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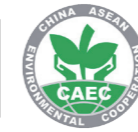


REPORT

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Lancang-Mekong Sustainable Infrastructure Investment and Financing

Research Report on Environmentally Sustainable Highway Infrastructure

China-ASEAN Environmental Cooperation Center

October 2018



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Introduction

The Lancang-Mekong region, which includes Cambodia, China, Laos, Myanmar, Thailand and Vietnam, is a main economic growth point in the Asia-Pacific region and an important regional pivot for Belt and Road Initiative. The Lancang-Mekong New Regional Cooperation Mechanism on the principle of achieving shared growth through discussion and collaboration was formally established at the first Lancang-Mekong Cooperation Leaders' Meeting convened in March 2016. The Lancang-Mekong Cooperation will develop cross-border economy, strengthen production capacity cooperation and complement respective advantages, with focus on the promotion of infrastructure interconnectivity. "Highway Infrastructure Interconnectivity" is a priority of both the Lancang-Mekong Cooperation Mechanism and the Belt and Road Initiative. The research on Lancang-Mekong road infrastructure investment and green finance will help China's inland areas to forge link with countries along the Belt and Road, paving a solid foundation for regional investment and trade that promotes regional integration and sustainable development.

The Lancang-Mekong region serves as a land and sea bridge connecting China with Southeast Asia and South Asia. The Lancang-Mekong region is imbalanced in economic and social development due to a variety of factors. As the financing capacity, technology and experience of infrastructure construction need to be improved, the regional infrastructure supply is insufficient, which restricts the regional economic growth rate and sustainable development capacity. In recent years, countries in the region have been actively reforming their economies, adjusting the industrial structure and expanding opening up. Great improvements have been made in infrastructure construction field, especially in transportation and infrastructure network connectivity. It has also played an important role in promoting regional economic growth, poverty alleviation and improving the people's living quality. According to data released by the Asian Development Bank in 2017, infrastructure investment demand in Southeast Asia is expected to reach USD 3.147 trillion in 2016-2030, accounting for 5.7% of GDP. The Lancang-Mekong region has huge potential in infrastructure construction and investment and will face unprecedented development opportunities.

At the same time, there are still some challenges in realizing the sustainable infrastructure connectivity in the Lancang-Mekong region. Firstly, the industrial development level in some countries is weak and infrastructure improvement level is not high as well as the investment and development capacity for participating in sustainable infrastructure construction needs to be improved. Secondly, the Lancang-Mekong region has a long history of international cooperation and has been involved in many international cooperation mechanisms. Different cooperation mechanisms have different emphasis on sustainable development. How to make full use of the experience of all parties to promote the long-term development of sustainable infrastructure construction in the region is an important issue to be discussed. Thirdly, the standards and implementation methods of sustainable infrastructure still need to

be strengthened in the regional infrastructure construction.

To promote the highway infrastructure connectivity and sustainable development in the Lancang-Mekong region, the report proposes: 1. Establish a policy dialogue platform and capacity-building system to promote the sharing of ideas and experience of sustainable highway construction, strengthen dialogue and cooperation among governments, enterprises, financial institutions, research institutes and social organizations, improve the level of environmental and social risk analysis and management of enterprises in infrastructure construction and carry out environmental management capacity-building projects for enterprises. 2. Promote the mainstreaming of environmental policies, promote the joint study on Lancang-Mekong sustainable infrastructure standards and promote the research on full life cycle design, construction and operation standards and specifications of Lancang-Mekong sustainable highway infrastructure and environmental management system and their application and promotion in the region combined with economic development of the Lancang-Mekong region and actual demand and affordability of each country. 3. Promote the greening of financial institution system under the framework of the Lancang-Mekong cooperation mechanism, introduce and build a relatively high standard environmental and social risk control system, promote the participation of Chinese financial institutions in the construction of the Lancang-Mekong cooperation mechanism and increase investment in green low-carbon projects and ecological environment protection projects. 4. Establish a sound and relatively transparent disclosure system for environmental and social risk information on highway infrastructure construction projects to strengthen the dialogue and cooperation with the public, communities and non-governmental organizations, and pay more attention to social equity and improvement of social livelihood. 5. Promote the comprehensive pilot projects of green highway infrastructure construction under the Lancang-Mekong cooperation framework to integrate the advanced technology of ecological planning and construction standards and concept of ecological corridor into the specific projects of regional highway infrastructure construction.

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I. Global sustainable highways: connotation and trends

1. Development connotation

Transport infrastructure construction, as a pillar of the national economy, plays a crucial role in the development of national economy. This report focuses on highway infrastructure among the diverse modes, including road, rail, aviation and water. Highway infrastructure construction and operation have direct and indirect impacts on the environment. The direct environmental impact covers mining, fossil energy utilization, eco-environmental destruction and pollutant emissions during construction, and the indirect environmental impact includes pollutant emissions, traffic problems and noise caused by vehicles during operation.

Internationally, the World Highways defines sustainable or green highway as a system of roads which limit their impact on the environment to a minimum through different sustainable practices. The aim is to maximize the lifetime of a highway while restricting its emissions¹.

In 2016, the Chinese Ministry of Transport (MOT) released the Guiding Opinions on Implementing Green Highways, which put forward the key requirements for green highways, including resource utilization efficiency improvement, ecological protection enhancement, life-cycle management, and technology and management innovation.

¹ <http://www.worldhighways.com>

Box 1: Highlights of the Guiding Opinions on Implementing Green Highways

The Guiding Opinions on Implementing Green Highways, released by MOT on July 20, 2016, makes the following highlights:

1. Basic principles:

Sustainable, coordinated and innovation-driven development, and adaption to local conditions.

2. Objectives:

By 2020, noticeable progress will be made in green highways: the standard and assessment system for green highways will be basically established; the concept of green highway will be embraced by the people; a number of green highway demonstration projects will be implemented, which deliver replicable and extendable experiences and remarkable results in industry promotion and demonstration.

3. Main tasks:

(1) Make coordinated and intensive use of resources for conservation purpose. Intensively use channel resources, strictly protect land resources, proactively apply energy-saving technologies and clean energy, and vigorously promote waste material recycling.

(2) Step up ecological protection with a view to harmony with nature. Promote eco-friendly design, strictly enforce environmental protection during construction and strengthen environmental management during operation.

(3) Place equal emphasis on construction and maintenance with focus on life-cycle costs. Underline life-cycle costs, practice standardized construction in all aspects, and improve maintenance facilitation.

(4) Implement innovation-driven, scientific and efficient construction. Intensify the research on green highway technologies, increase the application of information technology and summarize and extend new experience in construction management, explore the deployment of diversified service facilities and enrich the way of comprehensive road services.

(5) Improve standards and promote demonstrations. Formulate green highway standards, carry out five special campaigns and build demonstration projects

In September 2015, the 2030 Agenda for Sustainable Development, including 17 Sustainable Development Goals (SDGs) and 169 targets, was proposed by the United Nations and adopted unanimously by 193 member states. Transport is important to the achievement of these goals, though not directly within the scope, because it is closely related to food security, health, energy, infrastructure and urban development.

Table 1 Transport-related sustainable development goals and targets

	Goals	Targets	Indicators
Goal 2	End hunger, achieve food security and improved nutrition and promote sustainable agriculture	2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment	
Goal 3	Ensure healthy lives and promote well-being for all at all ages	3.6 By 2020, halve the number of global deaths and injuries from road traffic accidents	Traffic fatalities
		3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	Mortality induced indoor and outdoor pollution
Goal 6	Ensure availability and sustainable management of water and sanitation for all	6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all	
Goal 7	Ensure access to affordable, reliable, sustainable and modern energy for all	7.3 By 2030, double the global rate of improvement in energy efficiency	Energy intensity or energy consumption per unit of gross domestic product (GDP)
Goal 9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all	CO2 emissions per unit of added value
Goal 11	Make cities and human settlements inclusive, safe, resilient and sustainable	11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons	Proportion of persons with convenient access to public transport (by age, gender, persons with disabilities)
		11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management	Average annual urban concentration of fine particulate matter

Goal 12	Ensure sustainable consumption and production patterns	12.c Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities	Fossil-fuel subsidies per unit of GDP
		12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses	
Goal 13	Take urgent action to combat climate change and its impacts	13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	
		13.2 Integrate climate change measures into national policies, strategies and planning	

Source: Partnership for Sustainable Low Carbon Transport

2. Development trends

Taking into account the research experiences, strategic planning and priority areas of different development agencies and international organizations, developing countries will mainly face the following trends in the field of sustainable highway infrastructure

(1) Rapidly growing demand for highway infrastructure

The current road transport lags far behind the needs of the poor population in remote areas and links between developed and underdeveloped areas. In the developing regions, the high poverty rate in remote areas is largely caused by transport inconvenience. In the field of highways, expressway network construction can effectively reduce transport and trade costs and stimulate economic growth in the region, while the improvement of road quality at lower levels is crucial to better livelihoods of the people.

