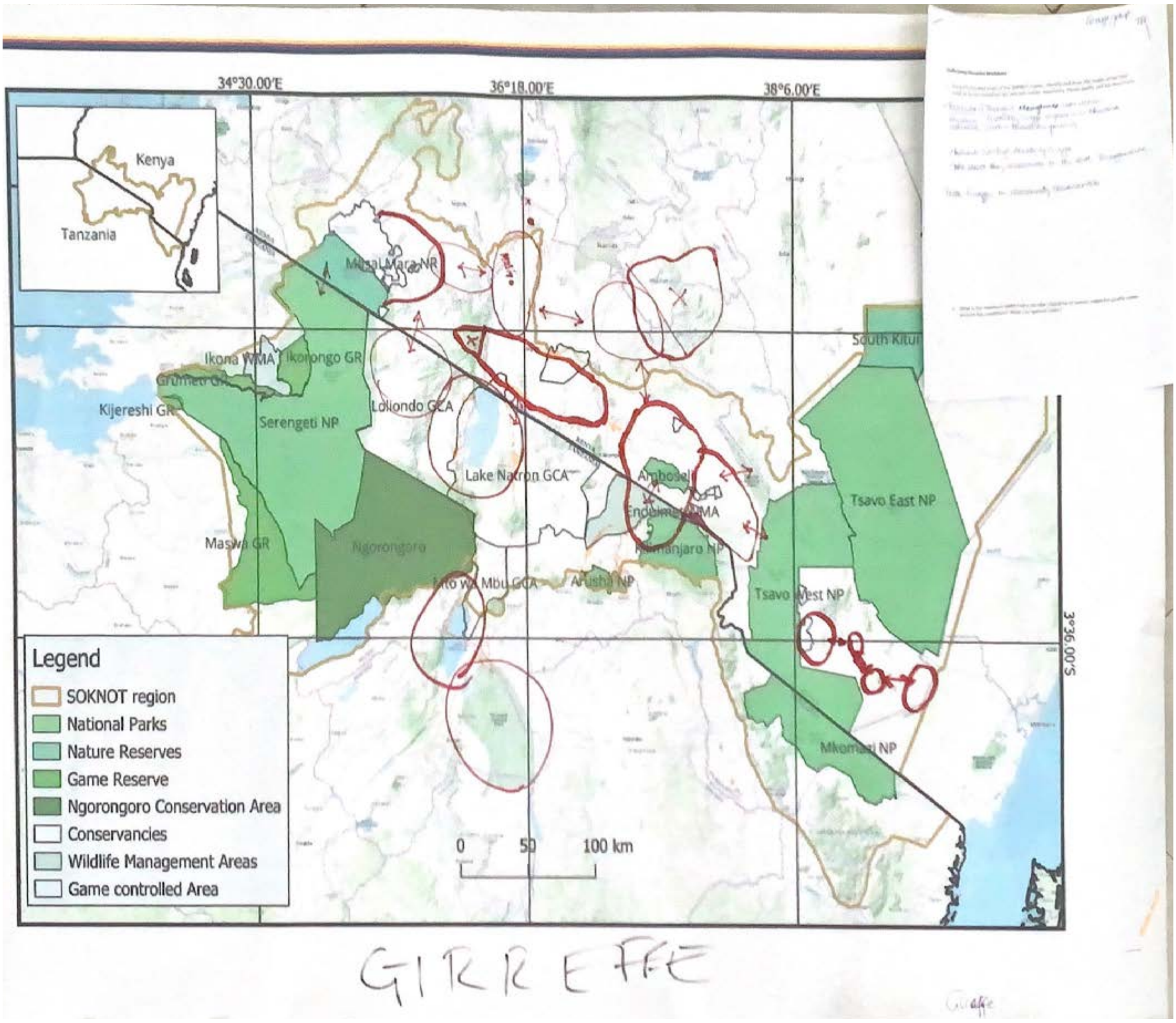
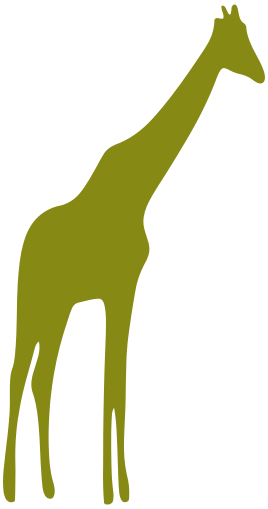


Figure 35. During the workshop species experts indicated movement zones of Maasai giraffes in SOKNOT.



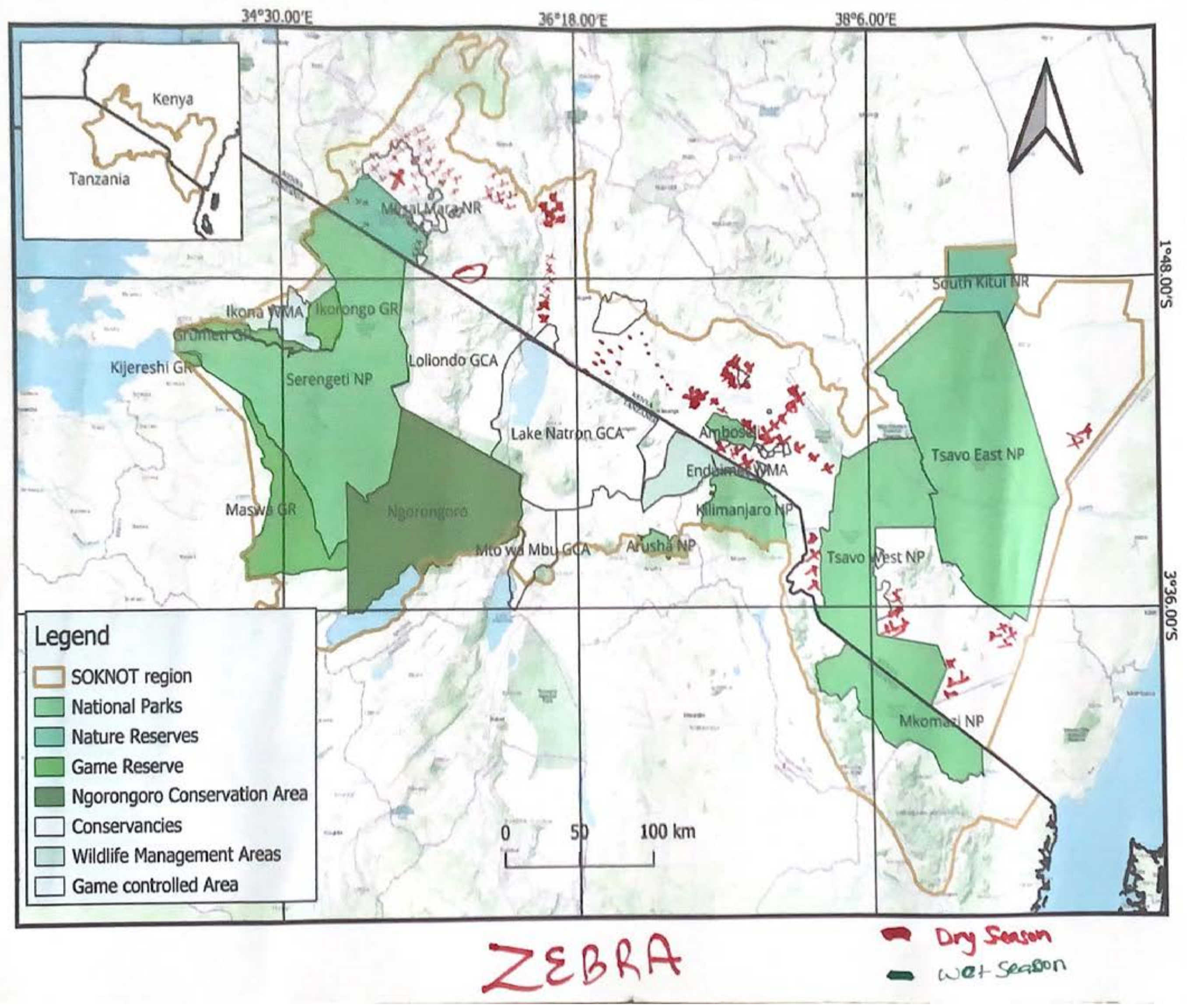
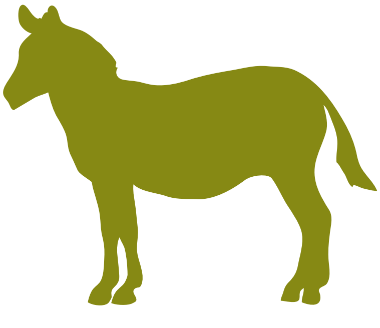


