CENTER for LARGE LANDSCAPE CONSERVATION

FOCUS-BRI Country Report

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

Democratic Republic of the Congo

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Acronyms

BRI	Belt and Road Initiative
CBD	Convention on Biological Diversity
CBI	Composite Biodiversity Index
CDB	China Development Bank
CEA	Congolese Environmental Agency
CHEXIM	China Export-Import Bank
CIA	Central Intelligence Agency
CIFOR	Center for International Forestry Research
COMIFAC	Commission des Forêts d'Afrique Centrale
EIA	Environmental impact assessment
EPA	Environmental Protection Act
ESIA	Environmental and Social Impact Assessment
ESIS	Environmental and Social Impact Study
ESMP	Environmental and Social Management Plan
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GEEC	Groupe d'Etudes Environnementales du Congo
GREC	Groupement des Entreprises Chinoises
IUCN	International Union for the Conservation of Nature
KBA	Key Biodiversity Area
LI	Linear Infrastructure
MEDD	Ministry of Environment and Sustainable Development
MENCT	Ministry of Environment, Nature Conservation, and Tourism
NEAP	National Environmental Action Plan
NIPA	National Investment Promotion Agency
NRN	National Road Network
PA	Protected Area
PWC	PricewaterhouseCoopers
REDD+	Reducing emissions from deforestation and forest degradation
TOR	Terms of Reference
UN	United Nations
UNESCO-MAB	United Nations Educational, Scientific and Cultural Organization - Man and the Biosphere Programme
USAID	United States Agency for International Development

DRC Factsheet

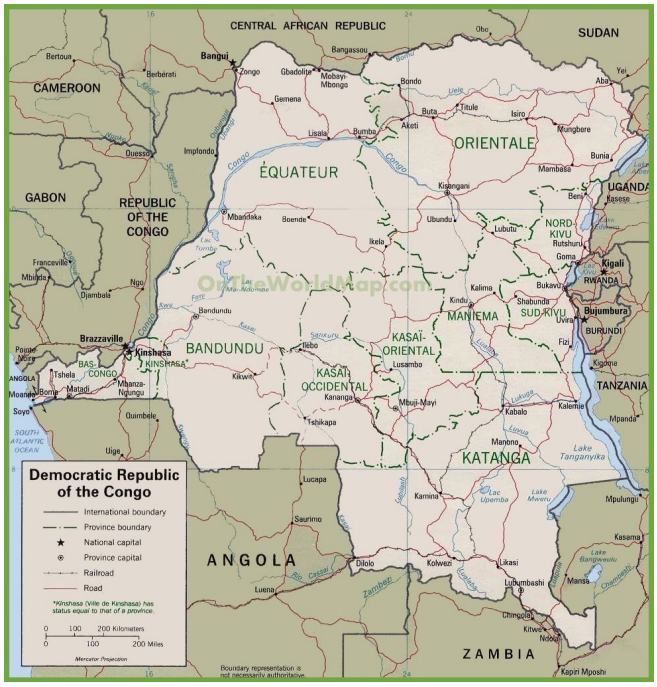

Figure 1. *Political Map of the DRC.*

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

Region	Sub Saharan Africa
Capital	Kinshasa
BRI Corridor	N/A
BRI investment ($ in millions)	2100
Income Status	Low-income
Population	89,561,404
GDP	48.72 Billion USD
Land Area	2,344,858 km^2
Protected Areas (km^2)	43802.31 km^2
Species Richness (ranking)	22
Biodiversity Intactness (ranking)	9
ND-GAIN Country Index; Climate vulnerability (ranking)	175
GDP Growth Rate Projections	1.7%
Inequality (Gini Coefficient)	42.1
Human Development Index (HDI)	0.480
Key exports	

I. Introduction

The Democratic Republic of the Congo (DRC) is a large, biodiverse country spanning over 2,344,858 km² in central Africa. It has a short coastline on the Atlantic Ocean. It is bordered by the Central African Republic and South Sudan to the north, Zambia and Angola to the south, Uganda, Rwanda, Burundi, and Tanzania to the east, and the Republic of the Congo to the west. DRC is divided into four geophysical regions: the Central Congo Basin, also known as the Cuvette Centrale. This low-lying, bowl-shaped depression is centrally located in the Congo River Drainage. The northern and southern uplands consist of mountain terraces, plateaus, and dense grasslands on either side of the cuvette. High mountain areas are found along the eastern border of the Congo Basin, where the East African Rift causes peaks to rise over 5000 meters. Lake Tanganyika, which forms the longest coastline of the Democratic Republic of the Congo, is also found in the rift. Nearly 68% of the DRC's total land area is forested, and 8.6% is designated as protected areas (USAID, 2010a). Of the 11.4% percent of land classified as agricultural, 3.1% is arable, 8% is permanent pasture, and less than 1% is used for permanent crops (CIA, 2022). The remaining 20.70% of the land is categorized as "other," comprising urban areas, roads, other transportation features, and land considered barren.

The DRC is considered one of the world's top ten biodiverse countries, with a high rate of endemism, important freshwater sources, and forest and soil resources, including subsoils with high mineral content (CBD, 2021). More than 50% of Africa's tropical forests lie within the borders of the DRC and are home to over 10,000 species of plants and 1,117 species of birds, 400 fish species, and 409 species of mammals (Flora and Fauna International, n.d.). Key charismatic mammals include the endemic okapi, Grauer's gorilla, bonobo, and Congo peacock. The dense forests and woodlands that cover the country play a crucial role in maintaining global climatic cycles. This rich diversity is not limited to flora and fauna but extends to a population of over 89 million people from over 200 tribes. The dominant Bantu group resides in northern DRC. Other large groups include the Mongo in the central region, the Kongo in the west, the Lunda in the south, and the Luba, Bemba, and Kasai in the south-central, southeast, and southwest, respectively. Northeastern DRC includes the Ngala, the Bira, the Buja, the Lega/Rega, and the Kuumu groups.

The country has a long and harrowing history of conflict, dating back to King Leopold II's brutal rule and entwined with the DRC's vast natural resources. There are purportedly US$24 trillion in untapped deposits of precious minerals, including the world's largest reserves of cobalt (51% of known reserves) and significant quantities of diamonds, gold, and copper (NIPA, 2021). Years of violent conflict have resulted in widespread degradation of natural resources and forced displacement of people into fragile ecosystems affecting their lives, livelihoods, and institutions that governed resource access. Over 70% of the population (approximately 60 million people) live on the international poverty threshold of less than US$1.90 per day. DRC ranked 175 of 189 countries on the 2020 Human Development Index, and nearly 43% of children are malnourished.

Based on the constitution, which was approved by a referendum in 2005, the DRC has been a unitary republic since 2006. Although the new constitution established a semi-presidential republic and separated powers between the executive, legislative, and judiciary, DRC's political system is fragile, often cited for accountability, transparency, and widespread corruption challenges. Moreover, the political regime is often observed to have authoritarian characteristics due to the governance actions of leaders. This is true, especially where communities reside in areas that are considered to be ecologically fragile and resource-rich. Since the colonial era, resource-rich regions of DRC have received considerable attention for conservation and have often been demarcated as

protected areas. However, the methods used to create these protected areas have rarely included any participation from local communities and have been essentially top-down. A large number of protected areas within the country have been made without the consent of the local communities, and their management has been more enforcement-oriented than inclusive of stakeholders, with forced evictions being a widespread occurrence (Inogwabini, 2014).

