CENTER for LARGE LANDSCAPE CONSERVATION

FOCUS-BRI Country Report

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

Kazakhstan

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Acronyms

ACBK	Association for the Conservation of Biodiversity of Kazakhstan
ADB	Asian Development Bank
BRI	Belt and Road Initiative
CAREC	Central Asian Regional Economic Cooperation
CBI	Composite Biodiversity Index
CBD	Convention on Biological Diversity
CDB	China Development Bank
CHEXIM	China Export-Import Bank
EIA	Environmental Impact Assessment
FDI	Foreign Direct Investment
FZS	Frankfurt Zoological Society
GDP	Gross Domestic Product
IUCN	International Union for the Conservation of Nature
KBA	Key Biodiversity Area
LI	Linear Infrastructure
NGO	Non-Governmental Organization
PA	Protected Area
RSPB	Royal Society for the Preservation of Birds
SEZ	Special Economic Zone
UNDP	United Nations Development Program
WCS	Wildlife Conservation Society
WWF	World Wildlife Fund

Kazakhstan Factsheet

Figure 1. *Political map of Kazakhstan. Source: Nationsonline.org.*

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

Region	Central Asia
Capital	Nur-Sultan
BRI Corridor	two of six BRI corridors pass through Kazakhstan connecting China with Europe, Iran, and Western Asia.
BRI investment	US$ 50,000 million
Income Status	Upper middle income
Population	18.75 million (2020)
GDP	169.8 billion USD (2020)
Land Area	2,699,700 km^2
Protected Areas (km^2)	Approx. 89,360 km^2
Protected Areas (ranking)	169
Species Richness (ranking)	61
Biodiversity Intactness (ranking)	88
ND-GAIN Country Index; Climate vulnerability (ranking)	40
GDP Growth Rate Projections	4-5.5%
Inequality (Gini Coefficient)	72.2
Human Development Index (HDI)	0.83
Key exports	natural gas, ferrous metals, copper, aluminum, zinc, and uranium.

I. Introduction

In January 2021, President Kassym-Jomart Tokayev signed Kazakhstan's new Environmental or Ecological Code (No 400-VI 3PK) into law. It was enacted to eliminate the shortcomings of the previous 2007 Environmental Code, namely the failure to prevent industrial pollution. The new Environmental Code was implemented primarily due to domestic pressure on the extractives industry to reduce pollution and international pressures on the Kazakh state to fulfill its international environmental obligations (Makhmetova, 2021). The new code aims to reduce industrial pollution and related challenges like biodiversity loss by encouraging environmental impact assessments (EIAs) and heightened industrial activity monitoring.

Despite the scant mention of linear infrastructure in the new Environmental Code, Kazakh conservationists are hopeful that EIAs mandated for proposed industrial projects outlined in the code can be used to protect species affected by current linear infrastructure (LI) investments. Some cite this hope in reference to BRI projects, despite observations that Chinese investors have thus far shown little concern for biodiversity conservation (Key Informant Interview). However, conservation challenges surrounding LI require more than a "creative" application of the new Environmental code—conservationists and environmental policy experts also call for greater data transparency and centralizing data about LI, EIAs, and species migration and habitat data. See Figure 2 for the intersections of Kazakhstan's protected areas and linear infrastructure.

Thus, this report on Kazakhstan will:

1. Explore the policy and informal infrastructure that shape linear infrastructure development and the biodiversity conservation space in Kazakhstan.
2. Explain how China navigates Kazakh policy infrastructure to build roads, rail, and powerlines.
3. Illustrate opportunities for engagement and advocacy for biodiversity conservation, including discussing how existing policy infrastructure, specifically articles within the New Environmental Code, can be used to support biodiversity conservation as it pertains to BRI-driven linear infrastructure in Kazakhstan, build domestic technical capacity to conduct and enforce EIAs, mainstreaming a list of NGOs and providing financial support to NGOs, addressing LI project data gaps.

II. Linear Infrastructure Investment Landscape

Investment conditions favor linear infrastructure development in Kazakhstan. Kazakhstan has attracted significant foreign investment since its independence from the Soviet Union. As of January 1, 2021, foreign direct investment in Kazakhstan totaled US$166.4 billion, mainly in the oil and gas sector. The government of Kazakhstan has incrementally improved the business climate for foreign investors. Corruption, lack of the rule of law, and excessive bureaucracy, however, remain serious obstacles to foreign investment, though this may not be a great barrier for Chinese investors (Investment Climate Statements: Kazakhstan, 2021).

Linear infrastructure development is at the core of Kazakhstan's development strategy (Fig. 2). The most recent strategy document is focused on transitioning from exporting oil to serving as a regional transportation hub for goods transported from East Asia to Europe. It also aims to limit its dependence on Russia and Russian investment in extractive infrastructure. It instead aims to build its relationship with China and build roads and rail to connect Western China to

Europe, thus serving as the "buckle" in the belt of the Belt and Road Initiative. Thus, we can expect a growth in linear infrastructure investment and development in Kazakhstan in the coming years. Kazakhstan is expected to invest more than US$9 billion to develop and modernize its roads, railways, and other infrastructure to support overland freight transport. The country's transport sector is expected to support the country's economic growth over the next five years. The regions with the heaviest investment are Atyrau, Nur Sultan, and Almaty. Foreign governments engage with this investment via - providing engineering, construction and project management services, advanced materials and energy efficiency technologies, road construction machinery, precision navigation equipment, and process automation technologies in addition to safety and security products and services (ITA, 2022). Currently, the Ministry of Industry and Infrastructure Development of Kazakhstan is conducting a feasibility study on the construction of the Turkestan-Shymkent-Tashkent high-speed rail project for which two options have been planned, one that proposes the modernization of existing railways and another that suggests building new ones.

