CENTER for LARGE LANDSCAPE CONSERVATION

FOCUS-BRI Country Report

Framing Opportunities for Conservation by Understanding Safeguards in the Belt and Road Initiative

Tanzania

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Acronyms

ACC	African Conservation Centre
ADB	African Development Bank
AFRICOG	African Centre for Open Governance
AWF	African Wildlife Foundation
BRI	Belt and Road Initiative
CBI	Composite Biodiversity Index
CDB	China Development Bank
CF-LI	Chinese Funded Linear Infrastructure
CHEXIM	China Export-Import Bank
CI	Conservation International
CITES	Convention on International Trade in Endangered Species
CMS	Convention on the Conservation of Migratory Species
DCP	Development Corridors Partnership
EAWLS	East African Wildlife Society
ESIA	Environmental and Social Impact Assessment
EWT	Endangered Wildlife Trust
FDI	Foreign Direct Investment
GIZ	Gesellschaft für Internationale Zusammenarbeit
IFAW	International Fund for Animal Welfare
IFC PS	International Finance Corporation Performance Standards
IUCN	International Union for the Conservation of Nature
IUCN	International Union for the Conservation of Nature
KBA	Key Biodiversity Area
LI	Linear Infrastructure
MEA	Multilateral Environmental Agreements
PA	Protected Area
PPP	Public private partnership
SGR	Standard Gauge Railway
SOEs	State Owned Enterprises
TNC	The Nature Conservancy
TUDOF	Turkana Development Organization Forum
UNCBD	United Nations Convention on Biological Diversity
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNEP	United Nations Environment
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
WWF	World Wildlife Fund

Tanzania Factsheet

Figure 1. *Political map of Tanzania.*

Table 1. *Tanzania country statistics. Information assembled from the Stimson Center, World Bank, and the Convention on Biological Diversity.*

Region	Sub-Saharan Africa
Capital	Dodoma
BRI Corridor	N/A
BRI investment ($ in millions)	2,000
Income Status	Low middle
Population	59.73 Million
GDP	62.41 Billion USD
Land Area	364,900 mi^2
Protected Areas (km^2)	947,253 km^2
Protected Areas (ranking)	38%
Species Richness (ranking)	11
Biodiversity Intactness (ranking)	29
ND-GAIN Country Index; Climate vulnerability (ranking)	145
GDP Growth Rate Projections	5.8%
Inequality (Gini Coefficient)	40.5
Human Development Index (HDI)	0.529
Key exports	Agricultural commodities (soy, tobacco, coffee, cotton, cashews, tea, and cloves), gold, and manufactured goods.

I. Introduction

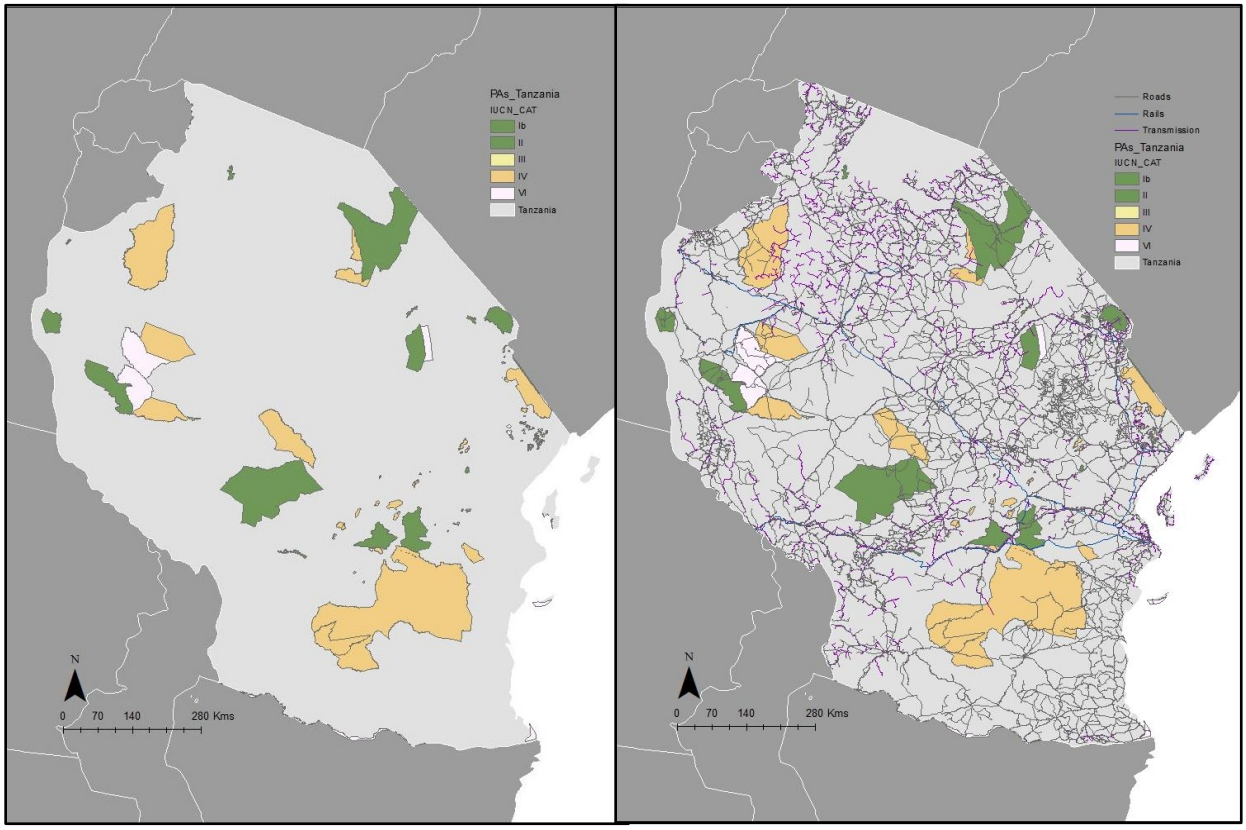
Tanzania's diverse ecosystems span mangrove forests to the highest alpine environment on the continent. Rated one of the most biologically rich countries, Tanzania is home to a range of iconic species with a booming tourism sector that accounted for 10.3% of GDP before the Covid-19 pandemic (Kyara et al., 2021). Over the last two decades, Tanzania has seen impressive economic growth averaging 6.9% from 2015-2019. In July 2020, Tanzania was reclassified by the World Bank as a lower middle-income country, five years ahead of schedule. Despite this impressive feat, challenges of poverty, inequality, political fragility, high youth unemployment, significant infrastructure financing gaps, and debt management persist and may inhibit the country's vision of becoming a competitive and inclusive economy. The development of sustainable transportation infrastructure, including roads, water transport, railways, and transmission, has been identified as key to achieving this objective (African Development Bank Group, 2020).