The economy of DRC relies on commodity exports, particularly minerals such as copper, cobalt, tin, tungsten, and tantalum, which were central to the country's economic growth between 2001 and 2014 (International Trade Administration, 2021). However, the global decline in mineral prices from 2015 to 2016 adversely impacted the national economy, and the growth rate dropped from 7.70% (in 2015) to 2.40% (in 2016). Over the three years, the growth rate rebounded to 5.80% but began to fall in 2019 and declined considerably (to 0.80%) due to the pandemic in 2020. However, due to a rapid increase in the export of copper and cobalt amid the post-pandemic surge in prices, the growth rate of the DRC more than tripled in 2021 and currently stands at about 4.90% (World bank, 2021). This boom in the economy not only led to a surplus after over two decades but also improved the fiscal position of the country. While mineral extraction and exports comprise approximately 20% of the country's GDP, the agriculture sector accounts for almost 65% of national employment and is an essential source of subsistence and livelihood. The DRC is host to an extensive road network (Fig. 2), whose density is tempered, but not excluded, by protected areas (PA).

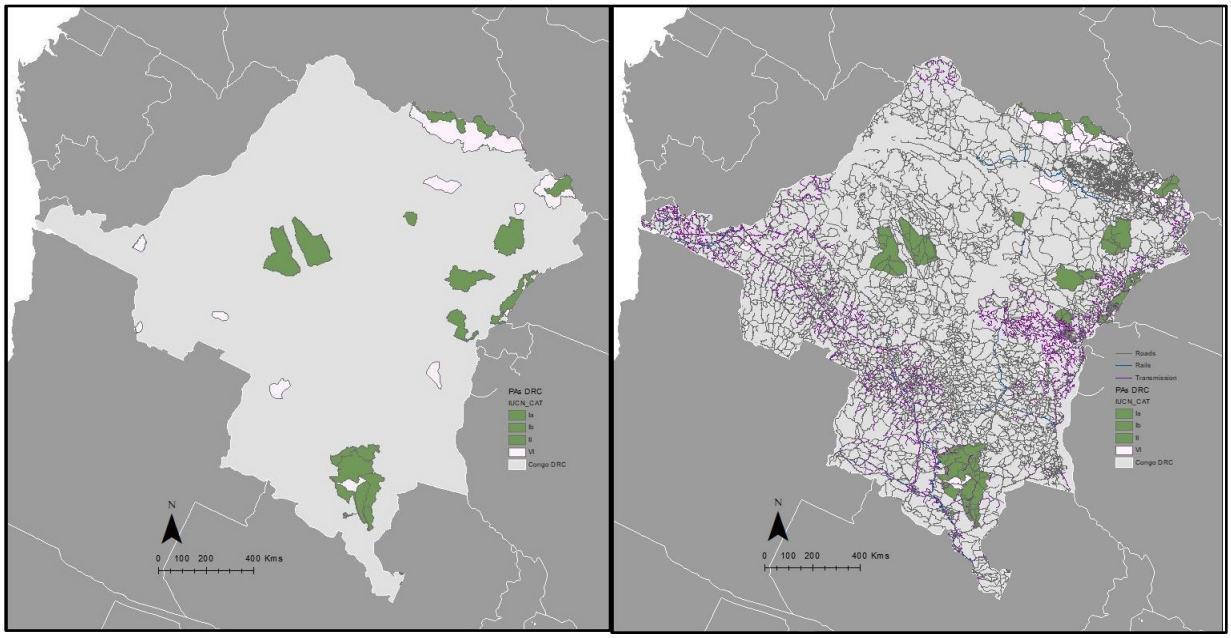

Figure 2. (a) *The protected areas in the DRC as categorized according to IUCN classification, where category I is the most regulated and IV is the least;* ***(b)*** *Linear infrastructure intrudes into protected areas across the country;* See Appendix A for Methodology.

II. LI Investment Landscape

Overview

Due to the country's vast topography with a dense network of rivers, low population density, and extensive forests, infrastructure development in DRC has been a challenging endeavor. Roads and railways that once existed were severely damaged and left in ruins throughout years of conflict. Currently, linear infrastructure in DRC consists of a network of roads, railways, runways, and waterways in varying conditions. The main roadways are the national road network (NRN) and roads of general interest. The total length of the NRN is 152,400 km, of which about 2% is paved. Other routes span over 58,125 km, of which 19.5% are in good condition. The DRC has some railway lines. However, 95% need rehabilitation and updating. The Congo River flows through the heart of the country, and thus the DRC has one of the longest navigable waterway systems, spanning over 16,000 km. There are also 500 runways in the country, of which 101 are open to public traffic and 4 to international traffic (Kinshasa, Lubumbashi, Kisangani, and Goma), most of which require rehabilitation and modernization (NIPA, 2019). According to assessments conducted by the World Bank, the infrastructure investment needed in the DRC is among the highest in Africa (PWC, 2013). While there has been a steady increase in investments in the infrastructure sector since the new government's swearing-in in 2018, there has been a disparity regarding funding disbursement and the actual construction work on the ground.

One of the main drivers of transport infrastructure development in DRC is the push to connect resource-rich areas to economic centers in the name of profit. To do so, decision-makers often draw up linear infrastructure plans and projects in direct consultation with affluent (primarily international) business owners and traders interested in investing in particular resource-rich regions. According to *Odendaal* (2011), "increasing copper and cobalt exports are drawing attention to the urgent expansion required to remedy the country's poor import and export infrastructure." The article says that if roads and railways are not upgraded or built, then copper and cobalt production will be interrupted, negatively impacting the national economy.

BRI and Chinese activities in the DRC

The DRC and the People's Republic of China claim to have maintained good relations over the last four decades. The two countries initiated an alliance based on a mutual interest in balancing power relations with Western countries and the Soviet Union in the 1970s. Relations were strengthened during the years of conflict when China extended support to DRC (then known as Zaire) and provided arms and ammunition to fight Angolan forces in the late 1970s. China further solidified this alliance in 2007 by sending troops to the UN-sanctioned peacekeeping mission in the DRC and providing monetary support for initiatives through the African Union (Putzel and Kabuyaya, 2011).

The diplomatic relationship between the two countries has evolved into a strategic business partnership for bilateral commerce, which includes increased investment from private Chinese companies. Between 2000 and 2020, Chinese actors, including private investors and policy banks, invested a total of US$ 2,329 million in DRC across various sectors (Table 2). The Chinese transport sector investments in DRC averaged about US$59 Million per year between 2009 and 2018. However, the total investment in the sector increased to over US$300 million in 2019 alone (Fig. 3). As of 2021, China was the largest investor in the country, contributing nearly 52.57% of the total investment in the DRC, including domestic sources (NIPA, 2021). Chinese investment in the DRC centered on transportation and energy infrastructure, followed by information and communication technologies, health, and government (Fig. 4).

