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SPECIAL POLICY REPORT

Key Pathways on a Green and Low-Carbon BRI

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China Council for International Cooperation on Environment and Development (CCICED)

Special Policy Study on the Key Pathways on a Green and Low-Carbon BRI

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EXECUTIVE SUMMARY

2021 is one of the 7 warmest years on record, and a "crucial year" for the international community to fight against climate change. The Sixth Assessment Report (AR6) of the United Nations Intergovernmental Panel on Climate Change (IPCC) warns that human influence has led to "widespread and rapid" changes in the ecosystem and has warmed the climate at an "unprecedented" rate. With the climate crisis triggering more widespread international concerns, **green and low-carbon development has become the distinct theme of global post-pandemic recovery**. Developing green and low-carbon energy is not only a **key move** to link to the **United Nations 2030 Sustainable Development Goal (SDG)** 7 "Affordable and Clean Energy", SDG 12 "Responsible Consumption and Production", and SDG 13 "Climate Action", **but also a key path to promote BRI green and low-carbon development.**

However, restricted by the level of economic and social development as well as resource endowment, developing countries represented by those BRI participating countries still face various challenges in terms of green and low-carbon energy development, including cost, infrastructure and technical capacity, etc. Today, with climate change compounded with resource and environmental constraints, the lingering pandemic triggering economic growth concerns, and geopolitical conflicts aggravating unbalanced regional development, global sustainable development is facing an unprecedented complex situation. For developing countries, access to affordable, renewable and sustainable clean energy will greatly help them reduce the reliance on fossil fuel, proactively respond to global climate crisis, and achieve sustainable development towards a "carbon-neutral" future.

Strengthening international cooperation, promoting the flow and efficient utilization of resources, jointly exploring the pathway of regional green and low-carbon collaborative development, and facilitating the promotion and transfer of development experience and models are still an indispensable and important force to support BRI green and low-carbon energy development. On September 21, 2021, at the General Debate of the 76th Session of the UN General Assembly, President Xi Jinping announced that China will step up the support for other developing countries in developing green and low-carbon energy, and will not build new coal-fired power projects abroad. This is another key action since China announced its carbon peaking and carbon neutrality goals, made the commitment to strictly control coal-fired power projects and coal consumption growth during the 14th Five-Year Plan period (2021 – 2025), and launched the National Carbon Emission Trading Market, creating new momentum for global climate governance. In recent years, China's investment in renewable energy projects in countries and regions along the Belt and Road has shown a significant growth trend, and a number of green, low-carbon and sustainable clean energy projects have been implemented.

The China Council for International Cooperation on Environment and Development's (CCICED) has been funding the special policy studies on green BRI since 2018. By December 2021, Chinese and international experts have focused on “comprehensive alignment of green BRI and SDGs with synergies”, “biodiversity and ecosystem conservation”, and “enhancing environmental management for BRI projects”, and put forward highly targeted policy recommendations, including the principles, objectives and roadmap of BRI green development. They also stressed that from the strategic perspective, it is necessary to further broaden the scope of BRI alignment to deeply incorporate and implement SDGs, and place a special focus on key areas such as green industrial and technological cooperation, investment and financing cooperation, and international cooperation.

On this basis, from 2021-2022, the Special Policy Study on the **Key Pathways on a Green and Low-Carbon BRI** (“Green BRI SPS” for short), starts from the realistic needs of BRI participating countries to cope with the global climate crisis and focuses on 3 **key aspects** – industrial and technological cooperation, investment and financing cooperation, and international cooperation, proposing 3 **key paths** to support BRI green and low-carbon energy development.

Pathway 1: Understand the transformation needs for energy mix adjustment and technology upgrade. → Promote industrial and technological cooperation in clean energy to support BRI green and low-carbon energy development.

Pathway 2: Understand the needs for capital supply to support green and low-carbon development. → Guide financial resources to support BRI green and low-carbon energy development.

Pathway 3: Understand the needs for international cooperation to solve global deficits. → Strengthen international cooperation to support BRI green and low-carbon energy development.

As of March 2022, China has signed more than 200 cooperation documents with 149 countries and 32 international organizations such as ESCAP and UNDP to jointly build the Belt and Road. Among them, more than half of the countries have included carbon neutrality in their planning and proposed specific timelines for achieving the target. It is expected that by 2050, the share of global carbon emissions of BRI participating countries will be as high as 76%. Under the global trend of carbon neutrality, promoting BRI green and low-carbon energy development is of outstanding strategic value and positive practical significance for BRI participating countries to address the climate crisis and achieve sustainable development.

In the context of global green and low-carbon transition, the green BRI development will have richer content and further broaden its scope. To facilitate more effective and practical implementation of green BRI, it is necessary to overcome the objective constraint of carbon emissions on BRI green and low-carbon development, respond actively to realistic challenges of post-pandemic economic recovery and sluggish global green investment, fully recognize the continuous impact of the changing international situation on BRI international cooperation, and effectively balance the differentiated transition endowments and development needs of regions and countries along the Belt and Road. The key is to stick to the key path of green and low-carbon energy development, and take effective actions centering on 3 key aspects – industrial and technological cooperation, investment and financing cooperation, and international cooperation.

Recommendation 1: Facilitate the industrial and technological cooperation in clean energy to become an important component for BRI green and low-carbon development. Identify the key needs and overall trends of BRI green and low-carbon energy development, expand partnerships based on the existing bilateral, multilateral, regional and international cooperation mechanisms, and establish a more systematic and complete mechanism for the industrial and technological cooperation on clean energy under the BRI framework. Make good use of China's market advantage and development experience in the global clean energy market, give full play to the key role of China's overseas development finance institutions and leverage their resource advantages, step up cooperation with focus on clean energy infrastructure construction, equipment manufacturing, technology promotion and application, as well as scale up support for investment in clean energy industrial and technological cooperation.

Recommendation 2: Guide various market players to improve capacities for green investment and financing services, to actively participate in and to support BRI green and low-carbon energy development. Lead various investment entities to track the shares of their infrastructure portfolios dedicated to the sector of green and low-carbon energy. Explore to establish a government-led and market-oriented BRI green development fund, make full use of the advantages of public-private partnership (PPP), and facilitate innovation of multi-channel hybrid financing models. Reinforce the "whole lifecycle" approach to environmental management of BRI projects, use independent inspectors and accountability mechanisms, and steer all actors towards enhanced risk awareness, improved risk prevention mechanisms, and the effective implementation of green development concept throughout the whole process of overseas investment and cooperation. Further clarify the scope of support, standards and best practices of BRI green and low-carbon energy development, actively explore the potentials of applying the *Green Bond Endorsed Projects Catalogue (2021 Edition)* in the BRI investment cooperation on

clean energy, and continue the research efforts for the Green Development Guidance for BRI Projects.

Recommendation 3: Deepen international cooperation to support BRI green and low-carbon energy development, and explore a new path for green and low-carbon cooperation in a changing global governance system. Deeply align with the BRI participating countries' demands for green and low-carbon development, and facilitate dialogues and exchanges between governments of BRI participating countries, financial institutions, enterprises, and other stakeholders based on multilateral cooperation platforms such as the BRI International Green Development Coalition (BRIGC). By using initiatives including the Belt and Road South-South Cooperation Initiative on Climate Change and the Green Silk Road Envoys Programme, assist the BRI participating countries to respond to the challenges brought by global climate change and achieve inclusive and resilient recovery. Facilitate the establishment of South-South platforms for green project preparation and development, strengthen various types of triangular cooperation especially the South-North-South low-carbon cooperation, and align the BRI with developing countries' demands for clean energy. Actively tackle the challenges brought about by the changes of the global governance system, and create the more open, inclusive, mutually beneficial and win-win cooperation on BRI green and low-carbon development. Encourage all actors to create synergies in areas of international investment and financing, development assistance, and third-party market cooperation, help developing countries improve infrastructure, and facilitate common development of the world.

Key Words: Belt and Road Initiative, Energy Transformation, Green and Low-Carbon Development

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1. DEVELOPING GREEN AND LOW-CARBON ENERGY: KEY PATH TO GREEN AND LOW-CARBON BRI

On September 21, 2021, at the General Debate of the 76th Session of the UN General Assembly, President Xi Jinping announced that China will step up support for other developing countries in developing green and low-carbon energy, and will not build new coal-fired power projects abroad. This is another key move since China announced its "twin carbon goals", made the commitment to strictly control coal-fired power projects and coal consumption growth during the 14th Five-Year Plan period (2021 – 2025), and launched the National Carbon Emission Trading Market, gaining positive response from the international community and creating new momentum for global climate governance. In his opening remarks to High-Level Dialogue on Energy, UN Secretary-General António Guterres also pointed out that "investing in clean, affordable energy for all will improve the well-being of billions of people. It can create the green jobs that we urgently need for COVID-19 recovery"[1].

Developing green and low-carbon energy is not only a **key move** to link to the United Nations 2030 Sustainable Development Goal (SDG) 7 "Affordable and Clean Energy", SDG 12 "Responsible Consumption and Production", and SDG 13 "Climate Action"; but also a **key path** to promote the green and low-carbon development of the Belt and Road. For many developing countries, access to affordable, renewable and sustainable clean energy is **the realistic need** to reduce the reliance on fossil energy, secure green and low-carbon energy development, and actively respond to global climate crisis. It is also a **prerequisite** to realize post-pandemic green recovery and march towards a "carbon-neutral" future.

Given such context, this chapter will start from the real-life demand of BRI participating countries to address the global climate crisis, and elaborate on their most significant needs in developing green and low-carbon energy from three perspectives: industrial and technology upgrade, financing, and international cooperation. The following chapters will further propose key paths for promoting green and low-carbon energy development under the framework of the BRI from the aspects of technological cooperation, investment and financing cooperation, and environment and climate cooperation.

1.1 Real-life Demand for Solutions to Global Climate Crisis

As of March 2022, China has signed more than 200 cooperation documents with 149 countries (including 52 African countries, 38 Asian countries, 27 European countries, 11 Oceanian countries, and 21 American countries) and 32 international organizations such as ESCAP and

UNDP to jointly build the Belt and Road[1]. According to current researches, most of BRI participating countries[2] (hereinafter referred to as "participating countries") are developing countries with fragile ecological environment, relatively low ecological carrying capacity, and economic development with prominently high carbon emission levels and intensity, so that they are quite sensitive to climate change[2-3]. Among them, there are some emerging economies with strong economic growth, but there are more developing countries with monotonous economic structure, prominent resource and environmental constraints, and low levels of infrastructure development and energy accessibility. Compared with a few emerging economies, most of these countries are at the stage of development where economic growth is the prominent demand and people's livelihood and welfare are the priority. With limited economic, human and technological resources at their disposal, these countries are more dependent on their natural resource endowments and are lack of climate resilience, while being highly susceptible to path dependence on a high carbon emission development model driven by fossil energy.

As a study shows, for the 68 participating countries alone as of the end of April 2017, their total CO_2 emissions increased by about 85% between 2000 and 2015, more than twice the world average. At the same time, the carbon intensity of these countries was also relatively high, at 0.83 tCO2/kUS$ in 2015, which was 1.8 times the world average[4]. Recent studies have also pointed out that by the end of 2019, the carbon emissions of the 146 participating countries accounted for about 30.8% of the world's total, significantly higher than their share of 22.1% of the world's GDP, and the growth rate in the last five years was much higher than that of other regions[5]. Since most of the participating countries are still in the early stage of economic and social development with heavy tasks of modernization, industrialization and urbanization, the trend of high carbon emission intensity will be maintained for a certain period of time, resulting in a fact that the total carbon emissions will continue to increase. Studies have shown that if the high-carbon growth pattern in history (the "worst-case scenario") continues, the global share of carbon emissions in the participating countries will be as high as 76% by 2050[6]. **Therefore, under the global trend of carbon neutrality, promoting BRI green and low-carbon energy development is of outstanding strategic value and positive practical significance for addressing the climate crisis and achieving the UN 2030 Sustainable Development Goals in participating countries.**

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[1] Source: https://www.yidaiyilu.gov.cn/xwzx/roll/77298.htm; https://zh.wikipedia.org/wiki/%E4%B8%80%E5%B8%A6%E4%B8%80%E8%B7%AF。

[2] The BRI participating countries mentioned in this report refer to countries that have signed cooperative agreements or MOUs with China with regard to BRI.

1.2 Transition Demand for Energy Mix Adjustment and Technology Upgrade

Energy mix adjustment and technology upgrade are important tasks in green and low-carbon energy transition. For many participating countries, achieving green and low-carbon transition in the energy sector requires balancing two needs. On the one hand, there is a need to balance the accessibility and affordability of energy supply while ensuring energy security; on the other hand, there is a need to accelerate the development of clean energy and get rid of the over-dependence on fossil energy while ensuring smooth and efficient energy supply.