(2) Financing channel diversification and social capital participation

The mobilization of diversified financing and social capital participation has always injected new vitality into the construction of sustainable highway infrastructure and is also conducive to the sustainability and stability of sustainable infrastructure construction. Nevertheless, due to a variety of factors, the private sector takes a generally low share in sustainable road infrastructure loans in developing countries. These factors include institutional guarantees to be improved, lack of relevant experiences, unpredictable political, environmental and social risks, and maturity mismatch caused by the prolonged investment cycle of sustainable infrastructure. Therefore, it is necessary to take relevant measures to promote the participation of social capital.

(3) Infrastructure operation and management sustainability

In general, each U.S. dollar short in basic road maintenance costs will add vehicle operating costs by more than 3.9 U.S. dollars. Many developing countries and regions still suffer larger deficiencies in road infrastructure maintenance. Some governments pay more attention to the construction of new roads, but ignore the maintenance of existing roads. They underperform in the necessary policies, institutional arrangements and maintenance capabilities for sustainable operation and maintenance of road transport.

(4) Regional cooperation and integration

Regional cooperation and integration is recognized as a work priority and long-term strategy in many countries, regions and national organizations. In the transport sector, promoting and achieving integrated development means accelerating the investment needed to complete the regional road network through investment plans, fostering a competitive regional transport network, and streamlining cross-border rules and procedures in a faster and more efficient way.

The international community has reached a consensus that sustainable infrastructure is necessary to promote inclusive growth and achieve sustainable development. However, sustainable infrastructure poses high requirements for both capital and technology in all aspects of infrastructure, such as design, construction and operation. With an imperfect standard system, sustainable infrastructure has faced challenges. Investors' lack of the concepts and technologies and unity problems of standards of sustainable infrastructure hinder the promotion of sustainable infrastructure in a large area. The cost-benefit analysis of infrastructure indicates that sustainable infrastructure requires high upfront investment but low operating costs. The current lack of business models that facilitate life-cycle reasonable allocation of costs and benefits remains a major factor restricting investment in sustainable infrastructure.

II. Highway infrastructure investment in the Lancang-Mekong region

Highway infrastructure interconnectivity and international channel construction will not only upgrade the technical structure of highways, but also facilitate improvements in the space capacity, investment environment, as well as trade and industry of countries in the region. This will provide effective support for industrial layout and input flow and contribute to substantial growth in economic strength within the region and along the transport routes. At the same time, upgrading and expanding highway infrastructure between regions will lead to the high concentration of production technology, manpower, capital, logistics, industries and markets along the transport routes, so as to achieve regional economic integration.

1. Regional infrastructure construction and development

Although some Asian countries have reached more advanced levels in infrastructure construction, the Lancang-Mekong region as a whole remains below the world average both qualitatively and quantitatively.

Table 2 Infrastructure competitiveness rankings of the Lancang-Mekong countries²

	Overall infrastructure quality	Road quality	Railway infrastructure quality	Port infrastructure quality	Aviation infrastructure quality	Available airline seat kilometers	Power supply quality	Number of mobile phone subscriptions per 100 persons	Number of fixed phone subscriptions per 100 persons	Overall infrastructure rankings
China	43	39	14	43	49	2	56	105	64	42
Cambodia	95	93	98	76	99	81	106	35	116	106
Laos	81	91	N/A	132	100	115	77	131	73	108
Thailand	72	60	77	65	42	15	61	55	91	49
Vietnam	85	89	52	77	86	29	85	40	99	79

* Data unavailable for Myanmar

Source: The Global Competitiveness Report 2016–2017, Columbia University

² Source: The Global Competitiveness Report 2016–2017, Columbia University

In terms of road transport infrastructure, the Southeast Asia routes represent partial Asian Highway (AH) network in Southeast Asian countries. AH is an international road transport network connecting major Asia cities initiated by the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) in 1959. Under the framework, the East Asia routes and the Northeast Asia routes have the longest kilometers, followed by the South Asia routes which cover the Indian Highway. The Southeast Asia routes are the third longest and mostly distributed in Indonesia and Thailand. The construction degrees in Southeast Asia countries are different.

At the ASEAN Transport Ministers Meeting, a milestone plan of road standards was formulated for infrastructure construction in the ASEAN territory. More specifically, all member states should complete the layout and marking of domestic road routes by 2000, install universal road signs on the prescribed routes and upgrade roads to Class II or higher standards by 2004, upgrade designated roads to Class I standards and non-backbone routes to Class II standards by 2020. However, constrained by the lack of funds for transportation projects, the completion of this plan on schedule has great obstacles and difficulties.

2. Laws and regulations on regional sustainable infrastructure

In most countries, environmental protection and management associated with investment have been reflected in the foreign investment law and relevant environmental protection laws and become an important criterion of overseas investment and construction for companies and organizations. The Lancang-Mekong countries have formulated the investment and environment laws, but their current investment laws do not define the relevant provisions of environmental protection for infrastructure investment. Environmental protection provisions for infrastructure construction are mainly defined by environmental impact assessment laws or relevant regulations.

Box 2: EIA provisions for infrastructure construction and investment in Cambodia³

Cambodia's Sub-Decree on Environmental Impact Assessment Process defines the nature and size of projects subject to EIA. In the Annex, EIA-required projects are divided into four categories: industry, agriculture, tourism and infrastructure. Among them, infrastructure projects cover urbanization development, bridges, road, railway and port construction, restaurants and hotels, airport construction etc.

Article 6 stipulates that the project sponsor shall conduct initial environmental impact assessment (IEIA) and pre-feasibility study for the project. Article 7 and Article 9 set forth that the project sponsor shall submit the Environmental Application for reviewing IEIA reports and pre-feasibility study to the Ministry of Environment, or the Provincial Environmental Department for the local projects. As EIA corresponds to IEIA, Article 8 made clear that the project sponsor shall submit the

³ Source: Environmental Monitoring Report on Cambodia Highway Improvement Project in the First Half of 2017, <https://www.adb.org/projects/documents/cam-43309-013-emr-0>

Environmental Application for reviewing full-scale EIA reports and feasibility study to the Ministry of Environment for the projects deemed serious impact to the natural resources, ecosystem, health and public welfare. Only a part of projects requires full-scale EIA review after IEIA-based screening. The general EIA review process is described as follows:

- Submit the investment plan. The project sponsor must submit the investment proposal to the environmental department for examination.
- Screen for environmental impact. There are three possible outcomes after the examination by environmental authorities: EIA not required; IEIA required; full-scale EIA required. The project sponsor shall conduct full-scale EIA report in case the environmental department determines the project is deemed serious impact to the natural resources, ecosystem, health and public welfare.
- Scope EIA review and evaluation. The environmental department will carefully review the EIA report of projects where EIA is required.
- Develop mitigation measures. The environmental department will require the project sponsor to take mitigation measures in case the project is deemed serious impact to the natural resources, ecosystem, health and public welfare.
- Submit EIA report. The project sponsor shall report their previous activities to the Ministry of Environment.
- Review EIA report. The environmental department will review the EIA report upon application.
- Publish review findings. If the EIA report of proposed project complies with the requirements, the environmental department will make affirmative decisions and the project sponsor can implement the project. However, during the process of project implementation, the environmental department will monitor and conduct EIA audit and review. In case the EIA report is not approved, the project sponsor can only redesign the report resubmit the application in similar process to continue the investment.

The approval for the EIA report of infrastructure project does not mean that the project sponsor is no longer responsible for the environment. Article 23 and Article 26 note that the project sponsor shall implement the Environmental Management Plan contained in the EIA report within six calendar months, commencing from the date of the confirmation of the Ministry of Environment or Provincial Environmental Department that the EIA report duly meets the requirements of this sub-decree.

In other words, the project sponsor is subject to and responsible for implementing the Environmental Management Plan contained in their EIA report. In case that project sponsor fails to accomplish the plan stated in the approval of their EIA report, the Ministry of Environment will cooperate with concerning ministries/institutions to issue an order of halt in accordance with Article 28. The project sponsor will also be punished accordingly.

3. Lancang-Mekong highway infrastructure construction and investment

The following conclusions are drawn after investigation and research of infrastructure policies and regulations and highway infrastructure investment realities in the 5 countries in Mekong region:

(1) The Lancang-Mekong countries remain at a developing stage with infrastructure construction capacity to be improved. As an important foundation for sustained and steady economic growth, infrastructure is of crucial importance to sustainable economic development of these regions and countries. Some countries' infrastructure construction is relatively lagging behind, and industrial supporting capacity needs to be improved urgently in the region.

(2) The legislative and institutional capabilities are to be improved and developed. Through reviewing the laws and regulations of the Lancang-Mekong countries, the provisions concerning sustainable infrastructure are only found in investment and trade laws. For example, the industry-specific preferential policies include incentives such as tax relief and other non-tax preferential interests for infrastructure construction. There are neither regulations on overseas investment in infrastructure construction nor laws and regulations specific to infrastructure construction. The environmental protection requirements for infrastructure basically depend on the environmental laws and EIA provisions.