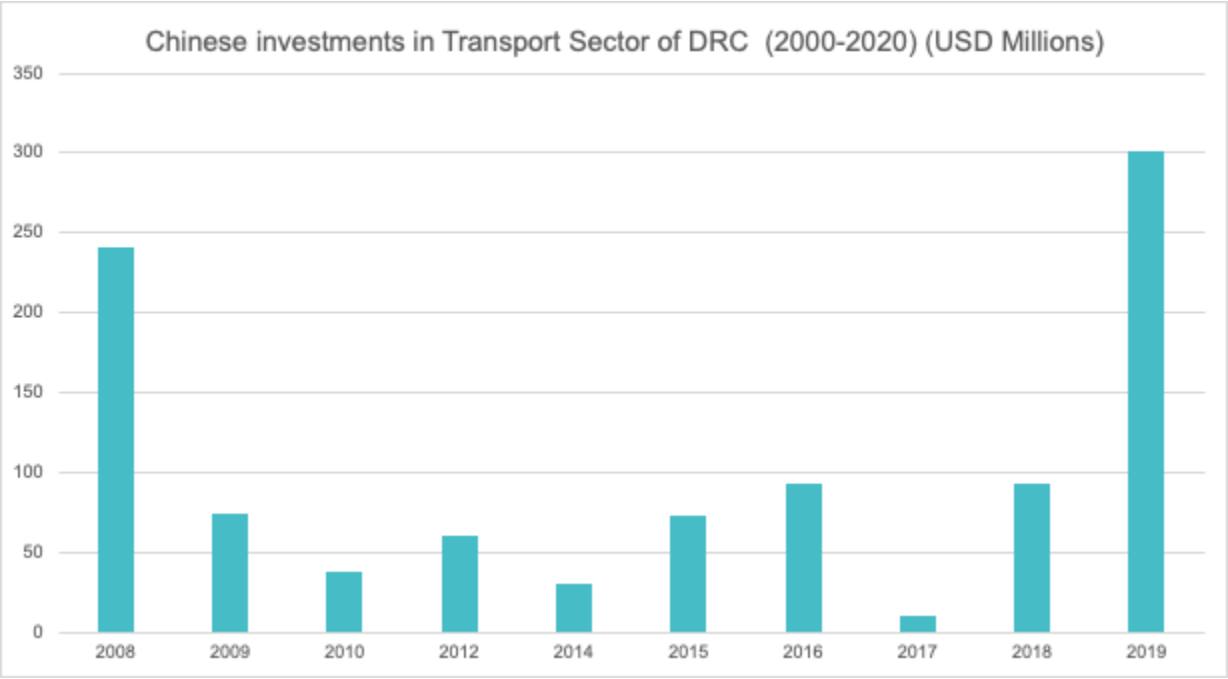

Figure 3. *Chinese investment in the DRC's transportation sector from 2000 to 2020 in USD. Source: Developed by the author using data available on Boston University, Global Development Policy Center. 2022.*

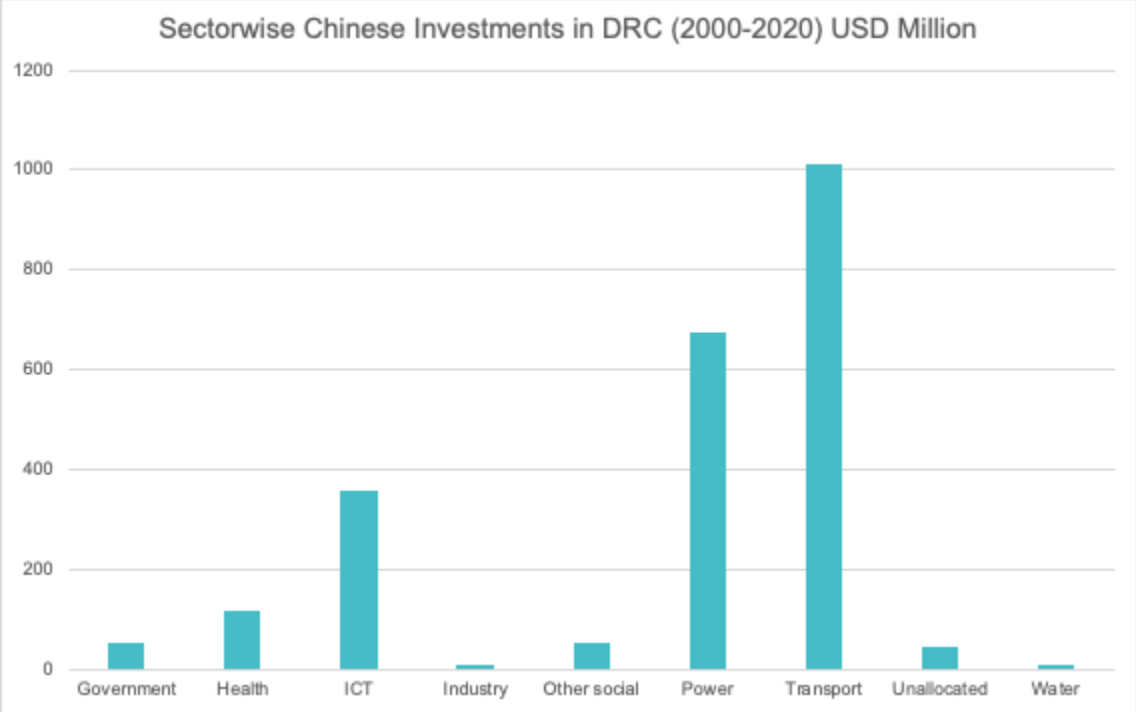

Figure 4. *Chinese investment in the DRC from 2000 to 2020 by sector. Source: Developed by the author using data available on Boston University, Global Development Policy Center. 2022.*

Although the preceding charts present a comprehensive picture of the state of Chinese investment in the DRC, they neglect a rather interesting pattern that emerged in the early 2000s concerning the economic immigration of Chinese citizens to the DRC. The early 2000s, as the diplomatic relations between DRC and China strengthened, came with an increase in Chinese nationals migrating to various parts of the country for employment and business opportunities. Men and women migrated from China to the DRC and found jobs primarily in the hospitality and service sectors in the country. However, over the years, due to efforts to improve the investment landscape of DRC, these Chinese nationals accumulated sufficient wealth to buy small pieces of land for agriculture or small timber extraction businesses. Acute poverty, especially in remote areas of the DRC, provided cheap labor and raw materials, creating what became an attractive business environment. One interviewee explained that small pockets of business hubs operated by Chinese nationals flourished as they were relatively more minor in comparison to large Chinese corporations operating in the same areas, thus leaving them to fly under the radar. Given the extent of corruption and lack of transparency and accountability in the governance structure of DRC, these seemingly small businesses were woven into the country's socio-economic fabric, which is now seeing increased Chinese influence in the agriculture sector. One interviewee explained this is at least partly a cause of food insecurity in the region.

Links between China and Africa have also diversified due to increasingly autonomous Chinese sub-state initiatives whereby provincial and municipal officials are empowered to broker transnational deals. In the DRC, for example, soon after ex-President Joseph Kabila came to office in 2001, an agreement was signed between Guangdong Province, China, and Katanga Province, DRC (Alden, 2007). This points to the importance of examining provincial-level arrangements rather than assuming that Chinese investment or the BRI today is only a centralized plan emanating from Beijing. For example, in 2008, all previous Chinese investments were dwarfed by the Sino-Congolese Convention for developing a mining project and several new infrastructure projects in the DRC. The Convention was between the DRC and the China Enterprise Group and comprised China Railway Group Ltd, Sinohydro Corporation, and China Metallurgical Group Corporation. The initial deal, now known as Sicomines, was worth US$9 billion before the International Monetary Fund intervened to suggest that the agreement would have a negative impact on the DRC's foreign debt portfolio. This led the parties to settle on a sum of US$6 billion eventually. Half of this amount was earmarked for mining operations and half for developing infrastructure, such as railways, roads, bridges, and energy, including constructing a hydroelectric dam. In return, the Chinese firms and sub-state actors received mineral rights for a potential 7 million tonnes of copper (Putzel et al., 2011).