Take Southeast Asia as an example. Due to the convergence of the world's fastest-growing economies including Indonesia, the Philippines, Vietnam, etc., the energy demand in Southeast Asia has been growing at a yearly rate of about 3% over the past 20 years. According to IEA estimates, this trend will continue until 2030, and about 75% of the new energy demand will be met by fossil energy, leading to a nearly 35% increase in CO_2 emissions in the region[7]. As one of the world's most vulnerable regions to climate change[8-9], although Southeast Asian nations are actively promoting green and low-carbon development in the energy sector, they are still facing outstanding challenges featured with the contrast between surging demand and fragile energy security environment, strong willingness for transition and heavy reliance on fossil energy, great potential for renewable energy development and low contribution, as well as accelerated regional power infrastructure development and insufficient investment. For the broader range of BRI countries, **there is also an urgent need to transform the energy sector with clean energy technology development, and balance the needs for energy supply, affordability, energy efficiency and energy security as much as possible, as a key step towards regional green and low-carbon development.**

The existing studies have concluded that the demand for climate change mitigation technologies in the energy sector of the BRI countries is mainly focused on renewable energy development and energy efficiency improvement, and has certain regional characteristics[10]. On the one hand, from the perspective of types of needs, based on the content analysis and need assessment of 138 countries' TNA reports, it is revealed that nearly 90% of the participating countries have put forward technology needs in the energy sector. Among them, 75% of the countries need renewable energy power generation technologies, such as photovoltaic power generation, hydroelectric power generation, etc. (photovoltaic power generation technology has the highest demand); 44% of the countries need clean and efficient combustion technologies, such as high-efficiency boilers, combined cycle gas turbines, etc.; 38.5% of the countries need non-fossil fuel production technologies, such as biomass energy, etc. On the other hand, in terms of regional characteristics, there are significant differences in technology needs in different regions due to geographical and economic factors. Asia has the

most prominent technology needs in the energy sector. In addition to the significant demand for renewable energy technologies, its demand for clean and efficient combustion technologies is much higher than other regions. The technology needs of African countries (especially landlocked countries) in the energy sector are mainly in renewable energy generation, such as photovoltaic power generation and hydroelectric power generation. Small island countries in Oceania, Latin America and the Caribbean are highly vulnerable to climate change and extreme weather events, and their technology needs in the energy sector are mainly in renewable energy generation and non-fossil fuel production.

In addition, the integration and application of traditional energy technologies with digital information technology, represented by Energy Big Data, AI, cloud computing, blockchain, IoT, etc., is also an important force in driving the green and low-carbon transition of the energy sector. A recent study by the Global System for Mobile Communication Association (GSMA) and the Inter-American Development Bank (IDB) also shows that mobile technology will become one of the key technologies for countries in Latin America and the Caribbean to protect the environment and address climate change, and that Latin America urgently needs to develop intelligent solutions and mobile technologies to ensure economic growth throughout the region[11]. The *14th Five-Year Plan for Scientific and Technological Innovation in the Energy Sector* of the Ministry of Science and Technology of China also proposes to focus on the integration of new-generation information technology and energy development, promote the deep integration of traditional industries such as coal, oil and gas, power plants and power grids with digital and intelligent technologies, carry out integrated pilot demonstrations of various energy plants and regional intelligent energy systems, and lead the energy industrial transformation and upgrading[12].

1.3 Demand for Capital Supply to Support Green and Low-Carbon Development

The financial system plays an indispensable role in the development of real economy. The resource allocation capacity, efficiency and direction of the financial system will have a profound impact on the green and low-carbon cooperation under the BRI framework. As China's green financial system continues to improve and the concept of ESG responsible investment spreads globally, the green-based BRI finance and investments are playing a more active role in resource allocation and investment guidance. In a long-term follow-up study of BRI finance and investments, Nedopil (2022) finds that China's investment cooperation with BRI participating countries was around USD 59.5 billion in 2021, down by about 48% (USD 53 billion) from the level of 2019, the year before the COVID-19 pandemic, but there was no longer any investments in coal projects. In the meantime, the total green energy finance and investments in the BRI grew steadily to USD 6.3 billion (USD 6.2 billion in 2021). This trend is

expected to continue due to the *Guidelines for Greening Overseas Investment and Cooperation* issued in July 2020, and the *Guidelines for Ecological Environmental Protection of Foreign Investment Cooperation and Construction Projects* issued in January 2022[13].

However, the existing green investment and financing market is still not large enough to meet the "trillion-dollar" supply demand for green and low-carbon development in the Belt and Road. Based on a study of the renewable energy demand in 112 BRI participating countries, Cabré et al. (2018) found that over the next decade, renewable energy investments will reach about USD 1.03 trillion, and this size is likely to continue to rise given that a number of countries have updated their NDC targets in 2021[14]. A study by Vivid Economics and Tsinghua University (2019) showed that to achieve the target of keeping the global temperature rise within 2°C, between 2016 and 2030, green investments needed in 126 BRI countries in four key sectors, including power, transport, construction and manufacturing, would be about USD 11.8 trillion in total, with an average annual capital requirement of about USD 785 billion[15]. According to a study by CICC in 2021, based on the estimation of a sample of 117 participating countries, between 2021 and 2030, the demand for green investments is expected to be USD 3.6 trillion, of which a large part is for climate mitigation measures, exceeding USD 2.5 trillion. The demand in renewable energy sector will reach USD 1.6 trillion, showing great potential for development. If the 117 sample countries are projected to 146 participating countries based on the share of their carbon emissions, the overall green investment demand of BRI participating countries may reach USD 5.7 trillion between 2021 and 2030, with the demand for renewable energy investment reaching USD 2.5 trillion. The study also pointed out that based on Liu and Raftery's (2021) assumption that "countries should increase their emission reduction efforts by 80% on the basis of their NDCs in order to achieve long-term goals for climate", over the next 10 years, renewable energy investments in the BRI participating countries will be as high as USD 2.84 trillion[16].

On the other hand, due to the constraints of economic development and capacity in green financing, the public sector funds and financial market resources that can be coordinated and invested by BRI participating countries are quite limited compared with the large capital demand arising from green and low-carbon development goals. In the long run, there is still a huge gap between the supply and demand of green finance and investments in those countries. Take climate finance as an example. According to Li Nannan and Wu (2021), the global climate finance was about USD 541 billion in 2018, and if estimated by the proportion of carbon emissions, the climate finance for non-OECD BRI participating countries was only USD 64.3 billion[16]. However, according to the Climate Policy Initiative (2021), to achieve the target of keeping the global temperature rise within 1.5°C, the global climate finance needs to reach USD 4.35 trillion by 2030 (from 2021 onwards, annual climate finance must

increase by at least 590%)[17]. **Establishing and developing regional green investment and financing markets, innovating and improving green investment and financing mechanisms and tools, encouraging and attracting the engagement of diversified entities, and guiding and restraining green investment and financing behaviors – all of the above are still the prominent demand of the BRI to enrich its green capital supply.**

1.4 Demand for International Cooperation to Solve Global Deficits

Global sustainable development is facing unprecedented complex challenges, with climate change compounded with resource and environmental constraints, the lingering pandemic triggering economic growth concerns, and geopolitical conflicts aggravating unbalanced regional development. The deficits of peace, development, governance and trust (hereinafter referred to as "global deficits") are serious challenges in front of all mankind[19]. According to the *Human Development Report-2022 Special Report* prepared by the United Nations Development Programme (UNDP), behind this development-security disconnect looms the Anthropocene context, and development approaches with a strong focus on economic growth over equitable human development have led to stark and growing inequalities and risks such as climate change and the COVID-19 pandemic. In response, there is a need for greater solidarity[18].

The Belt and Road Initiative (BRI) is committed to enabling more countries to share development opportunities and outcomes[20] and to jointly achieve the 2030 Sustainable Development Goals[19]. As the largest international cooperation platform in the world[21], the BRI has laid a solid foundation for participating countries to cope with the impact of the COVID-19 pandemic and economic recession, enhance exchanges and mutual understanding, and work together to solve global deficits under the framework of multilateralism. At the moment, given the phased requirements as well as the overall trend of BRI green and low-carbon energy development, the following two aspects deserve special attention.

First, understand the strong willingness of BRI participating countries to achieve green and low-carbon development, and identify the key needs of transition in their energy sector. The progress of carbon neutrality actions in 129 countries collected by Net Zero Tracker shows that by June 2022, 84 BRI participating countries have proposed a specific target time[3] for carbon neutrality, and that the will and consensus for green and low-carbon development is getting stronger. In addition, the regions along the Belt and Road have abundant wind, sunlight

[3] By analyzing the progress of 129 countries' carbon neutrality actions collected by Net Zero Tracker, we notice that a total of 84 BRI participating countries have proposed a specific target time for carbon neutrality. Among them, 37 countries have made public declarations or specified the target time for carbon neutrality at the policy or legislative level, 4 countries have already achieved carbon neutrality, and the remaining 43 countries have got a clear target time for carbon neutrality, but still further discussion is needed.

and hydropower resources, showing great potential for renewable energy development. However, given the large number and wide distribution of participating countries, as well as their significant differences in resource endowment, transition base, energy production and consumption structure, it is imperative to study, identify and clarify the differentiated needs of different regions and countries, so as to promote green and low-carbon energy development from concept to action at the practical level. Therefore, it is necessary to encourage the active participation of and deep cooperation among the governments of BRI participating countries, international cooperation platforms, multinational investment companies, NGOs, research institutions, etc., so as to ensure that the key needs of transition in BRI participating countries' energy sector are met first, thus laying a solid foundation for more extensive BRI renewable energy cooperation.

Second, on the basis of the phased results of green BRI development, consolidate and strengthen the construction of international cooperation platforms and mechanisms for BRI green and low-carbon energy development. The BRI, being green in nature, has established several international exchange and cooperation platforms for green and low-carbon development, such as the BRI International Green Development Coalition (BRIGC), the BRI Environmental Big Data Platform, and the Belt and Road Environmental Technology Exchange and Transfer Center, implemented initiatives including the Green Silk Road Envoys Programme and the Belt and Road South-South Cooperation Initiative on Climate Change, facilitated international cooperation in developing the *Green Development Guidance for BRI Projects*, which have received positive responses from both private sectors and governments in BRI participating countries, and advanced the process of policy dialogues, knowledge sharing, technology exchange and capacity building. In addition, China has also interacted extensively with BRI participating countries in areas of industrial energy cooperation, green investment and financing, sustainable infrastructure construction, etc., including organizing Belt and Road Energy Ministerial Conferences, promoting the establishment of Belt and Road Energy Partnership, and launching the *Green Investment Principles for the Belt and Road* (GIP). In addition, regional cooperation mechanisms including China-ASEAN, BASIC and BRICS have also paid close attention to issues such as energy, climate and efficient use of environmental resources.

However, facing the new challenges of global carbon neutrality and post-pandemic green recovery, policymakers must recognize that, due to the complex coupling features of climate change impacts on natural ecosystems and on socio-economic systems, to promote green and low-carbon energy development under the BRI and support BRI participating countries in addressing climate change and achieving sustainable development goals, it is necessary to strengthen the participation of both public and private sectors, seek broader support from

international, regional, bilateral and multilateral cooperation, and coordinate resources concerning policy, industry, technology and finance on the basis of existing international cooperation. Given the above needs, consolidating and strengthening the construction of cooperation platforms and mechanisms is still a key move and necessary action to promote international cooperation on BRI green and low-carbon energy development.

2. PATHWAY 1: PROMOTING INDUSTRIAL COOPERATION ON CLEAN ENERGY TO SUPPORT BRI GREEN AND LOW-CARBON DEVELOPMENT

As many countries in the world have successively proposed carbon neutrality goals, green and low-carbon transition of energy development has become a global consensus. Especially in the current complex situation where issues such as energy transition, energy security, and energy accessibility are intertwined and impacted, China and international community need to work more closely with hand in hand, so as to accelerate progress towards green and low-carbon transition of global energy and sustainable development. In this context, promoting industrial cooperation in renewable energy technology is an important strategic choice to boost green and low-carbon BRI energy development.

2.1 Renewable Energy: A key direction for technical cooperation in the energy industry under the BRI

China's international energy cooperation has gone through a process from active participation to integration, to gradually guiding and promoting the establishment of an international cooperation mechanism on energy that meets the needs of global energy development[22]. In recent years, the BRI has undoubtedly brought new opportunities for building a more comprehensive cooperation mechanism on energy. The implementation of a number of major energy cooperation projects, the continuous improvement in multilateral (bilateral) mechanisms of energy cooperation, and the growing exchange on energy policies and technologies have created positive conditions for the BRI to support the green and low-carbon development of energy in BRI participating countries. Meanwhile, more diversified cooperation contents and models have also been formed[23], which are mainly reflected in: (1) renewable energy cooperation has become an important part of the BRI energy cooperation; (2) the partners include both energy producing and consuming countries, and the model shifts from an one-way cooperation model based on energy trade that only revolves around oil and gas imports to a two-way cooperation model with more emphasis on the role of energy investment; and (3) triangular cooperation has become a new highlight of the BRI energy cooperation.

