



FOCUS-BRI Country Report

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

Vietnam

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Acronyms

ADB	Asian Development Bank
AFD	French Development Agency
BRI	Belt and Road Initiative
CBD	Convention on Biological Diversity
CBI	Composite Biodiversity Index
CDB	China Development Bank
CF LI	Chinese-funded Linear Infrastructure
CHEXIM	China Export-Import Bank
CICPEC	China-Indochina Peninsula Economic Corridor
CITES	Convention on International Trade in Endangered Species of Wild Flora and Fauna
DARD	Department of Agriculture and Rural Development
DMZ	Demilitarized Zone
DONRE	Department of Natural Resources and Environment
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GTZ	German Agency for International Cooperation
HDI	Human Development Index
IUCN	International Union for the Conservation of Nature
JICA	Japan International Cooperation Agency
KBA	Key Biodiversity Area
KfW	German Development Bank (Kreditanstalt für Wiederaufbau)
kV	Kilovolt (1000 volts)
LI	Linear Infrastructure
LOI	Law on Investment
MARD	Ministry of Agriculture and Rural Development
MoC	Ministry of Construction
MoF	Ministry of Finance
MoIT	Ministry of Industry and Trade
MoNRE	Ministry of Natural Resources and Environment
Mot	Ministry of Transport
MoU	Memorandum of Understanding
NGO	Non-governmental Organization
ODA	Official Development Assistance
PA	Protected Area
PPC	Provincial People's Committee
PPP	Public-Private Partnership
SEA	Strategic Environmental Assessment
SUF	Special Use Forest
UNCCD	United Nations Convention to Combat Desertification
WWF	World Wide Fund for Nature



Figure 1. Political map of Vietnam.

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

Region	East Asia & Pacific
Capital	Hanoi (Ha Noi)
BRI Corridor	CICPEC
BRI investment (\$ in millions)	8700
Income Status	Lower middle-income
Population	98,721,275
GDP	US\$362 billion in 2020
Land Area	331,210 km ²
Protected Areas (km ²)	~45,250 km ²
Species Richness (ranking)	12
Biodiversity Intactness (ranking)	26
ND-GAIN Country Index; Climate vulnerability (ranking)	126
GDP Growth Rate Projections	6.5%
Inequality (Gini Coefficient)	64.3 as of 2018
Human Development Index (HDI)	0.704 as of 2019
Key exports	Electrical and electronic products, textiles, coffee, and rice

I. Introduction

The Socialist Republic of Vietnam is located along the eastern edge of mainland Southeast Asia. It stretches over 15 latitudes from north to south, with a length of about 1,650 km on the Indochina Peninsula, and has a total natural land area of 330,591 km² with 3,444 km of coastline. Vietnam shares terrestrial borders with China to the north, Laos, Cambodia to the west, and maritime borders with Thailand, the Philippines, Indonesia, and Malaysia. Vietnam has very diverse terrain across the country: mountains, hills, and forested highlands make up almost 50% of Vietnam's northern territory. The lowland part of the north comprises the Red River Delta and coastal plains that, despite experiencing seasonal flooding, are densely populated and intensely cultivated. The south of the country is more varied and includes low, marshy terrain dominated by the estuary of the Mekong River system as well as low-lying tropical rainforest, upland forest, and the rugged Annamite mountain chain. The diverse landscapes of Vietnam are home to over 10,500 species of animals, including approximately 8,000 species of invertebrates, nearly 500 species of reptiles and amphibians, 850 species of birds, and 312 species of mammals (Ministry of Natural Resource and Environment, 2020). Vietnam's aquatic ecosystems are also an incredible trove of biodiversity, with thousands of species inhabiting the country's dense network of rivers and the stretch of productive waters along its coast.

Vietnam is home to a population of around 99 million people from 54 ethnic groups, with the dominant Viet (Kinh) people accounting for almost 87% of the country's population and mainly inhabiting the Red River delta, the central coastal delta, the Mekong delta, and the major cities. The other 53 ethnic minority groups, totaling about 8 million people, reside in the mountainous areas that spread north to south and cover over two-thirds of the country's territory. Among these, the most populous ethnic groups are the Tay, Thai, Muong, Hoa, Khmer, and Nung, with a population of around 1 million each, while the least are the Brau, Roman, and Odu, with just about several hundred people each (Embassy of Vietnam, 2022a). About 63% of Vietnam's population lives in rural areas and over 50 million people are employed in various sectors (13.9 million in agriculture, forestry, and fishing; 16.7 million in construction & industry; and 19.4 million in the service sector) (General Statistics Office, 2021).

The government of Vietnam has designated 172 Protected Areas that cover 2.4 million hectares (Fig. 2). These protected areas include 33 national parks, 65 nature reserves, 18 species and habitat protected areas, and 56 landscape protected areas (Ministry of Natural Resources and Environment, 2019). As of 2022, 122 Key Biodiversity Areas cover an area of 3.75 million ha, accounting for over 10% of the land area of continental Vietnam (KBA Partnership, 2022).

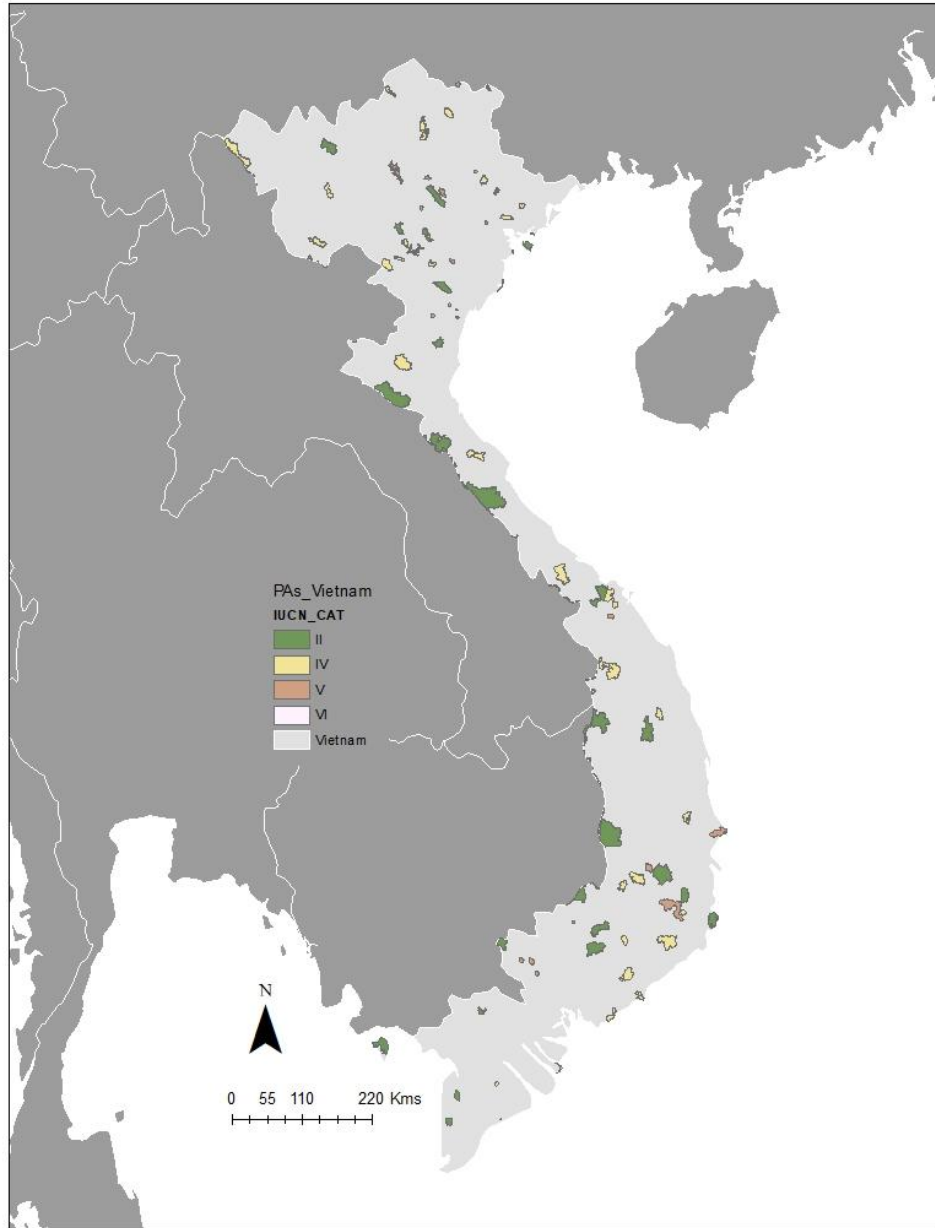


Figure 2. The protected areas in Vietnam are categorized according to the IUCN classification, where categories I and II have the highest protection, and others include gradients of use.