Figure 36. *During the workshop species experts indicated movement zones of zebras in SOKNOT.*



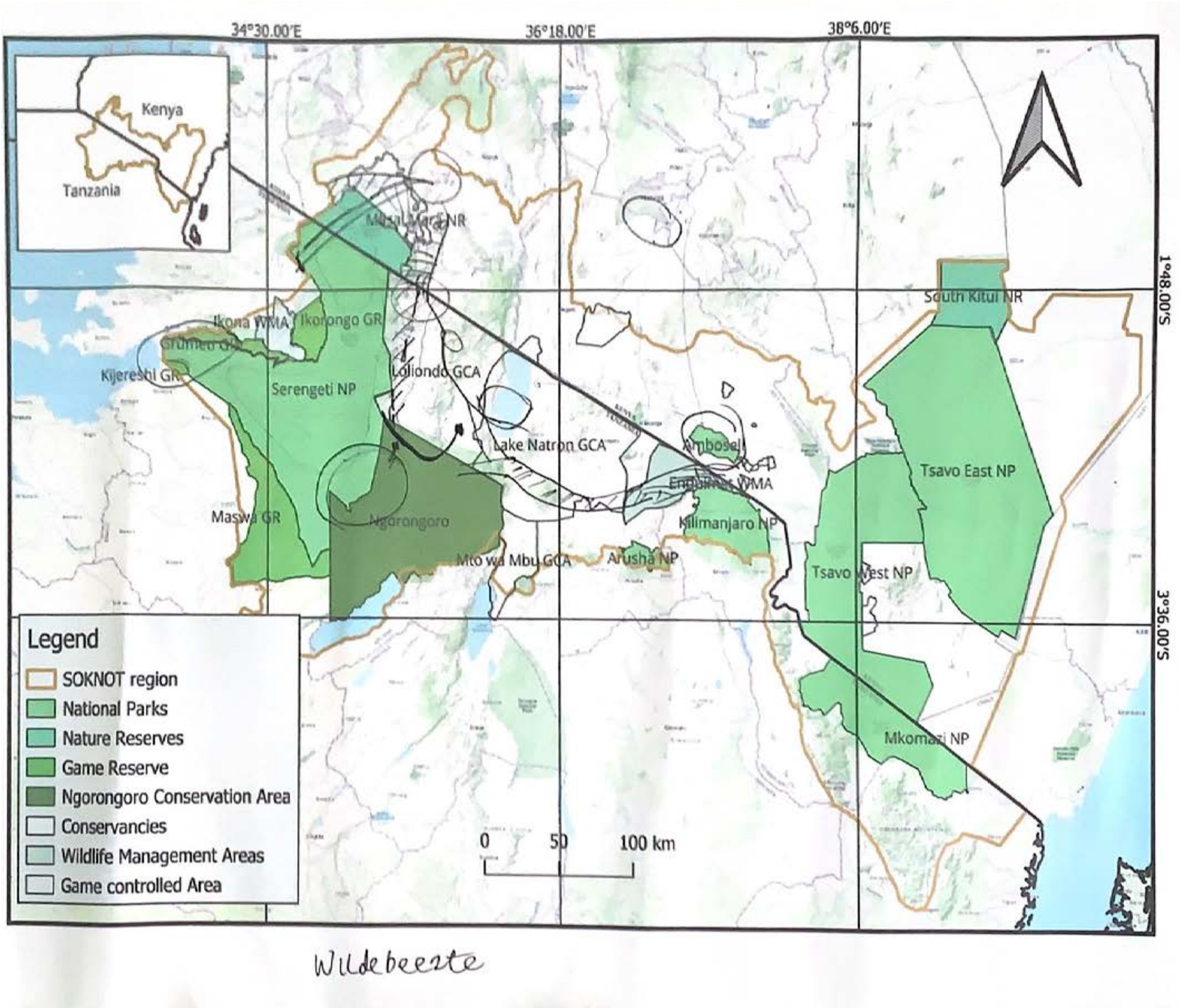
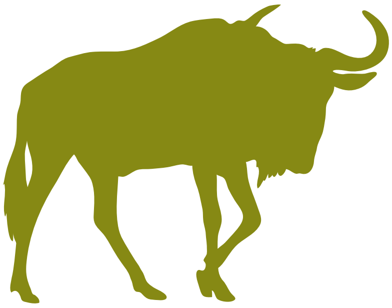


Figure 37. *During the workshop species experts indicated movement zones of wildebeest in SOKNOT.*