(3) The financing mode is relatively single. In the Lancang-Mekong countries, highway infrastructure projects are largely built with the help of concessional loans or grants from governments. Commercial banks and private enterprises exhibit a low degree of participation in project investment with single financing mode. Infrastructures have limited profitability and long payback periods and require increasing cash inflows over time, resulting in low short-term return. It is difficult to obtain funds from commercial financial institutions, so the overall financing capacity is weak; private enterprises invest and participate little in infrastructure projects, especially in the absence of effective mechanisms and payment policies.

III. Environmental management experience of multilateral developmental financial institutions agencies in highway infrastructure investment and financing in the Lancang-Mekong region

Multilateral financial institutions focusing on development play an active role in promoting the infrastructure construction in the Lancang-Mekong region. In particular, the Asian Development Bank and the World Bank supported projects on cross-border road construction and improvement in the Greater Mekong Subregion (GMS). Multilateral developmental financial institutions have basically developed strategies for sustainable infrastructure development and plans of action in the transport sector. In addition, the environmental and social safeguard systems of such financial institutions make great contribution to the sustainable construction of infrastructure including highways.

1. World Bank Group (WBG)

1.1. Current situation of WBG in Sustainable Infrastructure Investment in the Lancang-Mekong Region

According to the project database of the World Bank Group (hereinafter referred to as World Bank), as of the year of 2017, the World Bank has engaged in nearly 40 road infrastructure projects in Cambodia, Laos, Vietnam, Thailand and Myanmar, all of which are public sector (sovereign) financing projects, involving a total cost of 5.4 billion US dollars. These projects cover road rehabilitation, upgrading and construction, road network connectivity, capacity building, and other related activities.

The World Bank-supported road infrastructure projects in the Lancang-Mekong region focus on road rehabilitation, upgrading and construction, especially road construction in rural areas and remote areas, as well as repair, maintenance and upgrading for adaptation to climate change for major roads, thereby improving people's living standards and promoting local economic development. A road infrastructure project is usually divided into several sub-projects, including construction component, organization building and capacity building training. The World Bank rates infrastructure projects according to environmental categories, and formulate environmental protection standards referred to various environmental categories.

1.2. Environmental management system framework

The World Bank's safeguard policies are mainly made up of operational policies (OPs), which encompass core requirements and mandatory procedures. It's OPs related to environmental safeguard can be divided into the following categories:

(1) Environmental Assessment (OP 4.01). The policy identifies potential environmental and social impacts and designs measures to mitigate these impacts, and also determines whether other safeguards (e. g. involuntary resettlement) need to be applied. The World Bank requires its customers to establish an Environmental and Social Assessment and Management System (ESMS) to identify and manage potential environmental and social risks.

(2) Natural Habitats (OP 4.04). The policy prevents projects funded by the World Bank from affecting areas where are dominated by native plant and animal species, essentially assures they are not affected by human activities.

(3) Pest Management (OP 4.09). The policy promotes the use of biological or environmental control methods, reduces reliance on chemical pesticides, and sets limits on pesticide accessibility and usage. The World Bank will finance the purchase of pesticides only when their use with an integrated pest management is justified .

(4) Indigenous Peoples (OP 4.10). The policy defines standards and procedures for projects that affect Indigenous Peoples, which procedurally empowers these people to agree or reject proposed projects.

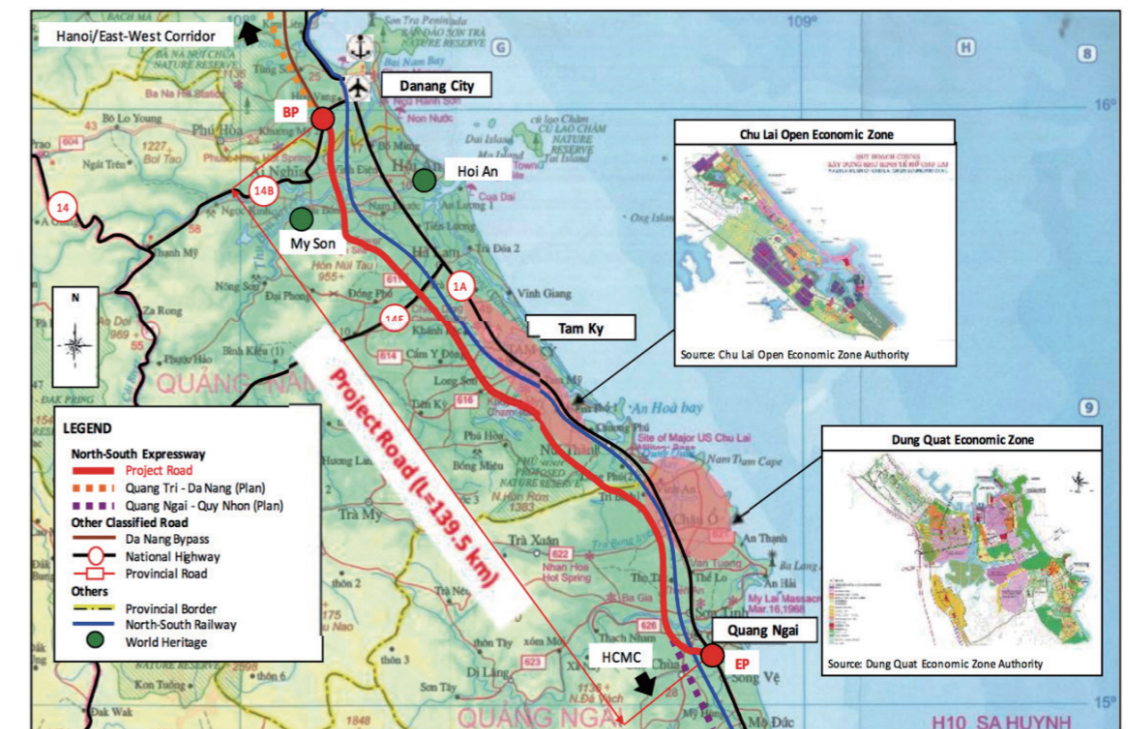
(5) Involuntary Resettlement (OP 4.12). The policy sets out standards and procedures for projects that result in economic resettlement due to relocation or loss of shelter, assets or income sources.

(6) Forests (OP 4.36). The policy sets the minimum standards for proposed forest projects, so that the World Bank may finance commercial harvesting and plantations on prescribed conditions.

Box 3: Environmental management case of the World Bank on highway construction in the Lancang-Mekong region

The Da Nang–Quang Ngai Expressway Development Project (P106235) in Viet Nam was approved by the World Bank on May 24, 2011 and is scheduled to close on October 31, 2018. The project cost totals 1403.7 million U.S. dollars with a World Bank commitment of 613.5 million U.S. dollars from the World Bank. Implemented by Vietnam's Ministry of Transport, the project aims to construct an expressway that will enhance efficiency and safety for road users travelling between Da Nang city and Quang Ngai province and build institutional capacity for expressway development in Vietnam's Ministry of Transport. It is rated “A” for environmental category by the World Bank. In July 2013, the World Bank released the EIA report of the project, including detailed project description, analysis of alternatives, local natural environment and socio-economic conditions, public consultation, information disclosure, and analyzed the environmental and social impacts in the stages of design, construction and operation, then offered solutions to mitigating the negative impacts.

Figure 1. Schematic diagram of Da Nang–Quang Ngai Expressway Development Project



The project is located in the central coastal area of Vietnam, which is strongly affected by tropical monsoon weather. Before the start of the project, the natural and ecological environment was investigated, and the results indicated good water quality of rivers, reservoirs and groundwater in the project area, noise levels at the schools beyond Class 1 standard, and good ambient air quality within the assessment scope. The wildlife conditions, protected areas (Phu Ninh Protected Area) and socio-economic conditions were also analyzed in detail. Though the investigation, the major environmental and social problems brought by the project are summarized as follows:

Table 3 Major environmental and social impacts potentially caused by the project⁴

Environmental elements	Design stage	Construction stage	Operation stage
Pollution			
Air pollution	-	▲	▲
Surface water pollution	-	▲	○
Groundwater pollution	-	○	-
Destruction and waste	-	▲	○
Soil pollution	-	○	○
Vibration	-	○	○
Noise	-	▲	▲
Natural environment			
Protected areas	-	-	-
Terrestrial ecosystems	-	▲	○
Hydrological conditions	-	▲	▲
Topography and soil erosion	-	▲	○
Social environment			
Land requisition and demolition	▲	○	-
Residential life	▲	▲	○
Heritage, culture and archeology	-	▲	○
Landscape (aesthetic and visual effects)	-	○	○
Transport and public safety	-	▲	○
Community severance	-	▲	▲
Public health	-	○	○
Risks	-	▲	▲
Religions	○	○	○
Minorities and indigenous peoples	-	-	-
Unidentified bombs and mines	○	○	-

▲ Expected serious adverse impacts

○ Expected moderate adverse impacts

- Limited / negligible impacts

In order to minimize the negative impacts on the environment and society, mitigation measures were proposed. At the designing stage, against the land acquisition and demolition as well as influence asserting on residents' life, the Livelihood Restoration Program with concrete measures such as relocation was proposed. At the construction stage, problems cover air and surface water pollution, destruction and waste, noise, terrestrial ecosystems, hydrological conditions, topography and soil erosion, residential life, heritage, culture and archeology, transport and public safety, community severance, and risks, etc. At the operation stage, flood, air pollution, water environment, noise and vibration, waste, community severance and landscape (aesthetic and visual effects) are major problems. A raft of measures were described specific to problems that may arise. In addition, the World Bank approved the environmental management plan of the project in October 2010, which contained the

⁴ Source: EIA Report of the World Bank on Da Nang–Quang Ngai Expressway Development Project, <http://projects.shihang.org/P106235/da-nang-quang-ngai-expressway-development-project?lang=zh>

environmental monitoring program, and reviewed and updated the plan in 2013.