Vietnam’s economy used to be largely dependent on agriculture, but has expanded considerably over the last 30 years and is now mainly based on large state-owned industries in electronic goods, textiles, food, furniture, plastics, paper, tourism, and telecommunications. Per the World Bank, the service sector represented 41.6% of Vietnam’s GDP in 2021, followed by industry (33.7%) and agriculture (14.8%). Interestingly, while agriculture had a smaller contribution to the GDP, it employs the greatest percentage of the workforce (38%), while the service and industry sectors employ 35% and 27%, respectively (World Bank, 2022). Moreover, poverty in Vietnam over the last decade declined precipitously, from 16.8% to 5%, with almost 10 million people lifted out of poverty (World Bank, 2022).

II. Linear Infrastructure Investment Landscape

Linear infrastructure (LI) in Vietnam consists mainly of energy transmission and transportation infrastructure. With an extensive existing road network and a relatively high overall road density, 86-90% of transportation in Vietnam is by road, followed by approximately 7% through inland waterways, and a mere 2% by railways (Fig. 3). As roads support the vast majority of transportation, the government of Vietnam has planned to expand national highways significantly in the next few years, especially to improve regional connectivity and better support trade flows. Regarding roads and railways, the Stimson Center identified 650 projects in the country: 35 railways, eight national road upgrades, and 136 National road projects (with roads totaling 33,458 km) (Stimson Center, 2022).

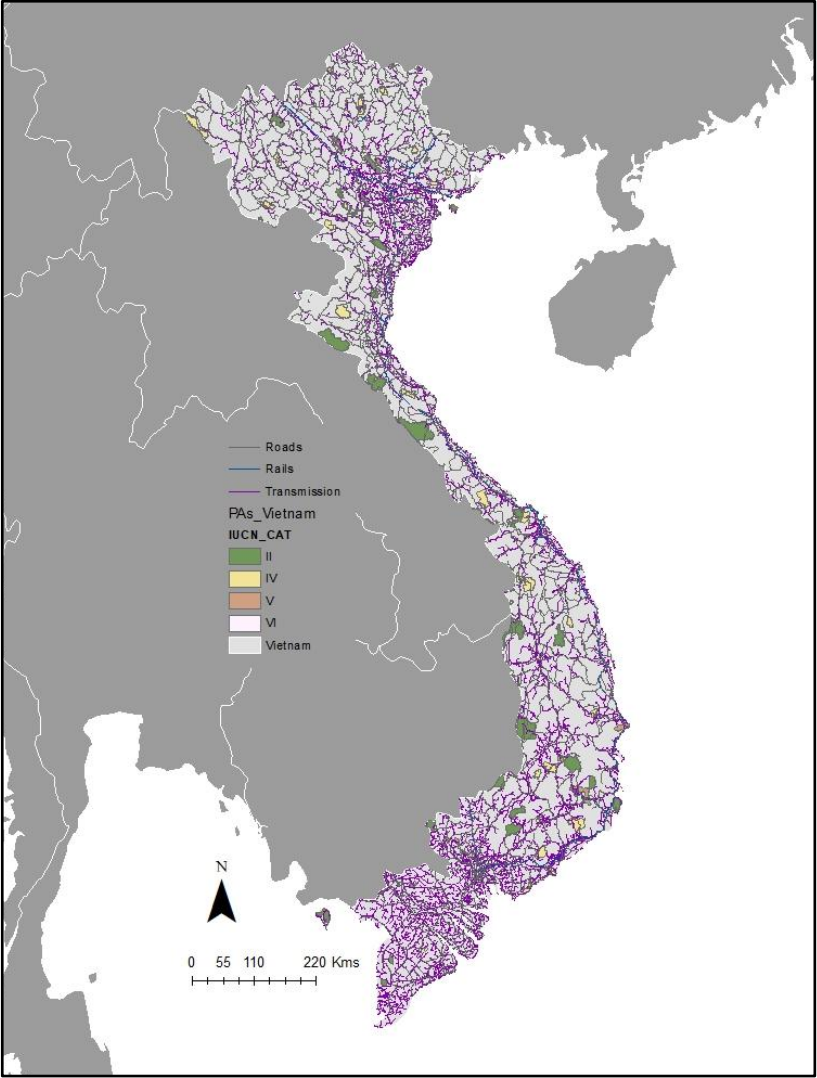


Figure 3. Existing infrastructure already transects multiple protected areas in Vietnam. We consider only Road, Rails, and Transmission lines as linear infrastructure for this study.

Energy transmission

As of 2019, Vietnam had more than 28,000 km of transmission lines with voltage levels of 220 kV and 500 kV, including more than 8,600 km of lines of 500 kV (EVN, n.d.) While the Ministry of Energy and Trade allowed independent power producers in Vietnam to build out transmission lines and substations that connect to the national grid, the current electricity market of the country is centralized under the state-owned utility, Electricity Vietnam. The 500 kV backbone transmission lines connect the power grids across the north, central, and southern regions to the national grid; however, these are close to capacity in most areas and require urgent upgrades. The current electricity infrastructure of the country supports cross-border power trade with China, Laos, and Cambodia, where Vietnam imports electricity from China and Laos and exports it to Cambodia.

Railway

Owing to the varied topography, railways in Vietnam play a minor role in transportation. Currently, Vietnam's railway network is distributed along seven main railway lines and has a total length of about 3,163 km. The main lines comprise 2,703.2 km, while inner and branch lines make up the remaining 459.7 km. Vietnam's railway infrastructure is outdated. While other types of transport in the country recorded rapid growth over the past half-century, the development of new railways has declined dramatically, with only 3% of annual transportation investment allocated for railways (General Statistics Office of Vietnam, 2021). The Vietnamese government has been approving plans to upgrade and modernize the network to support high-speed trains since 2002, with the latest plan proposed in 2020 emphasizing "strengthening the integration capacity of the economy based on building a modern railway network, enhancing marketability, focusing on developing transport corridors closely linked with urban economic corridors and countryside" (General Statistics Office of Vietnam, 2021). The Stimson Center's Mekong Infrastructure Tracker includes project-level data on 2,909 km of operational rail and 299 km of completed railway upgrades (Stimson Center, 2022). However, Vietnam has significant plans to expand this: one planned rail project would add 1,897 km of high-speed rail between Hanoi and Ho Chi Minh City, and an additional 236 km of traditional railways are in the works (Stimson Center, 2022).

Roads

The present network of Vietnam comprises more than 256,000 km of roads. While about 7%, or 17,000 km, of the network, is national roads, only 20% of these are paved. The remainder of Vietnam's road network comprises district and rural roads of lower quality, including many unpaved local roads. There is no fully operational expressway in Vietnam.

Infrastructure financing in Vietnam

After graduating from Low-Income Country status in 2009, infrastructure financing in Vietnam started to shift away from official development assistance (ODA) and soft loans toward private financing. Over time, Vietnam's infrastructure-related regulations also adapted to reflect this trend. As of January 2019, almost 336 Public-Private Partnership (PPP) projects have been implemented in Vietnam, with total investment capital of more than VND 1,600 trillion (c. US\$69 billion). Figure 4 highlights some of the crucial PPP road projects planned in Vietnam. The primary external funding sources for infrastructure in Vietnam include the Asian Development Bank (ADB), World Bank, Japan's JICA, France's AFD, and Germany's KfW/GTZ. Twenty-eight large transport and power infrastructure projects are proposed for FDI in Vietnam (Table 2). Climate finance organizations, like the newly created Green Climate Fund and the Clean Development Mechanism, are prevalent, with other development funding directed to hydropower (Ha-Duong et al., 2016). The transport sector comprises almost 65% of all projects, primarily roads.