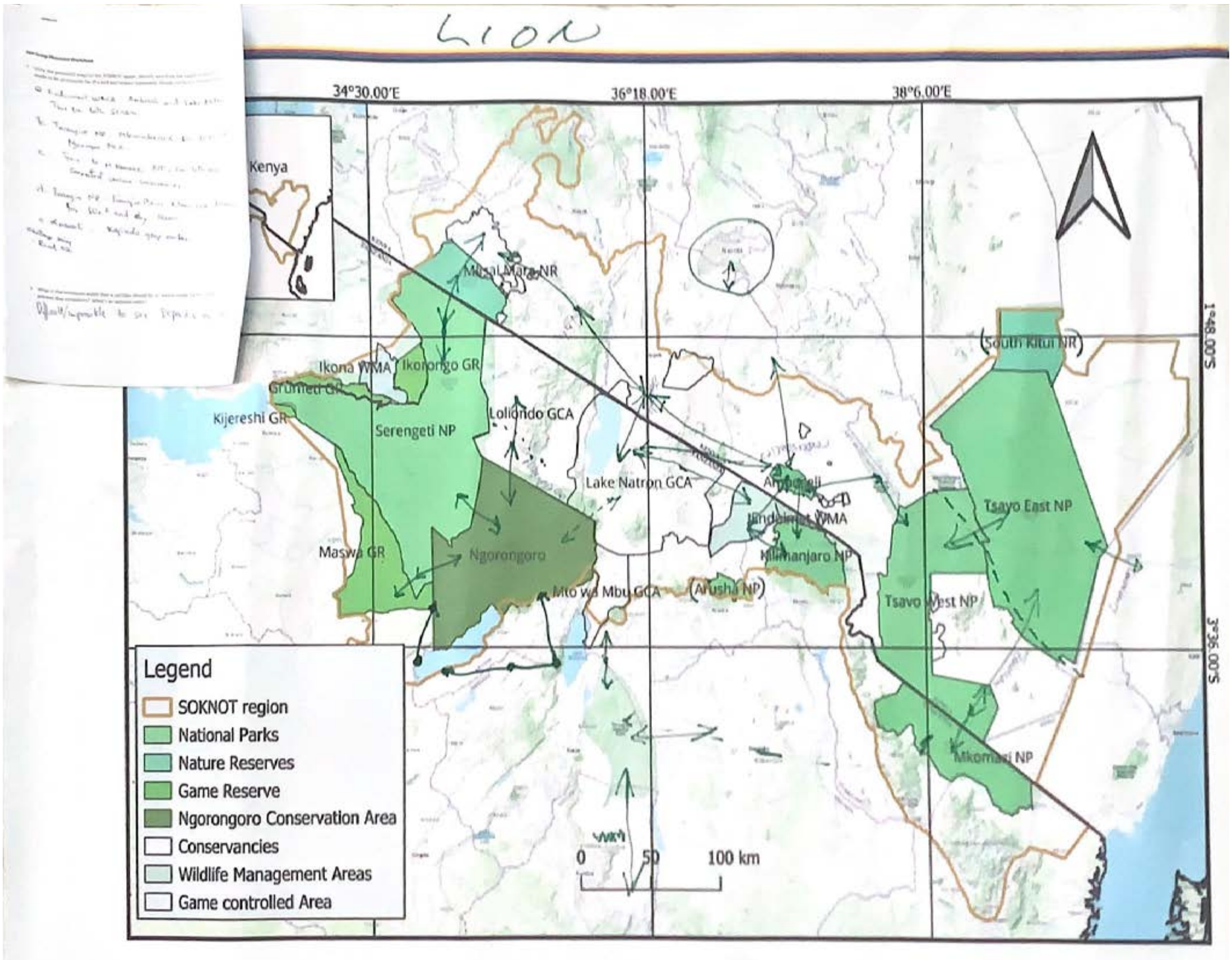
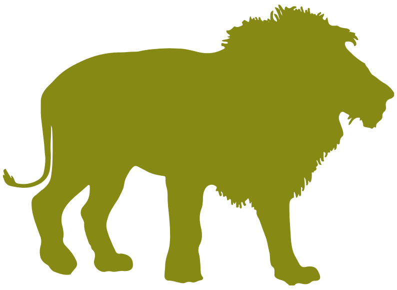


Figure 38. *During the workshop species experts indicated movement zones of lions in SOKNOT.*



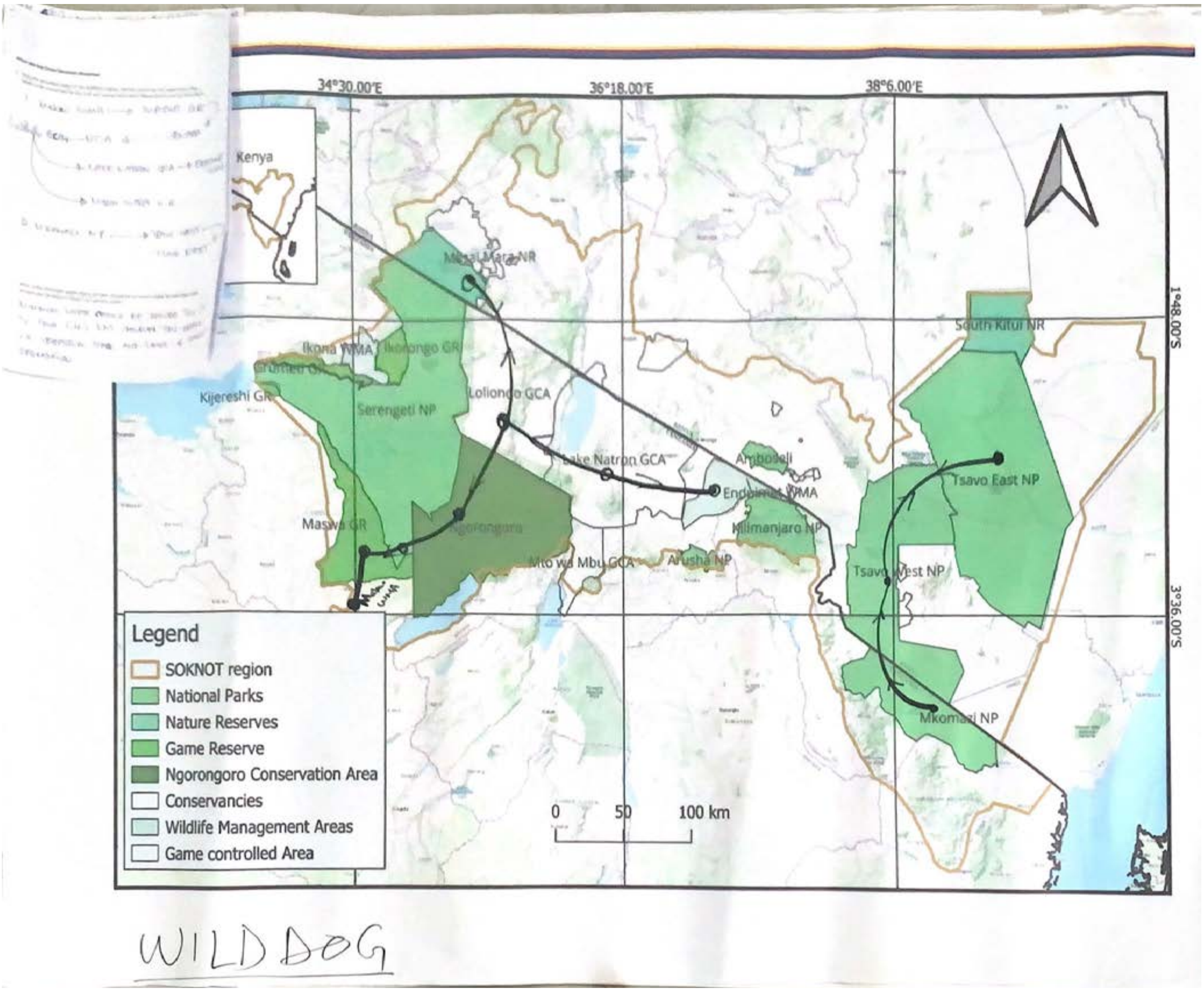
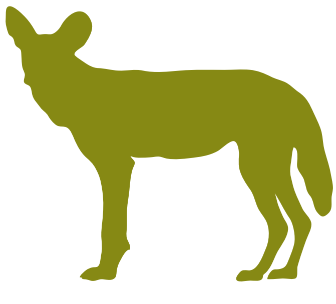