A recent scoping study by the Development Corridors Partnership (2019) identified five major development corridor projects in Tanzania:

1. Southern Agricultural Growth Corridor of Tanzania (SAGCOT)
2. Central Development Corridor
3. Mtwara Development Corridor
4. Tanga Development Corridor
5. Dar es Salaam Development Corridor/TAZARA Corridor

These corridors aim to increase economic growth through improved food security and agricultural productivity, poverty reduction, and trade with neighboring landlocked countries. Although their potential benefits are numerous, such development interventions significantly impact Tanzania's world-class biodiversity. Threats posed by the extensive infrastructure development within these corridors include loss of endemic biodiversity, threats to UNESCO World Heritage Sites, habitat fragmentation, increased pressure on water availability, and potential for resource-based conflicts (Fig. 2).

One example of a development that threatens Tanzania's natural heritage includes the construction of the US$3.6 billion Stiegler's Gorge dam, which will have a devastating impact on the Rufiji delta, home to the largest continuous stand of mangroves in East Africa, covering 210 square miles (Pearce, 2022). Despite pushback from environmental scientists, the Tanzanian government recently confirmed plans to build Africa's second-largest hydroelectric dam on the Rufiji River. The dam directly threatens two large protected areas, including the UNESCO World Heritage Site Selous Game Reserve. The reservoir will only directly flood around 2% of the Selous reserve, but this small percentage will eliminate key wetlands and block key species migration routes.



(a) **(b)**

Figure 2. (a) *There are multiple types of Protected Areas in Tanzania affording varying degrees of protection to multi-use landscapes. The greatest protection is afforded to IUCN categories I and II. This map only shows formally recognized protected areas and does not consider community and private conservancies, which may also serve as refuges for wildlife.* ***(b)*** *Figure 2a overlaid with existing infrastructure, which already compromises multiple protected areas. We consider only road, rails, and transmission lines as linear infrastructure for this study.*

II. Chinese investment in Tanzania and the linear infrastructure landscape

China is Tanzania's largest trading partner, accounting for 20% of total imports (*The Citizen*, 2019). As of 2019, capital from China was Tanzania's largest source of FDI (Namkwahe, 2019). Recent changes to the international political landscape have impacted both countries' domestic and foreign policies. As more players enter the African international relations arena, China faces increased competition for infrastructure contracts. Tanzania's recent decision to award a Turkish company the contract for the first and second phases of the standard gauge railway underscores this point.

Tanzania's debt to China is currently US$2 billion, significantly less than other African countries such as Kenya (US$9 billion), Angola (US$43 billion), and Zambia (US$9.7 billion) (Shangwe, 2021). In 2021, Chinese Foreign Minister Wang Yi visited Tanzania, and then President John Magufuli used the occasion to appeal for

debt cancellation and cheaper loans. The appeal included US$30 million in debt from two projects completed over 50 years ago, the Tanzania-Zambia railway (TAZARA) and the Urafiki textile mill (Malanga, 2012). The Chinese ministry made no guarantees of forgiveness.

Chinese investment in Tanzania has funded projects for transportation, mining, tourism, agriculture, and manufacturing. Such projects have resulted in 150,000 local jobs and considerably increased revenue and foreign reserves (The Guardian, 2022). A key upcoming project includes a 1,219 km standard gauge railway (SGR) to connect the port of Dar es Salaam to the country's eastern and southern borders (Ng'wanakilala, 2016). This will create much-needed transport links to boost the economies of Tanzania and its landlocked neighbors: Uganda, Rwanda, Burundi, and the Democratic Republic of the Congo (DRC). The railway is projected to cost US$1.9 billion and be constructed in five phases. The government of Tanzania secured a US$1.46 billion loan from the Standard Chartered Bank, to fund the first and second phases. See table below for detailed data on Chinese loans to Tanzania from 2009-2019 (Table 2).

Table 2. *CBD and CHEXIM loans to Tanzania between 2009-2019. Source: Boston University Global Development Policy Center, 2022.*

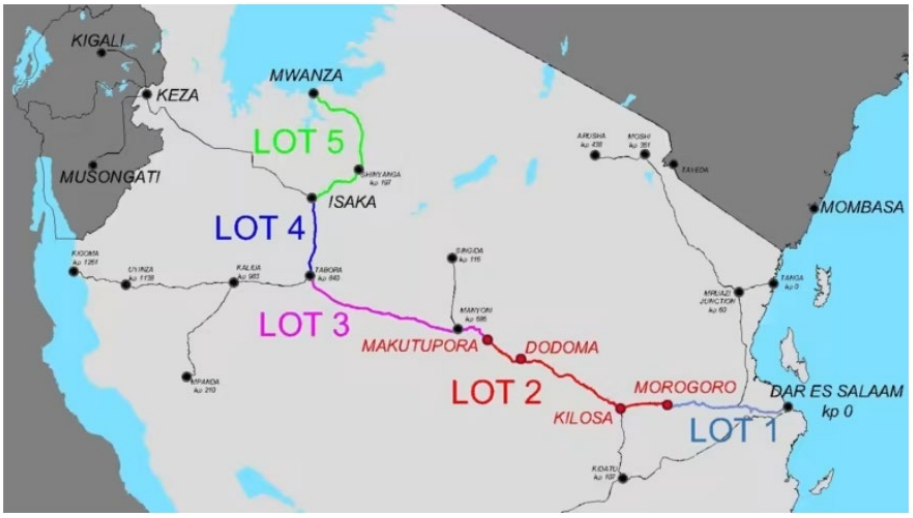
Project	**Type**	**Borrower**	**Lender**	**Signed**	**Total** (USD millions)
Zanzibar Airport Terminal 2 Expansion	Air Transportation	Public	CHEXIM	2010	73.00
Mnazi Bay to Dar es Salaam Gas Pipeline Construction	Pipeline for Natural Gas	Public	CHEXIM	2012	1164.00
ICT Fiber Optic Cable Network Project (Phase I)	Wired and Wireless Telecommunications	Public	CHEXIM	2008	77.00
ICT Fiber Optic Cable Network Project (Phase II)	Wired and Wireless Telecommunications	Public	CHEXIM	2010	106.00
ICT Fiber Optic Cable Network Project (Phase III)	Wired and Wireless Telecommunications	Public	CHEXIM	2013	94.00
Military Residential Houses Construction	National Security	Public	CHEXIM	2013	285.00
Bolster foreign exchange reserves	Monetary Authorities-Central Bank	Public	CDB	2015	200.00
				Total: US$1,999.00	

Tanzania has been in negotiations with China to fund the fourth and fifth phases of the SGR since 2019. This delay in negotiations and the recent departure from China's "open cheque diplomacy" may indicate that Tanzania may have to look beyond China to fund the final stages of the SGR. In addition to project finance from countries like China and Turkey, Tanzania has treaties with nineteen countries for bilateral investment, and seven agreements with regional economic blocs, including its membership in the East African Community (EAC) (Development Corridors Partnership, 2019).