Road PPP Projects in Vietnam

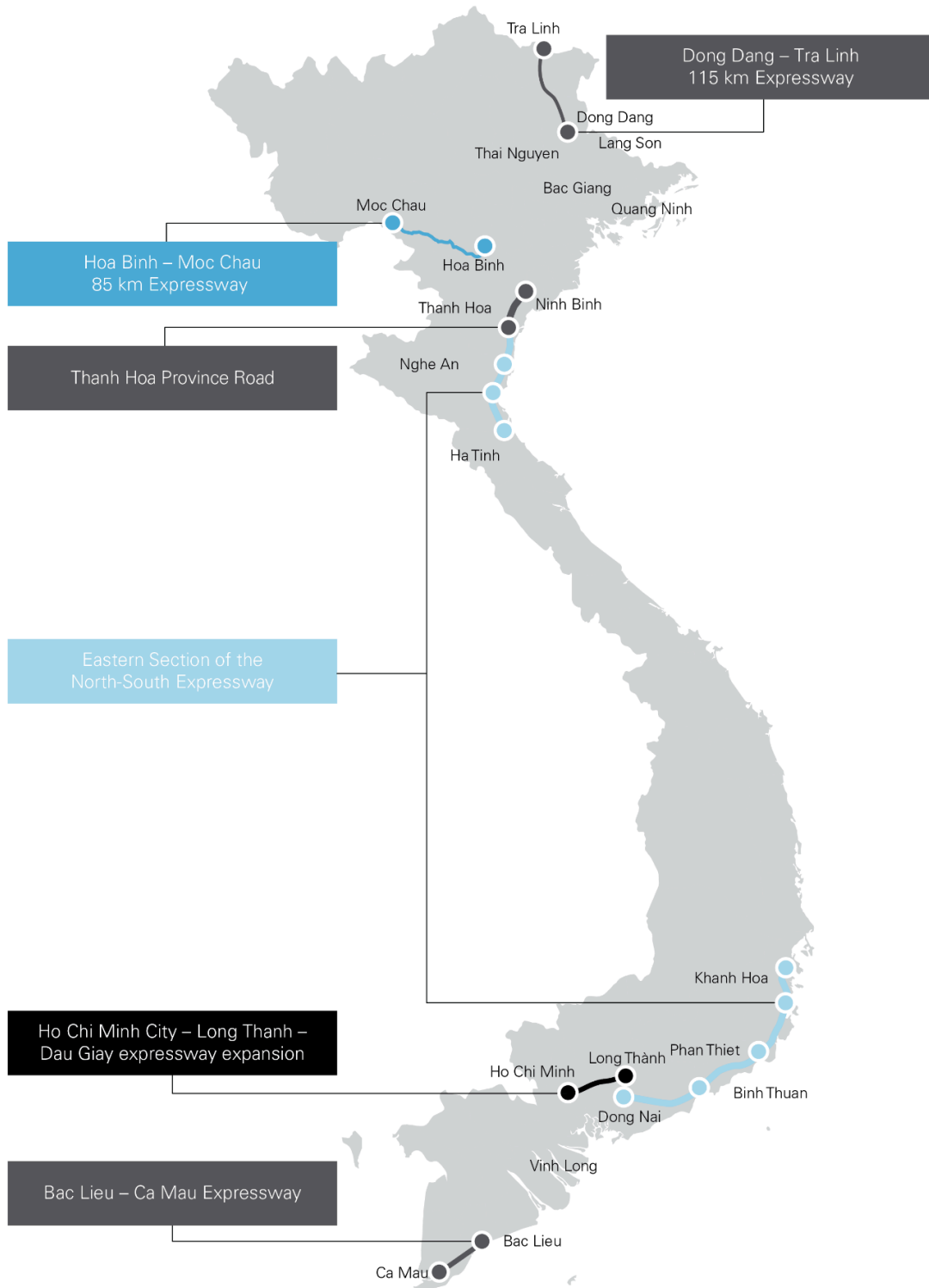


Figure 4. Public-Private Partnership road projects in Vietnam (Rosengarten, 2020).

Table 2. List of Vietnam's national infrastructure projects proposed for FDI in 2020.

Vietnam's national infrastructure projects proposed for foreign direct investment (FDI), from Embassy of Vietnam (2022b)

Transport infrastructure (sourced from - <https://vietnamembassy-usa.org/Projects/ProjectsList1>)

- Road development projects
 1. Ninh Binh-Thanh Hoa-Nghi Sơn Route of The North-South Highway
 2. Dau Giay-Phan Thiet Highway
 3. Bien Hoa - Vung Tau Highway
 4. Trung Luong - My Thuan Highway
 5. Ring road No.3 in Ho Chi Minh City from Tan Van to Nhon Trach
 6. Noi Bai – Ha Long Highway
 7. Cam Lo - La Son Highway
 8. National Road No.19 from Ba Gi Junction to Plei Ku city
 9. Ring road III of Hanoi city, Route from Mai Dich to Southern Thang Long
 10. Upgrading the National Road 91, Route from Can Tho to Lo Te
 11. Inter-port road in Nhon Trach, Dong Nai Province
 12. Dau Giay-Lien Khuong Highway
 13. Bus station at Cho Lon, Ho Chi Minh city
 14. Route from the central city of Quang Ngai to Dung Quat II Port
 15. Infrastructure of non-tariff zone in Dong Dang (Phase 1), Lang Son border gate

- Railways Development Project
 16. Railway into Hai Phong Int'l port
 17. Bien Hoa – Vung Tau railway
 18. Upgrading the Hanoi – Ho Chi Minh City railway route
 19. Hanoi urban railway route 6 (from the center of Hanoi to Noi Bai Airport)

- Airports
 20. Quang Ninh Airport
 21. Long Thanh International Airport (phase 1)
 22. Cam Ranh Int'l Airport
 23. Lao Cai Airport

- Seaports
 24. Phase 1 of Van Phong international port
 25. Lien Chieu port

- Power infrastructure
 26. Factories producing new energy and renewable energy equipment
 27. Dung Quat coal-fired thermal plant
 28. Binh Dinh power center

BRI and Chinese activities in Vietnam

Due to conflicts over the South China Sea and longer histories of conflict, the relationship between Vietnam and China is strained (Thu, 2020). The stark difference in naval power between the two countries has kept the weaker Vietnam on edge. However, in recent years China and Vietnam have found common ground for collaboration, especially since both countries have comparable political systems and face similar domestic challenges concerning the need to balance continued economic reforms. With increasing trade and investments over the last few years, both nations are becoming more interdependent in their bilateral relations (Toai et al., 2018). China's foreign direct investment (FDI) in Vietnam has changed considerably since 2011. For instance, during 1991-2000, Chinese investments in Vietnam were mainly concentrated in the light industry and consumer sectors. However, in recent years, China's FDI in Vietnam has shifted and encompassed several sectors, including construction, manufacturing, processing, and large construction and energy projects. Table 3 highlights some large, Chinese-funded projects and businesses operating in different parts of Vietnam.

Table 3. *List of large-scale Chinese projects and FDI in Vietnam.*

Examples of Chinese projects throughout Vietnam.