2. Asian Development Bank (ADB)

2.1. Current situation of ADB in sustainable infrastructure investment in the Lancang-Mekong region

There are abundant natural and cultural resources and great potential for economic development in the Mekong region, in order to promote regional transport infrastructure development and trade facilitation, ADB put forward the concept of economic corridor development, of which road transport is an important component.

In October 1998, ADB proposed the initiative to build GMS economic corridors at the 8th Ministerial Conference of GMS Economic Cooperation. GMS economic corridors are defined as an economic cooperation mechanism that integrates production, investment trade and infrastructure construction together within the subregion. They are conducive to strengthening infrastructure interconnectivity and harnessing economic potential in the GMS countries, thereby promoting GMS economic integration.

According to the overall layout of GMS transport network, GMS economic corridors are composed of three major economic corridors. According to ADB's route planning, the East-West Economic Corridor mainly covers Vietnam, Laos, Thailand, Myanmar and Cambodia that are "horizontally" distributed. The North-South Economic Corridor includes west, central and east routes, which extend from Kunming, China to "vertically" distributed GMS countries, such as Laos, Thailand, Vietnam and Myanmar. The Southern Economic Corridor connects three Mekong countries with coasts, namely Thailand, Cambodia and Vietnam. The later proposed extensions or supplements of the three GMS economic corridors include the Western Corridor, Northeastern Corridor, Central Corridor, and Eastern Corridor. The ADB-supported GMS highway projects as of early 2009 are as shown in Table 4.

Table 4 Statistics on ADB-supported highway projects in the Lancang-Mekong region, 1966–2008

	Regional highway mileage (km)	National highway mileage (km)	Provincial highway mileage (km)	Total mileage (km)	Cost (USD millions)		ADB loans (USD millions)
					Cost per unit km	Total cost	
Thailand	783	971.4	1459	3213	0.35	1130.6	631.2
Myanmar	253.2	0	0	253.2	0.50	127.1	34.4
Laos	1321.3	171.3	275	1767.6	0.24	416.9	298.2
Vietnam	1484.3	435	3200	5119.3	0.44	2246.8	1705.3
Cambodia	328	1596	0	1924	0.14	260.3	151
China	2624.7	2557.4	10139.2	15321.3	1.43	21853.5	6331

Source: Transport Infrastructure and Trade Facilitation in the Greater Mekong Subregion, ADB 2017

Approved by the GMS countries in December 2013, the GMS Regional Investment Framework (RIF) identifies a pipeline of investment and technical assistance projects with an estimated cost of more than 50 billion U.S. dollars in the period from 2013 to 2022. RIF encompasses more than 200 projects from ten sectors, including transport, energy, environment, agriculture, human resource development, information and communication technology, tourism, transport and trade facilitation, as well as urban development. The transport sector accounts for 86.0% of the estimated total cost, involving 78 investment projects (44.1 billion U.S. dollars) and 12 technical assistance projects (15.2 million U.S. dollars). In this sector, 30.1% of the investment projects and 24.3% of the technical assistance projects target highway infrastructure, as shown in Figure 2.

Figure 2. RIF transport investment and technical assistance projects by subsector

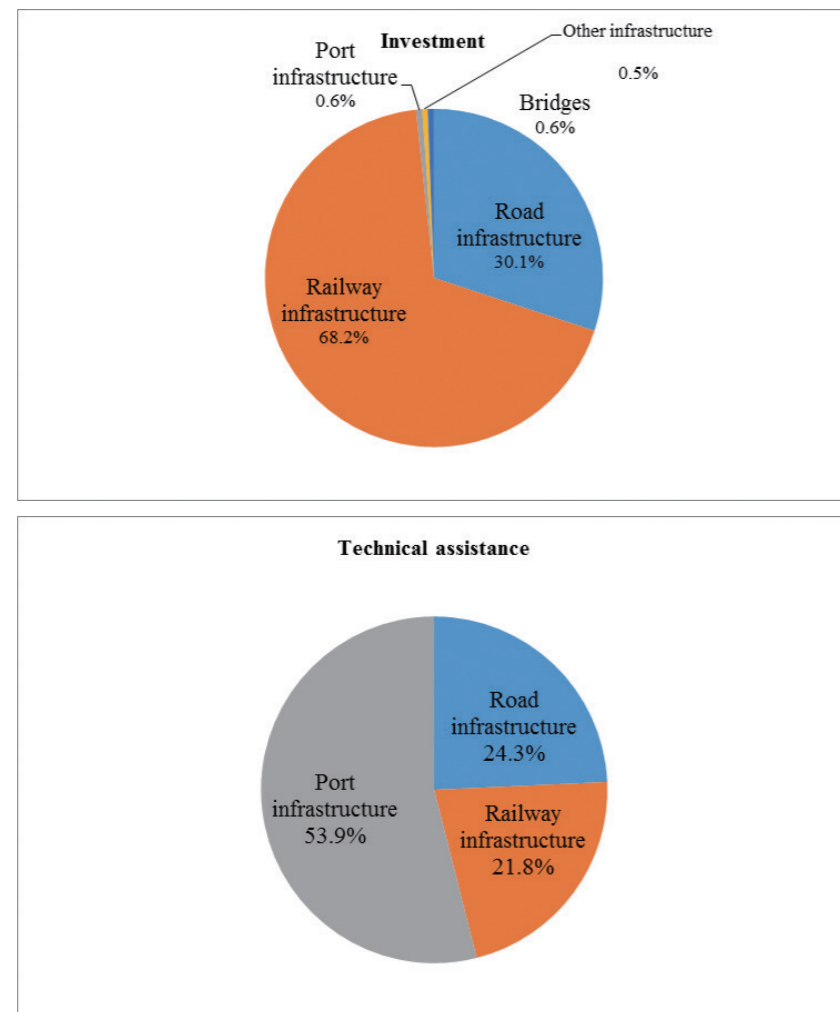


Table 5 lists some potential investment projects targeting highway infrastructure under the RIF framework. It can be seen that the GMS countries have an enormous demand for highway infrastructure construction, development and maintenance during 2013–2022.

Table 5 RIF pipeline of potential investment projects for road infrastructure in the transport sector⁵

Project	Country coverage	Cost estimate (USD millions)
Cambodia		
Poipet–Aranyaprathet New Road with Cross-Border Facilities	Cambodia, Thailand	TBD
Phnom Penh–Sihanoukville Highway Corridor Improvements	Cambodia	1000.0
Sihanoukville Port Access Road Improvements	Cambodia	40.0
GMS: Deepening Connectivity of Southern Economic Corridor Project	Cambodia	120.0
China		
Longling–Ruili Expressway	China	1750.0
Jinghong–Daluo Expressway	China	2040.0
Yunnan Pu'er Regional Integrated Road Network Development Project	China	500.0
Laos		
Upgrading of NR1A (Portion from Lantui to Bounneau)	Laos	91.0
Upgrading NR13 (Portion from Oudomxay to Pakmong)	Laos	82.0
Upgrading of NR8 East-West Transport Route	Laos	80.0
Myanmar		
East-West Economic Corridor Eindu–Kawkareik Road Improvement	Myanmar	130.0
Thaton–Payagyi Road Improvement Project	Myanmar	128.0
Thilawa–East Dagon Road Improvement Project	Myanmar	41.0
Thailand		
Aranyaprathet–Poipet New Road with Border-Crossing Facilities (Thailand part)	Cambodia, Thailand	TBD
Bang Yai–Kanchanaburi Intercity Motorway Project	Thailand	300.0
Mae Sot–Myawaddy Border Crossing Project and Infrastructure Improvements (Thailand part)	Thailand	TBD
Vietnam		
National Highway 14D Improvement Project	Vietnam	130.0
Central Mekong Delta Connectivity	Vietnam	886.0
GMS Ha Noi–Lang Son Expressway	Vietnam	1400.0
Second GMS Southern Coastal Corridor	Vietnam	373.0

⁵ Regional Investment Framework Pipeline of Potential Projects (2013–2022), ADB

2.2. Environmental management system framework

ADB approved the Safeguard Policy Statement (SPS) on environmental and social safeguards for its operations. ADB's SPS safeguard policy framework consists of three operational policies on the environmental protection, involuntary resettlement and indigenous peoples and pays more attention to the environmental and social impacts and risks. All safeguard policies involve a structured process of impact assessment, planning, and mitigation to address the adverse effects of projects throughout the project cycle.