Thus far, the Tanzania Railways Corporation (TRC) has confirmed that Turkish firm Yapi Merkezi in partnership with Portuguese Mota Engil Africa will construct phase one from Dar es Salaam.Phases two and three from Morogoro to Tabora will also be constructed by Yapi Merkezi (Dausen, 2021). In early 2021, the media reported that two Chinese companies, China Civil Engineering Construction Corporation and China Railway Construction Limited, had been contracted to build the SGR link between the Lake Victoria port city of Mwanza and the town of Isaka (Miriri, 2021). However, recent reports say that this project phase is still in negotiation (SGR-Tanzania Railways Corporation, 2022).

Box 1 - Project Profile: Tanzania's Standard Gauge Railway

Tanzania has begun updating its existing railway system to a standard gauge railway as part of the East Africa Railway Master Plan. The SGR is planned to be completed in 5 stages (Fig. 3), with stage one already complete and testing of electric trains beginning in 2022 (Tanzania's SGR Set to Start Operations End of April, 2022) Construction of the SGR began before a biodiversity action plan (BAP) was completed as part of an upgraded ESIA process, this uncovered issues which were overlooked during the original ESIA. Due to the start of construction prior to the BAP there was little option for following the avoidance measure of the mitigation hierarchy and field observations were seeing impacts that were not originally predicted. Within the BAP, it should be noted that underpass structures 3 m in height are the minimum suggestion for utilization by elephants, this is a departure from the 6 m wildlife underpass height utilized in Kenya's SGR through Tsavo national park (Okita-Ouma et al., 2021).



The planned railway will eventually connect Dar Es Salaam, the commercial hub on the Indian Ocean, to the port city of Mwanza on the shores of Lake Victoria -- which shares a border with Kenya and Uganda. (Map courtesy of Yapi Merkezi)

Figure 3. *Phases of SGR construction, courtesy of Yapi Merkezi.*

III. Tanzania's biodiversity landscape

Tanzania is home to 20% of Africa's large mammal population and more than one-third of Africa's total plant species (United Republic of Tanzania (URT), 2015). It is also dominated by forests, which occupy over 55% of the total land area. In comparison, 20% of the remaining land spans coastal and marine systems, including mangrove forests, seagrass beds, and islets. The country's diverse geomorphology has been attributed to the high rate of species endemism. Tanzania is the major hotspot for species at risk of extinction on the African continent. There are 1,320 threatened species on the IUCN Red List (2020), representing nearly every taxonomic group. Despite Tanzania's high percentage of protected areas (38%), the presence of many wide-ranging species like elephant, lion, cheetah, wildebeest, and African wild dog may be lost from even the largest natural areas if agricultural land conversion, infrastructure development, and urbanization continue to fragment and isolate protected areas (UNEP-WCMC, 2022).

Due to the huge diversity of flora and fauna, in addition to the scale of extinction risk, 708 Protected Areas (PAs) span 40,967 hectares (ha) of the country (Fig. 4). There are five categories of PA management regimes: Forest Reserves, Game Controlled Areas, Game Reserves, National Parks, Nature Reserves, and Forest Reserves or Forest Plantations. Tanzania's PAs are largely governed by local authorities or the central government (Table 3).

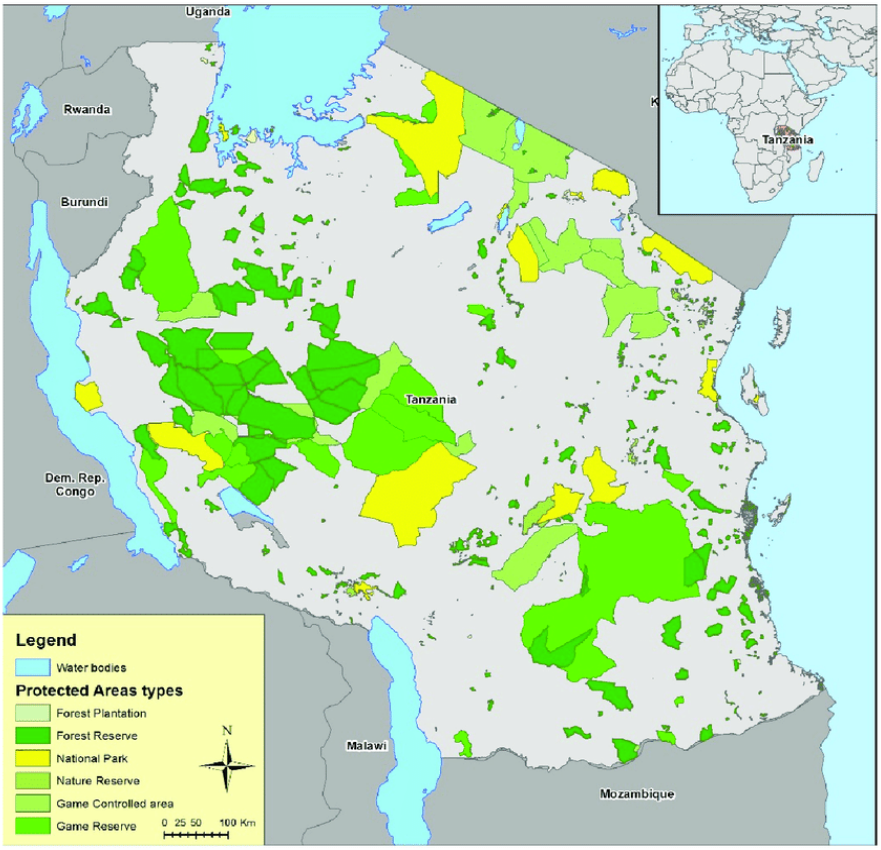


Figure 4. *Location of Tanzania in Africa and Protected Areas (PAs) in Tanzania by management regimes. The different colors (except the blue, which are water bodies) represent management regimes, namely (in no particular order), National*

Parks (NP), Game Reserves (GR), Game Controlled (GC) area, NatureReserves (NR), Forest Reserves (FR), and Forest Plantations (FP). Source: (Gizachew et al., 2020).