__Figure 39.__ During the workshop species experts indicated movement zones of wild dog in SOKNOT.



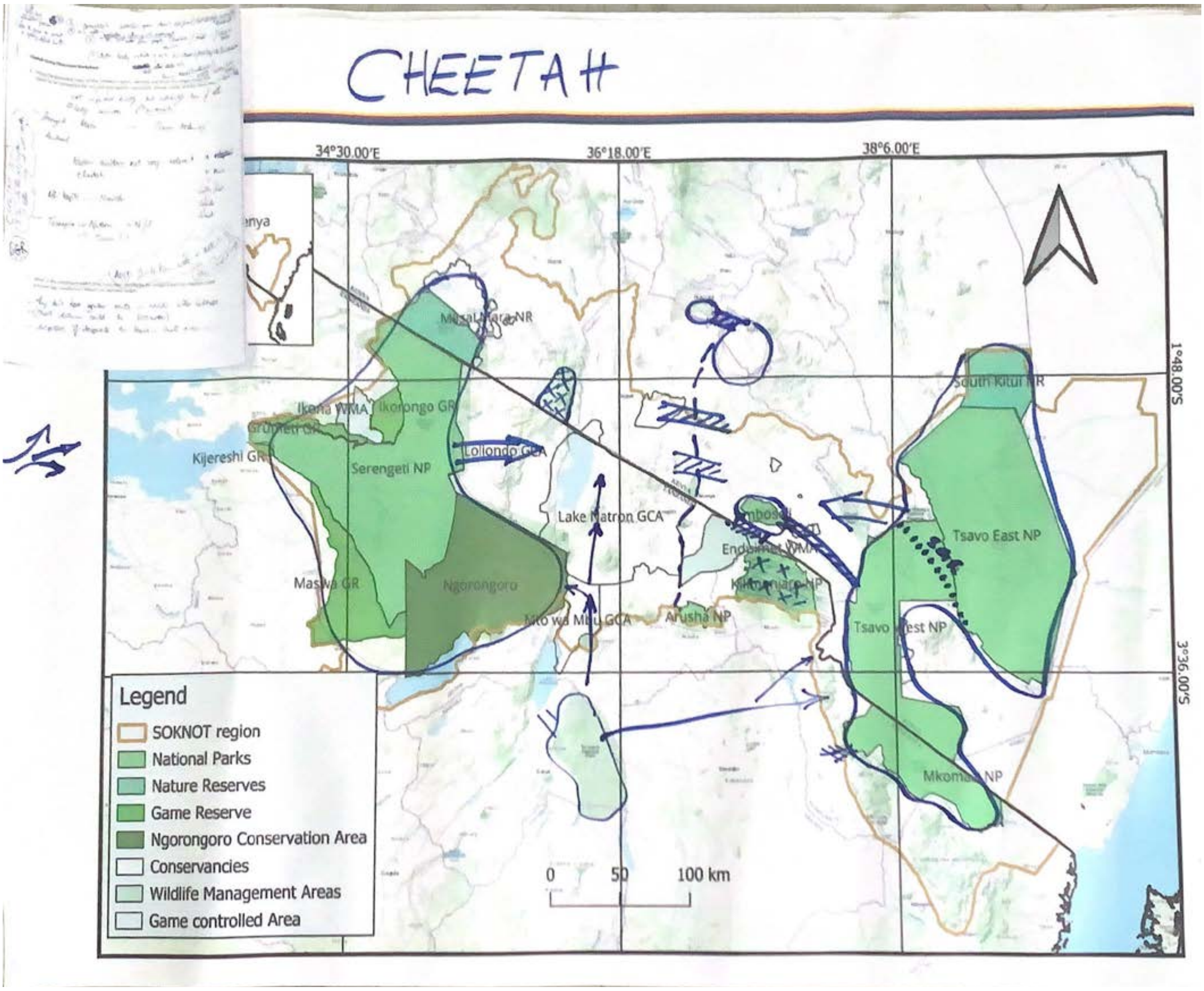


Figure 40. During the workshop species experts indicated movement zones of cheetahs in SOKNOT.

APPENDIX 2: COMPARISON OF CURRENT FLOW VALUES: MAPS

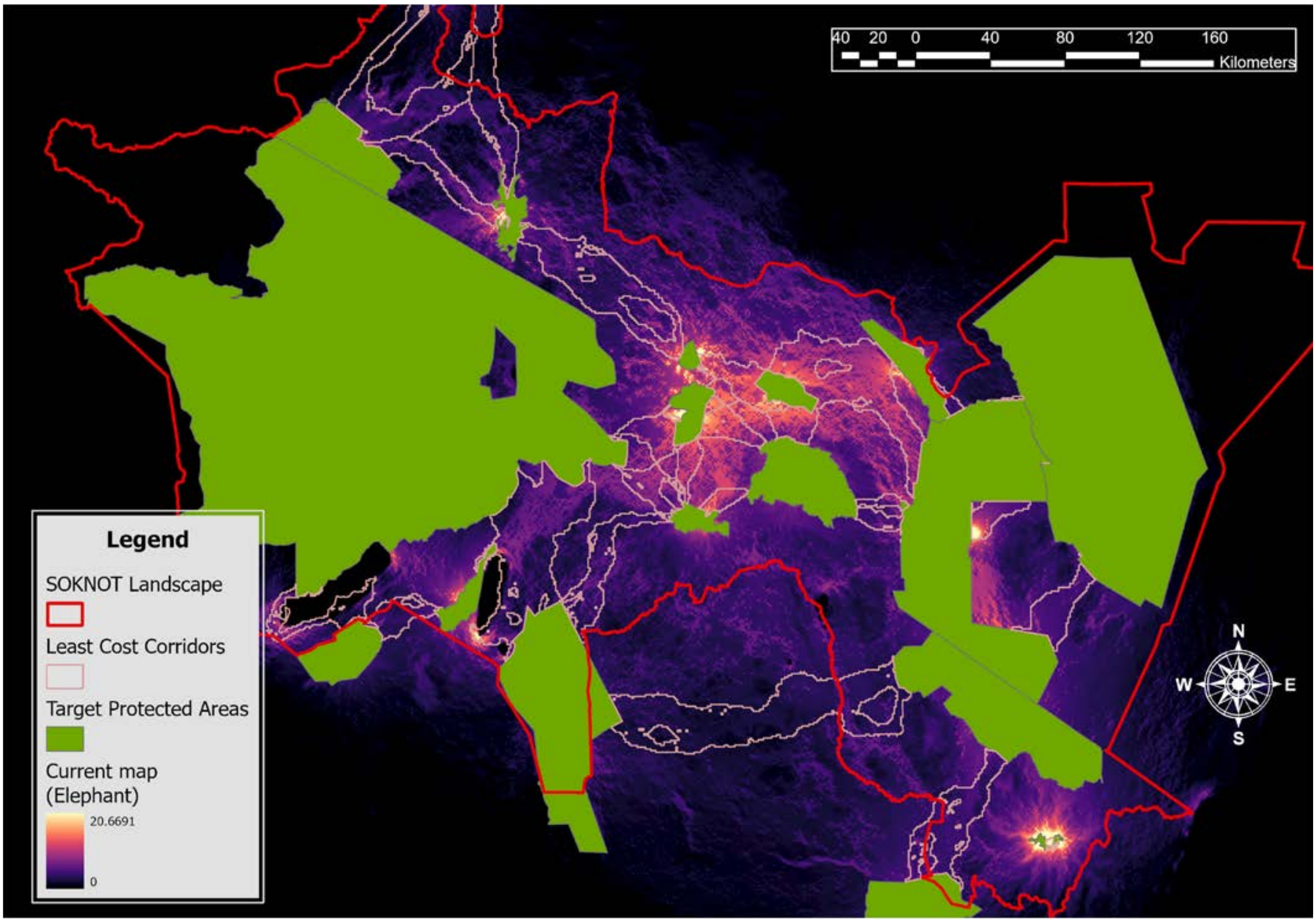
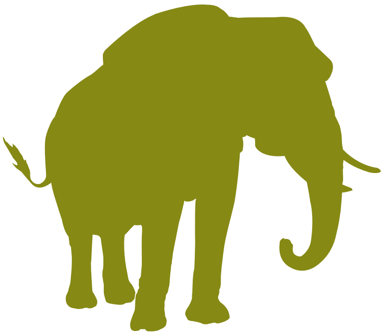


Figure 41. *Current flow map for elephant overlaid with structural corridors. Darker areas represent regions of low current flow, while lighter (yellowish) areas indicate higher resistance.*