Table 2. *Chinese Loans to the DRC in the transport and power sectors. Source: Boston University, Global Development Policy Center. 2022.*

Year	Lender	Lender Type	Purpose	Sector	USD (M)
2008	CHEXIM	Policy Banks	Kinshasa, Avenue du Tourisme Refurbishment, 6.8km	Transport	24
2008	CHEXIM	Policy Banks	Kinshasa, Lutendele Avenue Refurbishment, 2.8km	Transport	21
2008	CHEXIM	Policy Banks	North Kivu: Beni - Niania Road Refurbishment, 60km	Transport	57
2008	CHEXIM	Policy Banks	Katanga: Lubumbashi - Kasomeno RN5 Grading (137km)	Transport	51
2008	CHEXIM	Policy Banks	Katanga: Lubumbashi - Kasomeno RN5 Asphalting (137km)	Transport	88
2009	CHEXIM	Policy Banks	Boulevard du 30 Juin Refurbishment in Kinshasa, Part 2 (2.5km)	Transport	19
2009	CHEXIM	Policy Banks	Kinshasa, Triomphal and Sendwe Boulevards Refurbishment - Original (3.67km)	Transport	29

2009	CHEXIM	Policy Banks	Boulevard du 30 Juin Refurbishment in Kinshasa, Part 1 (5.3km)	Transport	26
2010	CHEXIM	Policy Banks	RN5 Bukavu - Ngangezi - Kamanyola Upgrade, 55km, Phase I (5/55km)	Transport	15
2010	CHEXIM	Policy Banks	RN2 Crossing to Butembo, Phase I (7.5km)	Transport	23
2012	CHEXIM	Policy Banks	N'Djili Airport Runway Refurbishment	Transport	60
2014	CHEXIM	Policy Banks	Lwambo - Mitwaba - Manono - Kalemie Road Rehabilitation, Phase I (171.6/466km) - Dirt Road	Transport	30
2015	CHEXIM	Policy Banks	Goma: Bunagana - Rutshuru - Goma Road, 15km	Transport	10
2015	CHEXIM	Policy Banks	Kolwezi Road Rehabilitation and Modernization	Transport	6
2015	CHEXIM	Policy Banks	Mbuji Mayi to Mwene Ditu Road Resurfacing	Transport	15
2015	CHEXIM	Policy Banks	Kalemie Road Rehabilitation and Modernization, Phase I	Transport	15
2015	CHEXIM	Policy Banks	Kabalo Bridge Construction and Modernization Project	Transport	6
2015	CHEXIM	Policy Banks	Kitanda - Ankoro Road Rehabilitation and Modernization Project (70km)	Transport	5
2015	CHEXIM	Policy Banks	Uvira Road Rehabilitation and Modernization Project, Phase I (5 km)	Transport	5
2015	CHEXIM	Policy Banks	RN2 Crossing to Butembo, Phase II (7.5km)	Transport	11
2016	CHEXIM	Policy Banks	Feasibility Study for the Rehabilitation and Modernization Project of the Mwene Ditu - Nguba Road	Transport	2
2016	CHEXIM	Policy Banks	Nzolana Avenue Rehabilitation and Anti-Erosion Control	Transport	39
2016	CHEXIM	Policy Banks	Kabongo-Dianda - Mukwende Road Rehabilitation Project (350 km)	Transport	6
2016	CHEXIM	Policy Banks	Kamina - Kabongo Road Rehabilitation Project (230 km)	Transport	6
2016	CHEXIM	Policy Banks	Kikwit - Idiofa Road Rehabilitation and Modernization Project (70 km)	Transport	10
2016	CHEXIM	Policy Banks	Kisangani Road Rehabilitation and Modernization Project (10.914 km)	Transport	15
2016	CHEXIM	Policy Banks	Manono Road Rehabilitation and Modernization Project (5 km)	Transport	10
2016	CHEXIM	Policy Banks	Ankoro - Manono Road Rehabilitation and Modernization Project (115km)	Transport	5
2017	CHEXIM	Policy Banks	Kalemie Airport Terminal Construction	Transport	6
2017	CHEXIM	Policy Banks	Kinshasa, Triomphal and Sendwe Boulevards Reinforcement (3.67km)	Transport	5
2018	CHEXIM	Policy Banks	RN5 Bukavu - Ngangezi - Kamanyola Upgrade, Phase II (50/55km)	Transport	57
2018	CHEXIM	Policy Banks	Kalemie Road Rehabilitation and Modernization, Phase II	Transport	27
2018	CHEXIM	Policy Banks	Lualaba: Kanina - Musonoï - Kapata Road Construction (12.93 km)	Transport	10
2019	CHEXIM	Policy Banks	N'Djili Airport Terminal (Kinshasa)	Transport	301
2011	CHEXIM	Policy Banks	Zongo II Hydropower Station 150MW	Power	367
2016	CHEXIM	Policy Banks	Study, Supply and Installation Contract for 5,000 Solar Poles and Accessories	Power	10
2018	CHEXIM	Policy Banks	220 KV substation in Kinsuka and Associated Distribution Networks	Power	299
				Total Amount (USD Million	**1,691**

III. The DRC's Biodiversity Landscape

Forest land in the DRC spans 152 million hectares. It includes nearly 50% of Africa's tropical rainforests (86 million hectares), dry forests (45 million hectares), swamp forests (9 million hectares), and mountain forests (5 million hectares) **(**USAID, 2010a**)**. These forests are home to more than 600 species of trees and 10,000 species of animals, including rare and endemic species such as the western lowland gorilla, the common chimpanzee, and the bonobo. Major flora species include bromeliads, Venus flycatchers, ferns, orchids, twisted roots, kapok trees, and mahogany, which are hundreds of years old.

Forest management in DRC

From the management perspective, forests in DRC are divided into three broad categories: classified, protected, and permanent production forests (Table 3). The classified forests comprise those that have been assigned a particular use, with user and exploitation rights. These are usually designated for environmental protection and are in the state's custody (including the protected areas network). The second category - protected forests - are those forests that are not defined by a classification act and thus have comparatively fewer restrictions on use and exploitation rights. These forests can be a part of concession contracts, under which the government leases out the whole or a part of the forest for up to 25 years. Local communities can also seek concession rights on this category of forests. Thus, protected forests include demarcated areas for community forestry, small-scale concession contracts, and subsistence farming operations. From 2017 to 2019, the government granted 71 forests with nearly one million hectares to local communities. The third category - permanent production forests, as the name suggests, are dedicated to the production of forest products, mainly timber. Industrial logging concessionaires have commitments in these forests to institute sustainable forest management plans (Forest Legality Initiative, 2013). According to 2020 estimates, permanent production forests make up about 10% of the DRC and cover 12 million hectares.