Table 3. *PA management regimes in Tanzania. Source: Gizachew et al., 2020.*

PA Management Regime	Number of PAs	Total Area (ha)	Managing Authority
Forest plantation	23	73	Tanzania Forest Services
Forest reserve	625	9,316	Tanzania Forest Services
Game controlled area	19	7,101	Tanzania Wildlife Management Authority
Game reserves	19	9,426	Tanzania Wildlife Management Authority
National parks	16	4,851	Tanzania National Parks Authority
Nature reserves	6	200	Tanzania Forest Services
Total	708	40,967	

With an economy based heavily on the use of natural resources, Tanzania is vulnerable to the adverse impacts of a changing climate. The country can be divided into four climatic zones, predicted to be impacted by climate events: Lowland Coastal Zone, Highlands Zone, Plateau Zone, and Semi-desert Zone. Extreme weather events, unpredictable precipitation, and an increase in temperature have raised concerns about the length of Tanzania's growing season, threatening traditional livelihoods and sustenance. Climate change is already impacting the country, affecting its ability to meet the Sustainable Development Goals and ensure the security of water, energy, biodiversity, and human health.

Linear transportation infrastructure (LTI) within Tanzania is poised to further fragment key wildlife habitats. Many of Tanzania's Key Biodiversity Areas (KBAs) lie outside of officially recognized protected areas (PAs), increasing the risk of a new development being allowed within these critical areas of high biodiversity (Fig. 5a).

Concern about LI development in Tanzania is not new. The international community quickly rose to condemn a new road proposed through the Serengeti in 2005, citing that such a development would seriously impact the famous wildebeest migration, which is recognized as one of the "Seven Wonders of the Natural World." Tanzania relies on road transport, which accounts for 90% of passengers and 75% of freight (Development Corridors Partnership, 2019). Unfortunately, the existing networks are often problematic, with dirt roads becoming impassable during the rains and demand for operation and maintenance outpacing national capacity. Our analysis of Tanzania's core biodiversity shows that protected areas safeguard only a portion of the country's rich biodiversity. With many KBAs falling outside of these protections, vulnerability to linear infrastructure development is increased (Fig. 5b). Without adequate protection, the country needs to maintain strong guidance during development that incorporates the needs of wildlife, habitat, and climate resiliency.

(a) **(b)**

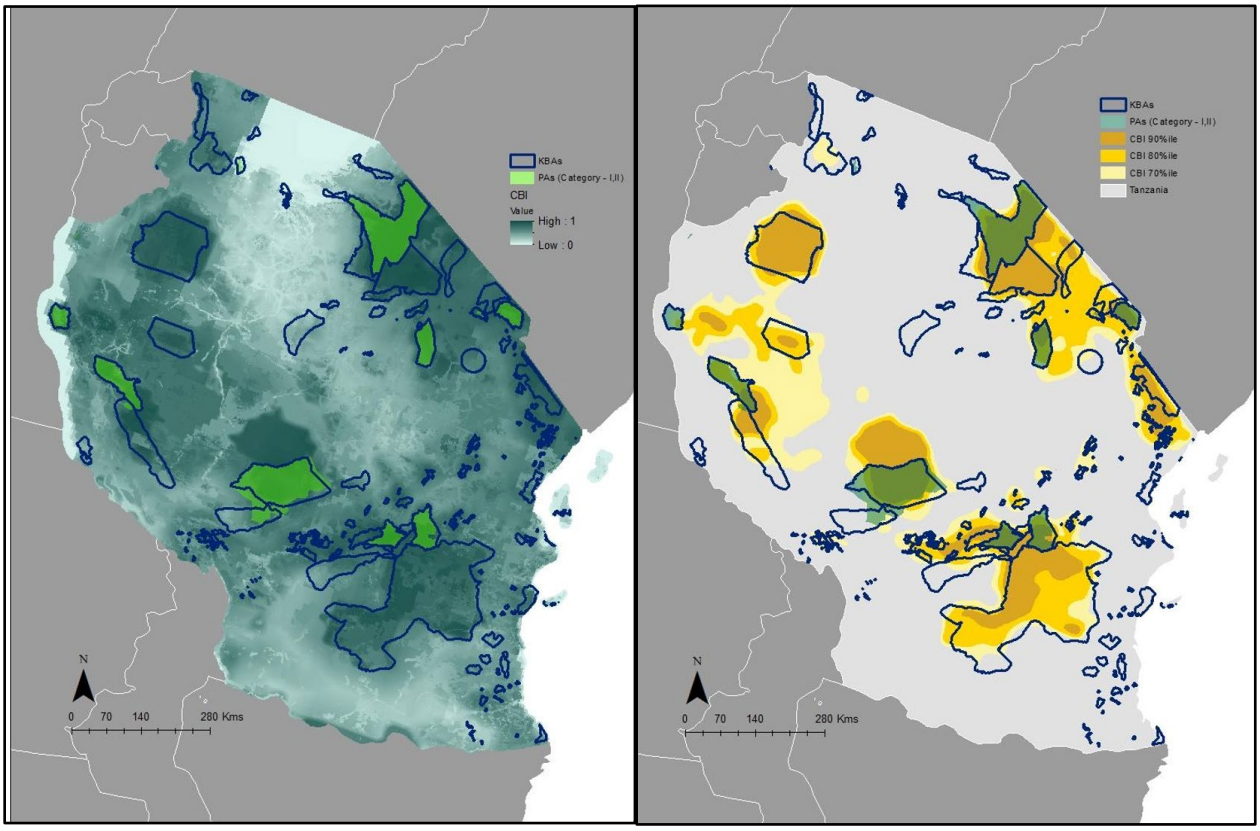


Figure 5. (a) *In Tanzania, Protected Areas (PAs) with the highest protection (at IUCN Category II) and (Key Biodiversity Areas) KBAs overlap to a great degree and cover some areas of highComposite Biodiversity Index (CBI) values.* ***(b)*** *Chinese-funded linear infrastructure - as captured by Custer et al., 2021 - overlaid over CBI Cores, PAs and KBAs. Methodology and further analysis in Appendix A.*

Box 2: Spotlight - *Mineral resources for a 'clean' energy transition*

In the wake of the Covid-19 pandemic and the rise of a 'clean' or 'green' energy revolution, countries are making decarbonization and supply chain security a key component of their recovery strategies. This convergence of events has highlighted the need for increased and expanded mining operations for key rare earth materials utilized in many renewable energy technologies. China currently produces 90% of rare earths (Evans, 2021), creating a need for expanded markets and increased viable competitors.