(a) (b)

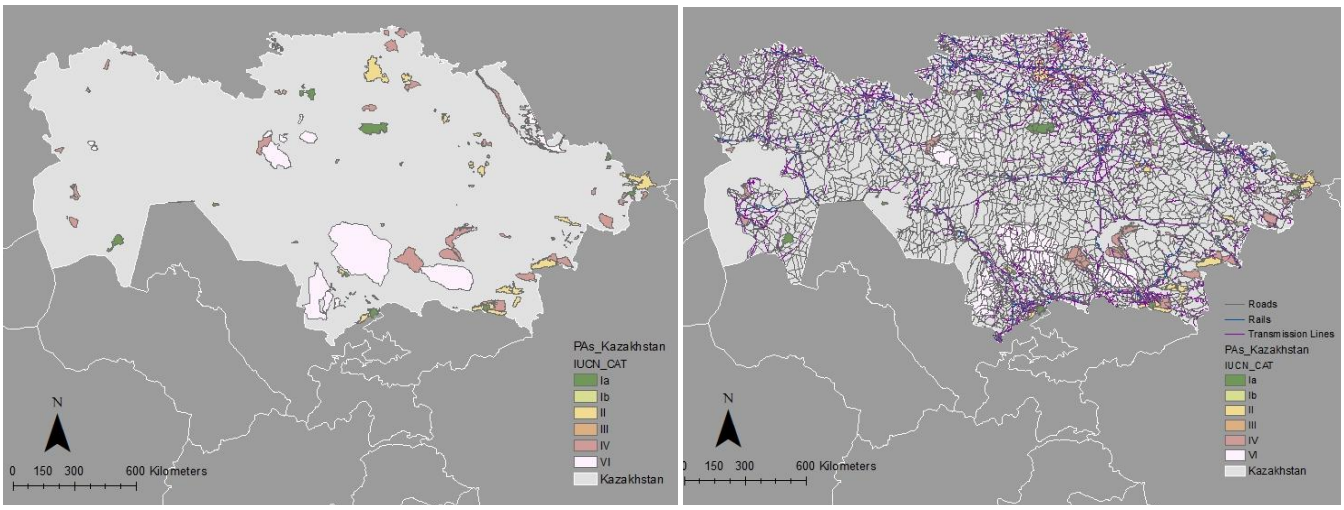

Figure 2. (a) *The protected areas in Kazakhstan are categorized according to IUCN classification, where category I is the most regulated and VI is the least.* ***(b)*** *Linear infrastructure already compromises many protected areas across the country. See Appendix A for Methodology.*

China in Kazakhstan: Geopolitics, Infrastructure, and Biodiversity Conservation

In September 2013, Chinese President Xi Jinping announced the "One Belt One Road" (now Belt and Road Initiative or BRI) in Kazakhstan. Kazakh leadership has come to consider itself the "belt buckle" in the BRI, and a keystone of the land-based dimension of the BRI, connecting the East and the West (Zogg, 2019). Kazakhstan was already a close partner of China, having collaborated on various large infrastructure projects before the BRI, specifically in energy and transportation. The country extends across the vast Eurasian landmass, which is rich in oil and minerals and holds an important geo-strategic position, bridging East Asia and Europe. The central Chinese government considers Kazakhstan's connectivity critical for its cross-country land-based transit goals. In addition, Kazakhstan is an appealing energy source, as it is rich in oil and uranium and is considered a stable neighbor of its unstable Xinjiang province, despite overall anti-Chinese sentiment in Kazakhstan regarding the treatment of the Uyghur population (Baldakova, 2021).

Before the BRI, China invested billions in Kazakhstan's energy and transport infrastructure. In the energy sector, bilateral cooperation has been advancing since the 1990s due to the complementary objectives and geographic proximity of

resource-rich Kazakhstan and energy-hungry China (Kassenova, 2017). There have also been consistent efforts to build strong transportation infrastructure networks to connect the two countries. Unlike Russia (China's traditional land gateway to Europe), Kazakhstan is enthusiastic about serving as a transit hub between Europe and Asia. Becoming the bridge between East and West has been at the core of Kazakhstan's development strategy since its independence from the USSR. A series of projects have been launched since the 1990s, including the first railway line from Dostyk in Kazakhstan to Alashankou in China and the second at Khorgos, where the two sides began building an ambitious, multi-modal logistics hub, dry port, and special economic zone (SEZ) known as the Khorgos–Eastern Gate, which launched in 2012. In 2008, Kazakhstan began constructing the West Europe–West China Highway, which stretches from St. Petersburg on the Baltic Sea to the Lianyungang port on the Yellow Sea and is also connected to the Khorgos–Eastern Gate SEZ. The Kazakh government believes enhancing its transit potential will also help it become more internally connected. For example, Astana's key motivation for joining the Central Asia–China gas pipeline project was to satisfy domestic gas consumption needs by connecting its oil-rich west with the densely populated south (Kassenova, 2017).

The Kazakh government has embraced Beijing's efforts to establish Kazakhstan as "a regional transit hub" because they were in line with its national development and geopolitical strategies. Kazakhstan has been trying to limit its dependence on Russia and aims to do so by moving closer to China as a regional economic partner. See Table 2 for details on Chinese loans in Kazakhstan between 2008 and 2019.The Kazakh government has even established its initiative to direct foreign investment, especially Chinese investment, called the Nurly Zhol or "Bright Path". The Nurly Zhol (launched in 2014 and originally supposed to last five years) is a large-scale program to build up domestic transportation, industry, energy, and related institutions. China and Kazakhstan agreed on three priorities for infrastructure construction: the priority is the construction of transportation infrastructure along the following corridors: China–Kazakhstan–West Asia; China–Kazakhstan–Russia–Western Europe; and China–Kazakhstan–South Caucasus/Turkey–Europe. Their second priority, trade, addresses the "simulation and optimization of trade, increasing the share of high-tech products and coordination of certification policies" (Kassenova, 2017). The third priority, manufacturing industries, focuses on the creation of joint ventures in Kazakhstan's SEZ, namely the Khorgos–Eastern Gate in Almaty Oblast and the National Industrial Petrochemical Technopark in Atyrau Oblast, as well as cooperation on biotechnology, energy, engineering technology, automobiles, construction materials, and textiles (Kassenova, 2017).