Safeguard Policy Statement requires that (a) impacts are identified and assessed early in the project cycle; (b) plans to avoid, minimize, mitigate, or compensate for the potential adverse impacts are developed and implemented; (c) affected people are informed and consulted during project preparation and implementation. The policies apply to all ADB-financed projects, including private sector operations, and to all project components.

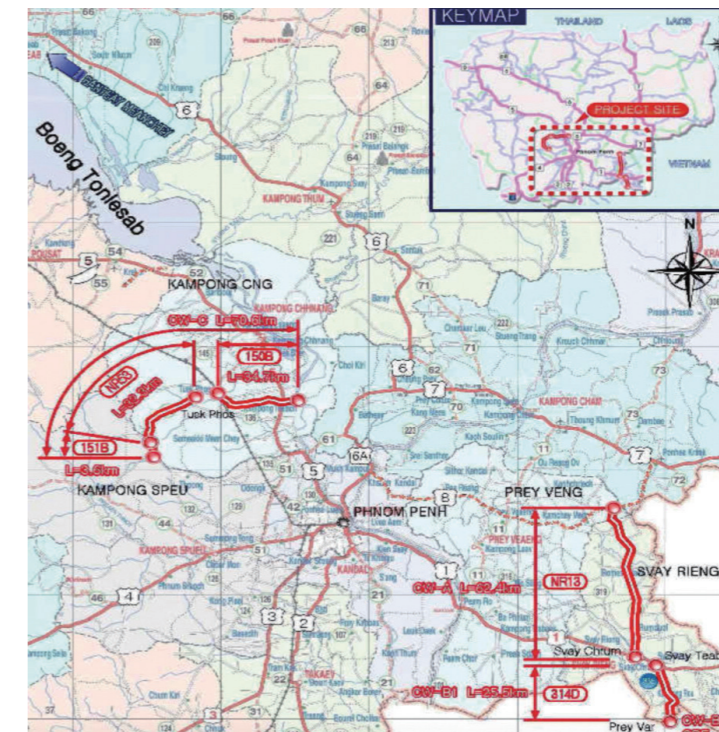
The internal procedural requirements are detailed as follows: (a) screening and scoping of the main issues start as soon as potential projects for ADB financing are identified and continue throughout the project cycle; (b) impacts are assessed, safeguard plans summarizing mitigation measures, monitoring program, and institutional arrangements are prepared, and arrangements are made to integrate safeguards into project design and implementation; (c) affected people are consulted during project preparation and implementation and information is disclosed in a form, manner, and language accessible to them; (d) safeguard plans are disclosed to the general public and the information is updated at various stages in the project cycle.

ADB and borrowers have their own monitoring responsibilities. The extent of monitoring activities, including their scope and periodicity, will be commensurate with the risks and impacts of projects. Borrowers are required to implement safeguard measures and relevant safeguard plans, as provided in the legal agreements, and to submit periodic monitoring reports on their implementation performance. ADB will conduct periodic site visits for projects with adverse environmental or social impacts; conduct supervision missions with detailed review by ADB's safeguard specialists, officers or consultants for projects with significant adverse social or environmental impacts; review the periodic monitoring reports submitted by borrowers to ensure that adverse impacts and risks are mitigated as planned and as agreed with ADB; work with borrowers to rectify to the extent possible any failures to comply with their safeguard commitments, as covenanted in the legal agreements, and exercise remedies to reestablish compliance as appropriate; and prepare a project completion report that assesses whether the objective and desired outcomes of the safeguard plans have been achieved, taking into account the baseline conditions and the monitoring results.

Box 4: An ADB environmental management case for highway construction in the Lancang-Mekong region⁶

ADB approved the Provincial Roads Improvement Project (PN: 43309-013) on December 16, 2011. This project, applied by the Government of Cambodia, aims to improve provincial roads in four southeastern provinces of the country, including upgrading the unpaved and paved roads in poor conditions through double-sided and single-sided bitumen processing, and improving bridges and other drainage structures to improve the quality of people's lives. It was launched on September 1, 2014 and was scheduled to close at the end of August 2017. The executive body is the Cambodian Ministry of Public Work and Transport and the implementing body is departments subordinated to this ministry.

Figure 3. Schematic diagram of Provincial Roads Improvement Project in Cambodia



As shown in Figure 3, the project covers a plurality of sections in several southeastern provinces of Cambodia and therefore involves a large amount of workload and time for dispersed subprojects, including CW-A, CW-B1, CW-B2, CW-C and etc.

According to ADB's safeguard policies, the project is required to publish an environmental monitoring report every six months. In July 2017, the semiannual environmental monitoring report for the first half of 2017 was released, containing environmental monitoring and assessment for each sub-projects. The ADB inspectors conducted field investigations on project implementation according to the Environmental Management Plan (EMP), covering community facilities, air quality (dust and gaseous emissions), noise levels, vibration levels, erosion and sedimentation, spoil treatment, soil and groundwater contamination, water availability, water quality, solid waste, borrow pits, traffic management and local access, damage to prosperities and community facilities, occupational health and safety, public safety, flora and fauna, as well as accidental discovery of artifacts.

⁶ Source: ADB Environmental Monitoring Report on "Cambodia Provincial Highway Improvement Project (loan No.: 2839-CAM)" Dated January 2017

The main environmental parameters used in the environmental monitoring plan are described in the following table:

Table 6 Main environmental parameters for environmental monitoring plan

Environmental issue	Parameter	Standard
Water quality	Biochemical oxygen demand (BOD)	<50mg/L
	Suspended solids (SS)	<50mg/L
	Temperature	<45oC
	Acidity (pH)	6-9
	Oil & grease	<5mg/L
	Dissolved oxygen	>4mg/L
Air quality	Total suspended particles (TSP)	<0.33mg/m3
Noise quality	Equivalent continuous sound pressure level (Leq)	75dB(A)
	Leq	65dB(A)
Vibration	Peak particle velocity (PPV)	<1mm/sec
Solid waste	Food waste	Properly removed
Liquid waste	Waste oil	Properly controlled after removed by subcontractor
Septic tank	Smell, sewage	Tasteless, no spills
Borrow pits	Condition of borrow pits	Filled after project completion, topsoil resurfaced
	Depth of borrow pits	No drowning hazard
Quarries	Conditions of quarries	Quarries reinstated
Tree if cut	Number of trees	Trees replanted

According to Table 6, inspectors carry out monthly monitoring for each subproject and put forward comments on improvements, and monitor and report the improvements made by contractors on a regular basis.

IV. China's practices for sustainable highway infrastructure investment and construction in the Lancang-Mekong region

1. Support and safeguard

China-ASEAN and Lancang-Mekong cooperation mechanism has been constantly deepened and development cooperation among Lancang-Mekong countries has ushered in a new starting point with the implementation of Belt and Road Initiative. The overall investment in infrastructure has been on the rise and the related issues of sustainable development attracted more and more attention. Southeast Asia region forms the main destination of Chinese overseas investment and construction, and the Lancang-Mekong region is the key investment area.

1.1. Strategic base

On March 28, 2015, the Chinese Government formulated and issued the Vision and Actions on Jointly Building Silk Road Economic Belt and 21st-Century Maritime Silk Road. The document identifies infrastructure interconnectivity as a priority area for implementing the Belt and Road Initiative, placing focus on key passageways, junctions and projects. It calls for improving road network connectivity and aviation infrastructure and advancing port infrastructure construction and port cooperation, so as to realize facilitation of international road, water and aviation transport. In May 2015, six major economic corridors were especially put forward at the Asia-Europe Meeting Industry Dialogue on Connectivity. Among them, the China-Indochina Peninsula Economic Corridor is the land bridge connecting China with Indochina Peninsula and is also a transnational economic corridor for cooperation between China and ASEAN. It starts from China's Nanning and Kunming and runs through Vietnam, Laos, Cambodia, Thailand and Malaysia and other countries before reaching Singapore. Relying on central cities along the route, the China-Indochina Peninsula Economic Corridor, with railways and highways as the carrier, evolves towards infrastructure interconnectivity with featuring complementary advantages, regional division of labor, joint exploitation and common development.