Tanzania is well established in the mining industry, with significant gem mining projects in operation, as well as large-scale rare earth, graphite, and nickel development projects. The mining sector is critical to the Tanzanian economy, making up more than 50% of the country's exports by value. ("Tanzania," 2022) With its existing workforce and established mining infrastructure, the Tanzanian government intends to ramp up mineral earnings by 33% by 2024 (Bloomberg, 2020).

Mining projects of note include the Kabanga Nickel project, the globe's largest development-ready nickel sulfide deposit (Njini & Biesheuvel, 2022). With the predicted growth in electric vehicles and the subsequent need for nickel as a key component of EV batteries, Tanzania will certainly be well positioned to meet its mineral extraction targets in the coming decades. And thus, the protection of biodiversity and local communities in the development projects is more vital than ever.

IV. Country policy and planning landscape for biodiversity & infrastructure

National and international commitments to conserve biodiversity

Biodiversity protection in Tanzania is essential for maintaining its tourism appeal, contributing US$2.4 billion annually to the country's GDP. Threatened by climate change, poaching, and habitat loss, these issues have profoundly impacted Tanzania's wildlife, including the loss of 60% of the country's elephants between 2009-2014 (Down To Earth, 2015). The negative effects of climate change are well recognized by the Tanzanian government, which has made the following statement on nationally determined contributions (NDCs) under the Paris Agreement:

> "Tanzania will embark on a climate-resilient development pathway. In doing so, it will reduce the impacts of climate change variability and associated extremes such as droughts and floods, which have long-term implications for all productive sectors and ecosystems, particularly the agricultural sector. The adaptation measures are expected to significantly reduce the risks of climate-related disasters compared to the current situation. Access to clean and safe water for the total population in urban and rural areas will be increased from 86% and 67.7%, respectively, in 2015, to 100% by 2030. Based on a conservative and a worst-case scenario of 50cm and 1m sea-level rise by 2100, the contribution will verifiably reduce the impacts of sea level rise on the island and coastal communities, infrastructure, and ecosystems, including mangroves. To achieve these targets, the government will consider the impacts of climate change in development planning at all levels and will pursue adaptation measures as outlined in this NDC." (The United Republic of Tanzania, 2021)

Relevant local laws and decrees surrounding biodiversity and infrastructure safeguards

Beyond international agreements, the country has also created key national policies related to addressing climate change and its associated risks, including:

- National Adaptation Programme of Action (NAPA 2007): Prioritizes sectors vulnerable to climate change as Agriculture and food security, water, energy, forestry, health, wildlife, tourism, and industry. Each prioritized sector includes six priority areas or projects which can address climate change. Projects relevant to biodiversity and linear infrastructure include: Enhancing the development of buffer zones and wildlife migratory routes and the relocation of people living in wildlife corridors.
- Tanzania National Development Plan (2016/17- 2020/21): Focuses on creating a high quality of life where all Tanzanians prosper. Nationwide peace, stability, and unity are centered. The creation of good governance practices and the transparent rule of law are highlighted, so people are empowered to hold

leaders and public servants accountable. The plan 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.

- National Climate Change Response Strategy 2021-2026: Tanzania's strategy to reduce deforestation, improve energy availability and diversification, and increase the efficiency of major energy-consuming sectors, including power generation, manufacturing, and transportation.
- Intended Nationally Determined Contribution (INDC) (2021): Guided by the Paris Agreement Work Programme adopted at the 24th Session of the Conference of the Parties (COP24), focused on contributing to reductions in climate vulnerability and enhancing long-term resilience to the adverse impacts of climate change.

The EIA process in Tanzania

Environmental Impact Assessments (EIA) are a well-known tool that allows decision-makers to make strategic, informed decisions regarding LI development. Conducting an EIA was mandated in 2004 by the Environmental Management Act Cap 191 and revised in 2018 (Sosovele, 2011). Within Tanzania's EIA manual (National Environment Management Council, 2005), the EIA is described as a tool to "ensure that development proposals, activities and programs are environmentally sound and sustainable; EIA can be used to minimize or prevent adverse effects and at the same time help countries to capture the real potential of the resource, and maximize the benefits of proposed developments." It is important to note that this manual overlooks one of the most important outcomes for biodiversity conservation regarding linear infrastructure development: avoidance. Unfortunately, the EIA process in Tanzania is opaque, at least from outside its borders. While an EIA manual does exist for the country, it lacks specificity. It offers much room for interpretation, leaving many gaps that ultimately need to be filled to ensure that EIAs serve their intended purpose and are not just another checkbox for developers.

A recent study (Mwanga, 2022) found that the effectiveness of Tanzania's EIA laws currently falls short of best practice, and implementation does not guarantee stakeholders' effective or inclusive participation during assessments. Mwanga also highlights the issue of the cost of conducting an EIA in Tanzania falling upon the project proponent, including hiring the environmental expert who will conduct the EIA. In such a situation, it has been suggested that the potential may exist for the environmental expert to skew their report to better align with the interests of the project proponent. In some cases, the Tanzanian government has also chosen to forgo the EIA process despite its environmental laws, citing projects as 'urgently needed' for energy and investment, as seen during the Nyerere implementation Hydropower project (Environmental Investigation Agency, 2021).

An interviewee described Tanzania's community engagement consultation process for LI development as present but significantly lacking. While policies exist to ensure local stakeholder engagement, the level of interaction is variable and dependent on many factors, including the project timeline, the experience of the person running the consultation practice, and the project in question. LTI development, by nature, is expansive and impacts communities across a large landscape, and consultation processes can often poorly represent the many stakeholders across such a broad region.

Box 3: Project Profile: A proposed road through Serengeti National Park

In 2005, the Government of Tanzania proposed the construction of a 53 km road that would transect the famous Serengeti National Park, a World Heritage site and Biosphere Reserve renowned for the incredible wildebeest migration (Fig. 6) (UNESCO World Heritage Centre, 2001). The construction of the road was aimed at stimulating socio-economic development within the region and increasing transportation connectivity. The conservation community quickly condemned this project, citing the irreparable damage such a road would have on the park and the entire ecosystem, affecting water quality, soil health, and ecological connectivity (Dobson et al., 2010).