In the north, some large-scale Chinese projects include:

1. a Vietnam-China Mining and Metallurgy project in Lao Cai province (US\$337.5 million)
2. a fabric plant in Quang Ninh province (US\$300 million) belonging to Texhong Group
3. Tan Cao Tham rubber processing plant in Lao Cai province (US\$337.5 million)
4. an iron and steel plant extension (US\$340 million) in Thai Nguyen province
5. the Cat Linh-Ha Dong urban railway (with an initial Chinese investment of US\$419 million); the Da River water pipeline (US\$450 million)
6. a steel refining and rolling factory (US\$33 million) in Thai Binh province
7. a real estate project (US\$100 million) in Tien Giang province
8. a footwear project in Dong Nai province (with US\$60 million from Phuong Dong – China)

In the central part of Vietnam, the major investments are:

1. the Nam Thanh Dong I urban area project, which includes a halal food production plant (US\$20 million) in Hai Hung province
2. plastic injection molding and plastic product manufacturing (US\$420 million)
3. electronic component manufacturing (US\$18 million) in Da Nang

In the south, key Chinese projects include

1. MDF plywood project (with US\$10 million from Glory Wing, China) in Long An province
2. Project services related to inkjet printing, graphics, advertising products, advertising services of spray printing Hai Thai Co., advertising Shandong (US\$10 million) in Ho Chi Minh City
3. Vinh Tan 1 power plant (US\$1.76 billion) in Binh Thuan province
4. Viet Lan Tire Plant (US\$400 million) in Tay Ninh province
5. the Hung Nghiep Formosa Dong Nai Textile Limited Company project (nearly US\$1 billion) in Nhon Trach Industrial Park.

The rapid increase of the domestic population combined with expanding markets in Vietnam has presented an urgent need to expand the existing infrastructure within the country. Due to its shift away from ODA and soft

loans and limited investment from the state, Vietnam experienced additional barriers to boosting PPP projects. As a result, Vietnam joined the BRI, signed the Memorandum of Understanding (MoU) in 2017, and committed itself to promote economic and regional connectivity. Projects in Vietnam that are a part of the BRI include the construction of a highway linking the southern provinces of China with Hanoi and the northern ports and upgrading or building new ports in the area (Pham et al., 2021). See Table 4 for infrastructure in Vietnam that China's two international policy banks have funded: China Export-Import Bank and China Development Bank.

Table 4. CDB and CHEXIM loans in Vietnam between 2009-2019.

Project	Type	Borrower	Lender	Signed	Cost
Uong Bi Power Plant	Fossil Fuel Electric Power	Government	CHEXIM	2009	178.50
Thai Binh 2 Coal Power Plant	Fossil Fuel Electric Power	Petrovietnam	CDB	2013	27.89
Duyen Hai 3 with Sinosure/BOC & ICBC	Fossil Fuel Electric Power	Vietnam Electricity (EVN)	CDB	2012	1000.00
Duyen Hai 2 Thermal Power Plant	Fossil Fuel Electric Power	Malakoff Bhd and Shanghai Electric Group (SHANGHAI)	CHEXIM	2017	1800.00
Coal-fired Thermal Power Plant Project (IPP project) in Hai Duong province, Vietnam with ICBC and CCB	Fossil Fuel Electric Power	JAKS, China Power Engineering Consulting Group Co Ltd (CPECC)	CHEXIM	2015	1402.00
Vung Ang Power Station	Fossil Fuel Electric Power	Petrovietnam	CDB	2011	673.00
Hai Phong Thermal Power Plant Phase 2	Fossil Fuel Electric Power	Government	CHEXIM	2008	557.00
Duyen Hai 1 with Sinosure	Fossil Fuel Electric Power	Government	CHEXIM	2011	1008.00
Vinh Tan 2 Power Plant	Fossil Fuel Electric Power	Vietnam Electricity (EVN)	CHEXIM	2010	300.00
Vinh Tan 1 Coal-Fired Thermal Power Plant	Fossil Fuel Electric Power	China Power International Development Limited Company (possible supplier's credit), Power Corporation (Vietnam National Coal-Natural Industries Corporation)	BOC, CDB, CHEXIM, ICBC, Sinosure	2014	1170.00
Vinh Tan Coal Fired Power Plant III Unit I, II, III	Fossil Fuel Electric Power	Government	CHEXIM, CLP Power Hong Kong Ltd	2015	2700.00

Quang Ninh-1 Unit 1	Fossil Fuel Electric Power	Government	CHEXIM	2009	176.00
Unspecified culture & infrastructure projects	International Trade Financing	Bank for Investment and Development of Vietnam	CDB	2015	200.00

III. Vietnam's Biodiversity Landscape

Despite being a relatively small country, Vietnam's territory stretches over 15 latitudes from north to south. A dense network of rivers and streams flows through the country; along with the Red River in the north and the Mekong River in the south, Vietnam has 16 other major river basins. Owing to the varied topography and climate, Vietnam is home to a diverse range of natural ecosystems, including forests, grasslands, inland wetlands, dunes, inter-tidal mudflats, estuaries, seagrass beds, coral reefs, and marine areas supporting high levels of biodiversity.

Approximately 51,400 species have been identified in Vietnam, including 7,500 varieties of microorganisms, 20,000 plant species, 10,900 terrestrial animals, 2,000 invertebrates, and over 11,000 marine species (Convention on Biological Diversity, 2020). Of the known organisms, the presence of endemic species is very high: about 30% of terrestrial species, 4.6% of species and subspecies of birds, 27.4% of freshwater mussels and snails, and 58% of freshwater shrimp and crabs (Ministry of Natural Resource and Environment, 2020). In 2015 alone, 344 newly described species of organisms were recorded in Vietnam (208 species of animals and 136 species of plants)(Ministry of Natural Resources and Environment, 2019).

Vietnam is home to several species of conservation concern, including the gray and red-shanked douc, Asian elephant, sun bear or honey bear, Indochinese tiger, leopards, wild boars, bats, flying squirrels, otters, and pygmy loris (Convention on Biological Diversity, 2020). As for the bird diversity, notable species include the great hornbill, white-winged wood duck, white-shouldered Ibis, Edward's pheasant, yellow-billed nuthatch, and many more. Vietnam was home to two subspecies of rhinoceros, the Vietnamese Javan rhino and the Northern Sumatran rhino, both of which are now extinct. The biodiversity landscape of Vietnam is divided into eight forest ecoregions with 47 subregions with unique vegetation and landscape characteristics. The country's unique natural ecosystems and diverse species composition have attracted international recognition (Table 5) (Ministry of Natural Resource and Environment,2020).

Table 5. Vietnamese protected areas and areas with high biodiversity value that international or regional organizations have recognized.

Sr. no	Type, Name of site
1	Global priority ecoregions (identified by WWF)
i.	Annamite Range Moist Forests
ii.	Indochina Dry Forests
iii.	Mekong River

iv.	Northern Indochina Subtropical Moist Forests
v.	South-east China Hainan Moist Forests
vi.	Xi Jiang Rivers and Streams (Bang River – Ky Cung river).
2	Ramsar sites:
i.	Xuan Thuy National Park in Nam Dinh province (1989)
ii.	Bau Sau in Cat Tien National Park,
iii.	Dong Nai province (2005)
iv.	Ba Be National Park in Bac Kan province (2011)
v.	Tram Chim National Park in Dong Thap province (2012)
vi.	Mui Ca Mau National Park (2013)
vii.	Con Dao National Park (2014)
viii.	U Minh Thuong National Park in Kien Giang province (2015)
ix.	Lang Sen Wetland National Park in Long An province (2015).
3	Biosphere Reserves
i.	Can Gio (2000)
ii.	Dong Nai (2001)
iii.	Cat Ba (2004)
iv.	Red River Delta (2004)
v.	Kien Giang (2006)
vi.	Western Nghe An (2007)
vii.	Mui Ca Mau (2009)
viii.	Cu Lao Cham (2009)
ix.	Lang Biang Lam Dong (June, 2014).
4	World Heritage natural sites
i.	Halong Bay (1994)
ii.	Phong Nha Ke Bang (2003).

5	ASEAN Heritage Sites:
i.	Ba Be National Park (2003)
ii.	Kon Ka Kinh National Park (2003)
iii.	Chu Mom Ray National Park (2003)
iv.	Hoang Lien National Park (2003)
v.	U Minh Thuong National Park (2013).