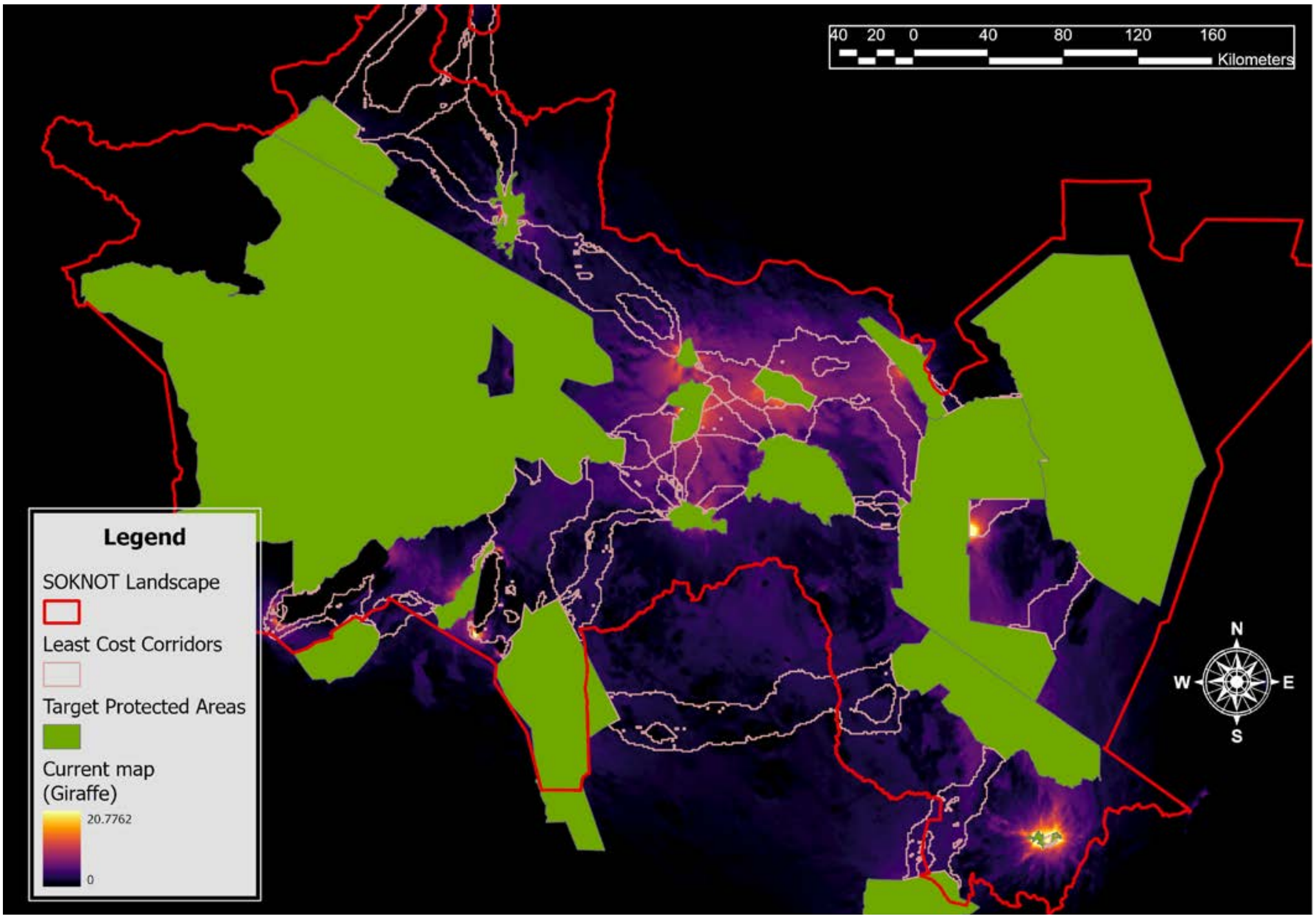
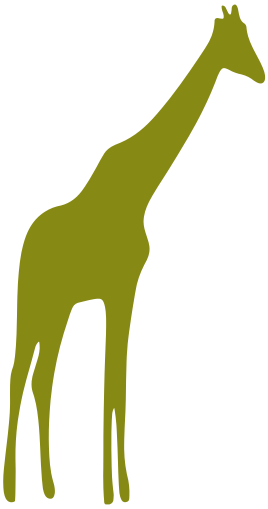


Figure 42. *Current flow map for giraffes overlaid with structural corridors. Darker areas represent regions of low current flow, while lighter (yellowish) areas indicate higher resistance.*



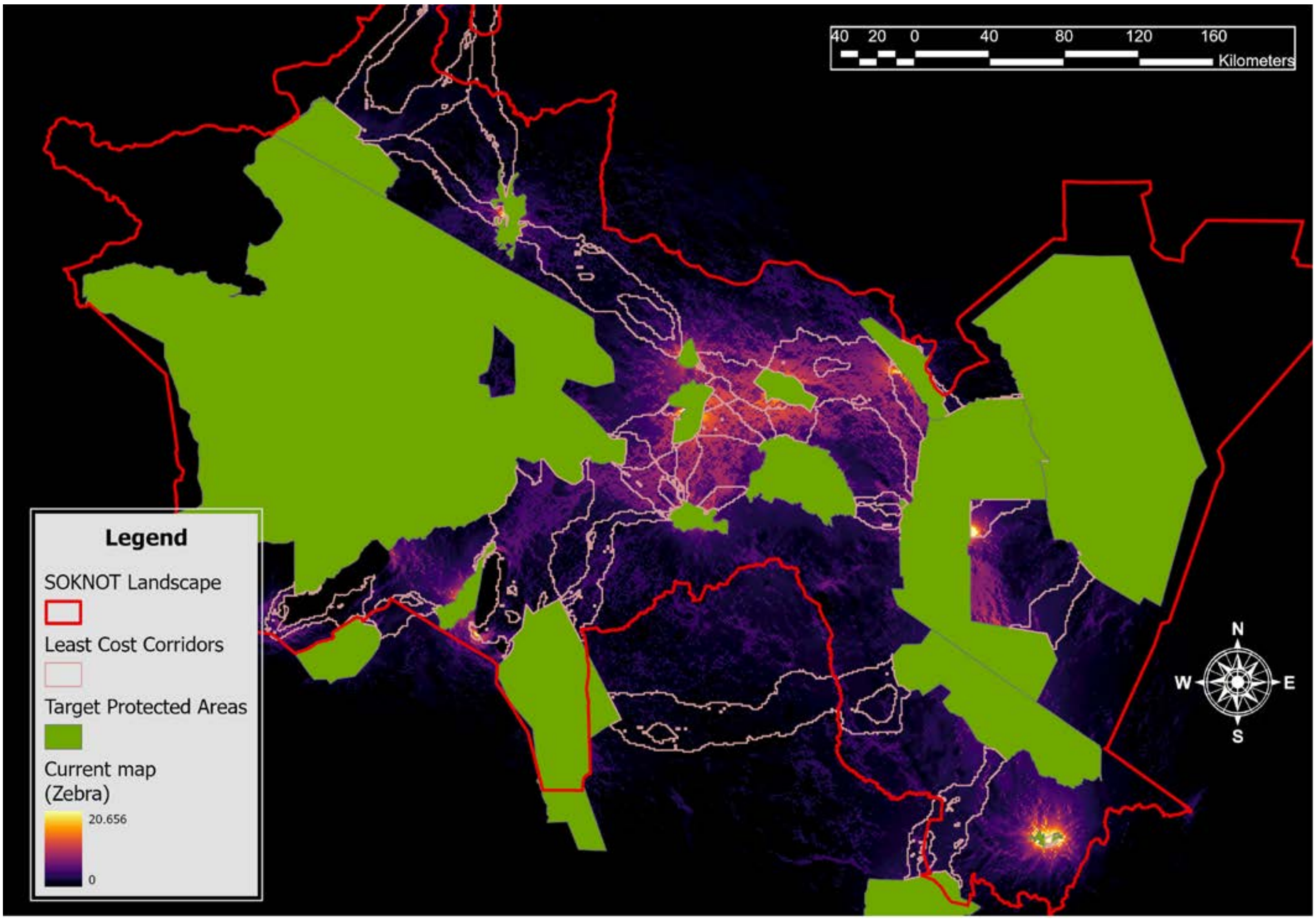
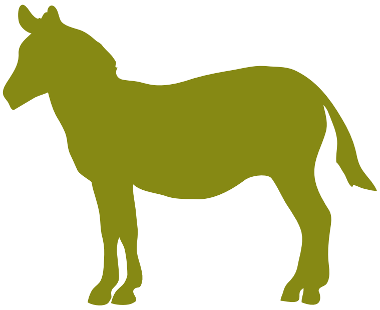