2.1.1 Outbound energy investment accelerates expansion to renewable energy sector

The proportion of China's outbound investment in renewable energy continued to increase. China has been the largest investor in production capacity of renewable energy in recent years, and investment in renewable energy and new energy fields including solar PV, wind energy, hydro power, biomass energy, and hydrogen energy has become an important area of

international cooperation on energy under the BRI. According to REN21's *Renewables 2021 Global Status Report*, China's foreign investments represented for the first time more than half of the country's total overseas energy investments under the BRI – increasing from 38% in 2019 to 57% in 2020, and the projects are widely distributed in key regions including South and Southeast Asia, Europe, Oceania and Latin America[24]. **Chinese enterprises have been more and more enthusiastic to participate in overseas investment in renewable energy.** According to data from the Ministry of Commerce (MOFCOM), China has newly invested in nearly 400 energy enterprises overseas since 2018, accounting for nearly half of the cumulative number of registered new energy enterprises overseas. **Solar PV and wind power projects are growing the fastest, where private sectors are the most active to participate.** Statistics from China Chamber of Commerce for Import and Export of Machinery and Electronic Products (CCCMB) show that in 2020, Chinese enterprises grew rapidly in the overseas new energy power generation industry, signing 177 projects with a contracted value of USD 15.63 billion, an increase of 69.1%, accounting for 35.5% of the total value of projects signed by all enterprises in the power industry, and for the first time exceeding thermal power projects. The fastest growth was seen in photovoltaic power generation projects, with 117 projects signed, amounting to USD 9.98 billion, a year-on-year increase of 140.5%. China signed 45 wind power projects overseas with a value of USD 4.83 billion, a year-on-year increase of 16.3%; biomass power generation (15 projects, USD 820 million), increased by 3.3% year-on-year, with a number of private enterprises involved[25].

2.1.2 Cooperation with countries and regions exporting traditional energies extends to renewable energy

Countries and regions along the BRI, including South and Southeast Asia, Central Asia, as well as the Middle East, have been not only important strategic partners in China's energy cooperation, but also equipped with great potentials for cooperation on renewable energy. In recent years, with the transition of energy strategies of these countries and regions as well as the needs of energy structure adjustment, the energy cooperation mode has been shifting from cooperation merely around oil and gas products to diversified green energy cooperation. For example, a number of renewable energy cooperation projects have emerged in the Middle East, represented by Morocco's Noor Ouarzazate Phase II and Phase III CSP Project, the world's largest solar thermal (CSP) power station in Dubai, as well as Egypt's Benban Solar PV industry. Pakistan, with whom China cooperated on the most intensive energy investment, has many representative projects such as Pakistan Karot Hydro Power Project, ZTE Energy Pakistan Solar PV Project, Jhimpir Wind Power Project invested by Orient Group.

2.1.3 The potential of renewable energy cooperation with developing countries has increased significantly

China has built a large number of Solar PV power plants in Africa, and the total Solar PV power generation reached 261.1 billion kWh in 2020, providing solar PV power support for hundreds of millions of households[26]. As an important mechanism for China-Africa comprehensive cooperative partnership, the Forum on China-Africa Cooperation has put forward *ten major cooperation plans* and *eight major initiatives*, emphasizing that the BRI shakes hands with Africa's *Agenda 2063*, the *2030 Agenda for Sustainable Development* adopted by UN, and the development strategies of African countries, providing an important platform for China-Africa renewable energy cooperation. Latin America is also a key area where China's renewable energy practices are conducted, and their cooperation on renewable energy pays particular attention to innovative investment and financing methods. At present, a diversified investment and financing model[27] has been basically formed that integrates policy banking, corporate mergers and acquisitions, as well as green field investment. At the same time, the practice of BRI projects with triangular cooperation as the entry point is also in progress. For example, in the second part of this chapter, China and Denmark cooperated in a South-South project of renewable energy technology transfer in Ghana/Zambia.

2.2 Triangular Cooperation: A model innovation for accelerating technical cooperation in renewable energy industry in BRI

As a global leader in renewable energy capacity and investment, China can mitigate and adapt to climate change by actively carrying out South-South cooperation, responding to the UN Sustainable Development Goals (SDGs), and supporting the green and low-carbon energy transition of BRI participating countries. At the same time, China can further leverage the innovative triangular cooperation model to mobilize, integrate and utilize global renewable energy development resources, especially industrial and technological resources, to create an innovative path for triangular cooperation to promote the green and low-carbon energy development of BRI. In this chapter, the case of renewable energy technology transfer project targeting at Ghana and Zambia, which is funded by Denmark and jointly organized by the Ministry of Science and Technology of China and the United Nations Development Program (UNDP), is examined as an example, introducing the experience, effects and implications of applying triangular cooperation in supporting the development of the renewable energy industry in BRI participating countries.

Box 1. South-South cooperation, North-South cooperation and triangular cooperation

Since most developing countries are located in the southern hemisphere or the southern part of the northern hemisphere, and developed countries are mainly in the northern part of the norther hemisphere, the terms "south" and "north" are used to refer to them respectively.

South-North cooperation: The extensive cooperation between developing countries and developed countries in the fields of economy and technology.

South-South cooperation: Economic and technological cooperation among developing countries, which is an indispensable part of international multilateral cooperation for development.

Triangular cooperation: Economic and technological cooperation on the basis of traditional South-South cooperation with the participation of international organizations, multilateral mechanisms or developed countries.

2.2.1 Triangular cooperation supports renewable energy technology development in Ghana and Zambia

Due to the difference in development levels between developing and developed countries, the technology transfer in South-North cooperation may encounter supply-demand mismatch and difficulty in implementation, and South-South cooperation may need to address the challenge of funding. The innovation of triangular cooperation is that it balances project efficiency and sustainability. As developing countries share a similar development environment and development needs, it is easier for them to promote technology transfer and application according to local conditions; while the funding support from international organizations and developed countries lays a solid foundation for cooperation, enabling stable operation of the projects.

In 2014, China, Denmark, Zambia and Ghana reached a consensus, agreeing that a developed country (Denmark) would fund and support China to carry out low-carbon applicable technology demonstration and experience sharing for Ghana and Zambia, taking into account the demonstration of equipment products and the creation of a soft environment for renewable energy technology transfer, so as to effectively enhance the capacity of developing countries to cope with climate change. In 2015, the Ministry of Science and Technology of China (MOST) and the United Nations Development Programme (UNDP) jointly organized and implemented China-Ghana-Zambia South-South Cooperation on Renewable Energy Technology Transfer Project (hereinafter referred to as "China-Africa Project"). The project adopted a North-South-South cooperation model, with its funding from a developed country (Denmark), and technology transfer from a developing country with relatively mature technologies (China) to relatively low-tech developing countries (Ghana and Zambia). Since its implementation, the project has received attention of all parties and won many international awards. It was selected

into the *Outcome of the 40th Anniversary of South-South Cooperation between China and the United Nations*, *Good Practices in South-South and Triangular Cooperation* of the UN, and *Good Practices in South-South and Triangular Cooperation for the least developed countries* of the UN .

2.2.1.1 Strengthen the cooperation platform and mechanism

The platform and mechanism development carried out by the China-Africa Project has a prominent exemplary role in technical exchanges and communication of the renewable energy industry.The the professional platform of pragmatic cooperation has strongly ensured the efficiency and effects of cooperation.

A new platform for South-South cooperation under the UN framework has been built. On September 12, 2019, the Administrative Center for China's Agenda 21 (ACC21) and UNDP jointly established the Center for South-South Cooperation in Technology Transfer (hereinafter referred to as the Center for South-South Cooperation). As one of the concrete initiatives to implement the *Memorandum of Understanding between the Ministry of Science and Technology and UNDP*, the Center for South-South Cooperation aims to (1) build a technology transfer platform and database to precisely match technology demand and supply, and provide relevant partners with appropriate technical solutions for sustainable development; (2) build itself into a think tank for South-South cooperation in technology transfer, conduct strategic and policy researches, and explore ways to apply China's experience and best practices in solving common problems faced by technical cooperation; (3) establish technology demonstration and promotion hubs along the Belt and Road, to share China's technological innovation experience with countries along the routes; and (4) create technology transfer capacity-building bases, organize and implement technology transfer and aid projects for developing countries commissioned by governments and international organizations like UNDP, and carry out capacity-building activities such as knowledge sharing, training exchanges, and technology demonstrations.

A long-term mechanism of the Steering Committee has been established. In the early stage of the China-Africa Project, an efficient and standardized management mechanism has been gradually established, including a Global Steering Committee including UNDP, Denmark and the implementation side. China, Ghana, and Zambia have established National Steering Committee respectively. During the implementation period of the project, UNDP China and each country's implementation side preside over the meeting of the Global Steering Committee and each country's National Steering Committee respectively summarize the annual results,

review the work plan, as well as provide guidance for the smooth implementation of various tasks.

2.2.1.2 Deepen policy communication and coordination

In order to better support the development of industries and technologies, the China-Africa Project focuses on policy alignment and communication between countries, which is an important guarantee for the smooth transfer and absorption of technology and experience from one country to another.

The *Ghana Renewable Energy Master Plan* (REMP) was compiled to support the top design of clean energy development in partner countries. By learning from China's five-year planning policy, Chinese experts assisted Ghana's partners in formulating the first mid-and long-term plan for Ghana's national renewable energy development. With a vision of enhancing Ghana's capacity for renewable energy research, production and services, and with the aim of promoting economic growth, improving social life and minimizing the adverse impacts of climate change, REMP sets out development goals and action plans for eight types of clean energy technologies based on Ghana's current energy supply and demand and policy and institutional framework, and taking into account the local business environment. REMP has been reviewed by Ghana's Congress, filling the gap in Ghana's mid- and long-term plan in the field of renewable energy, and fully implementing and reflecting Ghana's will of development in the top design, which is to take renewable energy technology development as a critical pathway.

The *Roadmap for China-Ghana Renewable Energy Technology Transfer* was compiled to implement policy alignment. Chinese experts analyzed Ghana's renewable energy development needs from the perspectives of local culture, technology, market as well as the regulatory framework. Based on the close communication between the two sides, focusing on Ghana's renewable energy development goals set in the REMP, experts from all sides have jointly formulated a roadmap for technology transfer of renewable energy for Ghana that includes specific actions and milestones, effectively promoting the common development of the clean energy industry on both sides.

2.2.1.3 Carry out technology transfer and matchmaking

After the project was implemented, a number of renewable energy technologies have been transferred to and widely applied in partner countries, laying a solid foundation for meeting the renewable energy development needs of partner countries.

Technology collection and screening have been organized according to local conditions. In the early stage of technology collection, the project team carried out demand research in various forms, such as field visits, expert discussions, questionnaires, etc., and also analyzed the influencing factors of applicable technologies, systematically sorted out the transfer advantages, existing obstacles and suitability of different technologies, and developed the *South-South Cooperation on Renewable Energy Technology Transfer Technical Manual (Chinese and English Edition),* creating a renewable energy technology library for developing countries, which helps to carry out technology exchanges based on local conditions and facilitate the long-term and stable functioning of transferred technologies.

Active exchanges have been conducted to solve practical problems encountered in implementing technology transfer. During the implementation of projects, several China-Africa renewable energy technology exchange networking meetings were held in succession. Government officials, experts, scholars, business representatives and other relevant parties from China, Ghana, Zambia and other countries visited and learned about representative laboratories and enterprises of renewable energy. Exchanges and discussions were carried out on the current status of technology development, challenges and responses to technology transfer, etc., to enhance mutual trust among all parties. For example, the Chinese technical experts and equipment suppliers found through on-the-spot investigation that the existing renewable energy stoves in China do not match the specifications of the traditional cooking pots with oval bottoms in Ghana. According to the shape of traditional cooking tools in Ghana, China adjusted the design of stove, so that a single stove can meet the local people's needs for cooking and heating at the same time, solving practical problems for the final implementation of technology transfer.

2.2.1.4 Highlight capacity building

The China-Africa Project actively creates an enabling environment for South-South cooperation on technology transfer and strengthens the capacity building of both sides, thus improving the quality of cooperation while effectively promoting the localization of cooperation results, and adding a long-term momentum to the development of partner countries' renewable energy industry.

In October 2016, China-Africa renewable energy technology transfer and matchmaking meetings were held in Chengdu, Beijing and Chongqing respectively. Through policy exchanging, technology sharing and other links, the needs of the African side have been fully expressed. The meeting also involved in-depth participation of enterprises, enabling African partners to learn more directly about management models and production concepts of enterprise

engaged in technology transfer. This novel matchmaking and exchange model has greatly improved the cognitive efficiency of renewable-energy-related technologies between China and Africa, as well as promoted the application and development of renewable energy technology in Africa.

In October 2019, as a specific measure to implement the *Memorandum of Understanding on Science Technology and Innovation for Achieving Sustainable Development Goals*, the International Training Course on Science Technology and Innovation for Achieving Sustainable Development Goals provides an effective platform for developing countries to exchange and share experience in technological innovation for sustainable development. Through a combination of classroom lectures and field visits, the training course held nearly 20 thematic activities on such topics as innovation financing, intellectual property rights, roadmaps for SDGs innovation, as well as innovative demonstration zones for national sustainable development agenda. The partners shared the concepts, methods and experiences of constructing innovative demonstration zones in an all-round way.