Conservation approaches in Vietnam include both in-situ and ex-situ conservation. As for forest management strategies, the forests are categorized into three main classifications: special-use forests (SUF), protection forests, and production forests. The term ‘protected area’ is commonly applied to the SUF category, which is also the only one supported by the Vietnamese Forest Protection and Development Law. As per the official definition, SUFs are forests mainly planned for forest development aimed at conserving essential species, forest botanical and animal gene resources, bolstering scientific research, protecting historical or cultural relics and landscapes, and supporting tourism. This law guides the management of 164 SUFs with an area of 2,265,754 ha (7.2% of the total land area), including 30 national parks, 58 nature reserves, 11 conservation sites, 45 landscape protection sites, and 20 sites for scientific research and experiment (Ministry of Natural Resource and Environment, 2020). See Table 6 for a description of the subcategories of SUFs.

Table 6. Details on each of the subcategories of SUFs.

Sub-category	No.	Total Area	Brief description
National parks	30	1,077,236	Areas demarcated for the protection of ecosystems containing high values for science, education, and tourism.
Nature reserves	58	1,060,959	Consist of wilderness areas designed to maintain ecological processes through the restoration of natural resources and biodiversity
Species and habitat reserves	11	38,777	Protect areas of endemic or valuable flora and/or fauna
Landscape protected areas	45	78,129	Protect natural and cultural sites with a high aesthetic value
Scientific forests	20	10,653	These are specifically designated to protect sites used for scientific research

However, it is important to note that while the SUFs are considered to be the backbone of the Vietnamese government’s national conservation strategy, they do not cover a majority of regions identified with high Composite Biodiversity Index (CBI) Values (see Appendix A for methods). Some of these areas are better covered by Key Biodiversity Areas (KBAs) (Fig. 5 and 6).

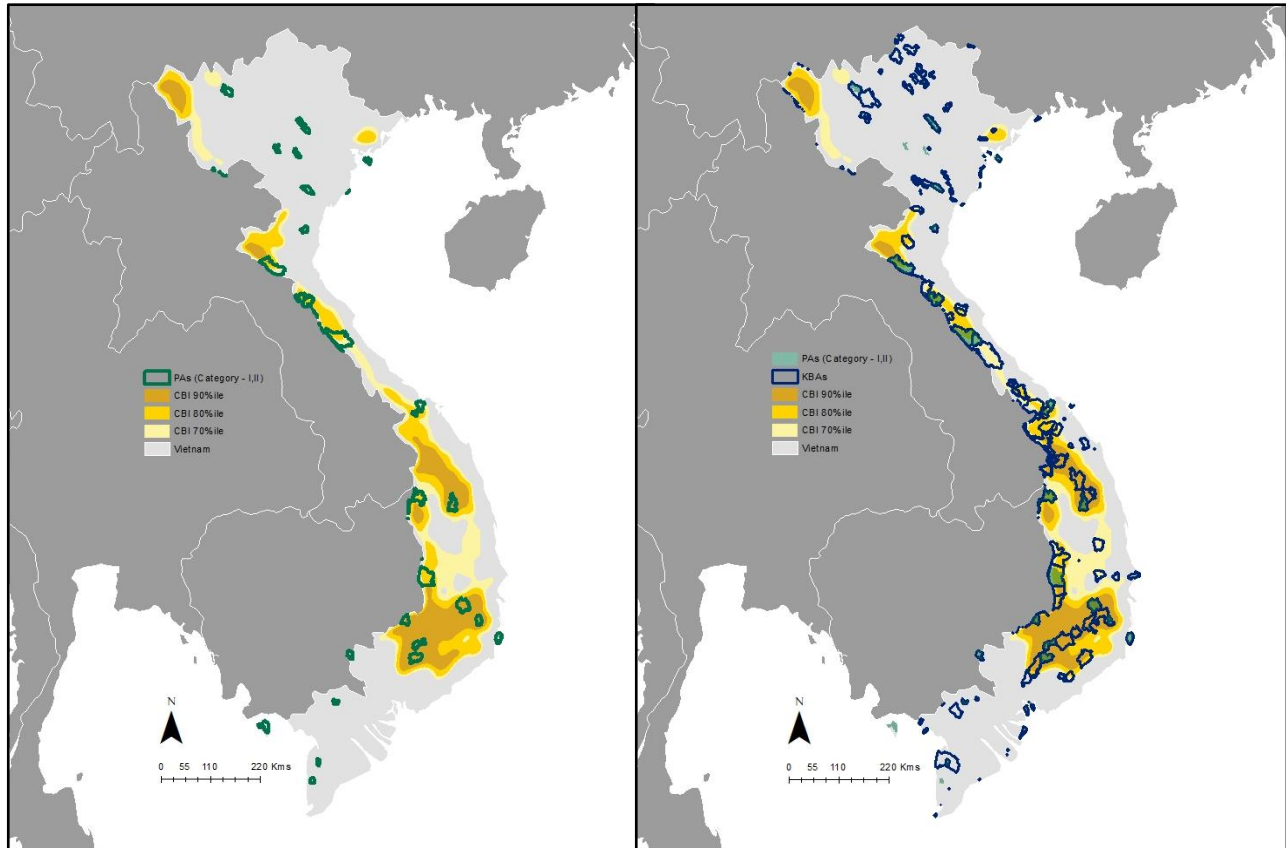


Figure 5. (a) In Vietnam, KBAs cover more CBI core areas than PAs of IUCN categories I and II. (b) CFLI (Chinese-funded Linear Infrastructure) refers to road, railway, and transmission (power lines) projects (from Custer et al., 2021). Even Custer et al. (2021) do not capture BRI projects, highlighting this specific spatial data paucity in Vietnam.

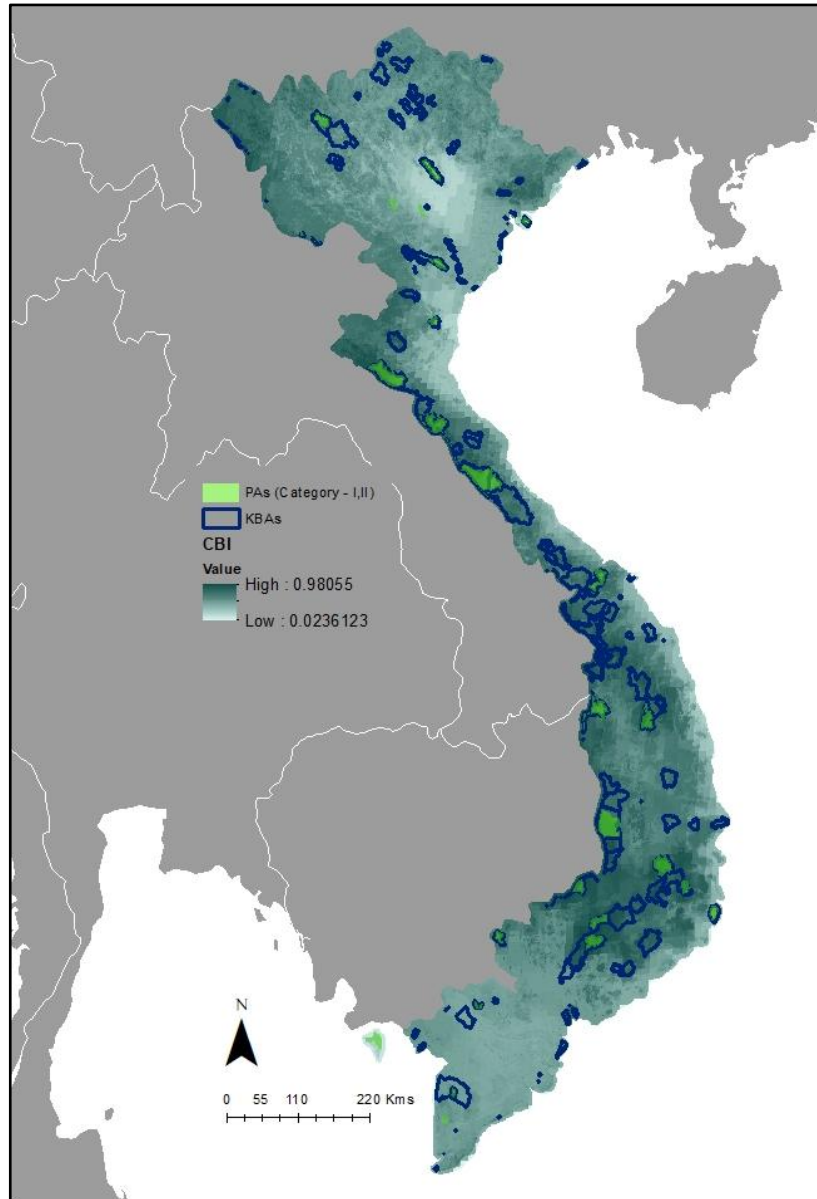


Figure 6. In Vietnam, KBAs cover more areas of conservation importance (high CBI values) than PAs with the greatest protection in IUCN categories I and II. See Appendix A for methodology.