Figure 6. *Possible routes for the proposed Tanzania Road to Lake Victoria. Source: Dobson et al., 2010.*

Support for the southern road alignment was vast, and the Frankfurt Zoological Society presented a strong case for the larger perceived economic benefit of the southern route, which would require fewer built kilometers and serve over five times the number of people as the northern route (Frankfurt Zoological Society, 2010). An EIA preceded the project but failed to demonstrate how alternatives or mitigation would reduce construction's negative impacts and facilitate safe wildlife crossings. Ultimately, the government tried to move forward with the project, resulting in formal litigation by the African Network for Animal Welfare (ANAW), which lasted four years. In 2014 the East African Court of Justice (EACJ) ruled that the project would cause irreversible damage and that any roads in the Serengeti should only be utilized for tourism, park administration, and wildlife. The court issued a permanent injunction against the government from implementing the project (Mwanga, 2022).

V. Understanding stakeholders and power dynamics

Government

- National Development Corporation (NDC)
- Tanzania Roads Agency (TANROADS)
- Tanzania National Park Authority (TANAPA)
- Tanzania Ports Authority (TPA)
- Tanzania Investment Centre (TIC)
- Tanzania International Container Terminal Services (TICTS)
- Tanzania Railways Ltd
- Rail Assets Holding Company (RAHCO)
- Surface and Marine Transport Regulatory Authority (SUMATRA)
- Tanzania Revenue Authority
- Marine Services Company Limited (MSCL)
- Tanzania Shipping Agencies Association (TASAA)
- Tanzania Chamber of Commerce Industries and Agriculture (TCCIA)
- Tanzania Electricity Supply Company Limited (TANESCO)
- National Institute of Transport NIT
- Tanzania Railways Corporation TRC
- Tanzania Rural Roads Agency TARURA
- Tanzania Wildlife Management Authority TAWA

SOEs

- Tanzania Wildlife Corporation (TAWICO)
- Puma Energy Tanzania Ltd.
- Mwananchi Engineering and Contracting Company Limited
- Modern Engineering Co. Ltd. (Privatized as National Engineering Company Limited)

Finance

- African Development Bank (AfDB)
- Gesellschaft für Internationale Zusammenarbeit (GIZ)
- Tanzania Investment Centre TIC
- East Africa Development Bank EADB
- International Finance Corporation IFC
- Multilateral Investment Guarantee Agency MIGA
- PTA Bank PTA
- World Bank/International Bank for Reconstruction and Development WB/IBRD

Research

- College of African Wildlife Management CAWM
- Nelson Mandela African Institute of Science and Technology NM-AIST
- University of Dar es Salaam UDSM
- University of Dodoma UDOM
- Tanzania Commission for Science and Technology COSTECH
- Tanzania Fishing Research Institute TAFIRI

- Tanzania Forest Research Institute TAFORI
- Tanzania Wildlife Research Institute TAWIRI

Community

- Engineers Registration Board ERB
- Roads Fund Board RFB
- Rural Energy Agency REA
- State Mining Corporation STAMICO

International NGO

- International Fund for Animal Welfare (IFAW)
- United Nations Development Programme (UNDP)
- United States Agency for International Development (USAID)
- Conservation International (CI)
- International Union for the Conservation of Nature (IUCN)
- The Nature Conservancy (TNC)
- United Nations Environment (UNEP)
- World Wildlife Fund (WWF)
- African Wildlife Foundation (AWF)
- Endangered Wildlife Trust (EWT)

National NGO and Civil Society Organizations (not wholly representative of all organizations)

- African Wildlife Service of Tanzania
- Tanzania People and Wildlife Fund
- Mikumi Community Wildlife Fund (Mcwf)
- Wildlife Education Organization "Wilded"
- Ecusini (Environmental Conservation Initiatives)
- Bangalala Conservation Organization
- The Environmental Conservation Family
- Igombe Ecosystems Conservation and Co. Management Organisation
- Kabwe Environment Conservation and Development Society
- Tumaini Jema Serengeti Environment Conservation
- Igombe Ecosystems Conservation And Co Management Organization(Igoeco)
- Environmental Conservation to Poverty Cutback
- Twende Pamoja Sanctuary Community Progress and Conservation Organization
- Nature Friends Tanzania
- Tanzania Environmental Conservation Society (Tecoso Tanzania)
- Conservation Resource Centre

VII. Recommendations

The following are recommendations for stakeholder engagement by group on how they can help ensure ESIAs are rigorous, transparent, community-engaged, and publicly available. Below are a broad set of priority and long-term recommendations:

Government of Tanzania

- Tanzania's ESIA process currently falls short of best practice and implementation and does not guarantee stakeholders' effective or inclusive participation during assessments.
- Ensure financing of projects includes a budget for land acquisition and compensation to ensure parties are properly and equitably compensated.

Research Institutions

- Research institutions in Tanzania are ready to engage in infrastructure development initiatives but often lack funding.
- Creating neutral ground opportunities for collaboration between government, contractors, and research institutions is key to ensuring their involvement in future projects. Support of conferences such as the African Conference on Linear Infrastructure and Environment.

CSOs, NGOs, Communities

- Tanzania NGOs are eager to engage in LI development, but interviewees representing these NGOs have expressed a lack of funding and low government initiative. Offering capacity-building and collaborative platforms which intermingle stakeholders is key to breaking down institutional silos and increasing cooperation.
- The recent controversial planned evictions of pastoralist Maasai in Ngorongoro highlight the continued need for community engagement and the importance of ensuring indigenous land stewards are given an equitable voice in decision-making.

Priority Recommendations in Tanzania

- Increase the state of knowledge of impacts to wildlife by roads and railways within Tanzania. This could be done by coordinating with existing research and NGOs to create a collaborative network of practitioners in a transboundary initiative with Kenya, building off existing relationships from the Southern Kenya Northern Tanzania (SOKNOT) work.
- Support promotion and involvement of Tanzanians in the 2023 African Conference on Linear Infrastructure and Environment (ACLIE), which offers an opportunity for disjunct stakeholders to engage with one another and catalyze collaboration.
- Further research into the impacts of climate change on wildlife corridors, community resilience, and ecosystem services.
- Development and implementation of a proactive mitigation plan for safeguarding wildlife from future energy infrastructure. Engaging with USAID's Power Africa-funded East Africa Energy Program (EAEP).