Table 2. *CDB and CHEXIM infrastructure loans to Kazakhstan 2008-2019*

Project	Type	Borrower	Lender	Signed	Total (USD millions)
Polypropylene plant in Atyrau	Petrochemical Manufacturing	Public	CHEXIM	2011	1,130.00
Atyrau Petrochemical Complex	Petrochemical Manufacturing	Public	CHEXIM	2008	1260.00
Third Unit of Ekibastuz GRES-2 Power Plant with Russia	Fossil Fuel Electric Power Generation	Public	CDB	2013	400.00
ENRC iron ore project	Iron and Steel Mills and Ferroalloy Manufacturing	Public	CDB	2011	1,600.00
ENRC chrome project	Non-Ferrous Metal (except Aluminum) Smelting and Refining	Public	CDB	2011	400.00
Beineu-Bozoi-Shymkent Gas Pipeline (Construction)	Pipeline Transportation of Natural Gas	SOE	CDB	2011	2500.00
Astana Light Rail Construction	Highway, Street, and Bridge Construction	Public	CDB	2015	1800.00
				Total: US$: 9090.00	

Despite public interest surrounding Chinese projects in Kazakhstan, there is very little publicly available information regarding proposed and accepted projects and related financial arrangements, not only making it difficult to encourage multi-stakeholder governance of the projects and evaluate impacts on the environment and biodiversity. There have been protests regarding Chinese land grabs in Kazakhstan, slowly souring public perceptions of China and the BRI, despite continued cooperation on behalf of the government, which is notoriously secretive and "closed." However, recent changes to the environmental code of Kazakhstan may push Chinese companies and the Kazakh state to share more information regarding LI effects on local species and their habitats via more rigorous environmental impact assessments. As it currently stands, there is little mention of biodiversity safeguarding in the policy that regulates and stipulates initiatives to shape and direct Chinese investments in infrastructure i.e., in the *Nurly Zhol*.

III. Kazakhstan's Biodiversity Landscape

The landscapes of upland Kazakhstan include steppe, shrublands, pinewoods, lakes, and wetlands that expand over 270,000,000 hectares (ha), much of which comprise critical and endangered ecoregions (Gloss & Ahmed, 2019). Kazakhstan's four major ecological systems include desert (32%), steppe (28%), mountain (7%) and forest (2% of the area of the country). The remaining area includes pastures (8%), fallow lands (4%), and agricultural land. Two major migration routes cross the Kazakh territory, i.e., the West Siberian-African and Central Asian-Indian. The Kazakh landscape is under threat, as pastoral livelihoods have lost ground to agricultural and urban development, and changes in grazing patterns have destabilized many of the ecosystems in the steppes and plains (Gloss & Ahmed, 2019).

The rare combination of flora and landscape mix of boreal, steppe, and desert plants makes for an equally rare group of fauna, including waterfowl, and saiga, the main regional game animal in the southern desertified steppes. Many Kazakhs hunt saiga for their meat and engage in the export of horns, which are used in Eastern medicine. Although waterfowl and saiga dominate conversations on biodiversity conservation in Kazakhstan, there are many other rare and endangered species, including 47 species of mammals, 279 species of birds (including 30 rare species such as nesting populations of the short-toed eagle, white-tailed eagle, imperial eagle, saker falcon, white and Dalmatian pelicans), ten species of reptiles, ten fish species, and thousands of invertebrates (see Box 1).

To better visualize biodiversity across the country, including its protection and threats, Figure 3 displays a Composite Biodiversity Index (CBI, see Appendix A), Key Biodiversity Areas (KBAs), and Kazakhstan's National Parks. They also include the Chinese-funded LI captured in AidData's Chinese Development Projects dataset. The lands that are protected by parks tend to have extremely high biodiversity. On the flip side, these parks cover a mere 8% of the 90th percentile biodiversity cores. That is, of the most biodiverse lands in the country, only a tiny fraction are protected to the full extent of the law. Further description, analysis, and summary tables of the spatial distribution of biodiversity, protected areas, and linear infrastructure are detailed in Appendix A.

(a) (b)

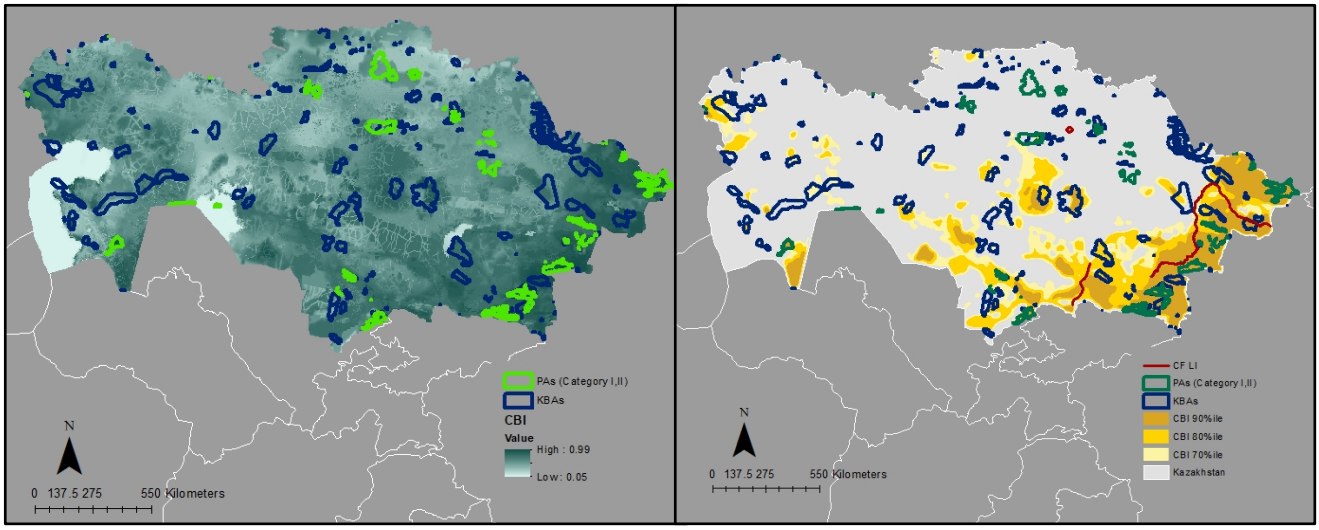

Figure 3 (a) *In Kazakhstan, PAs with the greatest protection (at IUCN Category II) and KBAs do not have high overlap with areas of high CBI values.* ***(b)*** *Many CBI core areas remain unprotected - see the country's eastern edge, for instance. Chinese-funded linear infrastructure refers to road, rail, and transmission (or power line) projects from Aid Data's Chinese development projects (Custer et al., 2021). Methodology and further analysis in Appendix A.*