Figure 43. *Current flow map for zebra overlaid with structural corridors. Darker areas represent regions of low current flow, while lighter (yellowish) areas indicate higher resistance.*



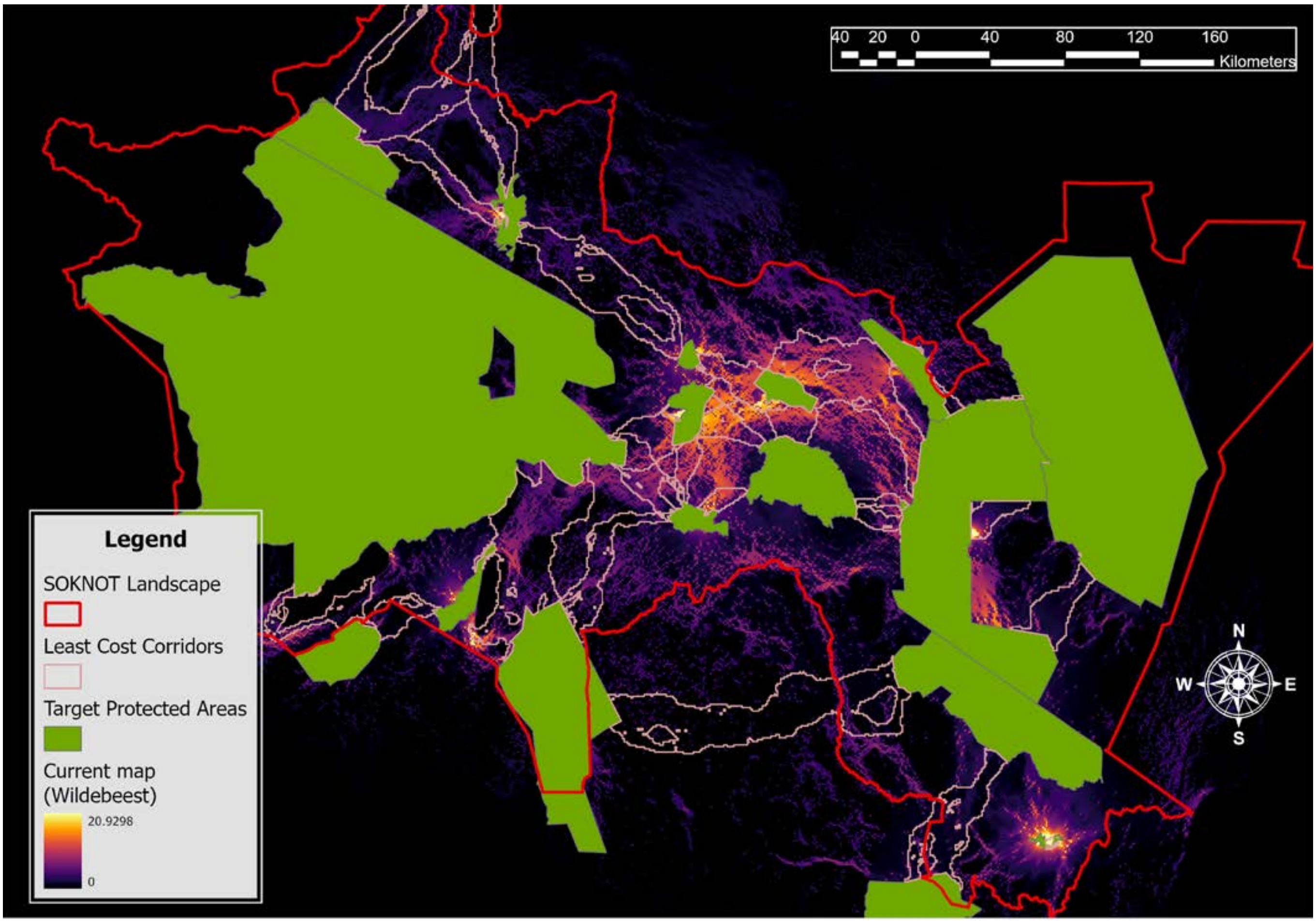
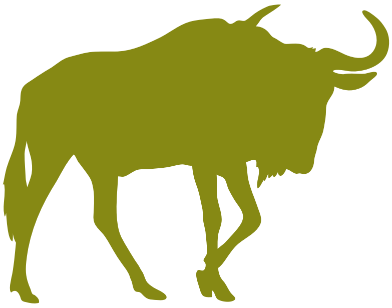


Figure 44. *Current flow map for wildebeest overlaid with structural corridors. Darker areas represent regions of low current flow, while lighter (yellowish) areas indicate higher resistance.*