Table 3. *Forest Classifications in the 2022 DRC Forest Code* **(**Rainforest Foundation UK, 2020**)**

Classified Forests	Protected Forests	Permanent Production Forests
• Forests are assigned a particular vocation with user and exploitation rights. • Usually designated for environmental protection and are managed by the State. • The government legally committed to this, representing 15-17% of the national territory	• Forests subject to less restrictive legal controls. • Includes uses for community forestry, small-scale concession contracts, and subsistence farming operations. • May also be granted long-term concessions for logging contracts of < 25 years	• Include previously allocated concessions and forests already in timber production. • Can be contracted to private entities. • Have commitments from industrial logging concessionaires to institute sustainable forest management plans • Category often referred to as the basket category as it covers all forests that are not classified for conservation or exploitation

Conservation landscape - Protected area network of DRC

The Clforest category comprises comprise the network of protected areas in the DRC and about 13% of the national territory (approximately 260,000km^2. A classification act defines these forests and their use and exploitation have judicial limitations often based on their ecological values. While 68% of the country comprises forests, all conservation efforts are concentrated in this category. Protected areas in DRC are divided into two broad categories: national parks and reserves. National parks equate to category II of the IUCN classification, under which the area's boundaries do not change, and land cannot be used for non-conservation or private purposes. These areas overlap with the Key Biodiversity Areas) to a great degree and cover some of the high Composite Biodiversity Index (CBI) values (Fig. 5(a)). Reserves are areas rich in natural resources and are further divided into various categories, such as nature reserves, wildlife reserves, game reserves, and biosphere reserves. Historically, the protected areas in DRC have been demarcated to protect endangered or vulnerable large mammals, such as elephants, gorillas, chimpanzees, bonobos, and northern white rhinoceros. However, multiple regions of identified composite biodiversity Index (CBI, see Appendix A) cores do lie outside of these protected area boundaries (Fig. 5(b)). Currently, there are 52 demarcated protected areas in DRC comprising nine national parks, three biosphere reserves, two wildlife reserves, 11 nature reserves, one scientific reserve, 12 hunting reserves, one community reserve, one primate nature reserve, 3 UNESCO-MAB Biosphere Reserves, 5 World Heritage Sites (natural or mixed), and 4 Ramsar Sites.

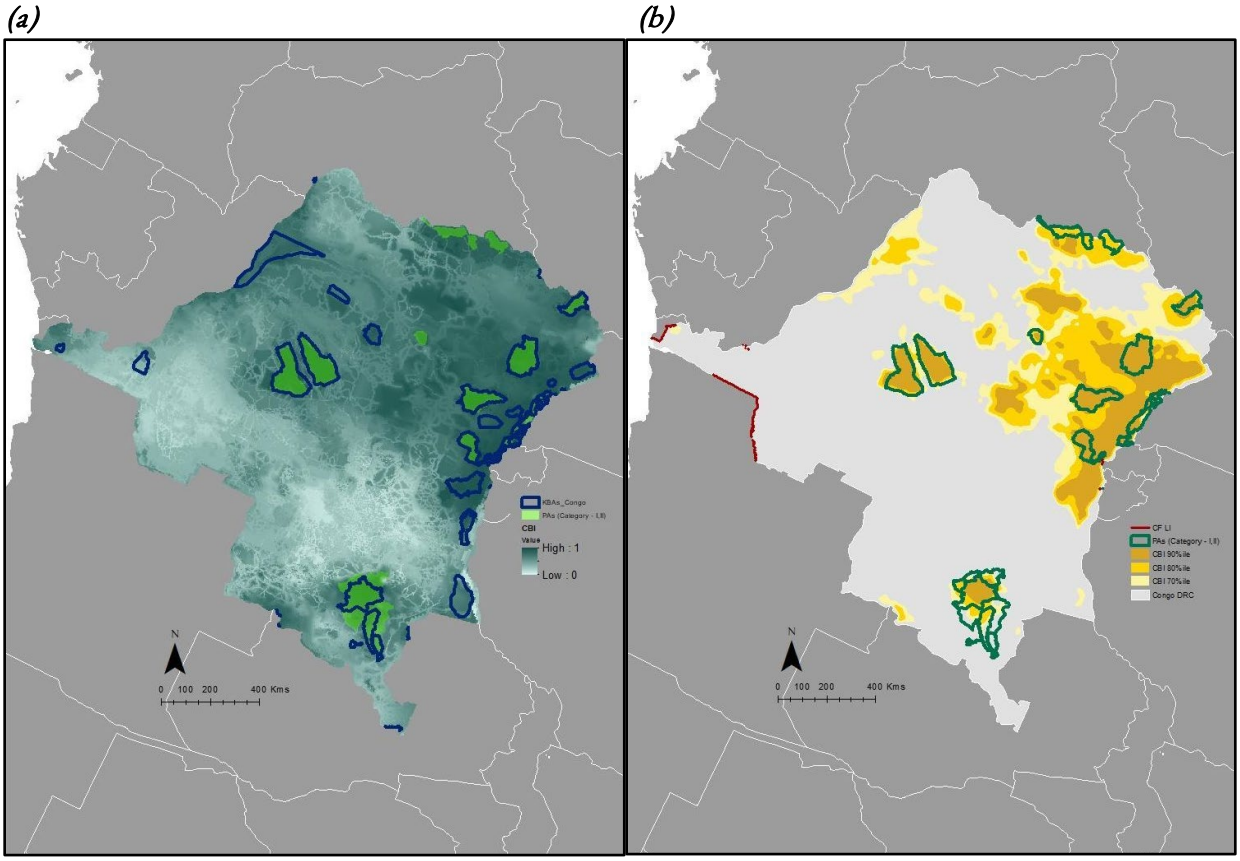

Figure 5. (a) *In DRC, Protected Areas (PAs) with the highest protection (at IUCN Category II) and (Key Biodiversity Areas) KBAs overlap to a great degree and cover a high Composite Biodiversity Index (CBI) values.* ***(b)*** *Chinese-funded linear infrastructure (red lines) - as captured by Custer et al. (2021), show the spatial data paucity of BRI projects. Many CBI cores (shades of yellow to ochre) lie outside of PAs. Methodology and further analysis are in Appendix A and B.*

Due to its rich and varied natural heritage, DRC attracts immense attention and support from the international conservation community for the wildlife conservation sector in terms of funding and other material and policy support, especially for species-specific conservation initiatives. However, there are several protected areas that exist only on paper and do not have any management plans or documents. Management effectiveness evaluations of the 52 PAs in the DRC are available only for 23 PAs (UNEP, 2022), suggesting a disconnect between PA demarcation and management. This is important to note because the government of DRC has committed to increasing its PA network to cover at least 17% of its geographical area under the National Objective 4.2 for Aichi Biodiversity Target 11 (CBD, 2021).

People, livelihoods, and agrobiodiversity

As many as 17 million people, or about 25% of the DRC's population, have been impacted due to forced evictions from their homes to demarcate a protected area for ecological/wildlife conservation. Decision-making in DRC, especially in the forestry sector, is top-down without any involvement of local communities. While the official records for evictions and these displacements state the "voluntary" movement of communities, there is evidence that communities strongly resisted the forced displacement even at gunpoint (Schmidt-Soltau, 2010). This issue is well-known in the DRC and was also emphasized by our key informants, who, in addition to confirming forced evictions as a regular forest management strategy, also mentioned the indirect role of international conservation organizations. While these organizations have strong people-related policies and programs, demarcation of a new protected area is often followed by additional monetary resources for its management. The money that comes for conservation is often the incentive for the government to create new protected areas. The critical informant also stated that once the money runs out after the "initial hand holding phase," the protected areas stop receiving due attention and are often left unmanaged and open for exploitation.

IV. Country policy and planning landscape for biodiversity & infrastructure

The Congolese legislative framework consists of many environmental instruments aimed at protecting various aspects of the country's natural systems and biodiversity, ensuring sustainable use, and managing the negative impacts of development. There are also several agencies and institutions responsible for protecting the environment and forests. This section highlights some of the primary laws and decrees surrounding biodiversity and infrastructure safeguards in DRC.

The Forest Code

Until 2002, forest management in DRC was governed by the Forest Decree dating from 1949. This code focused on the timber trade and did not have conservation as a core consideration. However, since the late 1980s, this code was amended multiple times to include additional components of land laws. Eventually, in November 2003, The Forest Code, law 1 1/2002, dated August 29, 2002, was published in DRC's Journal Official. This law deals with forest concessions and has 35 published regulations for implementing decrees and three decrees under development. Key elements of the Forest code law relating to infrastructure development include:

- *Consultations*: The code provides for prior talks with local people before a forest is designated for conservation or production and states that a public inquiry shall precede forest concession contracts.