Box 1. Rare Mammals and Avifauna in Kazakhstan

Source: World Wildlife Fund-Central Asia: Kazakhstan

Mammals

Saiga (Saiga tatarica); Desman (Desmana moschata); giant mole rat (Spalax giganteus); marble polecat (Vormela peregusna); Russian polecat (Mustela eversmanni), fox (Vulpes vulpes), corsac fox (V. corsac), wolf (Canis lupus); marmot (Marmota bobac), ground squirrels (Spermophilus fulvus, Sp. major, Sp. pygmaeus), rodent groups (Cricetus cricetus, Lagurus lagurus, Microtus sp.); long-eared hedgehog (Erinaceus auritus); jerboas (Allactaga major, Stylodipus telum); hare (Lepus europaeus); moose (Alces alces), Siberian roe deer (Capreolus pygargus); lynx (Lynx); common hedgehog (Erinaceus europaeus); hare (Lepus timidus); badger (Meles meles); Ermine (Mustela erminea); weasel (Mustela nivalis); common marten (Martes martes); racoon-like dog (Nyctereutes procyonoides); wild boar (Sus scrofa); Jerboas (Pygerythrus, Pygerethmus pumilio); forest marten (Martes martes).

Avifauna- Steppe species, Birds of Prey, & Rare Nesting Species

Lark; wheatears; pipits; Chettusia gregaria; Otis tetrax; Anthropoides virgo; Circus macrourus; Circus pygargus; Aquila rapax; great bustard (Otis tarda); blackcock (Lyrurus tetrix); Dendrocopos major; Oriolus oriolus; Columba palumbus; Streptopelia turtur; Parus cyanus; Phoenicurus phoenicurus; Anthus trivialis; Falco tinnunculus; F. vespertinus; F. subbuteo; F. columbarius; swans (Cygnus olor Cygnus cygnus); Grey geese (Anser anser); ducks and pochards (Anas platyrhynchos, A. strepera, A. acuta, A. clypeata, A. querquedula, Aythya ferin, Netta rufina, Aythya fuligula); Fulica atra; Podiceps; Larus; Sterna; Chlidonias; Gelochelidon; Pelecani formes; Charadriiformes; Falco naumanni; Circus macrourus; Pelecanus crispus

Pelecanus onocrotalus; Cygnus cygnus; Oxyura leucocephala; Platalea leucorodia; Grus grus; Anthropoides virgo; Haliaeetus albicilla; Aquila chrysaetos; Aquila heliaca; Aquila rapax; Falco cherrug; Otis tarda; Otis tetrix; Chettusia gregaria; Syrrhaptes paradoxus; Bubo bubo; Larus ichthyaetus; Cygnus bewickii; Branta ruficollis; Aythya nyroca; Melanitta fusca; Grus leucogeranus; Pandion haliaetus; Falco peregrinus; Numenius tenuirostris; Phoenicopterus roseus; Egretta garzetta; Ardeola ralloides; Plegadis falcinellus; Pterocles orientalis; Haliaeetus leucoryphus; Ancer erythropus. Note: Twelve of these species are included in the IUCN Red Data book. 3- 3.5 million geese fly through the ecoregion during migration, including 23 to 53% of the European population of Anser erythropus and about 100 % of the population of Branta ruficollis.

Despite the bio-sensitivity of the Kazakh ecoregions, there are only a few protected areas, which too are only weakly protected. Thus Kazakh land and its flora and fauna are repeatedly threatened by human activities centered around economic growth and profit. The greatest pressures on biodiversity in Kazakhstan are linked to oil and gas extraction, coal extraction, extraction of uranium and other minerals, rock and slag run-off, atmospheric pollution, draining, waste storage, road construction, electric power transmission lines, oil and gas pipelines, channels and water reservoirs, and irrigation (CBD, 2022). Such activities contribute to biodiversity loss in a variety of ways, including water, soil, and atmospheric pollution; accumulation of radionuclides in the biota; settlement and spreading of invasive species; and accumulation of heavy metals, pesticides, herbicides, and defoliants (CBD, 2022).

Approximately 14.8 million ha (5.44%) of Kazakhstan's land is protected, including 9 natural reserves, 4 national parks, 60 reserve plots, 24 nature memorials under republican jurisdiction, 3 zoological parks, 5 botanical gardens, several dendrological parks, 3 water lands recognized to be of international importance by the Ramsar Convention, and 150 water cavities that are relevant to the state and water governance (CBD, 2022). Protected areas primarily span the mountainous regions of the Aksu-Dzhabagly and Alamtinsky nature reserves. While the Saryarka-Steppe and Lakes of Northern Kazakhstan World Heritage Site, covering three lake and steppe areas, are protected, the amount of protection for the remaining steppes is very low ("One Earth-Kazakh Steppe", 2022). The desert and semi-desert ecosystems are the least protected despite covering upwards of 50% of Kazakhstan. The only desert and semi-desert reserves are Ustyurtskyi and Barsakelmeskyi. The Kazakh semi-desert is mostly covered by grassland (> 67% of area) with some areas of bare soil in desert areas. After the collapse of the Soviet Union, many of the once arable lands were abandoned and regenerated. The northeastern part of the ecoregion was subject to nuclear tests. While the ecoregion is now recovering, it has yet to be designated as a "protected area" ("One Earth-Kazakh Semi-Desert", 2022).

Land conservation is largely centralized under the direction of the national government, though regional and local governments also play a role. In general, state conservation efforts outweigh private, civic, and community conservation by design. Kazakhstan's land code states this quite explicitly, asserting that "Earth's protected areas are state-owned and not subject to privatization" ("Republic of Kazakhstan Land Code", 2003). Each protected area is registered either as the possession of a state-owned corporate entity or the national or regional government. The three different categories of natural gardens—functionally, smaller natural areas with high profile natural features for which to charge admission—are treated as state enterprises. Gardens of zoological, botanic, and dendrological interest are maintained by state enterprises created for the express purpose of their management. The biodiversity-oriented protected areas at the national level—natural park, natural reserve, and wilderness area—are granted full legal status as state agencies. In this case, the agency is granted permanent tenure to state-owned land. These institutions may serve as the guardians of monuments and preserves, which do not have state-owned corporations for the express purpose of their individual management. The 2003 Land Code prohibits the transfer (lease or sale) of protected areas, except for small areas needed for the development of

tourism facilities. Activities can be conducted in protected areas for the following purposes: scientific, cultural, educational, tourist and recreational, and limited economic purposes. Article 46 of the 2006 Protected Areas Law specifies the leasing procedures for permitted private enterprises in protected areas. Land use around protected areas may also be restricted by buffer zone status (Gloss & Ahmed, 2019).