In November 2015, the first Lancang-Mekong Cooperation Foreign Ministers' Meeting took place in Jinghong City, Xishuangbanna Prefecture of China's Yunnan Province. The meeting announced the launch of the Lancang-Mekong cooperation mechanism and issued a Joint Press Communique. The foreign ministers agreed to push forward cooperation projects that cover infrastructure, production capacity, cross-border economy, water resources, agriculture and poverty alleviation. In March 2016,

Chinese Premier Li Keqiang highlighted the need to speed up connectivity and production capacity cooperation when presiding over the first Lancang-Mekong Cooperation Leaders' Meeting in Sanya of China's Hainan Province. He said that China has signed or is discussing with the Mekong countries cooperation documents on jointly building the Belt and Road; wants to synergize its development strategy with that of countries in the subregion; may explore the possibility of establishing border area economic zones, industrial parks, investment zones and transportation networks to improve infrastructure development in the subregion; will strengthen cooperation in such fields as infrastructure, engineering machinery, electricity, construction materials and communications; may help the Mekong countries advance industrialization through production capacity production; will set up concessional loans and credit lines to support infrastructure and production capacity cooperation in the subregion; will provide active support for infrastructure cooperation and development in the subregion through such platforms as the AIIB and the Silk Road Fund; will set up, in collaboration with the Mekong countries, a water resources cooperation center and an environmental protection cooperation center, to strengthen technical cooperation, personnel exchanges and information sharing, and promote green, coordinated and sustainable development in the subregion.

The Belt and Road Initiative and the Lancang-Mekong Cooperation Mechanism affirms the strategic position of the Lancang-Mekong region in China's strategies for opening up and recognizes the priority of "interconnectivity" and infrastructure in the strategic actions, providing strong support for infrastructure development in the region.

1.2. Financial support

National infrastructure development is inseparable from financial support as infrastructure projects involve long-term large-scale capital investment. Generally, sustainable infrastructure requires more investment than similar conventional infrastructure, but generates long-term return with benefits in the whole life cycle of project operation, such as reduction in environmental and social risks and operational and maintenance costs⁷. There is a larger infrastructure financing gap in areas along the Belt and Road where the economy is underdeveloped and the financial system is relatively backward.

Financial instruments can be used to provide effective support for "Going Global" enterprises, which is a common practice in the world. In fact, a wide range of financial services provided by Chinese commercial banks, including cross-border settlement, financing model design, credit support and risk prevention, has become an important manifestation of Chinese enterprises in the global engineering contracting market. In recent years, infrastructure represents a relatively large share in the financing by commercial banks owing to rapid growth. By the end of 2015, the balances of bank loans to the infrastructure sector reached 19.4 trillion yuan, an increase of 9.4% year on year, accounting for about 20% of bank loan balances. These loans focus on key investment projects for infrastructure construction, and the Belt and

⁷ Yin Hong, Green finance supports sustainable infrastructure in the Belt and Road.

Road Initiative. The China Development Bank and the Export-Import Bank of China will set up special lending schemes respectively worth 250 billion yuan equivalent and 130 billion yuan equivalent to support Belt and Road cooperation on infrastructure, industrial capacity and financing, announced at the Beijing Belt and Road Forum for International Cooperation in May 2017.

1.3. Technical capacity

"Better roads lead to better life." This concept of development has been proved by China's practice in reform and opening up. An important reason behind China's rapid economic growth is to build physical infrastructure extending in all directions, including road, railway and communications networks,⁸ according to *Modernizing China: Investing in Soft Infrastructure* published by the International Monetary Fund (IMF) in 2017. Currently, China has accomplished significant achievements in various fields of infrastructure, covering energy, telecommunications, railways, high-speed railways, roads, ports, and airports. In terms of road, China has established a nation-wide road network, in which expressways amount to 124,000 km, ranking first in the world. It is noteworthy that rural highways with a mileage of nearly 4 million km reach 37,684 counties and towns and 634,390 administrative villages, representing 99.9% and 99.8%⁹ of the national total respectively. While meeting the domestic needs for infrastructure, China has built up its capacity of overseas infrastructure supply. Its advantages capacities cover the whole industrial chain of infrastructure, ranging from project planning, design and construction to installation, operation and management of mechanical equipment and automatic control systems, and even equipment maintenance and personnel training.

China has stressed the concept of ecological civilization in the process of domestic infrastructure construction and the Belt and Road Initiative implementation. From 2011 onwards, MOT has rolled out a series of documents to deploy and promote green transport, such as the Guiding Opinions on Building a Low-carbon Transport System (MOT [2011] No. 53), the Pilot Program for Building a Low-carbon Transport System (MOT [2011] No. 53), and the Implementation Rules for Special Funds for Energy Conservation and Emissions Reductions in Transport to Support Regional and Thematic Projects (Trial) ([2012] No. 251). It has also carried out thematic pilot and demonstration projects covering green highways and ports, in an active effort to promote green highways. Unveiled by MOT on June 3, 2016, the 13th Five-Year Plan for Energy Conservation and Emissions Reductions in Transport clearly requires the the transport sector to fully reflect the principle of green development, specifies the requirements for road transport and proposed green pilot projects for the five years. As of May 2017, MOT released a total of 33 green highway projects in three batches, covering provinces (autonomous regions and municipalities) in the country. Yet, the standards for green highways are still under preparation.

⁸ *Modernizing China: Investing in Soft Infrastructure*, IMF, 2017.

⁹ *Development of China's Transport*, the State Council Information Office, 2016

Box 5: China-assisted national highway No.7 project in Cambodia

The China-assisted Rehabilitation Project of Road from Kratie to Cambodia-Laos Border in Cambodia is by far the largest project of China's aid to Cambodia. It extends from 5.5 km east of Kratie to border checkpoint on the northern border of Stung Treng Province with Laos. With a total length of 186.648 km, the project is designed according to China's Class III highways standards, of which 39.8 km are rerouted (newly built). The project encompasses subgrade construction (including 225 culverts and 990 gutters), pavement engineering, bridge engineering (including 13 bridges, of which the grand bridge has 1056.84m main span), traffic safety facilities, and greening works. The project contract is worth 508 million yuan and the construction period is 41 months.

Chinese construction companies complied with quality control procedures and construction specifications while fully respecting the ISO9000 quality management system. They have established rigorous measurement, examination and testing systems

Source: China's outstanding practice cases of corporate social responsibility for foreign contracted projects, 2017

1.4. Environmental sustainability management**1.4.1. Foreign investment policies concerning environmental management of infrastructure projects**

Regarding environmental protection in foreign investment and construction, the Administrative Measures for Approval and Registration of Overseas Investment Projects, promulgated by the Chinese Ministry of Commerce (MOFCOM) on May 8, 2014, stipulate that "foreign investment undertaken by Chinese companies shall not be approved under any of the following circumstances: violating the national laws, regulations and policies; potentially violating international treaties concluded by the Chinese Government; contradicting the laws, regulations or customs of the host country or region."

In addition, the Chinese Government has launched a raft of policies to guide and regulate the foreign investment of Chinese enterprises. In 2006, the State Council issued regulations urging Chinese companies to "pay attention to protecting the local environments and resources" and "sustaining the livelihoods of local communities and people" in overseas operations. In February 2013, MOFCOM and the Ministry of Environmental Protection (MEP) jointly developed the Guidance on Environmental Protection in Foreign Investment and Cooperation to guide environmental protection of Chinese enterprises overseas and promote sustainable foreign investment and cooperation. Enterprises are advised to establish the awareness of environmental protection and perform the responsibility of environmental protection; required to abide by the environmental laws and regulations of the host country and fulfill their obligations in EIA, emission compliance, and environmental emergency management; and encouraged to align with international standards.

A number of organizations and associations have also provided industry-specific guidelines for foreign investment and contractual construction. In the field of infrastructure, the China International Contractors

Association released the Sustainable Infrastructure Guidelines for Overseas Chinese Enterprises in June 2017, together with the China Railway Group Limited, China Development Bank (CDB), Export-Import Bank of China (EXIM), Inter-American Development Bank, and German Agency for International Cooperation. The guidelines put forward detailed and specific requirements for infrastructure project decisions and operations of overseas Chinese enterprises in four dimensions: economy, society, environment and governance.

1.4.2. Environmental management practices of financial institutions

In recent years, the Chinese Government devotes great energy to boosting green finance and integrates environmental governance into financial and investment decisions. Since 2007, the former China Bank Insurance Regulatory Commission has issued the Guiding Opinions on Credit Provision to Emission Reduction and Emissions Reduction (2007), Green Credit Guidelines (2012), and Energy Efficiency Credit Guidelines (2015). In August 2016, the People's Bank of China, Ministry of Finance, former China Bank Insurance Regulatory Commission and other four ministries jointly released the Guidelines for Establishing the Green Financial System (PBC [2016] No.228), which clearly defines green finance and green financial system and proposes to develop green credit.

CDB and EXIM are two important policy financial institutions that provide foreign investment services for Chinese enterprises. With established environmental and social standards, both have the right to warn clients for inappropriate management of environmental and social risks.

EXIM has released environmental assessment policy applicable to both domestic and overseas projects (see Box 6). The policy details the environmental and social requirements in the standards for admission and investigation, risk assessment and approval, loan issuance and disbursement, and post-credit-extension management and withdrawal.

CDB requires in the published summary documents that the project appraisal needs to include the environmental and social risk assessment of the proposed project. While loan applications must present an EIA report, the bank can refuse to provide loans on environmental grounds. CDB may integrate environmental standards and costs into the loan agreement to force the borrower to honor its environmental commitments. CDB has joined in the United Nations Global Compact and the United Nations Environmental Programme (UNEP) Finance Initiative. Though not a signatory to the Equator Principles, the bank has created a dedicated internal working group and is gradually incorporated the framework into its business development.