Longer-term visions for biodiversity conservation in Tanzania

- Further training for professionals carrying out ESIAs and for regulators reviewing them. Including training on best practices for effective and meaningful stakeholder engagement, focusing on government entities and ESIA professionals.
- Capacity building for government officials: Creating a stronger knowledge base at the upper echelon of the decision-making process is needed.
- Capacity building for project planners, engineers, and project contractors: Literacy on the importance of environment and climate is needed at all levels of project actors.
- Increased funding for academic projects which can direct early career scientists into this arena
- Accessible and free training on global best practices for safeguarding wildlife and biodiversity from the impacts of linear infrastructure.
- Establishing a long-term repository of wildlife data related to linear infrastructure (i.e., roadkill or electrocutions)

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Appendix A: Methodology

The complexity of LI project development and safeguarding means that understanding local and regional cultural, political, historical, and environmental conditions is essential. The FOCUS BRI research process was developed to ensure consultation with the experts in their fields and locations, who also either constitute or represent overlooked or marginalized perspectives. To this end, the project relied on key informant interviews, focus groups, and the field expertise of its team members. Below, we detail our methodology across two key contributions of FOCUS BRI:

1. Country Case Studies

A. Country Selection

Country selection played an important role in defining project bounds and ensuring that goals may be effectively and efficiently met. Countries without involvement with the BRI (as evidenced by an MoU) were removed from our list, leaving 140 countries (as of September 2021). Next, we decided to focus our efforts in Africa and Asia, which represent the majority of BRI investment. Additionally, CLLCmaintains a widespread professional network, decades of combined experience, and ongoing programmatic work in these regions. To further narrow the list, a dataset of indicators was built around the key selection criteria, including:

1. Level of Chinese investment
2. Biodiversity
3. Existing network and stakeholder connections
4. Climate vulnerability

With different metrics populated for each category and remaining country, we developed a function to combine and rank countries, which resulted in a prioritized list. We then selected twelve countries from the top 30, with an eye toward a diverse and representative suite of country case studies.

B. Case Study Development

The twelve country cases were developed through two main methods: a desk-based research process and key informant interviews. We opted to conduct in-depth reviews of relevant secondary data prior to carrying out interviews. In this way, researchers became familiar with the country context, the relevant bodies of work, and potential interviewees who are actively involved in work related to either environmental or biodiversity conservation or infrastructure development. This process consisted of a secondary literature review guided by a research template, to ensure consistency and efficiency across the country cases. The literature review captured relevant academic work and gray literature pertaining to biodiversity issues, Chinese infrastructure development and relations, and national policy and implementation landscapes for biodiversity protection and LI project development. The following briefly summarizes the report sections:

1. **Introduction** - including country context, relations with China, and broader transboundary issues.
2. **Linear infrastructure investment landscape** - including statistics, projects, type of projects, and agencies involved.
3. **Biodiversity landscape** - describing the biodiversity characteristics and hotspots, national conservation spaces and policy frameworks, and the key work focused on conserving biodiversity. Agrobiodiversity considerations were also noted where relevant.

4. **Country policy and planning landscape for biodiversity and infrastructure** - the national environmental and biodiversity laws and regulations, ESIA processes, actors in charge and their role, and especially the way these pieces play out in the context of large LI projects.
5. **Exemplary projects** - describing illustrative projects, whether successes or failures, to add texture to the above information.
6. **Understanding stakeholders and power dynamics** - highlighting the network of stakeholders and the degree and ways in which these stakeholders can influence processes.
7. **Recommendations** - gathered from research and interviews; what interventions and investments can best improve LI development outcomes for biodiversity, local communities, and climate, and how might they proceed.

Following the secondary literature review, interviews were organized and conducted by the country research lead. To connect with interviewees, leads contacted existing CLLC connections in the country, relied on personal networks, and reached out to voices identified as especially relevant in these fields in-country. Interviewees thus consisted of actors from the academy, non-governmental organizations, government, the private sector, or communities. We aimed to gather 3-5 key informant interviews to ground the research, add texture to the information, fill gaps and connect to resources, and share their expert opinions on barriers, opportunities, and more.

Interviews followed a semi-structured template, tailored to the informational needs of the specific report and interviewee. The main sections of the interviews were:

1. Introduction to the FOCUS project, interview, and purpose.
2. The current country "landscape" of implementation processes, actors, and resources.
3. Understanding the formal and informal spaces for coordination and inclusion of diverse stakeholders and interests into these processes.
4. The barriers to safeguard implementation and how to overcome them.
5. Any additional/more specific questions
6. Concluding remarks

Interviews were recorded for ease of transcription and information gathered during interviews was then integrated into reports. Upon the completion of individual country case studies, a process of synthesis was initiated to uncover the trends and common threads found across these twelve countries and within each region (Africa, Central Asia, Southeast Asia). These findings were then incorporated into the summary report.

2. Spatial Context and Mapping

A. Context maps

We used ARCmap 10.8 and R Studio 2021.09.1+372 to develop all maps for this project. The aim of the first set of maps was to provide contextual detail by capturing the intersections between protected areas (PAs) and existing infrastructure in a given country. To visualize the diversity of PA uses within a country, we classified them according to the IUCN categories (Ia, Ib, II, III, IV, V, and VI). These categories are internationally recognized standards that classify PAs according to their management objectives. All PA polygons were acquired from the World Protected Areas layer found on the Protected Planet clipped to country boundaries

(Table A). To add existing linear infrastructure (LI) line shapefiles for each LI type (roads, rails, and transmission lines) were clipped to the countries' borders. These layers were overlaid with the PAs to highlight the intersection of LI and PAs. The Global Roads Open Access Data Set (gROADS) (CIESIN - Columbia University, and ITOS - University of Georgia, 2013), a global road layer for 1980-2010, was used to represent the road network. The railway layer was acquired from the World Food Program's global railway dataset, which was last updated in 2017. For the transmission lines, we used Aderne et al's (2019) dataset, which was last updated in 2019 (Table A). A more updated road layer (up to 2018), the Global Roads Inventory Project (GRIP) roads dataset was clipped to the country boundary and is represented in a separate map. The higher density of roads in the GRIP dataset often overshadows railways and transmission lines if visualized on the same map with PAs. We include the more recent dataset to highlight that spatial data needs regular updating to reflect continued LI construction and that our maps offer problem setting context but underrepresent the extent of LI interacting with wildlife habitat.

B. Composite Biodiversity Index and cores

We created a Composite Biodiversity Index (CBI) to identify regions of high biodiversity. To develop a CBI layer for each country, we applied a method created by Dr. Tyler Creech for the Center for Large Landscape Conservation. Dr. Creech created the CBI based on nine existing biodiversity indices related to species richness, endemism, abundance, intactness, ecological condition, rarity, and complementarity. The value of CBI ranges from 0 (lowest biodiversity value) to 1 (highest biodiversity value). We selected three percentile cut-offs from the CBI layer, representing biodiversity richness areas by the 70th, 80th, and 90th percentile, which we refer to as biodiversity cores. For more details of the CBI methodology, see the LISA project spatial annex[1]. The amount of overlap between PAs and CBI is of importance to spatial planning for LI as not all CBI areas have formal protection but provide for connected wild populations. To demonstrate this point, we overlay PAs from IUCN Categories Ia, Ib, and II, (i.e., areas with higher protection regulations and supported by country environmental and biodiversity laws), Key Biodiversity Areas (KBAs) - which enjoy wide acknowledgment as important for long-term conservation of wildlife though are not always formally protected, - and CBI. We acquired KBAs from Birdlife International (updated 2021) and clipped them to the respective country's boundaries. We then overlaid the resulting PAs and KBAs over the CBI layer to highlight protection provided to important biodiversity areas.