Linear infrastructure and biodiversity in Kazakhstan

The development of roads, railways, and powerlines in Kazakhstan pose threats primarily to migratory species like the saiga antelope and Steppe eagle, which already face biophysical challenges to their survival as a result of pollution and other development-driven externalities. The grasslands of Kazakhstan are also home to other species, some endangered and critically endangered, like the saiga Antelope, Siberian Roe Deer, wolves, foxes, badgers, susliks, marmots, varied bird species, and more. These species' habitat covers hundreds of thousands of square kilometers of ecologically intact grassland which the construction of roads has recently disrupted, railways, and powerlines (IUCN, 2018; Olson & Van Der Ree, 2015). The vast grassland that extends across both Kazakhstan and Mongolia makes up nearly 7,000 km^2 of habitat for these species. Many of these species require access to large grassland areas to survive and raise offspring. Kazakhstan is 2,724,900 km^2, and steppe ecosystems occupy more than 40%. Kazakhstan's steppe is the world's largest dry steppe region as the vast belt of dry grassland runs across the country along the latitudes 48° to 50°N.

Since the 1960s, the Kazakh government has worked to rapidly expand its overland transportation network to support trade and natural resource extraction by building out the Asian Highway Network, The Central Asia Regional Economic Cooperation (CAREC) program, and the Central Asian Highway Network (Zogg, 2019). These initiatives catalyzed the development of expansive linear infrastructure that now threatens the steppe habitats upon which many species depend for survival. The CAREC program, which was developed and implemented by the Asian Development Bank in 2014, consists of 10 countries that aim to achieve economic development and reduce poverty through cooperation on cross-country transportation. With trade increasing between Asia and Europe and the rise of China as the "workshop of the world," the CAREC corridors and Central Asia Highway gain more importance. As of 2015, 5% of the total volume of trade between Asia and Europe currently goes overland. Both road and rail transport are more expensive, but also significantly more efficient, than the dominant overseas method of transport. Infrastructural improvements will make overland transit more competitive against sea routes and increase traffic along major trade routes.

The government of Kazakhstan aims to build up roads and railways to harvest revenue generated from increased traffic volume and a stronger capacity to support trade, including creating new routes, increased customs capacity, faster container transfer times between different railways, improvements to existing roads and railways, and more. The recently constructed east-west railway to Europe from Asia via the Caspian Sea port of Aktau allows trains to change tracks if one is congested and reduces the reliance on Russian transit routes. The Kazakh state is focused on building domestic transportation infrastructure in order to support more efficient ground-based trade between Asia and Europe as well as developing renewable energy for domestic consumption, possibly as a means to be able to export more oil and thus make a greater profit (Key Informant Interview). Unrelated to regional development goals, the private sector, primarily extractive companies, are promot-ing linear infrastructure projects that are specific to their transportation needs ("CMS Guidelines", 2018).

Although the development of roads and railways may support the Kazakh state's development goals, they often disrupt indigenous species' migration routes and access to seasonal resources, thus causing the decline of their populations. For highly mobile grazing species like the saiga antelope, physical barriers have dire consequences on their ability to persist in an otherwise healthy steppe ecosystem. Barrier effects exist from fences along national borders and railways, as well as high- traffic-volume transcontinental roads and railways (Ito et al., 2013). saiga antelope grazing and migration patterns

have changed due to the recent construction of intercontinental railroads, lowering their overall populations (Kaczensky et al., 2011). In fact, the expansion of the existing railway through the habitat of the Ustyurt and the Betpak-Dala populations of saiga antelope is enough to cause local saiga extinctions (Olson et al., 2013).

The rise of Chinese investment in Kazakhstan as an extension of the Belt and Road Initiative has been met with international concern for biodiversity safeguards in linear infrastructure. Domestically, however, there seems to be little concern for monitoring and evaluating Chinese projects (Key Informant Interviews). The Kazakh government appears more concerned with directing BRI investment towards domestic economic development goals (and specifically in expanding and strengthening its cross-country transportation networks) than ensuring that Chinese investors are following newly established biodiversity conservation and environmental laws. Overall, there is minimal oversight, both as a result of limited capacity and perhaps, priority on the behalf of the government.

***Box 2. Perspectives*: LI, Saiga Protection, Challenges, and Recommendations**

The following is a collection of ideas paraphrased from a Key Informant Interview with a Kazakh conservation expert

Observation: Saiga populations appear defined by railway corridors that have been in use for over a century and which have recently become major intercontinental rail routes. Their migration patterns are highly impacted by how infrastructure is constructed and whether or not it is possible to easily cross roads and rail. Those with more barriers - i.e. walls surrounding roads - see greater difficulty in crossing. Where such barriers do not exist, saiga seem to be more concerned by traffic volume than they are by the roads themselves. Populations of saiga in Kazakhstan's Ustyurt region used to migrate to Uzbekistan, but when a new railway was built in 2013, ACBK tracked saiga and found that this migration had stopped. When the railway was planned, ACBK/WCS had provided recommendations for locations through which saiga could continue to cross, but few government officials and companies listened. LI doesn't work as a physical barrier but rather as a deterrent due to fear of movement (of cars/trains). These organizations had provided an alternative pathway for the road but the government thought this alternative would not be able to carry an appropriate number of cars. Saiga are afraid of traffic, but are not worried about the road itself and don't see it as a barrier. The World Bank was the original funder then state-funded. There wasn't much public support for the road either (may or may not be related to care for biodiversity).

Recommendations: Invest in NGOs for LI alternatives research.

Box 3. Perspectives: Chinese Investments and the New Environmental Code

The following is a collection of ideas paraphrased from a Key Informant Interview with a Kazakh conservation expert

Observation: Kazakhstan has a significant lack of data on the environment and its protection. Most of the data that exists is about industrial pollution from the extractives industry and comes directly from companies. Some companies' social responsibility reports have environmental performance data. There is high variation in how companies share or express their data on environmental performance. There is significant "data masking" (manipulating statistics) in environmental data collection across government and industry. Policies, including the Environmental Code and Nurly Zhol, are still in nascent stages concerning conservation. Corruption is still high, and back door payments are pervasive; when companies get fined for pollution, the government uses fines to sponsor green expos to illustrate their progress on clean energy. This is an example of greenwashing, where the company still pays fines. Still, the reward for paying the fine is associated with the national alternative energy expo, which is about environmental sustainability. Lack of data on environmental challenges leads to mostly qualitative analysis/Key Informant Interviews in environmental research.