IV. Country Policy and Planning Landscape for Biodiversity & Infrastructure

The Government of Vietnam recognizes the importance of safeguarding its natural heritage, as evidenced by the comprehensive yet complicated policies related to conservation, especially in the Lower Mekong region. With the addition of over 155 legislative papers directly and indirectly related to forestry and conservation, the legal framework of Vietnam has expanded considerably over the last three decades (Table 7).

The main instrument that directs environmental management in Vietnam is the Law on Environmental Protection (2014). Its implementation is supported by specific rules and regulations on Environmental Protection Planning, Strategic Environmental Assessment (SEA), Environmental Impact Assessment (EIA), and Environmental Protection Plans (Nguyen et al., 2019). Other laws safeguarding the environment in Vietnam are the Forest Protection and Development Law, 1991 (amended in 2004); the Land Use Law, 1993 (amended in 1998, 2003, and 2013); the Environmental Protection Law, 1993 (amended in 2005 and 2014); the Water Resources Law, 1998 (amended in 2012); and the Fisheries Law, 2003. The Biodiversity Law, adopted in 2008, is especially important as it marked a milestone for conservation by including the legal basis for local community involvement in preserving natural resources through new co-management and benefit sharing mechanisms. The Biodiversity Law considered the principles and priorities of biodiversity conservation ranging from national and ministerial levels to provincial and local, while defining roles and responsibilities for all stakeholders.

Table 7. Important legislation and policy for environmental protection in Vietnam. Compiled by author using information sourced from Yen et al., 2013.

Instrument	Year	Overarching goal/purpose
National Conservation Strategy	1985	Focused on: <ul style="list-style-type: none"> · maintaining ecological processes and life support systems including the maintenance of forests, midlands, croplands, freshwater, and estuarine, coastal and deep sea ecosystems; · preserving genetic diversity by demarcation of protected areas, identification of protected species, establishment of regulations for hunting as well as the control of the wildlife trade and ex situ conservation; · the sustained use of renewable resources, the maintenance of environmental quality for human life · the implementation of conservation in partnership with international organizations
National Forest Policy	1991	Introduced a detailed framework for effective management of Vietnam’s forests and strengthened the role,s of local communities in overseeing the forests by allocating land to private households
Law on Environmental Protection	1993	Raised the effectiveness of state management and administrative responsibilities for environmental issues at all levels
5MHRP or Programme 661	1998	Government initiative to increase the country’s forest cover to 43%.

Forest Protection and Development Law	Amended 2004	Emphasizes forest protection and combating illegal wildlife trade, including monitoring and support for Programme 661
The Management Strategy for a Protected Area System	2003	For the protection of the rich and unique biodiversity resources within Vietnam’s sustainable development framework. Areas covered by this strategy include: <ul style="list-style-type: none"> · Policies and legal issues · Establishment and management of protected areas · Awareness building · Capacity building and staff training · Scientific research · Socio-economic issues · International cooperation

As for the international commitment to biodiversity conservation, Vietnam is a signatory to several conventions including:

1. Convention on Biological Diversity (CBD, 1994)
2. Convention on Wetlands of International Importance (RAMSAR, 1989)
3. CITES (1994)
4. United Nations Convention to Combat Desertification (UNCCD, 1998).

Relevant Vietnamese laws and decrees surrounding biodiversity and infrastructure safeguards

The Law on Environmental Protection, the Decree on Environmental Protection Planning, Strategic Environmental Assessment, Environmental Impact Assessment, and Environmental Protection Plans, and the Circular on Strategic Environmental Assessment, Environmental Impact Assessment, and Environmental Protection Plans govern the EIA system of Vietnam. As per these laws and decrees, all projects of national importance or those with potential risks or adverse environmental impacts are mandated to undertake Environmental Impact Assessment (EIA).

EIA in Vietnam has been evolving since 1993 when the country's first Law on Environmental Protection (LEP). The 1993 EIA guidelines provided a clear implementation structure and consistent procedures for screening and scoping of a project including considerations of location, technical design, and scale. Clausen et al. (2011, p.137) identify phases of EIA in Vietnam (Fig. 7). While the EIA procedure does not include social assessments, it provides an opportunity to municipal-level People’s Committees and representatives of communities residing in the vicinity of the project site to weigh in their opinions and concerns. There is also a special provision in the Vietnamese EIA process that mandates the EIA appraisal councils must consider petitions or recommendations sent in by various stakeholders including civil society organizations, population communities, and individuals.

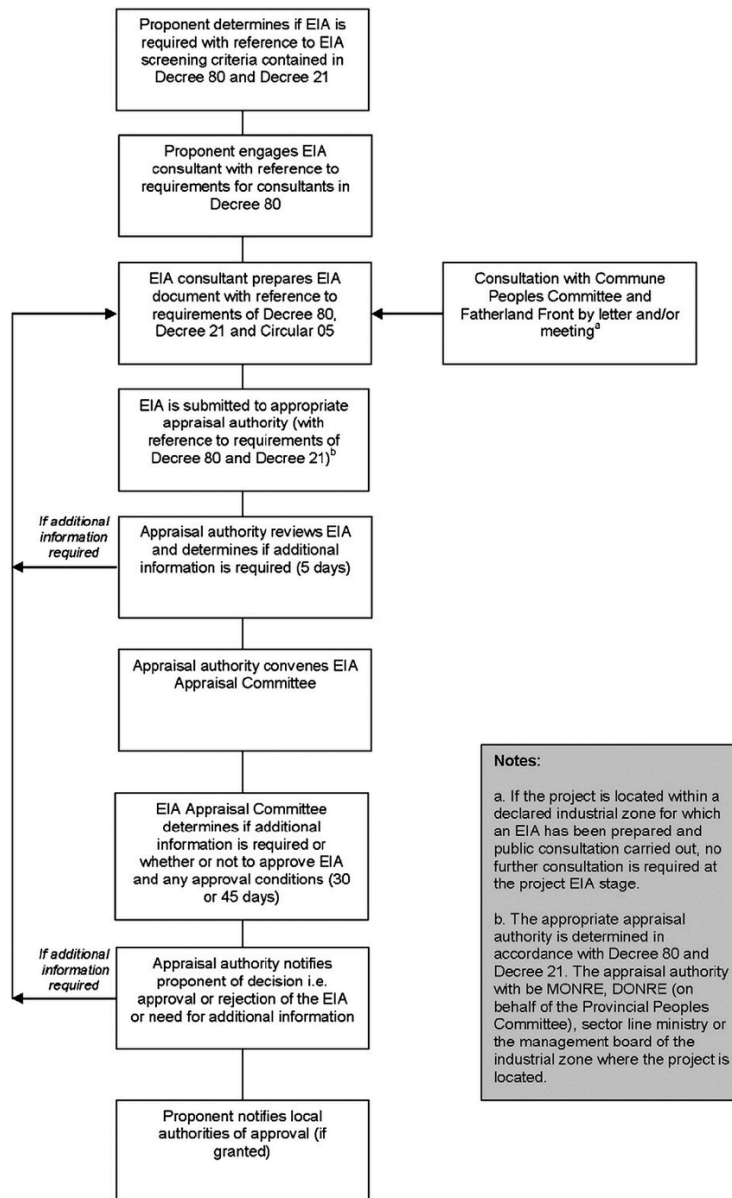


Figure 7. Vietnam's EIA process. Source: Clausen et al., 2011.