2.2.2 Triangular cooperation promotes technology exchanges and cooperation in the renewable energy industry

Triangular cooperation is an important initiative to support the promotion of South-South cooperation in renewable energy technologies in BRI participating countries under the UN framework, and it requires the multilateral mechanism to work as a bridge in international cooperation, coordinating all parties to move in the same direction, and integrating and mobilizing the resources of the international community, so as to help developing countries enhance their capacity to address climate change, and achieve the SDGs together. As the flagship project of the UN triangular cooperation, the China-Africa Project created a “package” cooperation model featured with full research in the early stage, effective communication in the mid-term, experience exchange in the later stage, strengthening policy communication and focusing on the application of results.

In terms of content, the China-Africa Project fully demonstrates the concept of win-win situation for all parties, and is highly compatible with the development needs of the partner countries. Both Zambia and Ghana have strong demand and willingness for energy development, have relatively stable domestic political situation, and are in leading positions in Africa in terms of economic growth. On the basis of the Ghana and Zambia’s willingness to develop, and considering China’s technological strength, renewable energy has been selected as the priority area for cooperation.

In terms of cooperation model, the China-Africa Project provides a relatively complete set of BRI renewable energy technology cooperative schemes. Focusing on green and low-carbon energy development, the Project has carried out a series of high-quality technical training, technology demonstration and capacity building activities, while strengthening cooperation mechanisms and platforms in a targeted manner, and carrying out multi-level intergovernmental policy coordination by supporting partner countries to prepare national-level plans or industrial development roadmaps, and thus effectively enhancing macro and meso support for the traditional cooperation model featuring single technology exchange.

In terms of effects, the China-Africa Project has significant value of sustainable application and radiation demonstration effect in supporting international cooperation in green and low-carbon BRI energy development. The innovative exploration and successful experience of the Project provide a replicable set of solutions for the subsequent green and low-carbon BRI energy development cooperation in a broader sense, which can be introduced to other participating countries and regions. Through the cooperation with UN agencies, the Project has not only supported the renewable energy development in Ghana and Zambia, but also resulted in certain demonstration effects on the renewable energy development in neighboring countries, which is conducive to the expansion of the green and low-carbon BRI cooperation network.

With the successful experience of the China-Africa Project, in April 2019, the Chinese government signed a project agreement with Ethiopia and Sri Lanka regarding the China-Ethiopia/Sri Lanka Triangular Cooperation Project on Renewable Energy. As a practice of the successful experience of the China-Africa Project, this project was carried out within the framework of South-South cooperation, aiming to build a platform for experience sharing and learning, adjust and optimize the local energy structure through demonstration projects, promote the sustainable development of agriculture in partner countries, reduce greenhouse gas emissions, and improve the income and productivity of local residents. The project has been included in the list of outcomes of the 2nd Belt and Road Forum for International Cooperation, and been selected as one of the *Good Practices in South-South and Triangular Cooperation for the Least Developed Countries* of the UN, becoming another successful practice of triangular cooperation in supporting the green and low-carbon energy development of BRI participating countries.

Figure 2-1 China-Africa renewable energy technology transfer exchange conference

Figure 2-2 Chinese and international experts together with relevant units of Zambia studying the siting of hydro power stations

2.3 Policy Recommendations for Improving the Implementation of Pathway 1

According to results from reviewing the existing practices of renewable energy cooperation and case studies of specific cooperation projects, it is important to promote the formation of a more systematic and effective mechanism for technical cooperation in renewable energy industry for China when it works together with BRI participating countries to jointly address global challenges in environment, climate, energy and equity, to promote BRI green and low-carbon development, and to achieve 2030 SDGs. To this end, it is recommended to focus on the following four aspects in terms of cooperation mechanism development and cooperation items.

2.3.1 Deeply meet the differentiated needs of BRI participating countries, and conduct cooperation according to local conditions

In the global context of carbon neutrality and carbon peaking, there is huge space for renewable energy cooperation among countries and regions along the BRI. The data shows that from 2009 to 2018, the demand for renewable energy in the countries and regions along the BRI is

increasing rapidly, among which the growth rate in the Middle East is particularly obvious, with an average annual growth rate of renewable energy consumption of 36%, followed by 21% in Asia-Pacific countries, 20% in African countries, 16% in CIS countries as well as 11% in European countries[28]. To this end, it is important to continue the efforts of strengthening the alignment of the international and regional strategies and policies of low-carbon transition. However, for countries and regions at different stages of development and with different resource endowments, policies should be implemented according to specific conditions.

2.3.2 Give full play to the role of existing platforms, and deeply integrate considerations such as climate change and sustainable development

In mechanism development, the role of the existing cooperation platforms should be brought into full play. Especially in the relevant documents of the BRI energy partnership, the content of addressing climate change, sustainable development as well as social responsibility should be given closer attention. At the same time, it is important to strengthen exchanges and communications among countries through already established multilateral cooperation frameworks and dialogue mechanisms that have incorporated a wide range of renewable energy cooperation issues, such as South-South Cooperation, the Forum on China-Africa Cooperation (FOCAC), China-Arab States Cooperation Forum (CASCF), Shanghai Cooperation Organization (SCO), Ministerial on Climate Action (MoCA) (jointly sponsored by China, the European Union and Canada), and the China-U.S. Dialogue on Climate Change. Such approaches can also help countries to deepen the understanding of renewable energy technology innovation and application, assist all the players to get the knowledge of local society, culture, development conditions and needs, laws and regulations and other national conditions. On this basis, identify fields of cooperation which can bring mutual benefits to all parties and create opportunities for in-depth industrial cooperation.

2.3.3 Encourage enterprises to “go global” in groups and actively carry out triangular cooperation

It is important to develop relevant supporting policies to encourage and guide renewable energy manufacturing enterprises, project development companies, financial institutions, industry associations to “go global” in group, cooperate with each other, and play a synergistic role in renewable energy cooperation with the BRI participating countries and regions by a multi-angle holistic approach. At the same time, it is necessary to encourage Chinese enterprises to actively seek technical cooperation and joint operation with energy enterprises from a third country with regard to clean energy development and renewable power generation projects along the BRI. It

is crucial to give full play to the comparative advantages of Europe and the United States and other countries in international cooperation on renewable energy in terms of industrial norms, standards, consultation, operation, and management, and combine China's high-efficiency and low-cost renewable energy technology and experience to achieve win-win outcome in the BRI development.

2.3.4 Innovate a "renewable energy plus" model to promote the green and carbon reduction action

Cooperation on production capacity and transportation infrastructure are both key areas of the BRI development. According to the latest data, China's project contracting in the general construction field along the BRI has also achieved rapid growth, from USD 390 million in the same period in 2020 to USD 2.46 billion in June 2021, with tripled growth rate, making it the third largest engineering contracting investment industry subsequent to transportation and energy[29]. These above-mentioned industries are highly relevant to carbon emissions. For this reason, it is recommended to adopt the models of "renewable energy + industry", "renewable energy + transportation", as well as "renewable energy + buildings" to promote the green and low-carbon transition of the BRI development.

3. PATHWAY 2: GUIDING FINANCIAL RESOURCES TO SUPPORT GREEN AND LOW-CARBON DEVELOPMENT IN BRI PARTICIPATING COUNTRIES

3.1 Financing Challenges for Green and Low-Carbon Energy Development in Developing Countries

Two main types of barriers impede developing countries in their ambitions of realizing green and low-carbon energy development. Firstly, countries face barriers to accessing the technical and financial resources necessary to broadly deploy new technologies. Secondly, even low-carbon energy generation facilities can pose significant local environmental and social impacts, and these must be managed well in order to ensure effective and long-lasting investments. China is extremely well positioned to help other developing countries overcome the technical and financial barriers to renewable energy development, and in fact has already established itself as a crucial partner for countries wishing to overcome these obstacles. China's unique overseas financing model enables the country to overcome such obstacles. China has also developed a wide variety of tools and guidelines to help investors consider the local environmental conditions for renewable energy investment, but additional prioritization of this area can continue to contribute to these efforts. Given the realistic need to achieve high-quality development, the following two barriers need to be tackled.

3.1.1 Technical and Financial Barriers

One of the larger obstacles of investing in renewables in developing countries, especially those where fossil fuels are abundant, is the lack of necessary policy incentives. In many developing countries, fossil fuels and fossil fuel companies benefit from large subsidies and other policies that bias those firms despite the fact that renewables are increasingly the cheaper and more efficient option. As a result, the policy support for developing renewables from public sector is not sufficient enough, and developing. countries face a significant technical deficit in deploying renewable energy. These are partly related to low levels of existing energy access[30-31].

China is extremely well positioned to assist other BRI participating countries in overcoming these technical obstacles, having already developed the institutional capacity domestically[32]. Pingkuo and Peng (2022) explore five different incentive policies deployed in China that contributed to the growth of renewable energy domestically. They find that the most significant positive impact of these five was the incentive to develop capacity of development finance institutions (DFIs) to support the other aspects of renewable energy deployment, including innovation and investment intensity. Thus, the institutional knowledge gained by Chinese policy

makers in this area has been remarkably effective. It is just this type of capacity that can be transmitted well across BRI projects.

A second type of obstacle emerges from the barriers to financing facing developing countries. Low- and middle-income countries face higher sovereign borrowing costs and a reduced investor appetite for the long-term commitment necessary to build and sometimes operate energy infrastructure projects in an uncertain economic context. China has already played an important role in filling this gap, and continued to do so. For example, in Africa, the Export-Import Bank of China has extended more finance for renewable energy development than any other international DFIs[31]. Another key barrier is the lack of credit-worthiness and off-taker risk facilities in host countries, as well as currency risk.

Furthermore, the unique "coordinated credit spaces" that Chinese DFIs, state-owned enterprises, PPPs, and private investors form can make ambitious investment projects feasible where they would not otherwise be considered creditworthy. Where their Western counterparts operate independently as financiers or investors, requiring shorter-term financial returns on each separate aspect of a project, these Chinese lenders and investors better coordinate their efforts to create longer-term, broader economic benefits beyond what each party gleans[33]. For example, Argentina's Cauchari solar park – the largest in the country – was successfully developed through a combination of development finance from the Export-Import Bank of China, construction development by Shanghai Electric Power, solar panels from Talesun Solar, and inverters from Huawei. Thus, China is already using its unique lending and investment approach to help other developing countries overcome the financial barriers to renewable energy development.

3.1.2 Environmental and Social Barriers

To ensure the effective implementation of renewable energy investments abroad, particularly in countries where investors are relative newcomers, global practitioners and lenders have formed a broad consensus around appropriate due diligence and project management steps. This wide agreement has coalesced around a "whole lifecycle" framework[34-36].

Box 2. The "Whole Lifecycle" Approach to Best Practices in Renewable Energy Development

The "Whole lifecycle" approach to sustainable project management consists of four major steps: project preparation, when investors and policy makers are considering the type of project to pursue; design, when the specific project details are defined and financing is finalized; implementation, when construction and production are underway; and completion, as investors clean up worksites and wind

down their operations.

In project preparation, it is important to bear in mind that host countries' national strategies for renewable energy development can differ widely. In order to explore the type of renewable energy project that will be most likely to succeed in the long term, it is important to interface with a wide variety of host country government ministries, whose official strategies may facilitate the development of particular forms of renewable energy[37]. For example, some health ministries may prioritize replacing urban coal-fired power plants in order to improve air quality, while other countries' ministries for women or families may have strategies for rural renewable energy development to transition away from reliance on wood-fired cooking stoves, which are associated with significant respiratory health impacts for women[38].

Once a project has been selected and designs are underway, it is crucial to conduct adequate due diligence to identify any risk factors for a smooth implementation thereafter. As during project planning, working with a variety of host country ministries can help avoid unforeseen complications. Environment ministries may recommend or require supply chain analysis on the environmental and social impacts of a project's use of water, land, and commodity inputs[39-41]. Ministries of women, families, and culture may recommend or require community consultations that are separated by gender or ethnicity. Land and water use often effects stakeholders differently by ethnicity and gender. For example, women in agricultural societies are often responsible for household energy provision and are likely to embrace renewable energy projects, but they may have limited voice in mixed-gender consultation settings[42-43].

During project implementation and operation, project managers can safeguard the effectiveness and longevity of renewable energy projects by interfacing with national and local chambers of commerce and establishing business-to-business linkages with local suppliers of direct inputs as well as indirect inputs such as worker uniforms, catering, and other ancillary services[44-45]. Building local capacity can ensure a project's integration with local economies and contribute significantly to its longevity[46]. Finally, the lifecycle approach ends in project operation and completion, through the safe disposal of hazardous materials used in renewable energy generation, such as mercury in solar generation or a variety of heavy metals in geothermal power generation[36][47].

For policy makers and other entities overseeing outbound investment, two major avenues exist to ensure that investors follow the best practices outlined above: national governments and development finance institutions (DFIs), including both national and multilateral bodies.