China recently invested in roads and railways that span Kazakhstan and are designed to transport goods to Europe. Additionally, China bought PetroKazakhstan in 2006. Given that Kazakhstan is trying to reduce reliance on Russia, and is looking to diversify its foreign investment (another option was the Indian State Oil Company that would have used the Russian Pipeline), China is a politically and economically strong partner. Current gas pipelines go through Russia but Kazakhstan, with the help of China, is trying to build up alternative pipelines that extend through China and aim to reach the Caspian Sea. Regardless, Kazakhstan aims to limit its dependence on oil given the volatility of oil prices and subsequent political and economic uncertainty caused by this volatility. For example, the Nurly Zhol is intended to drive Kazakhstan's diversification away from oil. The Nurly Zhol requires that companies investing in extractives must also promise money to other industries like agriculture, manufacturing, etc. Kazakhstan also aims to be "everyone's economic friend". Overall, Kazakhstan wants to transition from exporting mostly oil to being a transport hub, which will invite a slew of new LI projects.

Recommendations: Encourage the collection and centralization of environmental data, and advocate for policy safeguards for conservation in existing policy infrastructure (i.e. New Environmental Code and Nurly Zhol) given Kazakhstan's intended transition from an oil-dependent economy, to a transportation-hub focused economy.

IV. Country policy and planning landscape for biodiversity and infrastructure

The conversation surrounding linear infrastructure in Kazakhstan rarely involves topics of biodiversity conservation and environmental sustainability. The main concern and subsequent policy infrastructure is catered toward greening power sources and addressing rising domestic pollution. The recent environmental policy movement is a result of rising and unchecked pollution due to the infrastructural development in the transportation and energy sectors. In January 2021, the Ministry of Ecology, Geology, and Natural Resources signed the New Ecological Code into law. The previous Environmental Code (signed into law in the early 2000s), played an important role in promoting environmental protection, though many of its provisions proved to be ineffective. In particular, the Code's enforcement mechanisms mostly involved fines for polluting activities that were designed to replenish the state budget. It often forced polluting companies to pay dues to the state that supported national expos showcasing Kazakh prowess in environmental protection, essentially enabling industrial greenwashing, rather than supporting effective mitigation measures, according to one key informant. Although the old Environmental Code aimed to utilize EIAs and environmental permits for large infrastructure projects, they were weakly enforced and rarely effective in encouraging sustainability. There is also still

limited legislative regulation of waste, limited public participation in environmental control and standard-setting, and weak procedures for economic assessment of environmental damage (Makhmetova, 2021).

The new Environmental Code of the Republic of Kazakhstan aims to address the identified shortcomings of the current code (identified via implementation assessments of the current code) by encouraging public participation in environmental decision-making by the state, strengthening enforcement mechanisms, and encouraging the use of environmental impact assessments more strongly to address biodiversity conservation challenges. The government's recent review of environmental challenges in Kazakhstan has produced the most recent Kazakh environmental policy infrastructure and subsequent safeguards. Biodiversity safeguards are still generally lacking even in the new Environmental Code (Key Informant Interview). Advocacy for environmental protection led to the passage of a new environmental code. That, in combination with the Nurly Zhol, an initiative to shape BRI to match Kazakh development goals, has led to a new era for linear infrastructure in Kazakhstan, where the deficits are more in coordination and capacity than advocacy. Both pieces of legislation and initiatives are new, often lacking coordination. Despite domestic pushes for environmental protection and conservation in Kazakhstan, China has done little to integrate such protections into its projects in the country.

There exist differences in Chinese-funded vs Chinese-constructed projects in Kazakhstan and thus opportunities for biodiversity conservation differ within the context of BRI. The primary environmental concerns that are incorporated in these projects are pollution and the conservation of endangered species i.e. the steppe eagle, saiga, etc. However, given that environmental issues are a relatively new priority (since 2021) and Kazakhstan is a closed regime, there is limited data regarding environmental challenges, Chinese investment in linear infrastructure, or environmental and biodiversity characteristics more generally. Additionally, few of the existing reports on Chinese development and or environmental conservation are in English.

Box 4. Utilizing Environmental Impact Assessments for Biodiversity Conservation

Utilizing the New Ecological Code for Biodiversity Conservation

There exists limited mention of biodiversity conservation in the new Ecological Code. Due to the Kazakh state's restrictions on civil society and subsequent protest and lobbying efforts, it would be most effective to use the New Code's framework for Environmental Impact Assessments to encourage biodiversity safeguards in LI.

Under the new Ecological Code code, activities that have a significant impact on the environment shall be subject to the obligatory EIA (See Sections 1 and 2). Activities listed in Section 1 of Annex 1 of the Code are subject to screening of planned activity - a procedure that enables the competent authority to determine whether the planned activity in each specific case can have a significant impact on the environment to then evaluate whether the EIA is required. If the nature of the activity causes specific impacts on groundwater, flora and fauna, or the atmosphere, an EIA is likely to be required. While EIA scoping, the competent authority will establish what impacts require detailed study, what research methods apply, what minimum information sources are used, and what alternative options for performing activities are to be considered when choosing the final one.

The most critical part of the EIA is the possible impacts report. Based on such reports, the EIA authority will issue EIA opinions - documents confirming the conclusions on the possible significant impacts of the planned activity on the environment, the admissibility of the planned activity, and the conditions under which the activity is recognized as admissible. The new Code

requires creating the conditions necessary to ensure participation of the interested public and interested state authorities at all EIA stages.

While screening and EIA scoping, authorities will collect, consider and consider the comments and proposals of the interested authorities and the public (i.e., NGOs that present evidence in support of or against the proposed project) received within the specified time. The possible impact report will be submitted to public hearings upon completion. Where there are still comments and suggestions after the public hearings, the initiator of the planned activity will have to arrange the report completion and submit it to repeated public hearings. Suppose during repeated public hearings the comments and suggestions are not removed, and the initiator does not agree with them. In that case, the case will be considered by an expert commission, which would include one representative of the National Chamber of Entrepreneurs of the Republic of Kazakhstan and one representative of an accredited non-profit organization, in addition to the representatives of the public and state authorities.