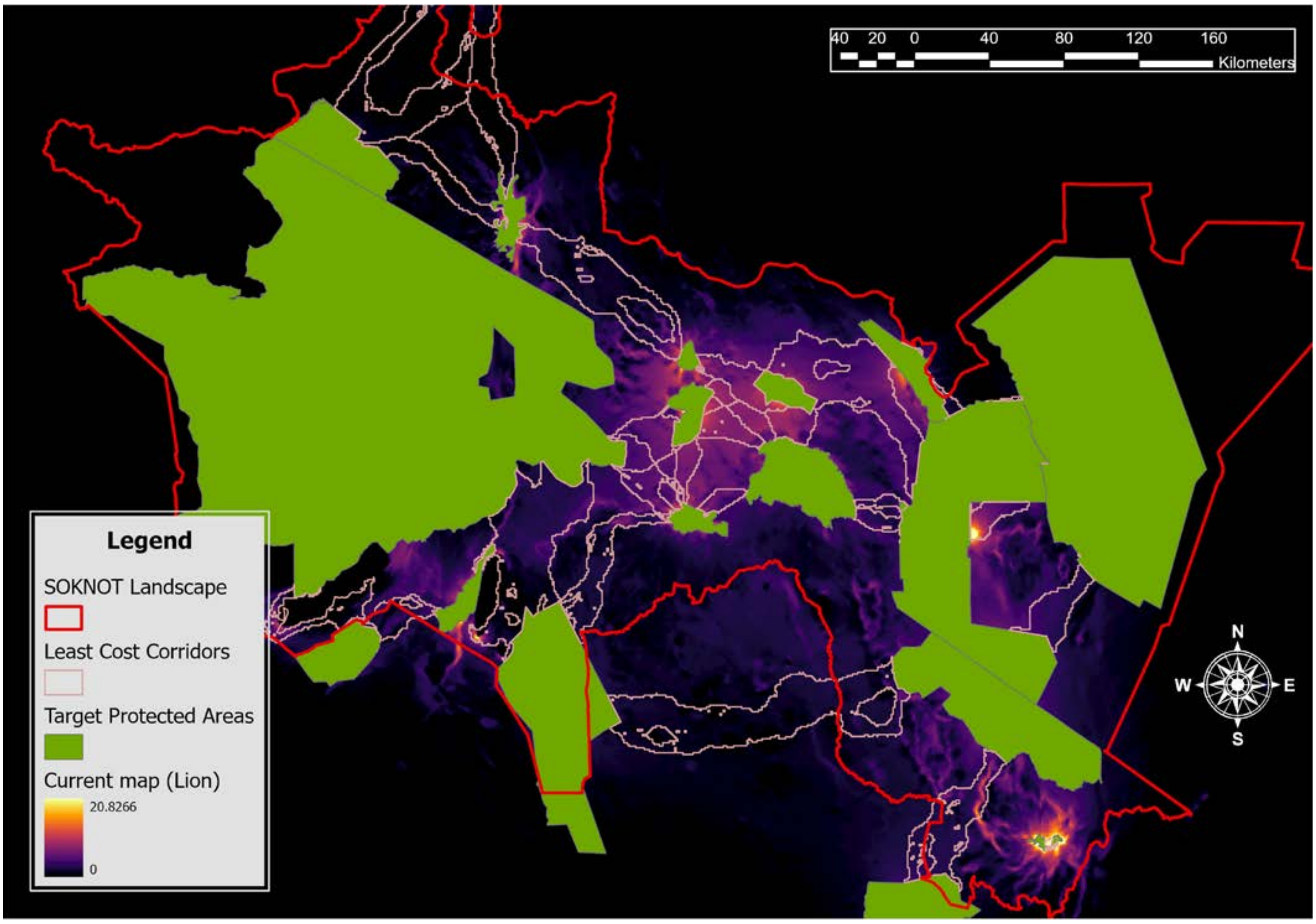
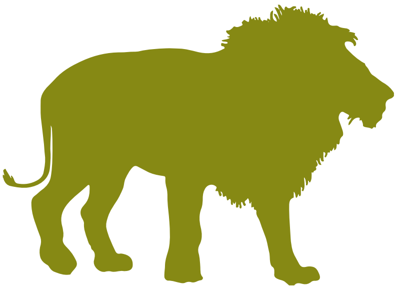


Figure 45. *Current flow map for lion overlaid with structural corridors. Darker areas represent regions of low current flow, while lighter (yellowish) areas indicate higher resistance.*



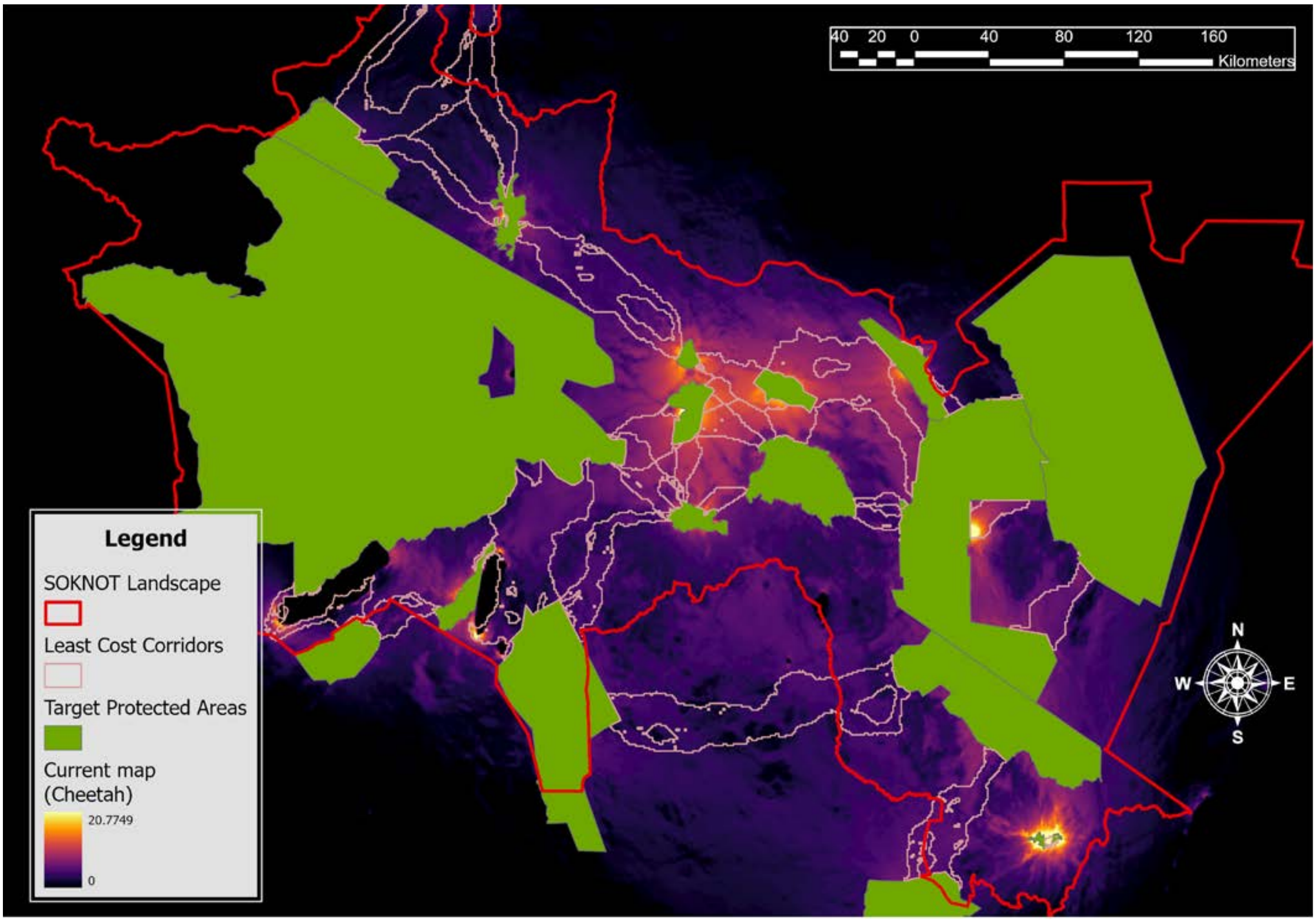


Figure 46. *Current flow map for cheetah overlaid with structural corridors. Darker areas represent regions of low current flow, while lighter (yellowish) areas indicate higher resistance.*