Nationally, government policy makers can enact guidelines and tools for their outbound investors, and their DFIs can enact specific requirements for projects that receive their financing. China has developed two avenues for direct facilitation of best practices, through the development of official guidance and a broad array of toolkits for investors. The 2021 CCICED special policy report on the Green BRI covers these extensively, including policies issued by the State Council, MOFCOM and other high-level government bodies[48]. Most notable is the 2021 *Green Development Guidelines for Overseas Investment and Cooperation*[49]. Among other

advice, these Green Development Guidelines strongly encourage outbound investors to adhere to the "green development concept" throughout an entire project process, as detailed in the "whole lifecycle approach" explained above. These Guidelines make clear that investors should follow host-country law or international best practices, when operating in countries without robust domestic standards. Across this body of increasingly comprehensive policies and advice, the Chinese government has made it clear that investors are expected to follow high-level environmental practices.

Complementing these official guidelines are toolkits published to assist outbound investors in understanding the potential environmental factors that may need to be taken into account to effectively and responsibly pursue their projects of interest. For example, a group of seven Chinese associations and committees that act in subordination to Chinese government ministries, in collaboration with government and industry groups (including the Foreign Economic Cooperation Office of MEE, China International Contractors Association, China Chamber of Commerce of Metals, Minmetals, and Chemicals Importers and Exporters) contain detailed advice for specific sectors, such as infrastructure, and can provide significant guidance for renewable energy infrastructure investors. More practical guidance is available through FECO's Environmental Risk Screening Tool (ERST), through which investors can see location-specific risks that apply to the area where they are considering investing. With the ERST, investors can estimate potential biodiversity impacts and create policy compliance analysis reports[48][50].

Despite these important steps, one additional avenue remains for China to ensure the effectiveness and longevity of outbound green energy investments: due diligence requirements and oversight by government-funded development finance institutions (DFIs) that support outbound projects. China provides crucial support for investment and the expansion of the BRI through its DFIs, both through national DFIs and through participation in multilateral development banks (MDBs) such as the Asian Infrastructure Investment Bank (AIIB) and the Asian Development Bank (ADB). These national DFIs and MDBs lend directly to outbound investors and also to overseas national governments who hire Chinese firms and public-private partnerships (PPPs) to carry out infrastructure projects. Thus, whether China's push for renewable energy overseas operates through direct investment or through construction contracts for projects owned by other governments, these DFIs ensure that the implementing firms have the capital needed to initially invest, and continue to support them through the life cycle of the project and the repayment years thereafter. As such, they form close collaborations with the investors they support and they rely on those investors to use environmentally responsible practices in order to ensure the effectiveness and longevity of the supported projects. They have the financial incentive as well as the access necessary to guide firms through best practices.

Table 3.1 shows a variety of common DFI policies and practices to guide investors in best practices throughout project lifecycles. It includes two regional MDBs in which China has a significant role, ADB and AIIB, as well as two Chinese DFIs and the national DFIs of Japan and South Africa. Shortly after China announced that it would no longer support coal projects overseas and would instead increase support for renewable energy around the world, South Africa and Japan followed suit, joining the G20 in announcing an end to overseas coal financing[51-52]. Like China, both South Africa and Japan use their DFIs to support outbound investments. Thus, it is useful to examine the tools they have developed to encourage and facilitate the use of best practices by investors, for maximum project effectiveness and longevity.

Table 3.1 DFI Environmental Oversight Processes throughout Project Lifecycle

	Regional		**China DFIs**		**Peer DFIs**		
	ADB	AIIB	CDB	CEXIM	DBSA	JICA	JBIC
Preparation							
Exclusion/inclusion lists	X	X	X	X	X	X	X
Technical support for developing green projects	X	X			X	X	
Financial support for developing green projects	X	X			X	X	
Design							
Use of risk/impact rating system	X	X			X	X	X
Conditions for use of host country standards	X	X	X	X			
Implementation							
Disclosure of lender documents		X				X	X
Facilitation of disclosure of borrower documents	X	X			X	X	
Use of independent / third party monitors	X	X			X		
Operation and Completion							
Project completion provisions	X	X	X	X	X		
Independent accountability mechanism	X	X			X	X	X

Source: Gallagher and Qi 2021, Ray et al. 2021, Zhuo, Shi, and Gallagher 2021[53-54]
Note: ADB: Asian Development Bank; AIIB: Asian Infrastructure Investment Bank; CDB: China Development Bank; ExIm: Export-Import Bank of China; DBSA: Development Bank of Southern Africa; JICA: Japan International Cooperation Agency; JBIC: Japan Bank for International Cooperation.

As Table 3.1 shows, national and multilateral DFIs have developed tools to guide investors throughout the project lifecycle. During project preparation, DFIs may establish inclusion and exclusion lists to avoid association with particularly high-risk sectors and encourage investment

in others. China's BRI Green Light System is an example of this type of guidance, and research by the BRI International Green Development Coalition (BRIGC) shows that it has a strong potential to help ensure a successful implementation of China's push for green energy abroad[55]. In addition, they may **offer technical or financial assistance** to borrowers in developing credit-worthy green projects. Notably, Chinese DFIs are the only ones studied here to not offer these supports, and this may be an area for future policy strengthening.

Once projects have been **chosen and are being designed**, DFIs may perform **due diligence** steps to ensure that projects have considered potential environmental impacts and related risks to project viability. DFIs may establish their own risk and impact rating system in order to determine which pre-investment steps need to be elaborated before construction (as Japan and South Africa DFIs do) or establish conditions under which investors may rely on host country systems, as China does.

During **project implementation**, DFIs often support investor **transparency and monitoring** in order to crowd in additional oversight from host country stakeholders, who may notice and address potential risks before they can create problems for the projects.

Finally, during **completion and operation stages**, DFIs can require responsible handling of cleanup or establish independent accountability mechanisms for ongoing risk management after construction is complete. China's DFIs are noteworthy here in their use of post-hoc environmental assessments to track the performance of investors and contractors. These are the only institutions shown here to use post-hoc evaluations, which have great potential in informing future investment decisions. They do not yet inform the exclusion and inclusion lists that China's DFIs use, but this may be an area of future policy strengthening. In 2017, the State Council shared a directive opinion advising the creation of a blacklist system for poorly-performing overseas investors, as NDRC does for domestic investors[56]. Preparation for this step is still ongoing and could enhance the quality of China's future renewable energy investment overseas.

3.2 Public-Private Partnerships: An Effective Solution to the Barriers to BRI Clean Energy Development

3.2.1 PPP Development in BRI Countries and Chinese Companies' Embrace to PPP

To achieve the goals of the *Paris Agreement*, the world needs tremendous financial resources to develop green and low-carbon energy, especially for the BRI participating countries. On the one

hand, governments have to invest large amounts of fiscal funds in response to the COVID-19 and improve people's livelihood, worsening the already limited fiscal fund. On the other hand, institutional investors make prudent investments due to future uncertainties, presenting the difficulties and increasing cost of financing. These circumstances have seriously impacted infrastructure investment, including green energy development. This is especially the case in developing countries. Therefore, it is necessary to innovate the financing mode for green energy in BRI participating countries.

As an innovative modality to encourage the participation of private sector in infrastructure investment, the Public-Private Partnership (PPP) has been acknowledged and disseminated by the international community. The World Bank Group set up the Global Infrastructure Facility (GIF) in 2014 to provide financial support to developing countries in PPP project preparation. Asian Development Bank (ADB) established the Office of PPP in 2014. G20 founded Global Infrastructure Hub in 2014, aiming to promote the information exchange of infrastructure projects and promote PPP application. UNESCAP set up the Infrastructure Financing and PPP Network of Asia and the Pacific in 2018, whose member countries have rapidly grown to more than 50 at the beginning of 2022 from 24 at its establishment. Under the support of Heads of African States and The United Nations Economic Commission for Africa (UNECA), Africa PPP Network was formed in 2020.

At present, PPP has been applied in an increasing number of BRI participating countries, and more and more green energy projects have been developed rapidly in PPP, which benefits local people and promotes local social and economic development. Like other infrastructure investments, Chinese companies which invest in clean energy development overseas (mainly in BRI participating countries) adopt EPC (Engineering Procurement Construction) mode, mainly financed by policy funds from the Export-Import Bank of China, namely foreign aid preferential loans and preferential export buyer's credit. These facilities enjoy low interest rates (2% - 3%) and long maturity periods (15-20 years). Under the official preferential loan, usually, the host country applies for sovereign loans from China. The existing investment is facing challenges, mainly as follows. First, the sovereign loan will increase the debt-to-GDP ratio of the host country. Second, Chinese companies are mainly involved in project construction, but not enough in project design, financing and operation, which makes it difficult to form a long-term impact on the environment and climate. Third, project risks are unevenly distributed between Chinese export credit agency and the Chinese company. If the project operation fails, the cash flow is interrupted, and the company is unable to repay the loan, the capital loss may be borne by the export credit agency. At present, the main Chinese export credit agencies who can provide funds for Chinese enterprises include the Export-Import Bank of China, China Development Bank,

and China Export & Credit Insurance Corporation. Their potential losses will eventually be passed on to China's central finance.

In the case of PPP, generally, the host country/government bears the risks pertaining to politics, policy, land acquisition, immigration, while the private mainly takes responsibility for capital, technology, and management. As an investor, the private firm can integrate various resources to provide financing for the project without increasing the debt of the host government. The return on investment comes from fees for services provided by the infrastructure built and/or agreed subsidy from the host government. The private firm can also make the most of its technical expertise to provide life-cycle services from the front-end planning, design and consultation to the construction, operation and maintenance afterward, so as to solve the problem of lacking operation capacity for the host country, mitigate the risk in getting return of the investment, and also contributes to obtaining long-term benefits and establishing a corporate brand in the host country by through years of project operation. A Chinese enterprise, whether state-owned or private, can participate in an overseas PPP project as a role of private sector, sharing risks with the host country appropriately.

PPP can be an effective solution to the technical and financial barriers as well as the environmental and social barriers mentioned above. Chinese companies can play important roles to promote BRI clean energy development via PPP, especially with the *Guidelines for Ecological and Environmental Protection in Overseas Investment and Cooperation Construction Projects* jointly issued by MEE and MOFCOM in January 2022 and the *Opinions on Jointly Promoting Green Development of the Belt and Road* issued by NDRC, MFA, MEE and MOFCOM in March 2022.

3.2.2 Chinese Government and Enterprises Support to Implement BRI via PPP

At the First Belt and Road Forum for International Cooperation in 2017, Chinese President Xi Jinping pointed out that it is necessary to "innovate investment and financing models, promote Public-Private Partnership (PPP) for a diversified financing system and multidimensional market". According to the *Proposals for Formulating the 14th Five-Year Plan (2021-2025) for National Economic and Social Development and the Long-Range Objectives Through the Year 2035*, to promote the high-quality development of the BRI, it is necessary to adhere to the principle of "extensive consultation, joint contribution and shared benefits", "maintain the main-body role of the enterprise, adhere to the market-oriented philosophy, follow international practices and debt sustainability, and improve the diversified investment and financing system".

According to a survey by China PPP Center and China International Contractors Association in 2021, Chinese line ministries, enterprises and financial institutions expressed eagerly that the traditional model of China's outbound investment in infrastructure needs to be upgraded and transformed into PPP that involves design, financing, construction and operation among others in the life cycle of a project. Some institutions have kicked off their actions.

Since 2014, the Chinese government has promoted a new round of PPP application in China, referring to the PPP practices of the World Bank, Asian Development Bank among other international institutions, and has learned from PPP advanced countries. PPP has been turned from a method of market-based financing to one of the means of modernized governance of the country, that is, to innovate the system of infrastructure investment and financing of the government, and introduce market-oriented supply and management mechanisms in the sector of public services. As of January 2022, 7,683 PPP projects have reached commercial close, with an investment of 12.8 trillion yuan, covering all provinces in China's mainland and 19 sectors including energy, transportation, environmental protection, poverty alleviation, and rural revitalization. China has become the world's largest regional PPP market. A large number of enterprises, financial institutions and consulting agencies with infrastructure business overseas, who have gained practical PPP experience in China, have the capability to carry out PPP projects outside of China. According to the assessment of World Bank Group, China is above the average level of high-income countries in terms of PPP project preparation, procurement and contract management[57].

3.2.3 Practices of Supporting the Development of the BRI Clean Energy Infrastructure via PPP

Since the BRI was launched by China in 2013, Chinese enterprises have expanded their businesses in overseas project contracting in BRI covered regions, with an increasing growth in scale[58]. In 2019, the number of new overseas project contracts reached 6,944, with a total contracted amount of USD 154.89 billion. Among them, the contracted amount of electricity projects accounted for 21.1%(shown in Table 3.2).