Thus, the EIA processes are aimed at ensuring a detailed study of the significant impacts of the planned activity on the environment, application of research methods that correspond to the current level of knowledge development, the participation of the interested public and state authorities at all EIA stages, and the opportunity for the interested public to defend their rights and legitimate interests during the EIA.

Recommendations: Consultations with researchers over the initial findings of the EIA and public hearings are good spaces to identify opportunities for biodiversity safeguarding and provide alternatives to proposed LI projects if proven to be ecologically problematic.

V. Understanding stakeholders and power dynamics

A graphical representation of all the key actors in the infrastructure and biodiversity realm are presented below (Fig. 4)

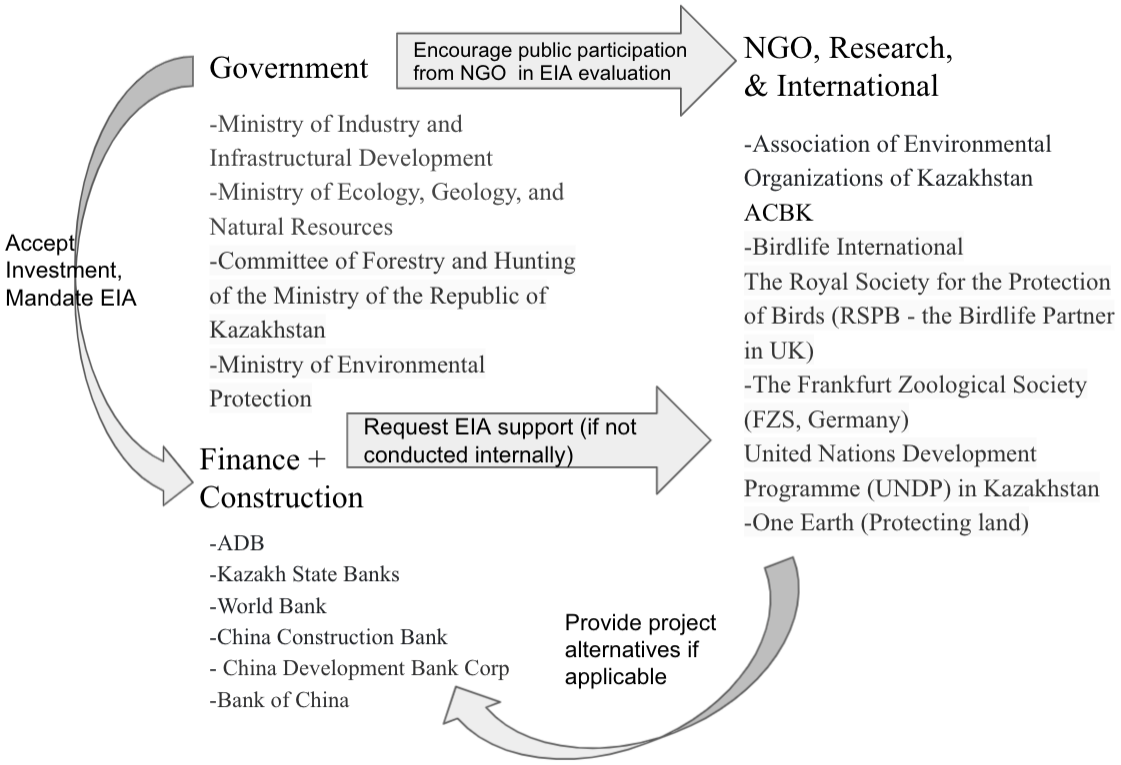

Figure 4. *Stakeholders and power dynamics*

VII. Recommendations

There are a suite of clear barriers to address and potential interventions to bolster safeguards for large LI projects in Kazakhstan. Given that environmental issues are a relatively new priority and the fact that Kazakhstan is a closed regime, data availability on environmental challenges, Chinese investment in linear infrastructure, and more is quite limited. Additionally, there are few reports available on China, Chinese investment, and conservation in Kazakhstan in English. Broadly, opportunities for assistance include capacity building for biodiversity conservation - particularly with birds of prey, saiga, snow leopard, and other species most affected by linear infrastructure. The new Ecological Code has produced a demand for new EIA infrastructure, as companies are under more pressure to address biodiversity conservation concerns before starting projects. But many relevant organizations within the country are short-staffed, often looking towards the country's universities to recruit research assistants and help fill capacity gaps.

Generally, the most important interventions involve capacity development for EIAs, highlighting and supporting the country's NGOs, and addressing data gaps. High-priority action items include collaborating with universities and local NGOs to build datasets on linear infrastructure and training a workforce to conduct robust EIAs for linear infrastructure projects. Specifically, collaborating with the ACBK on EIAs that are being requested by companies investing in Kazakhstan would be effective. Other action items include delineating protected regions and sharing information on alternative techniques and technologies for infrastructural construction that are best for migratory species, and advocating for the best route alternatives and types of infrastructure construction depending on the region. This includes funding research into species behavior, distribution, and more, to understand how different species react to different

types of infrastructural barriers and how to cite the least impactful routes during planning stages. The following sections detail specific interventions and strategies for Kazakhstan and important considerations to account for when engaging in the region.