Another law that indirectly safeguards the environment from large infrastructure development projects is the Law of Investment (LOI, introduced in 2014). There are 3 three different authorities with the power to grant investment approval in Vietnam, namely the National Assembly, the Prime Minister, and Provincial People's Committees (PPC). The LOI mandates that all project proponents seek an investment license from the relevant license granting authority by submitting the relevant project documents, including environmental screening and assessment reports. Moreover, the LOI stipulates that before providing the investment license, all three authorities are to consult with other specialized state management agencies, including environmental protection agencies, which are given 15 days to put forward their comments and opinions. While this is not a part of the environmental impact assessment rules, the need to obtain the license to invest brings in an additional potential level of environmental safeguards, even before the project planning phase.

V. Project Profile: Ho Chi Minh Trail Highway Conversion

Ho Chi Minh Trail is a historic system of pathways in Vietnam that was used to funnel Communist troops and supplies in the fight against the Americans and their allies in the south during the Vietnam War. This route connected Northern Vietnam's central coast to the Lao panhandle to the west, via a demilitarized zone (DMZ) before emerging again along the spine of South Vietnam. During wartime, the trail was known in the north by many names: the "Trường Sơn road" or "Trường Sơn supply route" (McElwee, 2021). The mountainous landscape, culverts, and thick canopy of forests on this route were crucial in providing secret pathways for military movement. The route was frequently expanded and changed to support military operations. By the end of the Vietnam War, the Trail had reached its maximum extent. It had become a comprehensive transportation network with five main, roughly parallel roads and twenty-one horizontal "rung" roads, claiming that nearly sixteen thousand kilometers had been built or used during the sixteen years it was in service (The New York Times, 2000). It also passed through parts of neighboring Laos and Cambodia.

In February 2000, the Government of Vietnam announced plans to convert the historic Ho Chi Minh Trail into a two-lane highway. This highway was expected to run almost 1,600 km between the Ha Tay province in the North and the southern hub of Ho Chi Minh City, along the old Vietcong supply route (The New York Times, 2000). Vietnam at the time had only one road that connected the north to the south, which too would routinely get flooded in the monsoon season and remain congested almost all year round. In climate change scenarios, the coastal highway is vulnerable to detrimental impacts. The expansion of the Ho Chi Minh Trail was anticipated to ease the congestion on the existing road and would cut through 10 provinces and dense jungles in the less flood-prone territory. With an anticipated cost of about \$375 million, the expansion was to be completed by 2003. However, the original route approved by the government would cut through ten protected areas, including the first natural protected area of Vietnam, Cuc Phuong, and Phong Nha-Ke Bang declared a UNESCO World Heritage site.

The highway is very likely to adversely affect the ecosystem of the Central Annamites Landscape, home to some of the world's rarest species - the saola, an antelope-like animal very recently discovered in 1992, and the Douc langur (endangered primate). As of 2022, despite having a single cumulative EIA, the highway has been successfully constructed and operational. It cut through the many PAs, which caused massive damage to the biodiverse landscapes and increased access to several biologically sensitive areas. The project was a part of the strategic government plan, and thus it could not be challenged.

VI. Understanding stakeholders and power dynamics: Who can influence the development of infrastructure projects and how?

Despite many wildlife conservation policies in Vietnam, implementation is ineffective due to overlapping institutional frameworks and inadequate enforcement of environmental laws. The legal framework of Vietnam is extremely hierarchical and fragmented, with administrative responsibilities resting with various government departments at the commune, district, and provincial levels without a standard procedure for implementing the rules and regulations. These individual institutions have legal instruments spread across a range of laws, ordinances, decrees, circulars, and directives that outline how environmental and social management will relate to their activities. These overlapping and inconsistent guidelines have created major challenges for local authorities in conserving wildlife. For example, Vietnam's administration of protected areas is based on

ecosystem type. The protected areas that fall within terrestrial, inland water, and marine ecosystems are managed by the Ministry of Agriculture and Rural Development (MARD). In contrast, the protected areas that fall within wetland ecosystems, including wetlands listed under the Ramsar Convention, are the responsibility of the Ministry of Natural Resources and Environment (MoNRE). However, several departments under each of these ministries are responsible for managing specific aspects of the same, often without interdepartmental coordination mechanisms for planning or decision-making activities (Fig. 8). Each protected area also has its respective PA management board, responsible for ensuring effective protection and conservation of the PAs. At the provincial level, provincial authorities and the departments of Natural Resources and Environment (DONREs) and Agriculture and Rural Development (DARDs) are key agencies responsible for implementing national policies and plans on biodiversity. Moreover, there is no consensus on the critical species that need to be preserved as various authorities and departments have issued their own lists of endangered and protected wildlife species under several decrees. While the sentiment for conservation is strong, effective inter-ministerial coordination and implementation are missing.

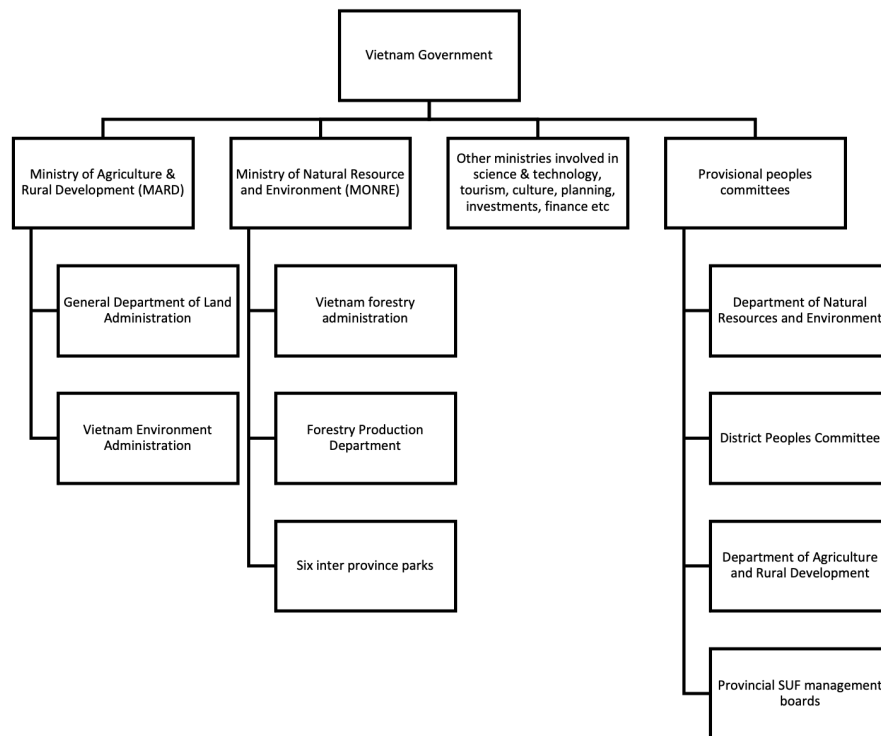


Figure 8. The different ministries and departments responsible for the effective management of special-use forests in Vietnam.

For infrastructure development in and around PAs in Vietnam, there are additional relevant ministries such as the Ministry of Construction (MoC), the Ministry of Transport (MoT), and the Ministry of Industry and Trade (MoIT) that are a part of the project planning and development processes. However, these institutions have their own, independent circulars that regulate the application of environmental assessments, other environmental protection instruments, and land-use restrictions within rights of way. These regulations are distinct and sometimes incongruous from the mechanisms for the conservation-related ministries and departments.