Table 3.2 Projects Contracted by Chinese Enterprises in 2019 by Sectors

Sectors	New contracted amount		Completed amount	
	Billion USD	Share	Billion USD	Share
Transportation	699.0	26.9%	471.0	27.2%
Housing	464.3	17.8%	353.6	20.4%
Power development	548.9	21.1%	328.4	19.0%
Petrochemical	300.9	11.6%	157.7	9.1%

Sectors	New contracted amount		Completed amount	
	Billion USD	Share	Billion USD	Share
Communications technologies	240.5	9.2%	151.3	8.7%
Industrial development	83.4	3.2%	76.0	4.4%
Water conservancy construction	72.1	2.8%	61.0	3.5%
Manufacturing and processing facilities	39.2	1.5%	44.0	2.5%
Others	154.1	5.9%	86.1	5.0%

PPP is relatively feasible in the electricity sector compared with other sectors like transportation and environmental protection. Electricity projects, with good social and economic benefits, are usually among the priorities in the host country. At the same time, electricity projects can produce stable cash flow, with strong abilities of repayment and financing.

Electricity projects include power generation and transmission. Power generation projects have a large demand for funds, with high requirements for the professionalism and timeliness of project construction. Generally, the State Grid of the host country performs the obligation of payment, so that the project return will be guaranteed. Wind power and solar photovoltaic projects are delivered more simply, with shorter development and construction cycle. Hydropower projects are relatively complex. Transmission projects are the key of power system and national energy structure transformation in all countries, especially in developing countries, with large capital demand and high professional requirements. The return of the project mainly comes from the income of power distribution fee and the value-added services provided for various users.

Due to the important position and role of the power sector in the national economic system, it is strictly supervised by the host government. The investment policies, decision-making procedures and market environment of power sector vary from country to country. Chinese enterprises, with rich experience in design, investment, construction and operation of electricity projects, especially in the field of green energy, have kicked off their green energy PPP projects in BRI participating countries, as shown in Table 3.3.

Table 3.3 Renewable Energy Projects delivered via PPP by Chinese Enterprises in BRI Participating Countries

Nation	Project	Contractor	Sector	Model	Contract amount (in $100 million USD)	Phase (As of October 2020)
Pakistan	Suki Kinari Hydropower Project	China Gezhouba Group Corporation	Hydropower Station	BOOT	19.62	Under construction

Nation	Project	Contractor	Sector	Model	Contract amount (in $100 million USD)	Phase (As of October 2020)
Guinea	Kaléta Hydroelectric Facility	China International Water and Electric Corporation	Hydropower Station	BFOT	15.67	Operation
Laos	Nam Pay Hydropower Project	China North Industries Corporation	Hydropower Station	BOT	2.18	Operation
Laos	Nam Ngiep 1-2 hydropower	China International Water and Electric Corp.	Hydropower Station	BOOT	1.49	Operation
Pakistan	Dawood Wind Power Project	PowerChina International Group Limited	Wind Power Station	BOO	1.15	Operation

3.2.4 Challenges on Supporting the Development of the BRI Clean Energy Infrastructure via PPP

The challenges faced by Chinese enterprises in delivering green energy projects (like other infrastructure projects) with PPP in BRI participating countries are as follows.

In terms of mechanism, the current outbound investments are supervised by different authorities, including the National Development and Reform Commission (NDRC), the Ministry of Commerce (MOFCOM), the State-owned Assets Supervision and Administration Commission (SASAC), the State Administration of Foreign Exchange (SAFE), and the China International Development and Cooperation Agency (CIDCA). Each takes a specific power of administration but manages one or more aspects, resulting in scattered functions, complex procedures and long approval. There is a lack of cooperation platforms guiding BRI PPP projects in China, so no such ecosystem is formed that is guided by the government, undertaken by companies, financed by financial institutions, and assisted by consulting agencies.

In terms of financing mechanisms, the existing models have relatively high dependence on sovereign guarantee. Chinese enterprises are not using diversified methods of financing. They mostly rely on sovereign guarantees and have inadequate experience in project financing. The application for the Concessional Loan and Preferential Export Buyer's Credit Facility needs complex procedures, and is not good at project financing. The financing method for international projects is mainly credit facility provided by banks, rather than raising funds for international projects by issuing bonds and stocks and establishing funds through domestic and foreign capital markets, leading to a lack of awareness and ability to finance in the target market.

In terms of management, Chinese enterprises are in relative shortage of professionals in PPP and experience in overseas PPP market. The risk of investing in overseas PPP projects is far greater than traditional engineering projects. PPP projects require enterprises to implement the life cycle management of the project. However, Chinese enterprises are weak in project operation, compared to their strength in project construction. Chinese companies and financial institutions are not yet developed a sound mechanism for risk assessment and prevention, with limited capacities in feasibility study and survey, coordination on project operation, innovation in financing tools, operation monitoring, as well as risk management, all of which weakened the competitiveness of financing solutions provided by Chinese enterprises.

3.3 Policy Recommendations for Improving the Implementation of Pathway 2

China is to be applauded for its commitment to ramp up support for renewable energy around the world. It is in a better position to carry out these plans after several years of improving reforms for overseas investor performance, which will help ensure the effective implementation of this ambitious agenda. Several additional policy steps could help cement this progress. First, China can continue to crowd in private sector capital through cultivating a greater application of PPPs. Second, China can offer greater technical and financial support and greater accountability for outbound investors. Technical and financial support can open new possibilities and help investors meet best practice standards.

3.3.1 Strengthen Policy Support and Inter-Ministerial Coordination of the BRI PPP Projects

First, it is suggested that a BRI PPP inter-ministry coordination mechanism be set up, consisting of the Ministry of Finance, the Ministry of Foreign Affairs, the National Development and Reform Commission, the Ministry of Commerce, the People's Bank of China, the State Administration of Foreign Exchange, the State-owned Assets Supervision and Administration Commission, and the China International Development and Cooperation Agency. This mechanism is responsible for coordinating the foreign investment and external financing policies, improving the policies of enterprise performance assessment and financial supervision, for better complying with the international PPP rules and practices. China should build a top-level policy framework for high-quality development of BRI infrastructure including streamlining the approval of BRI PPP projects, and standardize the design, financing, construction and operation process and establish incentive mechanism for BRI projects. When developing BRI infrastructure cooperation, the ministries involved should take the initiative to

promote PPP, especially in green energy sector which is regarded as the key growth area of BRI countries and is easier to be delivered.

Second, it is advised to establish a BRI PPP alliance, getting relevant ministries and enterprises (including construction enterprises, design institutes, engineering operators, equipment suppliers, consulting agencies, etc.) and financial institutions together for a good BRI PPP development ecosystem. This alliance also welcomes the participation of the PPP authorities, PPP units and project owners from BRI countries as well as international organizations, and joins hand with the Infrastructure Financing and PPP Network of Asia and the Pacific established by UNESCAP in 2018 with the assistance of China PPP Center.

Third, it is recommended to encourage Chinese enterprises to improve their PPP professional capacity and make rational investment. Chinese enterprises should train their own experts for overseas PPP development as soon as possible, establish prudent PPP project evaluation system, strengthen risk identification and evaluation based on the target market, specific projects and their own capability, actively innovate the cooperation modes without ignoring the ESG rules in the process of project preparation, construction and operation.

Fourth, Chinese enterprises should be encouraged to pioneer green energy projects in appropriate countries or regions. It is suggested inspiring Chinese enterprises to make innovations in improving their international business abilities. It is necessary for Chinese enterprises to transform themselves from "enterprises that go global" to "globalized Chinese enterprises" by innovating its operation and management, improving the technology in engineering delivery, and strengthening the planning and operation ability of large-scale projects; to expand and seek for new investment and financing channels, improve the capacity in integrating domestic and international resources, and come up with a flexible design of financing structure to meet the needs of multiple market players. In addition, they need to improve the risk-sharing mechanism and build a reasonable exit mechanism.

3.3.2 Increase Technical and Financial Support for the BRI Clean Energy Investment

First, it is suggested that Chinese DFIs consider blending instruments across its overseas institutions to overcome some of the barriers to overseas renewable expansion. Blending grants with loans would expand the use of concessional loans and preferential export buyer's credit facilities in outbound renewable energy projects in order to expand the opportunities for Chinese contractors and direct investors. Additionally, China may consider establishing special funds for grants or loans to support Chinese enterprises to participate in the construction of

major projects (such as green energy projects) in BRI participating countries via PPP. Existing funds, such as the China South-South Climate Cooperation Fund and the Kunming Biodiversity Fund may also be able to effectively support these efforts. It is advised to establish a BRI PPP Project Development Facility to provide financial support to Chinese enterprises in order to encourage them to participate in PPP project development of the host country as early as possible, so as to improve their competitiveness as well as project construction and operation.

Second, it is suggested that Chinese government inspire Chinese financial institutions to improve their capacity of comprehensive service, engage in project preparation together with enterprises and guarantee agencies, and introduce appropriate financing schemes based on the situation in specific countries, markets and projects; to look for more flexible and sustainable financing solutions, such as new type of project financing and insurance products suitable for PPP projects; to strengthen risk awareness and prevention mechanism and optimize asset portfolio allocation by making good use of hedging, guarantee, insurance among other financial instruments to avoid systemic risks; to implement the concepts of sustainable development and ESG, and develop special financing products, such as green bonds and green loans; to encourage Chinese financial institutions to set up branches in key BRI countries to provide comprehensive financial services. As part of this work, it is suggested that China continue to refine and implement the "Green Light System" of channeling investment away from high-risk activities and toward projects that are likely to be economically as well as environmentally sustainable.

Third, the Chinese government and its DFIs can continue to support its outbound renewable energy investors throughout project implementation, particularly those investors with long-term equity stakes such as those of PPP projects. These investors have longer-term commitments to these projects, and are thus exposed to a greater range of potential risks such as conflict and changing policy environments. The interests of Chinese enterprises can be better protected by means of diplomatic efforts and economic tools, such as strengthening intergovernmental cooperation, signing bilateral investment protection agreements and building a multilateral investment security mechanism. As part of this work, it is suggested to strengthen communication and publicity. It is necessary to actively participate in multilateral and bilateral PPP exchanges as well as in the formulation of international PPP rules, and share China's PPP good practices and experience. It is valuable to advertise successful cases of BRI PPP projects in providing high-quality public services, improving local people's livelihood, training local technical personnel and protecting the social environment.

3.3.3 Strengthen Comprehensive Service to Support the BRI Overseas Investment

First, it is suggested that China should develop a comprehensive overseas investment service system, pertaining to legal consulting, investment consulting, engineering equipment quality and safety supervision, cost consulting, risk management, finance and taxation, and provide professional services for outbound investment business. It needs to build up a domestic asset trading platform to carry out overseas asset transactions on a pilot basis so as to form a transfer mechanism for overseas investment assets and realize the refinancing or transfer of the project and its operation right, income right, operation right and equity, which contributes to the formation of a virtuous investment cycle.

Second, it is suggested that China continue developing the "whole lifecycle" approach heralded in MOFCOM's 2021 Green Development Guidelines. First, China can continue to enhance investor accountability through the establishment of a blacklist of poorly-performing international investors, and the integration of this process with the ongoing plans for developing the "green light system" of encouraged, discouraged, and prohibited investment. Chinese DFIs are already well ahead of their peers in establishing robust exclusion inclusion and exclusion lists for outbound investments, and in developing post-hoc environmental assessments of investor and contractor performance. By combining these two streams of work, China can ensure that the post-hoc evaluations have meaningful input on future investment decisions, raising the expectation of investor performance and ensuring that the investors representing China's push for renewable energy expansion are representing China well.

Third, it is suggested further carrying out more extensive BRI green development cooperation with other DFIs in the global south and in the world. Given that infrastructure projects are featured as large scale, long life cycle and high risks, it is important for Chinese enterprises to coordinate the various stakeholders to keep complementary advantages and risk sharing in project planning, design, financing, construction, operation and management, by means, including inter alia third-party market cooperation with developed countries and regions, cooperation with such entities as the Build Back Better World or the Global Gateway, cooperation with companies that have professional strength, and cooperation with upstream and downstream companies on the industrial chain. Combining China's significant technological and financial power with these institutions' deep knowledge of local environmental contexts in Africa and Asia, for example, can benefit host countries and ensure the effectiveness and longevity of Chinese investment in this crucial new sector.

4. PATHWAY 3: ENHANCING INTERNATIONAL COOPERATION TO SUPPORT GREEN AND LOW-CARBON ENERGY DEVELOPMENT UNDER THE FRAMEWORK OF BRI

2021 is one of the seven warmest years on record[59], and a "crucial year" for the international community to fight against climate change[60]. The Sixth Assessment Report of the United Nations Intergovernmental Panel on Climate Change (IPCC) titled *Climate Change 2021: The Physical Science Basis* warns that human influence has led to "widespread and rapid" changes in the ecosystem and has warmed the climate at a rate that is unprecedented in at least the last 2000 years. Global warming of 1.5 °C and 2 °C will be exceeded during the 21st century unless deep reductions in CO_2 emissions and more ambitious climate change actions occur in the coming decades. In this regard, the international community is taking active cooperation across borders, fields and channels to jointly tackle the all-round impact of climate change on economic and social development. However, developing countries represented by multiple BRI participating countries restricted by the level of economic and social development and resource endowment, still face various challenges in terms of green and low-carbon energy development, including cost, infrastructure and technical capacity, etc. Strengthening international cooperation, promoting the flow and efficient utilization of resources, jointly exploring the pathway of regional green and low-carbon collaborative development, and facilitating the promotion and replication of development experience and models are still an indispensable and important force to support BRI green and low-carbon energy development.