- *Forest Zoning:* In 2009, a National Forestry Zoning Steering Committee was set up under the Forest code to improve land use planning in the DRC. One of the tasks of this committee is to develop a tenure map at a national scale that represents the various categories of forests along with mining sites, agroindustrial plantations, hydroelectric projects, and other infrastructure.
- *Consultations and Conservation Concessions*: The forest code provides a consultation system for discussions on forest allocations and concessions with larger stakeholder groups, including Provincial Forest Advisory Councils, the private sector, local communities, and NGOs.

The Mining Code

The Congolese Parliament adopted a new Mining Code on January 27, 2018. The code states that the DRC's government exclusively owns all the country's underground minerals. However, any private party may be authorized by the state to engage in mining activities such as exploration, exploitation, and distribution if they meet the specific objectives of eligibility, priority, and capacity criteria outlined in the Mining Code.

Environmental Protection Act (EPA)

The DRC's EPA contains several requirements for project proponents to undertake an environmental and social impact study (ESIS) or assessment (ESIA). Article 21 of the EPA is most crucial as it emphasizes that any activity that may have an impact on the environment, including the development, construction, or operation of all activities relating to industrial, commercial, agricultural, forestry, mining, and telecommunications projects, will be subjected to an ESIS and an environmental and social management plan, before obtaining approval from the competent authority. It also states that even though the ESIS will need to be commissioned by and be the sole responsibility of the project proponent, the terms of reference for the same will be established by the line ministry of the sector concerned, in conjunction with the project proponent and will be based on the general and sectoral guidelines which have been developed by the Congolese Environment Authority (CEA).

Below we detail the EIA process in the DRC (Fig. 6).

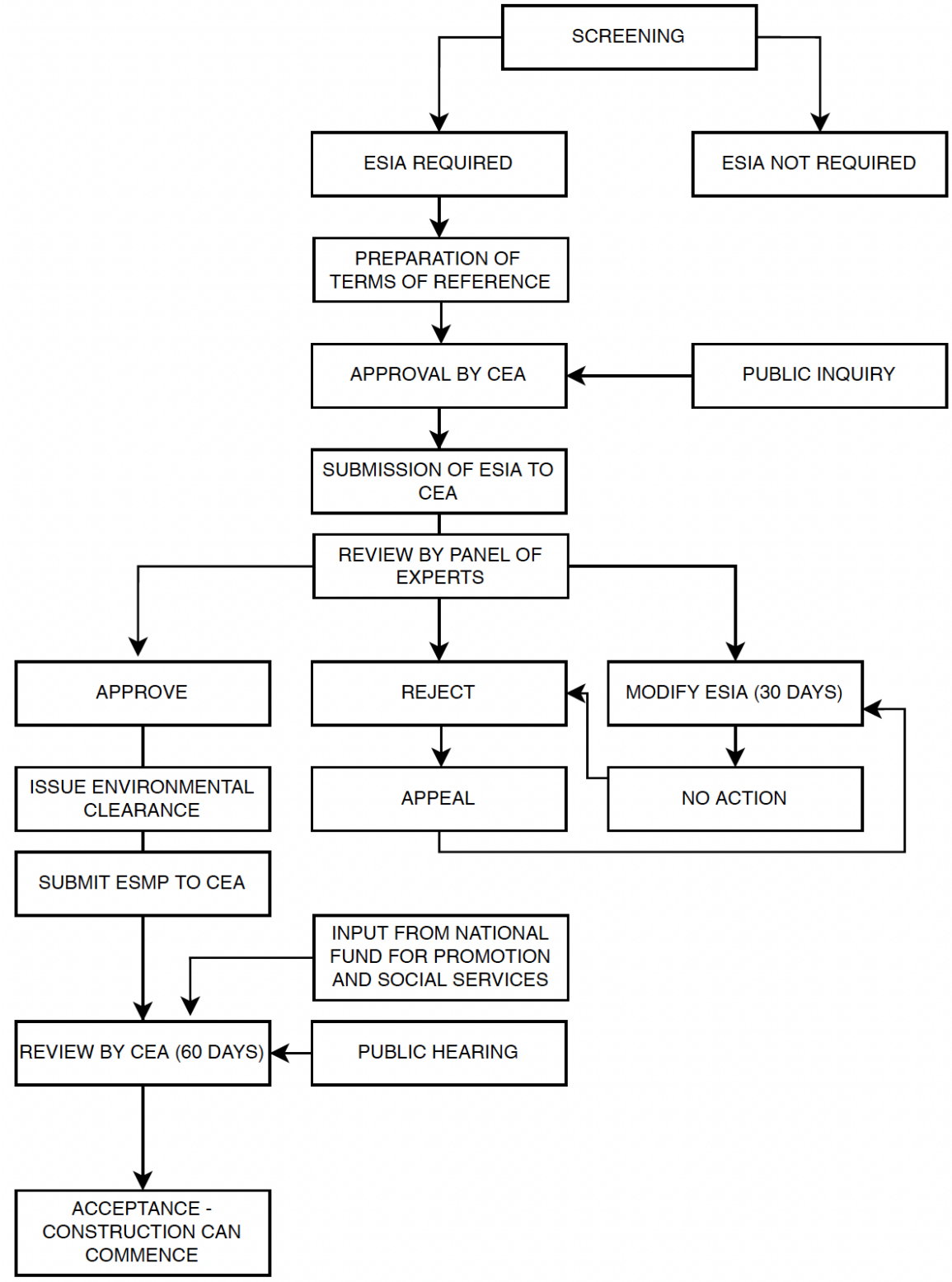

Figure 6. *Structure of EIA processes in the DRC.*

In addition to the laws and decrees, the legal fiber of DRC also includes several committees, institutions, and action plans with the responsibility to ensure the effective implementation of said laws. Some of these institutions that play a crucial role in the interaction between biodiversity and development, especially in the assessment phases of the projects are listed below:

Groupe d'Etudes Environnementales du Congo (GEEC): GEEC is a technical structure responsible for the administration and approval of EIA set up by the Ministry of Environment, Nature Conservation and Tourism.

Congolese Environmental Agency (CEA): The CEA's primary mandate is the administration and coordination of the ESIA process in the DRC. Environmental Focal Points assist it within various line ministries for the review and evaluation of projects within the ambit of their ministry.

National Environmental Action Plan (NEAP): Per DRC's NEAP, each province must develop its programs related to the management and protection of the environment in conformance with the new NEAP.

Department of Surveys and Forest Management: This department has developed a series of guidelines for various activities associated with forest management, including among other things: Framework and Guidelines for Socio-economic Studies (June 2017); and Forest Management Plans (June 2017).