Due to its socialist ideology, the government of Vietnam is an active stakeholder in the project planning and development of large projects and often has a great deal of power to influence infrastructure development in the

country. Regardless of who initiates or solicits an infrastructure development project in Vietnam, the approval of authorized state agencies at the pre-feasibility stage is mandatory (Fig. 9). Given that all land in the Socialist Republic of Vietnam is essentially owned by the government, the decision to change land use (e.g. convert agricultural land to residential land or set out for the development of roads/ rails, etc) is often a straightforward decision without much opportunity for other stakeholders to weigh in their concerns or opinions. Which is inconsistent with the provisions in the EIA guidelines. Large infrastructure projects are also required to obtain an “Approval of development orientation” directly from the Prime Minister during the design process. Post approval, there are a number of relevant government agencies, such as the MoC, which is the line ministry for urban development, MonRe, which is responsible for the management of water resources and land-use planning, and the Ministry of Finance (MoF), which is responsible for developing annual sector goals and distributing state funds. The project proponents must acquire both approvals on EIA’s as well as the investment license from relevant authorities *before* preparing technical construction designs and detailed project plans. Specialist government agencies such as the MoC and Ministry of Science and Technology are key stakeholders at this stage of the project planning and play a lead role in the development of the infrastructure project plans.

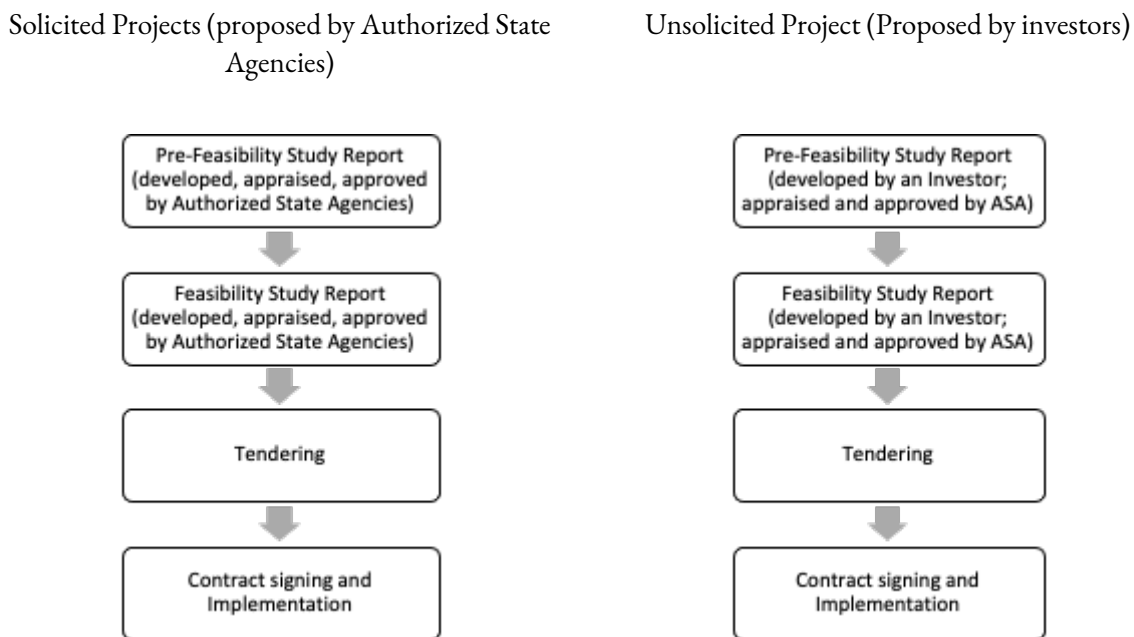


Figure 9. Role of state agencies in project appraisals across project proponents and the differences in project approval processes across project proponents.

Due to its rich biodiversity and natural heritage, there is an active network of international non-governmental organizations working towards the protection and preservation of the biodiversity of the country. Some of the main NGOs operating in Vietnam include the Vietnam Association for Conservation of Nature and Environment, the Vietnam Forestry Science and Technology Association, Center for Natural Resources and Environmental Studies, Education for Nature-Vietnam, PanNature, IUCN, Birdlife International, World Wide Fund for Nature, Wildlife Conservation Society, Fauna and Flora International, Asian Turtle Program, and the People Resources and Conservation Foundation.

VII. Recommendations

The following recommendations focus on how various stakeholders can help ensure project safeguards and ESIA are more rigorous, transparent, and community-engaged.

Safeguards driven by funders

Funder-driven safeguards are likely to push effective implementation of national regulations and enhance capacity for the same. Project funders, developers, and contractors could encourage and facilitate EIA processes and their enforcement for all projects. While a set of national environmental and social safeguards in Vietnam does exist, the implementation and direction for these are scattered across multiple departments and ministries. The funders of development projects can aid improved practices in the country by mandating compliance with national legal frameworks and international best-practice for state-owned and private enterprises seeking access to investment funds, loans, or import quotas. Further research should be conducted to compare how other lenders, such as the ADB or JICA, implement and monitor safeguards.

Engagement with conservation-based NGOs

While approvals of national EIAs and investor licenses are mandatory in project planning, cumulative biodiversity impacts at the landscape or regional level are often neglected, especially since all EIAs are completed only for specific projects. Investor engagement with conservation NGOs would greatly benefit the project planning and implementation stages, as NGOs can provide holistic oversight of the natural landscapes beyond the project's scope.

Inter-ministerial coordination

The lack of inter-ministerial coordination and transparency in governance is a huge challenge in Vietnam. While complex legal frameworks and safeguards exist, implementing the same is often ineffective as ministries and departments have disparate regulations and are very siloed. Providing an opportunity for these institutions to consult and inform each other would strengthen the EIA process. This could be done by developing, facilitating, and funding coordination groups and coalitions. These groups could be strengthened through capacity needs assessments followed by appropriate training and workshops, where representatives of various stakeholder groups could be invited to participate.

Centralized data portal

With growing plans for biodiversity, including taxa-specific plans like the primate action plan, a centralized data portal for upcoming development projects in high biodiversity areas, and a centralized library of biodiversity data would benefit stakeholders. Especially as coordination becomes formalized but is still hindered by the lack of open data to inform decision-making.

Standard Operating Procedures for onboarding EIA practitioners

While the EIA process in Vietnam is detailed and robust, and some loopholes must be urgently addressed. For instance, the project developers are the hiring agency of EIA consultants instead of government departments. Thus, EIA consultants are likely to face pressures to be selected more often if they underplay and minimize the detrimental impacts from large infrastructure in their reports. This potential conflict of interest could be solved by developing standard operating procedures that specify certain qualifications/ certifications/licenses every

EIA consultant or agency must possess to undertake EIA assessments in Vietnam. Moreover, the EIA reports produced after assessments should be scrutinized by government agencies.

Addressing rent-seeking and corruption

In Southeast Asia, our understanding of corruption needs scrutiny. In a resource-poor environment, where official government and enforcement roles do not adequately compensate those tasked with conserving lands, rent-seeking becomes a way of making ends meet in applied positions where stakeholders are required to engage with each other financially. Such a situation is neither the rule nor the exception in Vietnam. Future work in advancing governance in natural resources should consider the origin of corruption and work on the root cause without vilifying specific actors who remain resource-poor.

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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, CLLC maintains 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 annex¹. 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

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

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

C. Summary statistics from our analyses (Appendix B)

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

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

Vietnam	70th Percentile Core	80th Percentile Core	90th Percentile Core
CBI Core Area (km ²)	97276	64290	31819
Overlap with Protected Areas (km ²)	6047.91	4906.15	2290.14
Percentage of CBI Core within PAs (%)	6.21727	7.63128	7.1974

Chinese-funded LI across Vietnam

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

LI Mode	Length
Road (km)	67.789099
Rail (km)	2265.47726
Transmission (km)	0

Length of Chinese-funded LI within CBI Cores in Vietnam

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

LI Mode	70th Percentile Core	80th Percentile Core	90th Percentile Core
Road (km)	0	0	0
Rail (km)	99.706497	77.859596	0
Transmission (km)	0	0	0