4.1 The positive progress in the global response to climate change is difficult to break through the inherent challenges faced by green and low-carbon energy development

4.1.1 Development Perspective: Positive progress has been made in international cooperation to tackle climate change

Cross-border: The Twenty-Sixth Session of the Conference of the Parties to the *United Nations Framework Convention on Climate Change* (UNFCCC COP 26) marks another important historical moment in the process of global environmental governance. The conference adopted the *Glasgow Climate Pact*, which puts forward new objectives and measures on climate change mitigation, adaptation, finance, technology transfer and capacity building, providing guidelines on rules, models and procedures for the implementation of the *Paris Agreement*. By the end of COP 26, nearly 140 countries had proposed the goal of "net zero emissions", covering over 90% of world GDP; 153 countries have updated Nationally Determined Contributions (NDCs), covering around 80% of the world's greenhouse gas emissions, and have put forward new 2030

emissions targets (NDCs); and 80 countries are now covered by either Adaptation Communications or National Adaptation Plans to increase preparedness to climate risks[61].

Interdisciplinary: The *Kunming Declaration* adopted in the Fifteenth Meeting (Part 1) of the Conference of the Parties to the *Convention on Biological Diversity* (CBD COP 15) recognizes that the crises of biodiversity loss and climate change "share many underlying drivers of change", and that climate change is one of the main direct drivers of biodiversity loss[62]. The *Glasgow Climate Pact* notes the importance of ensuring the integrity of all ecosystems, including in forests, the ocean and the cryosphere, and the protection of biodiversity, as well as emphasizes the critical role of protecting, conserving and restoring nature and ecosystems in achieving the goals of the *Paris Agreement*. The impact of climate change on non-traditional environmental issues such as food security, health, gender equality and education has also been more widely recognized and acknowledged.

Multichannel: Although the commitment by developed countries to a goal for mobilizing USD 100 billion a year by 2020 has been officially postponed to 2023, the improvement of market-oriented mechanism and the positive actions of private sector investors are facilitating the emergence of a trillion-level green investment and financing market, which is expected to effectively offset the lack of public funding and alleviate the financial needs of developing countries to combat climate change. The parties to the *Paris Agreement* have reached consensus on relevant terms of Article 6, which has further strengthened institutional guarantee for the establishment of global carbon market. The Glasgow Financial Alliance for Net Zero (GFANZ), composed of more than 450 financial institutions with over USD 130 trillion in assets across 45 countries, pledges to deliver USD 100 trillion of finance needed to achieve net zero emissions through private sector investment and public-private cooperation over the next 3 decades, so as to boost "decarbonization" transition of the real economy. The Net-Zero Banking Alliance (NZBA), representing 43% of banking assets worldwide, promises to accelerate its own decarbonization and promote the decarbonization transition of loan and investment decision-making[63].

4.1.2 Realistic Perspective: Green and low-carbon energy development under the framework of BRI faces great challenges

Due to the reason that a large number of BRI participating countries are still in the stage of industrialization, some of them have underdeveloped economy, insufficient electricity and underdeveloped infrastructure, and energy shortage, which leads to the rapid increase of their energy demand. At the same time, limited by insufficient national financial resources,

infrastructure construction, energy development technology and other problems, these countries' energy structure and economic structure are relying on heavily on fossil fuels, making the green and low-carbon transition of energy sector facing greater challenges.

First, the upgrading cost of the existing high-carbon industrial structure is high. For BRI participating countries to achieve green and low-carbon transition of their industrial structure, they need to start building a green manufacturing system, including upgrading and transforming existing factories and equipment, using new technologies, increasing the proportion of renewable energy, etc. In the short term, it requires a large amount of capital investment and increases the production and manufacturing costs. This process not only needs constant financial and technical support, but also requires to improve policy and mechanisms, train industry professionals and build up capacity to enhance well coordination within the economy sector. The green and low-carbon energy transition involves all sectors of society, and for the vast number of developing countries along the Belt and Road, the low-carbon transition means a comprehensive social change. In particular, for major crude oil producers such as Kazakhstan, Nigeria and Venezuela, the high-carbon industry is an important source of government revenue. They need to afford the high transition costs needed for the smooth industrial transition, to address and defuse the impact of industrial restructure on economic growth, public income, new employment and social stability. The difficulty of financing that developing countries face is an international challenge, which exacerbates the socio-economic challenges of upgrading their industries. Besides, uncertainties in the market also create barriers for businesses to invest in developing countries, which may lead to higher investment costs. Despite the developed countries' commitment to provide USD 100 billion per year to developing countries for their mitigation and adaptation activities under the *Paris Agreement*, the current progress is still far from the expected "sufficient, transparent and verifiable climate finance". Due to the lack of necessary financial support for upgrading the industrial structure, BRI participating countries face huge obstacles in their green and low-carbon energy transition.

Second, there is a need to resolve the carbon lock-in effect of high-carbon energy infrastructure. Previously, constrained by factors such as the power generation costs, high emission energy infrastructure represented by thermal power was a preference for BRI emerging economies and developing countries. Since 2021, those BRI participating countries with an energy structure dominated by coal, represented by Indonesia, Vietnam, Pakistan, and Kazakhstan, have made clear carbon neutrality commitment and promised to vigorously promote the green and low-carbon energy transformation. However, given that most BRI participating countries are still in the process of industrialization and urbanization, they have a greater demand for energy and basic raw materials. At the same time, as they lag behind

developed countries in R&D and marketing of low-carbon technologies, they are more inclined to continue investing in new high-carbon infrastructure under the pressure of new demand. How to break away from high-carbon development, and how to balance the decades-long carbon lock-in effect of infrastructure and the demand for energy and economic growth remain the primary challenge for BRI participating countries, which requires long-term planning based on a country's specific national condition and needs to be solved in a step-by-step manner.

Third, different carbon emission standards make it difficult to establish rigid constraints in the process of transition. With the progress in environmental legislation, most BRI participating countries have issued corresponding environmental protection policies and formulated air quality standards according to their own green development plans. However, there are great differences in specific standards, rules and management flexibility, which makes it difficult to fully and effectively regulate the green and low-carbon investment behaviors. In addition, the investment and financing standards play a key role in the process of promoting BRI construction, but there are still some differences among them concerning the specific definition of "green and low-carbon", leading to some obstacles to the application, promotion, and supervision of green investment and financing standards. Finally, due to the huge differences in economic structure, resource endowment, human resources, technology level and development stage among BRI participating countries, there is no universally applicable green and low-carbon energy development path. In this sense, the different national conditions and different development goals of BRI participating countries are also one of the challenges that need to be addressed for BRI green and low-carbon energy development.

4.2 Promoting international cooperation for green and low-carbon energy development under the framework of BRI

In the past 8 years since its inception, the BRI has generated fruitful outcomes and positive influence worldwide. In 2021, with new goals and actions for low-carbon development being identified, the concept of green BRI has been further enriched and improved. Currently, it has become a key solution for China to work together with all sides to promote the implementation of the United Nations 2030 SDGs.

4.2.1 International cooperation in ecology and environment promotes global consensus on BRI green development

4.2.1.1 The development of multilateral cooperation platforms under the framework of BRI green development is making constant progress

The Green Finance Committee (GFC) of China Society for Finance and Banking, in partnership with the City of London's Green Finance Initiative (GFI), published the *Green Investment Principles for the Belt and Road* (GIP) in 2018. Currently, over 40 financial institutions worldwide have signed the GIP to jointly develop the environment and climate risk assessment toolkit, climate and environment information disclosure framework and other systems and tools for the development of green finance. The BRI International Green Development Coalition (BRIGC) established in 2019 has been actively promoting dialogues, joint research and capacity building programs with a global perspective and operational model. Currently, BRIGC has over 150 partners from 43 countries, gaining positive response and extensive support from UN organizations, environmental authorities of BRI participating countries, international NGOs and think tanks, related businesses and environmental activists. In June 2021, 29 countries jointly launched the *Initiative for Belt and Road Partnership on Green Development* at the Asia and Pacific High-level Conference on Belt and Road Cooperation, highlighting the recognition of and support for green development philosophy from the international community.

4.2.1.2 Policy and legislation system to support BRI green development is being improved

In 2017, the Ministry of Ecology and Environment (former Ministry of Environmental Protection) issued *The Belt and Road Ecological and Environmental Cooperation Plan* and released the *Guidance on Promoting Green Belt and Road* jointly with the Ministry of Foreign Affairs, the National Development and Reform Commission, and the Ministry of Commerce. The two documents identified the priority tasks and roadmap for the development of Green Belt and Road in terms of enhancing exchanges and publicity, ensuring the ecological and environmental safety of investment activities, building a green cooperation platform, and improving policy measures, and proposed the objective of building a relatively complete eco-environment protection service, support and guarantee system and implement a cohort of key eco-environment protection projects. In July 2021, the Ministry of Commerce and the Ministry of Ecology and Environment joint issued *Green Development Guidelines for Overseas Investment and Cooperation*. The *Guidelines* identified 10 priority tasks, including preventing ecological and environmental risks, following international rules on green development, building green infrastructure, and promoting green production and operation, pointing out the

direction for the green development of overseas investment and cooperation under the framework of the BRI. In January 2022, the Ministry of Ecology and Environment, together with the Ministry of Commerce, issued the *Guidance for Ecological and Environmental Protection in Foreign Investment and Cooperation Projects*, which is an amendment to the *Guidelines for Environmental Protection in Foreign Investment and Cooperation* issued in 2013. The document further optimized environmental management of foreign investment and cooperation projects. In March 2022, the Ministry of Ecology and Environment, the National Development and Reform Commission, the Ministry of Foreign Affairs and the Ministry of Commerce jointly issued *Opinions on Promoting the Green Development of the Belt and Road Initiative*. The document proposed 15 tasks for strengthening cooperation in green infrastructure development, green energy and green transportation in terms of promoting cooperation in priority areas of green development, promoting the green development of overseas projects, and improving the supporting system for green development. The document also identified the major goals for Belt and Road green development in 2025 and 2030, pointing out the direction for jointly promoting the green development of the Belt and Road[64].

4.2.1.3 Capacity support for the green development of the Belt and Road is being optimized

First, China has been enhancing the development of the BRI Environmental Big Data Platform and released the *Belt and Road Environmental Big Data Report (2021)* to build and improve the environmental risk assessment system for foreign investment and cooperation projects. Second, efforts have been made to promote the construction of the Belt and Road Environmental Technology Exchange and Transfer Center (Shenzhen). With the innovative advantages of Shenzhen Pioneer Demonstration Zone and the development advantages of Guangdong-Hong Kong-Macao Greater Bay Area, the BRI Green Innovation Conference 2021 was held and the Belt and Road Environmental Technology Transfer and Industry Incubator & Innovation Center was established to foster a flagship green technology match-making platform and promote Chinese solutions. Third, the Green Silk Road Green Envoys Programme have been implemented. The Belt and Road Youth Green Envoys Dialogue, Climate Envoys Action and other capacity building activities have been organized, providing training for about 3,000 environmental officials and technical staff from nearly 120 developing countries. Fourth, the Belt and Road South-South Cooperation Initiative on Climate Change has been carried out to help developing countries that are vulnerable to the impact of climate change to better cope with climate change through jointly building low-carbon demonstration zones, implementing climate adaptation and mitigation programs, and carrying out capacity building and training activities. Through providing green and low-carbon technology, products, knowledge and information

services, the Initiative has been very effective in supporting BRI participating countries to address environmental and climate challenges.

4.2.2 International cooperation on clean energy has built a solid foundation of BRI green and low-carbon development

4.2.2.1 Green and low-carbon development has become an important factor in BRI energy cooperation

In 2017, the National Development and Reform Commission of China (NDRC) and the National Energy Administration (NEA) jointly formulated and released *the Vision and Actions on Energy Cooperation in Jointly Building Silk Road Economic Belt and 21st-Century Maritime Silk Road*, which clearly stated that joint efforts will be made to build a green and low-carbon global energy governance structure and push forward global green development together. In October 2018, the first Belt and Road Energy Ministerial Conference was successfully held in Suzhou, Jiangsu. Chinese President Xi Jinping stressed in his remark that energy cooperation is a key area for BRI development, and China is willing to strengthen energy cooperation with other countries in the framework of BRI to promote establishment of Belt and Road Energy Partnership (BREP). In April 2019, the BREP was officially established in Beijing with 30 countries including China. Member states of the partnership jointly released the *Cooperation Principles and Concrete Actions of the Belt and Road Energy Partnership*, in which one of the main objectives is to promote cooperation in renewable energy and energy efficiency, so as to address climate change, secure universal access to affordable, reliable and sustainable modern energy service. On October 18, 2021, the second Belt and Road Energy Ministerial Conference was held in Qingdao. The meeting released the *Qingdao Initiative for Belt and Road Green Energy Cooperation*, which further stated the support stepped up for other developing countries in developing green and low-carbon energy. In 2021, the *Green Development Guidelines for Overseas Investment and Cooperation* issued jointly by the Ministry of Commerce (MOFCOM) and the Ministry of Ecology and Environment (MEE) also proposed to support outbound investment in renewable energy as well as build a clean, low-carbon, secure and efficient energy mix.