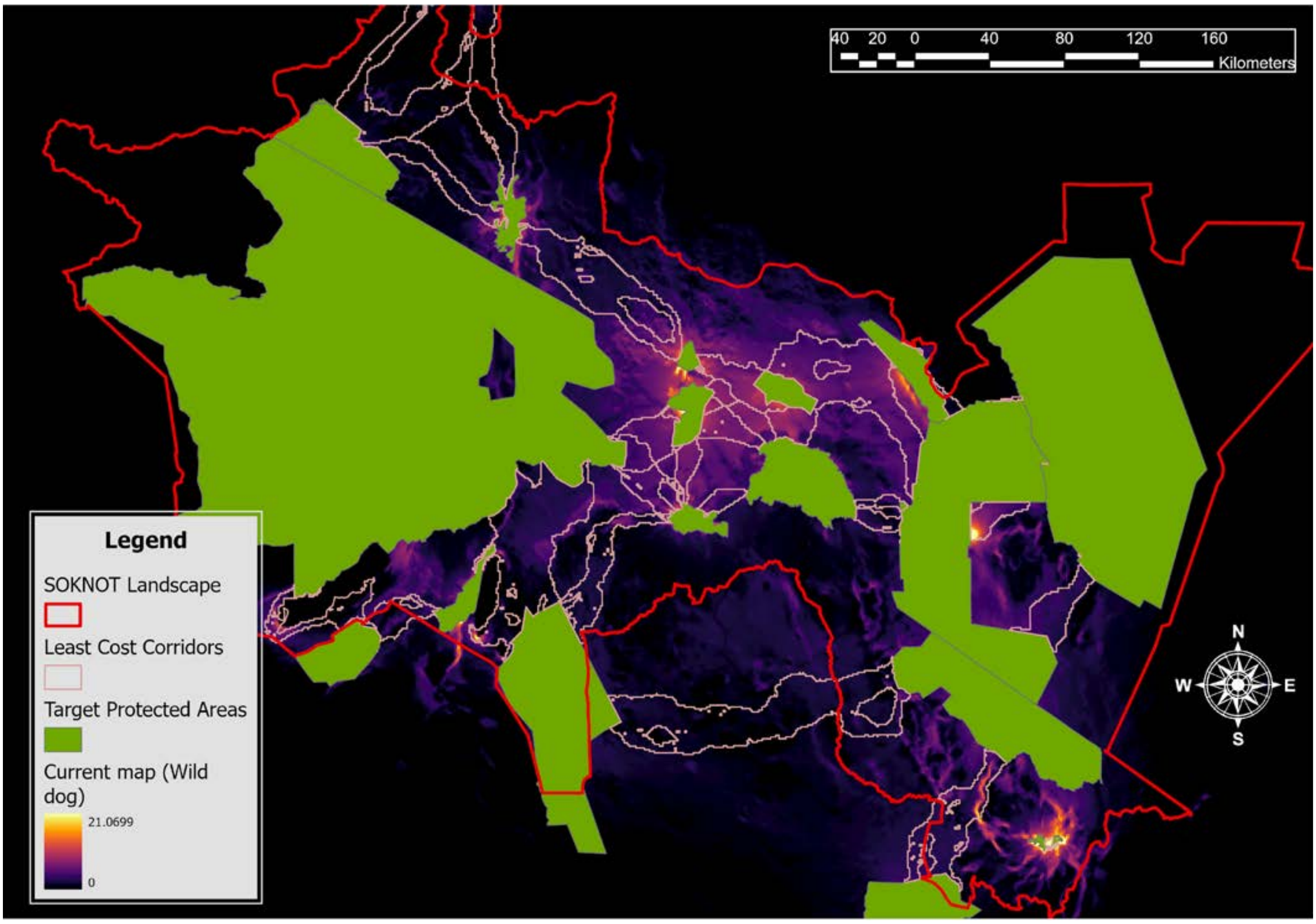
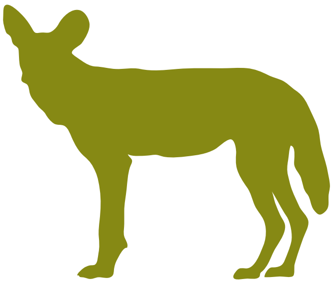


Figure 47. *Current flow map for wild dog overlaid with structural corridors. Darker areas represent regions of low current flow, while lighter (yellowish) areas indicate higher resistance.*



APPENDIX 3: COMPARISON OF COST-WEIGHTED DISTANCE VALUES: MAPS

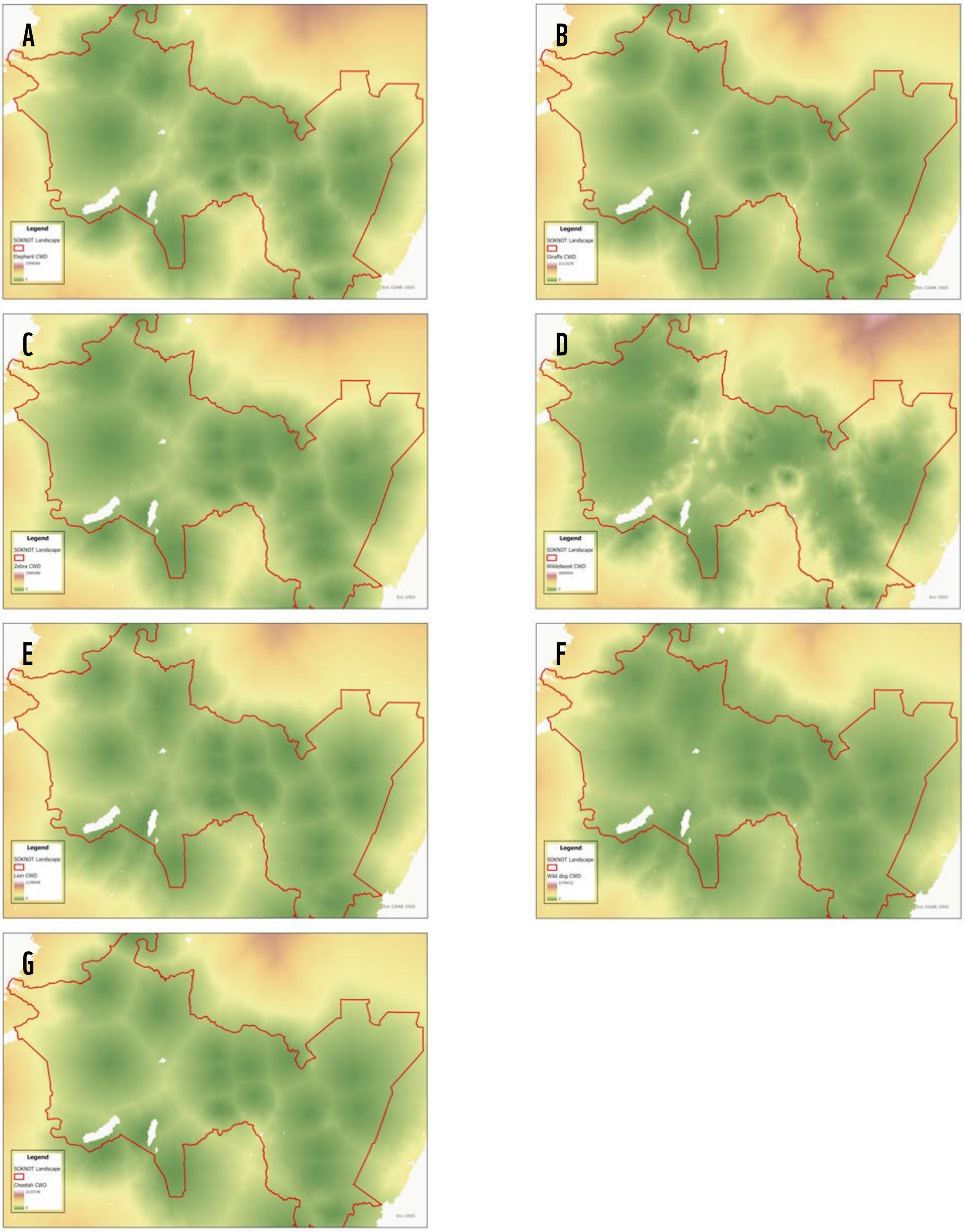


Figure 48. *Cost weighted distance values (CWD) focal species: (A) Elephant, (B) Giraffe, (C) Zebra, (D) Wildebeest, (E) Lion, (F) Wild Dog, and (G) Cheetah. Greener areas represent regions with lower cost-weighted distance values*

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