Box 6: Environmental management measures of export-import bank of china for overseas projects**I. Admission and investigation standards**

The bank pays attention to potential risks of environmental protection and implements stringent admission standards. When providing credit business, the investigation prioritizes the environmental and social risks of clients and projects. Regarding domestic and overseas lending projects, the bank requires comprehensive, thorough and detailed investigation of the compliance, authenticity and risk related to social benefits and provides preliminary comments on due diligence. When the environmental and social risks are particularly complex and difficult to judge, a qualified independent third party will be sought for investigation.

2. Risk assessment and approval standards

The bank-supported projects are required to abide by the relevant environmental policies, laws and regulations of China and the host countries and to obtain the necessary approval of the competent authorities of China and the host countries based on complete examination and approval procedures. When the host countries do not have a perfect environmental protection mechanism or the corresponding environmental and social impact assessment policies and standards, the bank will conduct reviews according to China's standards or international practices. In practice, the assessment and review department strictly observes the above-mentioned requirements. It takes the approval of the environmental authorities of the host countries as one of the prerequisite elements for submission and includes environmental risk as an indispensable part into the risk analysis. At the same time, the bank makes normative requirements to strengthen the compliance review of clients who intend to enter into the credit business. If EIA is found incomplete in the review, the assessment and review department may adopt measures such as approval suspension or re-entry.

Source: Official website of The Export-Import Bank of China, <http://www.eximbank.gov.cn/>

On the whole, **China has relatively complete strategic and financial support and certain technical reserves for Lancang-Mekong infrastructure development, but the exploration is underway in the fields of environmental management and green investment and financing.**

Overseas infrastructure investment is generally included in the foreign investment policies and the environmental and social management involved mainly regulated through guidelines.

Environmental safeguard system of Chinese financial institutions is in the exploration stage. The banking practice of green finance focuses on green credit, green bonds, and conceptual products and emphasizes the certification and public information disclosure of green projects. However, the relevant systems of certification standards, environmental supervision and information disclosure need to be perfected and green financial instruments for sustainable infrastructure development remain to be developed.

2. Local action — a case study of Yunan province

Yunnan is the land route connecting China with Southeast Asian countries and an important geographical fulcrum of the Lancang-Mekong cooperation. As a hub in the Belt and Road Initiative, Yunnan is positioned to focus on building and improving the integrated transport system¹⁰. Yet, sustainable highway infrastructure here faces new challenges associated with unique natural landscapes and important ecosystems and eco-sensitive areas all over the province.

Yunnan is one of China's major provincial participants in the Lancang-Mekong cooperation. It has highly connected ecological and natural environment with the Mekong countries and relatively rich experience in the construction, investment and financing of highway infrastructure. These factors enable the province to play an important role in promoting sustainable infrastructure in the Lancang-Mekong region.

Yunnan has a certain experience in the highway infrastructure construction.

Yunnan's green highway practices have yielded results, such as Kunming–Bangkok Expressway (through Mohan), Kunming–Haiphong Expressway (through Hekou and Hanoi), Kunming–Kyaukpyu Expressway (through Ruili). The experience in investing and financing highways is highly replicable as Yunnan is similar and linked with the Mekong countries in various aspects, such as physical geography, ecological environment, cultural, social and economic development.

Yunnan stays at the forefront of peers in road standards and green highways in China.

At present, in the construction of cross-border road infrastructure, the China-financed portions overseas fall into integrated state management. Yunnan provincial government only participates in the management of border highway projects within the administrative area. The local experience and knowledge about Lancang-Mekong cross-border road infrastructure is limited to green highway construction. The sharing and outreach of highway construction standards, green highway practices and related technologies will be conducive to green and sustainable infrastructure in the Lancang-Mekong region.

However, due to constraints of economic development and ecological sensitivity, Yunnan Province currently suffers insufficiency in cooperation platforms, environmental management capacity, funding and publicity for cross-border road infrastructure projects. At present, such border highway projects are mainly financed by state subsidies, local financial allocations, bank loans and a minor share of private capital. Given limited project funds from the local government, bank loans and private capital become major financing sources. Nevertheless, for portions of border highways with small traffic, high input and low income makes it difficult to repay the loans as the tolls can barely cover the interest. As a result, such projects are unattractive to commercial financial institutions or private capital, and the Public Private partnership model is hardly achieved or extended in the true sense. At the same time, Yunnan's complicated natural conditions and rich sensitive biodiversity add cross-border environmental risks. Yunnan, as the last exit of the Lancang River in China to other five countries in the region, is confronted

¹⁰ Lv Wenli, Strategic position of Yunan Province in the Belt and Road Initiative.

with a variety of environmental risks in cross-border highway infrastructure construction, such as water environmental protection, biodiversity loss, vegetation destruction, soil erosion and water pollution.

Box 7: A case of Chinese highway infrastructure investment in the Lancang-Mekong region

The Xiaomengyang–Mohan Expressway was included in China's first green highway demonstration projects in the Circular on Carrying out Green Highway Demonstration Projects issued by MOT in May 2016. The extension of Xiaomengyang–Mohan Expressway, i.e. the last portion of G8511 Kunming-Mohan (Port) Expressway, is recognized as a major road infrastructure investment and construction project in the Lancang-Mekong region. The project will assume an important position and role in supporting the Belt and Road Initiative and building the southwest international thoroughfare. Once put into operation, the expressway will serve as a major international thoroughfare that connects China with South Asia and Southeast Asia.

The extension with a total length of 167 km and the design speed of 80 km/h will be built in accordance with the standards for two-way four-lane expressways. **Environmental protection measures are carried out during project implementation, including:**

1. **Strengthen top-level design and organizational guarantee.** The Plan for Building Green Xiaomengyang–Mohan Expressway was developed. It requires engineering quality improvements across the board, covering "ecological priority, low-carbon conservation, landscape integration, shared services, and intellectual innovation". Targeting starting and ending points, service areas and particularly sensitive portions, the important nodes of the green expressway are highlighted to achieve coordination of overall progress and key construction. The Leading Group for Building the Green Expressway was set up to ensure smooth work.

2. **Promote intensive use of resources.** First, the existing roads were fully used in order to reduce ecological damage and pollutant emissions and conserve resources and energy. Second, tunnel spoil was comprehensively utilized. A large amount of spoil was produced in the construction of 33 tunnels with a total length of 29.313 km, but re-use was realized using a "three-level filter" approach. High-quality gravel aggregate for concrete tunnel lining, secondary gravel for subgrade strengthening layer, and the remaining residue was used for construction of embankment. Third, conservation and intensive use of land resources was realized. Excavated or filled roadbed and spoil ground were used to the maximum for temporary facilities, and the spoil ground was designed with consideration to service facilities along the route, so as to minimize land use and ecological impact.

3. **Reduce ecological impact with focus on sensitive ecological environment.** First, an eco-friendly route was selected. From an ecological point of view, a route with minimum damage to the surrounding environment was selected in the existing topographical context, which tries to avoid such ecological sites as forests and water sensitive areas. Second, the wild Asian elephant population would be protected. Route comparison and selection gave consideration to the migration route of Asian elephants. In the Mengla–Shangyong portion, a tunnel was built for the migration of Asian elephants, and the rubber plantations on the tunnel were restored after felling to natural forests to enable barrier-free pass of elephants. Third, protection was extended to plant species of importance. Based on preliminary investigation on plants along the route, National First and Second Protected Plants were transplanted for protection purpose, and ancient trees were protected at the original sites as much as possible by means of fences and boards. Fourth, ecological restoration was carried out according to types of

slopes, with success achieved in high steep slopes and rock slopes, laying the foundation for good roadside landscape.

4. **Cut pollutant emissions.** First, the feed-forward intelligent fuzzy control system was introduced for tunnel ventilation, which can forecast traffic volume and composition and timely supply air as appropriate, to effectively control air pollution in tunnels. Second, the pollution of runoff from bridges was prevented. The pre-construction runoff pollution and emergency response systems facilitate comprehensive prevention and control of water pollution associated with large bridges across sensitive water bodies and emergency response to pollution incidents associated with transport of hazardous goods on bridges. Third, ecological sound barriers were deployed. Sound barriers were adopted to protect nearby villages from construction noise. Fourth, sewage discharge from sites along the route is eliminated. The wastewater treatment system was installed in service areas, ramps and main toll stations, so that the sewage is recycled rather than discharged.

5. **Practice strict monitoring and supervision.** Environmental monitoring was carried out during construction and trial operation, covering air, water, noise, and animal channel utilization performance. Environmental supervision was conducted over sensitive target portions during construction, such as national nature reserves and scenic spots, in order to ensure compliance with the relevant environmental requirements.