4.2.2.2 The twin goals of carbon peaking and neutrality are boosting the BRI green and low-carbon energy development

In 2020, China pledged its enhanced NDC and proposed the "30·60 Dual Carbon Goal". China has been promoting the utilization of renewable energy as an important part of the implementation of the dual-carbon goal written into the national 14th Five-Year Plan (2021-2025)

and the 2035 Long-term Goal. The energy sector will also successively issue *the Implementation Plan for Carbon Peaking in the Energy Sector*, *the 14th Five-Year Plan for the Modern Energy System, the Opinions on Improving Institutional Mechanisms and Policy Measures for Green and Low-Carbon Energy Transition*, and other top-down designs in various sub-sectors, which will not only serve the green and low-carbon transition of China's energy sector, but also point out an important direction for further promoting the green and low-carbon BRI development. Since China proposed the dual carbon goal, countries and regions including Kazakhstan, Indonesia, Saudi Arabia, Argentina, Brazil and others have successively announced their commitments to achieving carbon neutrality. Meanwhile, Uzbekistan, Kyrgyzstan and other countries and regions along the BRI have also put carbon emission reduction on the government's agenda. These countries and regions are all important partners in the BRI energy cooperation. China's commitment of no longer building coal-fired power projects abroad will also encourage other developing countries to cooperate with China to switch to renewable energy. There will be more space for cooperation in the field of renewable energy development and technology exchanges in the future.

4.2.2.3 Green investment and financing is guiding clean energy development under the framework of BRI in a positive manner

Domestically, China established a green financial system in the early days, and now has the world's largest green credit market and the second largest green bond market. In 2021, the Ministry of Commerce and the Ministry of Ecology and Environment jointly issued the *Guidelines for Overseas Investment and Cooperation on Green Development*, proposing to support foreign investment in clean energy and build a clean, low carbon, safe and efficient energy system. It is believed that with the progress towards carbon peaking and carbon neutrality, financial institutions will further improve the green financial system and a richer green financial product system with the goal of carbon neutrality. In terms of strengthening international cooperation on green finance, the G20 Sustainable Finance Working Group co-chaired by China and the United States released the G20 Sustainable Finance Roadmap. The IPSF Sustainable Finance Standards Working Group led by China and the European Union is about to release a draft of *Common Ground Taxonomy: Climate Change Mitigation*, which covers economic activities that contribute significantly to climate change mitigation, including energy, manufacturing, construction, transportation, solid waste and forestry. The cooperation will further promote the green process of Chinese investors' overseas investment as well as providing necessary financial support and investment guidance for the BRI clean energy cooperation.

4.3 Policy Recommendation for Improving the Implementation of Pathway 3

4.3.1 Exploring a New Pathway for Green and Low-Carbon Cooperation in Global Governance System

The National Determined Contribution (NDC) and diversified behavior of global inventory initiated by the *Paris Agreement* have laid the foundation for global climate governance. Although the BRI is mainly carried out and promoted according to bilateral or multilateral cooperation agreements between China and relevant countries, and is not bound by the United Nations Framework Convention on Climate Change and the Paris Agreement, the underlying theme of the green BRI is green development, and it is necessary to fully integrate the green BRI development into the framework of global climate governance according to the situation of global climate governance and the emission stages and characteristics of its own region. China should play a more active role to fulfill its green commitment, give play to the existing BRI green and low-carbon international cooperation platform, and firmly implement the objectives of the second Belt and Road Forum for International Cooperation, which is to attach importance to promoting green development and meeting the challenges of environmental protection and climate change, including strengthening cooperation in implementing the Paris Agreement[65]. China will actively align the renewal of independent contribution of the BRI participating countries with the long-term low-emission development strategy of greenhouse gas in the middle of this century, seek a fair, reasonable, win-win cooperation and support solution under the global temperature rise target, and support the BRI developing countries, especially the least developed countries, landlocked developing countries and small island developing states to address challenges brought by climate change.

4.3.2 Deepening Regional Cooperation

The resource endowments of countries along the BRI are quite different, and each country has different appeals for green transition. First of all, it is important to strengthen mutual trust in bilateral and multilateral parties in political security, and stay true to the principle of extensive consultation, joint contribution and shared benefits. Although all BRI participating countries have joined the Paris Agreement and committed to accelerating the process in addressing climate change, there are still differences in product demand, technology demand and policy priorities due to different economic development levels and climate challenges. Therefore, it is important for China to make good use of the existing multilateral cooperation mechanisms under the framework of the BRI, such as the China-Eastern Europe mechanism of “16+1”, China-ASEAN mechanism of “10+1”, Asia-Europe Meeting and China-Arab Cooperation

Forum. For countries and regions that are unable to improve NDC due to great economic growth pressure, on the basis of reaching cooperation consensus, the issue of climate change should be fully considered into policy communication, and governments at all levels should timely exchange ideas on policies to deal with climate change, so as to ensure that climate policies of different countries are compatible to avoid conflict. Secondly, it is necessary to deepen and expand the existing cooperation mechanisms. Countries along the BRI with high development level and relatively rich experience can contribute solutions through bilateral or regional cooperation, and help other countries to find a green growth path that suits their national conditions and optimizes resource utilization efficiency. In addition, make full use of the existing mechanism to to promote the green and low-carbon development of the BRI to contribute to global climate governance, and explore the establishment and improvement of communication and dialogue mechanisms for other countries and regions not covered by the BRI, such as the establishment of a climate change partnership and a regular consultation mechanism, so as to provide a more solid guarantee of cooperation for the green and low-carbon development of the BRI.

4.3.3 Deepening Cooperation on Industrial Technology and Market Exchange

The BRI international cooperation has created unprecedented opportunities for BRI participating countries to enhance technological exchange in green and low-carbon industries, such as PV and solar energy, hydrogen energy and energy storage, to adopt innovative models for industrial and technological cooperation, and to optimize the spatial deployment of production capacity. In order to support BRI participating countries to realize green and low-carbon transition in industrial structure and development pathways and achieve the synergy in reducing pollution and carbon emissions, it is necessary to promote the BRI green and low-carbon industrial technology cooperation and the flow of production factors in the market. First, it is necessary to promote the low-carbon transformation of traditional industries with advanced technologies. Second, it is necessary to vigorously develop clean energy, promote cooperation in the development of PV power, solar power, hydrogen energy and other types of clean energy, and accelerate the phase-out of traditional industries based on fossil energy. Third, it is necessary to improve the management of global green value chain and incorporate ecological and environmental protection, energy conservation, low-carbon development and emission reduction into every aspect of the value chain to promote the structural transition and upgrade of traditional high-carbon industries. Fourth, it is necessary to further improve the BRI green trade and industrial cooperation system, promote the formation of an inter-regional technological cooperation and exchange platform and build up a green and low-carbon technology transfer and equity exchange system for BRI participating countries to facilitate the efficient sharing and

promotion of green and low-carbon knowledge and technologies. Fifth, it is necessary to accelerate the development of regional carbon emission reduction standards and carbon markets. We need to link carbon markets of different countries and regions and develop voluntary carbon emission reduction trading and mandatory emission reduction to form regional mechanism for carbon emission pricing.

5. SYNTHESIS POLICY RECOMMENDATION

In the context of global green and low-carbon transition, the green BRI development will have richer content and further broaden its scope. To facilitate more effective and practical implementation of green BRI, it is necessary to overcome the objective constraint of carbon emissions on BRI green and low-carbon development, respond actively to realistic challenges of post-pandemic economic recovery and sluggish global green investment, fully recognize the continuous impact of the changing international situation on BRI international cooperation, and effectively balance the differentiated transformation endowments and development needs of regions and countries along the Belt and Road. The key is to stick to the key path of green and low-carbon energy development, and take effective actions centering on 3 key aspects – industrial and technological cooperation, investment and financing cooperation, and international cooperation.

Recommendation 1: Facilitate the industrial and technological cooperation in clean energy to become an important component for BRI green and low-carbon development, and provide systematic support for the BRI participating countries to address climate change, achieve green recovery, and move towards sustainable development.

1. Identify the key needs and overall trends of BRI green and low-carbon energy development, and expand partnerships based on the existing bilateral, multilateral, regional and international cooperation mechanisms.

2. Make good use of China's market advantage and development experience in the global clean energy market, and step up cooperation with focus on clean energy infrastructure construction, equipment manufacturing, and technology promotion and application.

3. Give full play to the key role of China's overseas development finance institutions and leverage their resource advantages. Encourage them to help bear the credit risk of overseas financing and scale up support for investment in clean energy industrial and technological cooperation.

4. Establish a more systematic and complete mechanism for the industrial and technological cooperation in clean energy under BRI framework, and reinforce the systematic support with policy and strategic alignment, investment and market support, capacity building, and technical assistance as the starting points.

Recommendation 2: Guide various market players to improve capacities for green investment and financing services, to actively participate in and to support BRI green and low-carbon energy development.

1. Scale up financial support for green and low-carbon energy development though the BRI. Establish a government-led and market-oriented BRI green development fund to facilitate innovation of multi-channel hybrid financing models that blend government finance with sovereign wealth funds, equity funds, grants, and other financial sources. Make use of the advantages of public-private partnership (PPP) to facilitate the development and finance of green and low-carbon energy projects.

2. Reinforce the "whole lifecycle" approach to environmental management of BRI projects, enhance risk awareness, and improve risk prevention mechanisms. Lead Chinese policy banks and major investors to track the shares of their infrastructure portfolios dedicated to the sector of green and low-carbon energy. Soft targets may be set to further encourage growth in this area. Encourage development finance institutions (DFIs) to progress in this direction by facilitating the development of renewable energy projects, the publication of project information including environmental impact assessments, and the use of independent inspectors and accountability mechanisms.

3. Strengthen the refinement and implementation of existing guidelines, guidance, and opinions and steer all actors towards the effective implementation of green development concept throughout the whole process of overseas investment and cooperation. Explore the establishment of an inter-ministerial coordination, incentive, and restraint mechanism for key investment projects. Facilitate the establishment of a data platform that analyzes the extent to which BRI investments are aligned with the *Opinions on Promoting the Green Development of the Belt and Road Initiative* (released in 2022 by NDRC, MFA, MEE, and MOFCOM), the *Green Development Guidelines for Overseas Investment and Cooperation* (released in 2021 by MOFCOM and MEE), and the *Guidelines for Ecological and Environmental Protection in Overseas Investment and Cooperation Construction Projects* (released in 2022 by MEE and MOFCOM).

4. Further clarify the scope of support, standards and best practices of BRI green and low-carbon energy development. Actively explore the potentials of applying the *Green Bond Endorsed Projects Catalogue (2021 Edition)* in the BRI investment cooperation on clean energy. Continue the research efforts for the Green Development Guidance for BRI Projects and pilot the development of corresponding guidelines for the green and sustainable development of key industries, such as photovoltaic power generation.

Recommendation 3: Deepen international cooperation to support BRI green and low-carbon energy development, and explore a new path for green and low-carbon cooperation in a changing global governance system.

1. Deeply align with the BRI participating countries' demands for green and low-carbon development. Based on multilateral cooperation platforms such as the BRI International Green Development Coalition (BRIGC) and Green Investment Principles for the Belt and Road Development (GIP), facilitate dialogues and exchanges between governments of BRI participating countries, financial institutions, enterprises, and other stakeholders. By using initiatives including the Belt and Road South-South Cooperation Initiative on Climate Change and the Green Silk Road Envoys Programme, assist the BRI participating countries, especially the least developed countries (LDCs) and Small Island Developing States (SIDS), to respond to the challenges brought by global climate change and achieve inclusive and resilient recovery. Facilitate the establishment of South-South platforms for green project preparation and development to align the BRI with developing countries' demands for clean energy.

2. Actively tackle with the challenges brought about by the changes of the global governance system, and create the more open, inclusive, mutually beneficial and win-win cooperation on BRI green and low-carbon development. Make full use of the communication and dialogue mechanisms such as the China-US Special Climate Envoy Meeting and the Ministerial on Climate Action to help China continue the effort for fruitful dialogues and cooperation on climate change with the US, the EU, the UK and other major economies, and effectively implement the United Nations Framework Convention on Climate Change and the Paris Agreement. Encourage all actors to reconcile differences and seek common ground. Facilitate synergies in areas of international investment and financing, development assistance, and third-party market cooperation. Carry out multi-faceted cooperation, multi-platform dialogues, and multi-channel communication to help developing countries improve infrastructure and facilitate common development of the world.

3. Deepen platforms for South-North- South cooperation on low carbon cooperation and seek cooperation between BRI and efforts such as Build Back Better World (B3W) and the Global Gateway.

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