International programs

- **Forest Investment Program Coordination Unit (REDD+)**
  - The Improved Forest Landscape Management Project supported by the World Bank
  - Integrated Emissions Reduction Project in selected regions supported by the African Development Bank

- **Programme for Preservation of the Congo Basin Ecosystems (African Development Bank)**

Regional organizations and coordination groups

Central African Forest Commission (COMIFAC)
African Timber Organization (ATO)
International Agency for the Development of Environmental Information (ADIE)
Organization for the Conservation of African Wildlife (OCAW)
Central African Protected Areas Network (RAPAC)
Conference on the Dense and Rainforest Ecosystems of Central Africa (CEFDHAC)
Congo Basin Forest Partnership (CBFP)
Central African Regional Programme for the Environment (CARPE)

List of international conventions that DRC is a signatory of

DRC's constitution stipulates that all properly concluded treaties and international agreements take precedence over national laws on the condition that the parties to the treaties or conventions apply them (Seyler et al., 2010). The list of treaties and conventions related to the environment and biological resources that the government of DRC has signed includes the following:

1. Agreement Concerning Cooperation in the Quarantine of Plants and their Protection Against Pests and Diseases
2. African Convention on the Conservation of Nature and Natural Resources
3. Convention on Wetlands of International Importance, Especially as Waterfowl Habitat
4. Convention Concerning the Protection of the World Cultural and Natural Heritage
5. Convention on the Conservation of Migratory Species of Wild Animals (Bonn)
6. Vienna Convention for the Protection of the Ozone Layer; London and Montreal Protocol
7. United Nations Convention on Climate Change
8. Convention on Biological Diversity
9. Bamako Convention on the Ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Waste within Africa
10. International Tropical Timber Agreement
11. United Nations Convention on the Law of the Sea
12. Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
13. Convention Relative to the Preservation of Fauna and Flora in the Natural State
14. Phyto-sanitary Convention for Africa
15. International Plant Protection Convention
16. The Convention on the Prohibition of the Development, Production, and Stockpiling of Bacteriological (Biological) and Toxin Weapons and their Destruction
17. Convention Concerning the Protection of the World Cultural and Natural Heritage
18. Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter
19. Convention on International Trade in Endangered Species of Wild Fauna and Flora
20. Convention on the Conservation of Migratory Species of Wild Animals
21. African Migratory Locust Convention
22. Treaty Establishing the African Economic Community
23. Convention on the Sustainable Management of Lake Tanganyika
24. Kyoto Protocol
25. Earth Charter
26. Paris Climate Change Agreement 2015

V. Understanding stakeholders and power dynamics

According to our interviews, many policies and regulations were developed through a top-down approach, in which a select few leaders, politicians, and affluent business-people convened and reached a consensus without including or consulting with the public, people's representatives, or other stakeholder groups. The emerging generation of leaders in the DRC has committed to greater transparency and institutional reforms. However, the legal and political framework of the DRC remains influenced by its colonial past and the more recent exploitation of its natural resources - by domestic elites and international entities. Unless the people of the DRC residing across multiple, often remote areas of the country are consulted during policy-making, the democracy of the country will likely remain a concept solely on paper.

While multiple ministries and departments are managing the different forests of DRC, the forestry sector as a whole is under the responsibility of the Ministry of Environment and Sustainable Development (MESD). The MESD is mandated to ensure sustainable management of forests by designing and developing, and implementing policies, strategies, standards, mechanisms, and projects; however, its actions are often primarily influenced by discussions and decisions taken in other sectoral ministries such as the Ministries in Charge of Interior, Finance, Mines and Agriculture (Eba'a Atyi et al., 2022). In many instances, comments put forward by MESD and those from several civil society organizations have been entirely disregarded because of an imbalance in the power dynamics.

It is important to note that the decades of conflict, lawlessness, poor governance, and explosive economic growth that led the DRC to experience persistently high levels of poverty, is a leading cause of why environmental protection is not the top priority for a government serving over 60 million people living on less than 1.93 dollars a day. Poverty eradication has remained one of the top priorities for all elected governments since 2005. Often, these means have involved widespread environmental degradation and exploitation, ignored or sidelined for economic growth and prosperity. While DRC is a signatory to several international conventions and has passed many national bills and regulations to ensure environmental protection, these laws, rules, and regulations have many loopholes. They are often neglected to make way for new developmental projects, which could potentially help create short-term and long-term jobs and foster a healthy business environment. Moreover, even if poverty eradication is not the ultimate goal, forest governance in DRC has remained weak.

As per Oyono and Lelo Nzuzi 2006, the socio-political context of DRC is generally marked by poor governance covering virtually all development sectors, including the forestry sector. The forest code established in 2002 could significantly impact the country's forest governance as it aligned with the Central African Forest Commission (Commission des Forêts d'Afrique Centrale, COMIFAC) agenda and took into consideration DRC's unique socio-economic conditions. The Code aimed to guarantee public consultations before allocating forestlands and include all stakeholders in forest management, including local communities. It not only supported community forestry but also recognized and respected the communities' customary rights to forest lands for traditional usage. However, despite having put several strategies and decrees in place to ensure implementation of the code, the governance of forests in DRC has remained ineffective and weak. Timber logging, both legal and illegal, extensive mining operations, and the construction of roads to transport material out of forests have continued to increase. The violation of the provisions of the law without any significant repercussions, legal confusion between various sets of rules and decrees, the ineffectiveness of the forest verification and control system, lack of uniformity and regulations in the logging title granting process, weak

exploitation capacities, and a lack of appropriate human and material resources are common reasons for the weak forest governance in DRC by multiple independent organizations (Samndong & Nhantumbo, 2015).

During our interviews, our key informant emphasized that while the DRC has independent ministries such as the Ministry of Environment and Sustainable Development, the Ministry of Planning, etc., the power dynamics between these ministries and industrial lobbies also need to be considered. The highest power of influence for decision-making for mining-related activities and planning is held by DRC's mining lobby, which includes members belonging to several large multinational, influential mining corporations, private mining companies, mining investors, local level politicians, and the ministries related to mineral extraction and mining. Since the DRC's economy is highly dependent on mineral extraction (copper and cobalt constitute over 80 percent of exports (World Bank, 2022)), the mining sector directly influences the entire political environment, which has implications for conservation. This directly impacts linear infrastructure planning as well because where the roads are constructed is often dependent on where new mines are located, with roads being built primarily to transport mined minerals out of DRC.

VI. Recommendations

Dialogues
Facilitating multi-stakeholder discussions at various levels of decision-making would allow the forest conservation sector in DRC to improve manifold. Many current issues exist in the country primarily because the current processes are highly siloed and top-down. By facilitating dialogues between the decision makers and other stakeholders (including communities, planners, contractors, industry, etc.), conservation would become more inclusive and acceptable and bring in a higher degree of accountability and transparency in the governance structure.

Corruption mitigation
The DRC is plagued with corruption at almost all levels of governance. Despite protocols and due processes, there have been many instances where decision-making was biased and skewed towards benefiting the industry instead of the country. For example, despite a detailed, standard procedure for tendering and procurement for infrastructure development in DRC, certain companies were selected even before official tenders were published. Contracts between the government and these companies were dated before the official tender publication date. While combating deep-rooted corruption is a long journey, DRC could undoubtedly benefit from the availability of more open data and global standards for governance. Contextualized funder regulations specifically for DRC would also help ensure due, fair processes.

Interministerial coordination
The DRC has a complex administrative structure with several ministries and departments under those ministries functioning as independent units. While it would be expected that with a clear outline of roles and responsibilities, governance in the country would be smooth, in the case of DRC, this has resulted in a lack of coordination. There are no rules in DRC that mandate communication and coordination between the different ministries for effective decision-making. By facilitating this through official coordination bodies or introducing periodic, interministerial round table conferences, the priorities of other ministries can be aligned.

Monetary incentives for landscape-level conservation

The DRC is a recipient of many conservation grants and funds focused on protecting and managing specific forests, forest communities, and species. There is sufficient evidence to show that monetary incentives are vital in driving conservation in poverty-stricken countries such as the DRC. Thus, introducing financial incentives for landscape-level conservation programs could be very beneficial as more stakeholders can be engaged at a more significant landscape level, and more aspects of conservation, including landscape-level land use planning, sustainable forest use, etc., can be incorporated. This, combined with effective channels for communication and bottom-up approaches to conservation strategies, could revolutionize the conservation sector within the country.