V. Prospects and recommendations

The green Lancang-Mekong cooperation on the principle of achieving shared growth through discussion and collaboration substantially is a process of regional integration of green, environmental protection and low carbon, which requires the consensus of all parties, especially the highway infrastructure construction projects actively promoted by the countries in the region and the guarantee of green policy system and cooperation mechanism. Due to peculiarity and high degree of relevance of geographical environment, the countries in the Lancang-Mekong region share a common demand for the development of sustainable infrastructure. The sustainable highway infrastructure is not only crucial to regional connectivity and inclusive development, but also has a positive impact on mitigating and adapting to climate change and intensive use of resources and energy, which is the trend of future development. Under the background of Lancang-Mekong cooperation, the sustainable highway infrastructure construction in the Lancang-Mekong region is facing a good opportunity.

As for the construction, management and evaluation of sustainable highway (or green highway) infrastructure, all countries do not have the unified standards and norms and the highway interconnection is not smooth. In the norms and guidelines of the Mekong River countries on environmental issues related to foreign investment, the requirements for environmental protection in the investment activities of overseas enterprises need to be further improved in terms of pertinence and operability, especially in the field of highway infrastructure investment and construction, there are differences in some regulations and policy requirements of the Mekong River countries and the concept of construction and development is still in the stage of negotiation as well as mutual cooperation and dialogue are being explored step by step. For this purpose, the report recommends as follows:

Firstly, establish a policy dialogue platform and capacity-building system to promote the sharing of ideas and experience in sustainable highway construction

1. The idea that "better roads lead to better life" helps China to break through the bottlenecks of poor infrastructure and investment environment. The country has built roads over the past few decades and boomed "green highways" in recent years. These practices contribute a lot of advanced technologies and management methods available for sharing. In addition to the Chinese experience, reference can be drawn from multilateral development institutions and developed countries, covering sustainable infrastructure development strategies and policies, investment and financing models, and environmental management and safeguard systems. The Lancang-Mekong countries will strengthen the construction of Sustainable Infrastructure and Investment & Financing Platform, strengthen dialogue and cooperation among Lancang-Mekong regional governments, enterprises, financial institutions, research institutions, and social organizations, develop demonstration projects of sustainable infrastructure and typical cases of green finance projects and share the good practices of sustainable highway construction and investment and financing. .

2. Improve corporate capacities for analyzing and managing environmental and social risks and carry out enterprise environmental management capacity building project. Enterprises and financial institutions that carry out highway infrastructure construction, investment and financing in the Lancang-Mekong region should strictly abide by the laws and regulations of the host country. In environmental aspect, they should adopt international standards and guidelines without prejudice to the investment and environmental laws and related environmental standards of the host country and further develop the capacity building training projects for sustainable infrastructure construction and environmental management as well as guide and encourage enterprises to set up county guidelines on environmental and social risks in investment based on practical experience, and to enhance capabilities of identifying and assessing environmental, climatic and social risks in the region.

Secondly, promote the mainstreaming of environmental policy and promote the joint research and application of standards for the Lancang-Mekong sustainable infrastructure

3. Environmental management and environmental standards are closely related to sustainable transport infrastructure. Only by promoting the close cooperation between environmental departments and transport departments, and by means of spatial planning and ecological management, environmental impact assessment and environmental performance assessment can the environmental management level of national sustainable infrastructure in the region be improved to really realize the mainstreaming of environmental policies and project implementation.

4. Sustainable infrastructure lacks industry-specific standards, guidelines or indicator systems and investors' unfamiliarity with green technologies and lack of integrated life-cycle planning limit the development of sustainable infrastructure. The transportation departments in the Lancang-Mekong countries are studying the standard system of green highways. Countries in the region can learn from the advanced standards of sustainable infrastructure in the international community and the good practices of sustainable highway construction and operation at home and abroad to set up joint research teams to promote the research on full life circle design, construction and operation standards and specifications of Lancang-Mekong sustainable highway infrastructure and their application by combining with the economic development of the Lancang-Mekong region and actual needs and affordability of all countries.

Thirdly, promote the greening of financial institution system under the framework of the Lancang-Mekong cooperation mechanism

5. On the premise of efficiency, we should introduce and build a relatively high standard environmental and social risk management and control system. The core of regional economic cooperation is infrastructure construction and sustainable investment, which is also the focus of attention of the international community. The participation of Chinese financial institutions and related enterprises in the Lancang-Mekong investment projects requires the introduction and construction of a relatively high

standard environmental and social risk control system. Reference to higher international environmental risk control system standards will help China to promote the multilateral financial system and participation of enterprises in foreign investment, especially international regional construction projects. China should take full account of potential environmental impacts in its investment and financing decisions on promoting the multilateral development projects in the future, integrate potential returns, risks and costs related to environmental conditions into the daily operations of finance and investment project management and guide the flow of funds to green infrastructure construction, resource-saving technology development and ecological environment protection industry as well as guide enterprises to pay attention to green environmental protection to avoid investment and financing for short-term interests.

6. Promote the participation of Chinese financial institutions in the construction of the Lancang-Mekong cooperation mechanism and increase investment in green low-carbon projects and ecological environmental protection projects. Green investment is a new business opportunity and business growth point brought to enterprises by developing green economy under the sustainable development strategy, thus bringing the investment with commercial and social impact value to investors and society. In regional cooperation, financial institutions should actively participate in green investment and increase investment in green low-carbon projects and eco-environmental protection projects by linking up with the sustainable development trend of domestic industrial upgrading and establishing pilot green eco-industrial park on the premise of sustainable commercial development and controllable risks to promote the green growth of host countries.

Fourthly, establish a sound and relatively transparent disclosure system for environmental and social risk information on highway infrastructure construction projects

7. Information disclosure system can also play a supervisory role in all stages of project implementation to ensure that the project implementation will not have an irreversible impact on the environment and society. The existing highway infrastructure construction and investment projects supported by the multilateral development banks basically adopt the information disclosure system applicable to multilateral development banks, which can protect the interests of all participants and stakeholders. There is still a certain gap between Chinese enterprises and banks in the practice of information disclosure system and other multilateral development banks. It is necessary to establish a perfect information disclosure system according to the international common practice. Financial institutions should fully consider the concerns of stakeholders and communities at all stages of pre-loan, lending and post-loan, while enterprises should make full information disclosure and public exchanges with the communities in the process of project operation, construction and maintenance to ensure the necessary project transparency.

8. Strengthen the dialogue and cooperation with the public, communities and non-governmental organizations and pay more attention to social equity and improvement of people's livelihood. Environmental sustainable infrastructure emphasizes ecological protection and natural harmony and promotes social inclusion and development. In the whole process of highway infrastructure construction, we should attach importance to the principle of dialogue and cooperation between community relations and public participation should be taken into consideration and attention must be paid to the improvement of people's livelihood around the project. In particular, it is urgent to enhance the sense of social responsibility of business enterprises and financial institutions, and pay attention to the participation of the public, communities and civil society organizations in projects as well as hold the tolerant attitude towards multiple values. .

Fifthly, promote the comprehensive pilot projects of green highway infrastructure construction under the Lancang-Mekong cooperation framework

9. Combined with the construction standards, project EIA, ecological corridor construction and ecological restoration, biodiversity protection and ecological poverty alleviation, it is suggested that the comprehensive demonstration pilot projects of green highway infrastructure construction should be promoted under the Lancang-Mekong cooperation framework to popularize the outstanding highway traffic projects and ecological corridor construction cases of the Lancang-Mekong countries and even the world in the region and integrate the advanced ecological planning technologies, ecological corridor construction standards and concepts into the specific projects of regional highway infrastructure.

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China-ASEAN Environmental Cooperation Center

Regional Hub for South-South Environmental Cooperation

With the approval of Chinese Government and support of Ministry of Environmental Protection (MEP), the China-ASEAN Environmental Cooperation Center (CAEC) was launched in 2010 and gained its second identity as the China Center for Shanghai Cooperation Organization Environmental Protection (CSEC) in 2014, serving as the MEP-affiliated think-tank to concretize initiatives proposed by Chinese leaders during major regional summits. In 2017, CAEC gained its third identity as the Lancang-Mekong Environmental Cooperation Center.

Our Missions

As an active player to facilitate South-South environmental cooperation and boost sustainable development at regional level, CAEC aims to establish itself into:

- A regional hub for South-South environmental cooperation;
- A think tank for environment and development;
- A demonstration base for environmentally sound technology and environmental industries;
- A knowledge center for sustainable development.

Our Mandates

- Fueling up sustainable development and South-South environmental cooperation at both regional and global levels;
- Implementing environment-related strategies, initiatives, and action plans under pan-regional, regional and sub-regional frameworks such as China-ASEAN, Shanghai Cooperation Organization (SCO), Asia-Pacific, China-Japan-ROK, Lancang-Mekong cooperation;
- Backing up Belt and Road Initiative in the field of environment, building the Big Data Service Platform on Ecological and Environmental Protection, and establishing the International Coalition for Green Development on the Belt and Road;
- Researching on major environment and development issues to inform China’s own policy process and support China’s pan-regional, regional and sub-regional environmental cooperation;
- Enhancing cooperation and exchange on environmentally sound technology and environmental industries;
- Supporting environmental outreach at regional level and implementing capacity building activities such as Green Envoy Program.

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