Finally, to identify where Chinese-funded projects intersect with PAs and top percentile CBI cores, we looked at Chinese-funded LI in the AidData dataset within each country. AidData captures projects with development, commercial, or representational intent that are supported by official financial and in-kind commitments (or pledges) from China between 2000 and 2017, with implementation details covering a 22-year period (2000-2021) (Table A). Given the inconsistent sharing of data, dearth of publicly available geospatial information for LI projects, and many disparate institutions involved, AidData's list is one of the most comprehensive and publicly available to date. We filtered results to include only roads, rails, and transmission

[1] USAID ((U.S. Agency for International Development). 2021. Annex 1: Spatial analyses of linear infrastructure threats to biodiversity in Asia. *In:* Building a foundation for linear infrastructure safeguards in Asia. Authors: Creech T, Stonecipher G, Bell M, Clevenger AP, Ament R. Prepared by Perez, APC for Contract no. AID-OAA-I-15-00051/AIDOAA-TO-16-00028, ESS WA#13. U.S. Agency for International Development, Washington, DC. 98 pp.

projects. The layer for Chinese-backed LI was overlaid with PAs, KBAs, and the three percentile cores, summarizing the impact of such LI on biodiversity-rich regions and the incidences of Chinese LI impinging on PAs.

C. Summary statistics from our analyses (Appendix B)

We converted CBI cores for each percentile (70th, 80th, and 90th) to polygons, then calculated the area of each polygon using the 'Calculate Geometry' tool in Arcmap. Each of the cores was clipped to the category I and II PA boundaries, resulting in layers representing the overlap of each core with PAs. The area of the overlap layers was similarly calculated using the 'Calculate Geometry' tool. We then determined the percentage of the PA overlap area with the total core area. We then clipped AidData's LI layer to each country boundary. The length of each of the line attributes within the clipped layer was calculated using the 'Calculate Geometry' tool. The linear length of each LI type (roads, rails, and transmission lines) was calculated using the 'summary statistics' function. We repeated this process for each of the percentile cores by clipping the LI to each core boundary in the first step. Finally, the Chinese LI layer was also clipped using the PA (Category I and II) polygons. The length of each of the line attributes within the clipped layer was calculated using the 'Calculate Geometry' tool. The length of road for each of the LI type (roads, rails, and transmission lines) was calculated using the 'summary statistics' function.

Table A. *Datasets used to visualize protected areas and linear infrastructure in each of the 12 countries chosen for FOCUS-BRI*

Dataset	Year Last Updated	Geographic Scale	Dataset Format	Source	Data Download link
World Protected Areas (WDPA)	2021	Global (separated by continents)	Vector polygon shapefile	UNEP-WCMC and IUCN (2021)	Explore the World's Protected Areas (protectedplanet.net)
gROADS	2010 (1980-2010)	Global	Vector lines shapefile	CIESIN - Columbia University, and ITOS - University of Georgia(2013)	https://www.globio.info/download-grip-dataset
GRIP Road Data	2018	Global	Vector lines shapefile	Meijer et al. (2018)	https://sedac.ciesin.columbia.edu/data/set/groads-global-roads-open-access-v1

Global Transmission Lines	2019	Global	Vector lines shapefile	Arderne, Christopher, NIcolas, Claire, Zorn, Conrad, & Koks, Elco E. (2019). Data from: Predictive mapping of the global power system using open data [Data set]. In Nature Scientific Data (1.1.0, Vol. 7, Number Article 19). Zenodo. https://doi.org/10.5281/zenodo.3538890	Data from: Predictive mapping of the global power system using open data | Zenodo
Global Railway	2017	Global	Vector lines shapefile	World Food Program/ Humdata	https://data.humdata.org/dataset/global-railways
Key biodiversity areas - KBA	2021	Global	Vector polygon shapefile	BirdLife International (2021)	Key Biodiversity Areas GIS Data Request
Chinese development projects	2021	Global	Vector polygon shapefiles	Custer et al., 2021 - AidData	https://github.com/aiddata/china-osm-geodata

Limitations

This project was exploratory and survey-oriented in nature. It is intended to be a first step that sketches the biodiversity, infrastructural, and local policy landscapes in each country. As such, it was also intended to raise important and possibly overlooked questions and issues for funders to direct their money. Given the scale and scope of this project, there were several limitations. First, it would be practically impossible to detail the complete policy landscape of each country, as they are both vast and constantly evolving over time. Second, we used spatial data to set the context for this project. Due to data limitations, our maps are likely very conservative. They do not include spatial data for planned LI, nor the expansion of existing LI. Instead, we highlighted only existing LI to showcase how biodiversity is currently impacted. Finally, due to the exploratory nature of this project, we gathered information to address particular foci in our reports and, thus, our methods did not lead to a comprehensive review.

Appendix B: Spatial Data Tables

The following tables provide summary information on the spatial analysis of Tanzania:

PAs (IUCN categories I and II) and CBI cores overlap

Tanzania	70th Percentile Core	80th Percentile Core	90th Percentile Core
CBI Core Area (km^2)	282274	187709	93103
Overlap with Protected Areas (km^2)	40898.6	34476.9	25087
Percentage of CBI Core within PAs (%)	14.489	18.3672	26.9454

Chinese-funded LI across Tanzania

The Chinese-funded LI dataset was clipped by Tanzania's boundaries and line length of each LI Mode was calculated.

LI Mode	Length
Road (km)	0
Rail (km)	948.025024
Transmission (km)	0

Length of Chinese-funded LI within PAs (IUCN categories I and II) in Tanzania

The Chinese-funded LI dataset was clipped within the PA boundaries.

LI Mode	Length
Road (km)	0
Rail (km)	55.058498
Transmission (km)	0

Length of Chinese-funded LI within CBI Cores in Tanzania

The Chinese-funded LI dataset was clipped by boundaries of every percentile core and line length of each LI Mode within each core was calculated.

LI Mode	70th Percentile Core	80th Percentile Core	90th Percentile Core
Road (km)	0	0	0
Rail (km)	366.17099	270.764008	140.684998
Transmission (km)	0	0	0