Priority Recommendations

There are a series of challenges that funders can directly invest in mitigating in order to strengthen biodiversity conservation efforts surrounding linear infrastructure development in Kazakhstan:

a. Long-term recommendation: We recommend that funders utilize policy infrastructure, specifically EIAs, defined by the new Ecological Code to strengthen biodiversity conservation efforts in Kazakhstan.
    i. Short-term starting point for long-term goal: Developing and training teams within existing NGOs to conduct environmental impact assessments. The most pressing challenge is the lack of a well-trained workforce that can conduct environmental impact assessments of linear infrastructure projects. Biodiversity NGOs like ACBK have direct influence over how Environmental Impact Assessments are conducted, but require a larger, well-trained workforce that are familiar with all relevant species in order to conduct robust EIAs. Funding for training programs at NGOs like ACBK and their partners will be useful in filling this gap. Training should be conducted with local NGOs in partnership with international NGOs with greater capacity like UNDP, Birdlife International, and WWF. Kazakh universities, like KIMEP and Nazarbayev are also looking to train more conservation professionals and get them into the workforce.
    ii. Short-term starting point for long-term goal: Translation of important policy documents from Russian to languages researchers, activists, and investors speak (i.e. primarily English and Chinese). Specifically, language translations to clarify the process by which companies request environmental impact investments and subsequent enforcement mechanisms.

b. Long-term recommendation: Supporting research and lobbying efforts to delineate more protected lands for species mentioned in Box 1.0.
    i. Short-term starting point for long-term goal: Collecting and centralizing data on native species habitats and migration patterns in Kazakhstan. Highlight the presence and absence of protected spaces for these species, protect against invasive linear infrastructure development into critical habitat, and develop and promulgate more sustainable alternatives to LI plans. This work can lead to the creation of new PAs covering vital, as yet unprotected habitat. Funding can go toward GPS monitoring of migratory species to track migratory behavior and expansiveness of habitat. Consult with ACBK, which has expertise in such efforts.
    ii. Short-term starting point for long-term goal: Funding existing lobbying activities by NGOs to strengthen the protection of native species through the new ecological code. Consult with ACBK.
    iii. Cooperate with One Earth's Kazakhstan team to identify regions that should be protected, as they have already collected data and have specific recommendations on how to invest money toward delineating new protected lands.

c. Long-term recommendation: Collecting and centralizing data on the effect of Chinese-funded linear infrastructure projects on biodiversity.

i. Short-term starting point for long-term goal: Funding ACBK and its partners who are already attempting to do this work but don't have enough people to work on it. Using funding to hire Chinese infrastructure specialists will be effective.
ii. Short-term goal: Encouraging Chinese companies to have local NGOs like ACBK to conduct EIAs for LI projects.

d. Long-term recommendation: Addressing the workforce deficit in biodiversity conservation in Kazakhstan.
    i. Short-term starting point for long-term goal: Funding conservation and sustainability training programs and departments at universities. One such program is Nazarbayev University's new Sustainable Development Network, which aims to get more information on companies' environmental performance and other environmental challenges.

e. Long-term recommendation: Building up a team of engineers, data scientists, and conservation biologists to provide alternative options to invasive infrastructure projects.
    i. Short-term starting point for long-term goal: Build up a team at ACBK. There is an existing team that does this work, but it has limited capacity to conduct research on similar projects (road alternatives project). Future roads and railways must avoid further fragmentation, existing roads and railways should be modified to restore wildlife movements, and fences should be modified or removed to allow wildlife migration. Eventually, this team can be expanded to include experts across multiple sectors and government.

Important Considerations

- Most environmental policy enforcement (especially the new ecological code) is concerned with pollution from extractive industries. The Republic is rich in natural fuel resources with substantial coal, oil, and gas deposits. The largest Tengiz oil field in Central Asia is located in the Caspian Sea region (ADB Civil Society, 2007). Biodiversity conservation remains a weak priority overall. Thus, environmental impact assessments are more targeted toward reducing pollution. Issue linkages between pollution mitigation and biodiversity conservation will likely be the most effective in making biodiversity safeguarding a stronger priority.
- Corruption is an endemic problem in Kazakhstan. Corruption is still high, and back-door payments are pervasive between government actors and businesses, and many businesses in LI try to dodge state-led pollution monitoring apparatuses. However, data on corruption in the conservation space in Kazakhstan is limited, though many say that it is mostly tied to pollution. For example, some Chinese construction companies operate at nighttime to escape state monitoring of pollution.
- China's influence in Kazakhstan's "sustainable" development is purposefully overblown and simultaneously understudied: Kazakhstan plays to China's ego, but China is not the largest investor. Thus, national development strategies utilize certain rhetoric-i.e., Being the "buckle" of the Belt and Road initiative and initiatives like the Nurly Zhol. Additionally, There is little information on how Chinese infrastructure investments affect biodiversity and conservation in Kazakhstan and how China operates in Kazakhstan more

broadly. It is known that environmental protections are of weak importance to Chinese investors in Kazakhstan and that they request few, if any, EIAs for their projects from the NGOs that conduct them.

- Civil society is heavily restricted in Kazakhstan. Many NGOs are state-sponsored. Much like in China, state-sponsored NGOs operate as intermediaries between the state and businesses. In the case of conservation, many are specifically designed to provide expertise in policymaking and to conduct EIAs. After the fall of the Soviet Union, a number of international agencies financed the development of NGOs in Kazakhstan. However, the financing of NGOs by international agencies has declined recently, NGOs in turn look to develop relationships with both the private and public sectors for continued funds. Ongoing legislative changes enable the government to fund NGOs in service provision directly, with some parts being co-opted by business interests, though there has been a genuine increase in philanthropic support for NGOs and charitable causes. The perestroika era in the mid-1980s allowed for more civic participation, since then environmental issues have become the focus of many NGOs. The wasting of the Aral Sea, its related problems, the legacy of the former nuclear testing grounds, and questions on access and distribution of water resources have led to strong advocacy by NGOs for environmental protection. Similarly, natural resources extraction by industries have increased NGO engagement in encouraging transparent use of oil revenues and associated environmental degradation (ADB, 2007).
- The Ministry of Ecology, Geology, and Natural Resources can be an effective government partner alongside NGO, ACBK, and University-partner Nazarbayev University's Sustainable Development Network.

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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 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, 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)

[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.

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 from the spatial analysis.

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

Kazakhstan	70th Percentile Core	80th Percentile Core	90th Percentile Core
CBI Core Area (km^2)	849655	564728	283030
Overlap with Protected Areas (km^2)	28531.4	25920.5	21882
Percentage of CBI Core within PAs (%)	3.358	4.58991	7.73134

Chinese funded LI across Kazakhstan

The CF LI dataset was clipped by Kazakhstan's boundaries and line length of each LI Mode was calculated.

LI Mode	Length
Road (km)	1582.481018
Rail (km)	0
Transmission (km)	0

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

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 Kazakhstan

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

LI Mode	70th Percentile Core	80th Percentile Core	90th Percentile Core
Road (km)	1362.495972	1141.03801	797.207993
Rail (km)	0	0	0
Transmission (km)	0	0	0