References

Alden, C. 2007. *China in Africa*. Zed Books, London.

CIA. 2022. "World Factbook - DRC." Accessed from: https://www.cia.gov/the-world-factbook/countries/congo-democratic-republic-of-the/. on June 12, 2022,

CBD (Convention on Biological Diversity). 2021. "Aichi Biodiversity Target 11 Country Dossier." *Country Dossiers - CBD.* Accessed from: https://www.cbd.int/pa/doc/dossiers/democratic-republic-of-congo-abt11-country-dossier2021.pdf on June 3, 2022.

Duster, S., Dreher, A., Elston, T. B., Fuchs, A., Ghose, S., Lin, J., Malik, A., Parks, B. C., Russell, B., Solomon, K., Strange, A., Tierney, M. J., Walsh, K., Zaleski, L., and Zhang, S. 2021. Tracking Chinese Development Finance: An Application of AidData's TUFF 2.0 Methodology. Williamsburg VA: AidData at William & Mary. From Dreher, A., Fuchs, A., Parks, B. C., Strange, A., and Tierney, M. J. (Forthcoming) Banking on Beijing: The Aims and Impacts of China's Overseas Development Program. Cambridge, UK: Cambridge University Press.

Eba'a Atyi, R., Hiol Hiol, F., Lescuyer, G., Mayaux, P., Defourny, P., Bayol, N., Saracco, F., Pokem, D., Sufo Kankeu, R., and Nasi, R. 2022. Les forêts du bassin du Congo; Etat des Forêts 2021. 392-409.

Forest Legality Initiative. 2013. *Risk Tool - DRC*. Accessed from: https://forestlegality.org/risk-tool/country/democratic-republic-congo. Accessed 1 June 2022.

Flora and Fauna International. (n.d.) Democratic Republic of Congo: Conservation in a conflict zone. Available from:https://www.fauna-flora.org/countries/democratic-republic-congo/#:~:text=It%20has%20the%20highest%20number,50%25%20of%20Africa's%20tropical%20forests.

Inogwabini, Bila-Isia. 2014. "Conserving biodiversity in the democratic republic of congo: a brief history, current trends and insights for the future." *PARKS*, vol. 20.20, no. 10,pp. Accessed from: https://parksjournal.com/wp-content/uploads/2014/10/PARKS-20.2-Inogwabini-10.2305IUCN.CH_.2014.PARKS-20-2.BI_.en_.pdf.

International Trade Administration. 2021. *The Democratic Republic of the Congo - Country Commercial Guide - Market Overview*. Accessed from: https://www.trade.gov/country-commercial-guides/democratic-republic-congo-market-overview. Accessed 05 06 2022.

NIPA (National Investment Promotion Agency). 2019. "Infrastructure Sectoral Assets." *Investment opportunities*. https://www.investindrc.cd/en/Infrastructure. Accessed 03 June 2022.

NIPA (National Investment Promotion Agency). 2021. "Distribution of FDI by nationality." *Investment volume*. Accessed from: https://www.investindrc.cd/en/Investment-volume on July 1, 2022.

Odendaal, N. 2011. *DRC Transport infrastructure needs more investment focus*. In Mining Weekly. Accessed from: https://www.miningweekly.com/print-version/drc-transport-infrastructure-needs-more-investment-focus-2011-06-21.

Oyono, P.R., and Lelo Nzuzi, F. 2006. Au sortir d'une longue "nuit" institutionnelle, nouvelles transactions entre les forestières et les sociétés rurales en RD Congo post-conflit. *Africa Development* 31: 2.

PWC. 2013. *Africa gearing up*. Future prospects in Africa for the transportation & logistics industry. PricewaterhouseCoopers.

Putzel, L., Assembe-Mvondo, S., Bi Ndong, L.B., Banioguila, R.P., Cerutti, P., Tieguhong, J.C., Djeukam, R., Kabuyaya, N., Lescuyer, G. and Mala, W. 2011 Chinese trade and investment and the

forests of the Congo Basin: Synthesis of scoping studies in Cameroon, Democratic Republic of Congo and Gabon. Working Paper 67. CIFOR, Bogor, Indonesia
Putzel, Louis, and Noël Kabuyaya. 2011. Chinese aid, trade, and investment, and the forests of the Democratic Republic of Congo. Working Paper 82: Center for International Forestry Research (CIFOR), Bogor, Indonesia.
Samndong, R.A. and Nhantumbo, I. 2015. Natural Resources Governance in the Democratic Republic of Congo: Breaking Sector Walls for Sustainable Land Use Development. IIED Country Report. IIED's Natural Resource Group. London.
Seyler, James R., Duncan Thomas, Nicolas Mwanza, and Augustin Mpoyi. 2010. Prosperity, Livelihoods and Conserving Ecosystems Indefinite Quantity Contract (PLACE IQC). USAID, Democratic Republic of the Congo. Available from: https://pdf.usaid.gov/pdf_docs/Pnads946.pdf
Rainforest Foundation UK. 2020. *Mapping the future: towards meaningful participation of forest peoples in land use planning in DRC and Cameroon*. Accessed from: https://www.rainforestfoundationuk.org/media/9a32f99c-8a50-4515-bea7-647ac2d2d439.
Schmidt-Soltau, Kai. 2010. "Evictions from DRC's protected areas." *Forced migration review*. Accessed from https://www.fmreview.org/DRCongo.
UNEP (United Nations Environmental Program). 2022. *World Database of Protected Areas*. Accessed from https://www.arcgis.com/home/item.html?id=ae78aeb913a343d69e950b53e29076f7 on June 22, 2022.
USAID. 2010. *Democratic Republic of Congo: Biodiversity and tropical forestry assessment*. Accessed from: https://pdf.usaid.gov/pdf_docs/Pnads946.pdf.
The World Bank. 2021. *DRC Country Overview*. Accessed from: https://www.worldbank.org/en/country/drc/overview. Accessed 05 06 2022.
The World Bank. 2022. *Macro Poverty Outlook for the Democratic Republic of Congo*. Accessed from: https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099037504262221926/idu07421d2520fe95041420a88d0bc58222ba500 on April 7, 2022.
Yanggen, D., Angu, K., and Tchamou, N. (eds). 2010. *Landscape-scale Conservation in the Congo Basin: Lessons Learned from the Central African Regional Program for the Environment (CARPE).* Gland, Switzerland. Accessed from: https://portals.iucn.org/library/efiles/documents/2010-037.pdf.

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 critical contributions of FOCUS BRI:

1. Country Case Studies

A. Country Selection

Country selection played an essential 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 on Africa and Asia, representing most 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 critical 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 to 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 projects. The layer for Chinese-backed LI was overlaid with PAs, KBAs, and the three percentile cores,

[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.

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 the DRC:

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

DRC	70th Percentile Core	80th Percentile Core	90th Percentile Core
CBI Core Area (km^2)	696404	464637	231562
Overlap with Protected Areas (km^2)	116679	105324	77039.2
Percentage of CBI Core within PAs (%)	16.7545	22.668	33.2694

Chinese-funded LI across DRC

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

LI Mode	Length
Road (km)	761.714364
Rail (km)	0
Transmission (km)	0

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

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

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

Length of Chinese-funded LI within CBI Cores in DRC

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)	31.289811	19.30137	8.31064
Rail (km)	0	0	0
Transmission (km)	0	0	0