

# Transition Towards Green and Low-carbon Energy

Shared Opportunities and  
Challenges 2022



The Odyssey



PEOPLE OF ASIA FOR  
CLIMATE SOLUTIONS

September 2022

# Acknowledgment

**We are grateful to the enterprises which responded to the questionnaires, as well as institutions and enterprises that took part in our interviews. Some of these institutions and enterprises include (in alphabetic order):**

BRI Green Development Institute

China New Energy International Alliance

Chinese Renewable Energy Industries Association (CREIA) under China Association of Circular Economy

Enronenergy Technology (Beijing) Co., Ltd.

JA Solar Technology Co., Ltd.

**We are thankful to following experts for their reviews on the report (in alphabetic order):**

Li Dan (Executive Secretary General, Chinese Renewable Energy Industries Association (CREIA) under China Association of Circular Economy)

Li Jiacheng (Researcher, Volunteer Association for Environmental Protection in Wuhu City)

Li Xiaoxin (CEO, Enronenergy Technology (Beijing) Co., Ltd.)

Xi Xi (Analyst, Innovative Green Development Program)

Zhang Jianyu (Executive Director, BRI Green Development Institute)

Zhang Shiguo (Executive Director and Secretary General, New Energy International Alliance)





# Preface

The year 2021 was important in the history of mankind’s fight to save climate. The global mean temperature in 2021 was already 1.1 degrees Celsius above the pre-industrial baseline, pushing hastily and dangerously close to the temperature rise limit of 1.5 degrees Celsius set in the Paris Agreement. The climate crisis is imminent, right here and right now. Some coastal side villages have gone inundated in rapidly rising seas, some lives have gone lost in extreme heatwaves and typhoons, and even some species have gone extinct, their secrets not yet decoded or discovered.

Mankind’s addiction to fossil fuels is the main cause for the train of global climate crisis to pick up speed and almost run off track. Naturally, the most efficient and effective way to slow this train down and bring it under control is to replace fossil fuels with safe clean renewable energy. At COP26 in Glasgow, 197 countries agreed to “phase down” the unabated use of coal. A few months before, at the 76th UN General Assembly, Chinese President Xi Jinping also pledged that China would “not build new coal-fired power projects abroad”.

“The no-new-coal pledge certainly deserves all the acknowledgement, but it’s only the second half”, my friend Renator Redentor Constantino, Executive Director of the Institute for Climate and Sustainable Cities, commented. “The first half deserves just as loud, if not louder, applause”. He was referring to the part where President Xi Jinping said that “China will step up support for other developing countries in developing green and low-carbon energy”.

Many developing countries, the Philippines included, are also climate vulnerable countries, faced with dual challenges of economic and climate crises. A transition towards green and low-carbon energy is precisely the solution to both challenges.

Although historically, developing countries have contributed the least to the climate crisis, they are now pushed, with hardly any ammunitions, to stand on the frontlines of the climate wars. Green and low-carbon energy is the food for their survival, the nutrition for their

growth and the tools with which to slow down the global climate crisis.

China is the world's largest renewable energy investor, producer, and market. Most importantly, China is a developing country who shares with other developing countries, the priority of other developing countries to grow their economies and aim for prosperity. So, it's understandable why developing countries and climate vulnerable countries are excited about the “green and low-carbon energy support” part of President Xi’s announcement on Sept 22nd, 2021.

The journey between this announcement and its realization is a long one, and the transition from fossil fuels to renewable energy will be a bumpy road. It cannot be done overnight, nor can it be done alone, without trusted partners. China’s energy policy makers, industry, financiers and NGOs, as well as their counterparts in host countries must reach their hands out at the same time for a successful handshake. They must connect and work together to be truly effective.

The sooner green and low-carbon energy is extensively adopted around the world, the better chance mankind will have to save ourselves from the runaway climate crisis. The coming decade will be crucial. We look forward to Sept 22nd, 2031, when China’s “green and low-carbon energy support” commitment reaches its 10th anniversary, when more developing countries are empowered with green and low-carbon energy to stand strong, not only against the climate crisis, but also to usher in a prosperous social and economic future, and when we allow ourselves to feel less anxious and more hopeful with a safe climate future.



Wang Xiaojun

Executive Director

People of Asia for Climate Solutions

# Executive Summary

We just experienced the hottest summer for many parts of the world, especially Europe and Asia. Heat waves, floods, and other extreme weather events have made an actual impact on nearly everyone. Pandemics, crop failure, and sea level rise already threaten our existence.

Accounting for nearly 75% of global carbon emissions, the energy sector needs urgent transition to achieve the climate goals set in the Paris Agreement. In this process, China is capable of playing a more significant role. As a major contributor to the increase of global renewable energy capacity and a growing figure in foreign direct investment outflows, China can speed up greening its overseas energy investment and financing, help developing countries adopt clean energy and support the global energy transition.

China is also willing and ready for a more important role. On September 21, 2021, Chinese President Xi Jinping announced at the 76th United Nations General Assembly 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”.

Based on thorough research of the available data, surveys with 52 enterprises, interviews with 7 stakeholders and analysis of 5 separate cases, we find that China's overseas investment in green and low-carbon energy is promising. From 2013 to 2021, Chinese overseas investment in renewable energy, such as solar and wind power, has generally increased, and 75% of companies interviewed expressed positive expectations for expanding overseas renewable energy investment in the future.

Hydropower is still the majority of Chinese renewable energy investment abroad, but its proportion is declining. Solar and wind power are growing more strongly, and the solar power industry has begun to shift from equipment export to building up overseas supply

chain. In the fields of solar and wind power, private enterprises are active and have the potential to cooperate with state-owned enterprises. Engineering, Procurement and Contracting (EPC) is China's most important type of engagement in overseas energy sectors, and the trend extends to investment (upstream) and operation (downstream).

Business interests (including those of shareholders and executive managers) are the top concerns for enterprises to invest in green and low-carbon energy abroad. At the stage of strategy formulation, companies are mainly affected by China's domestic climate policy and investment policy through the Belt and Road Initiative; when it comes to the stage of implementation, companies are mainly affected by the accessibility and feasibility of financing in the host country.

Chinese enterprises' interests in investing in green and low-carbon energy abroad mainly depends on the political situation of the host country and its relationship with China, as well as the climate and investment-related policies and regulations of the host country.

These factors bring enterprises both opportunities and challenges:

- With renewable energy technologies advancing, the green and low-carbon transformation of energy is unstoppable, albeit the disturbances from the Russo-Ukrainian war.
- The demands for manufacturing localization and energy independence in Europe and the United States can spread to developing countries. While bringing challenges to solar and wind power equipment suppliers in China, these demands have also opened up new opportunities for investment in developing countries.
- The establishment of local renewable energy industries in developing countries is subject to their technological constraints and financial sustainability.
- Chinese companies still face high financing costs, which constrain their investments abroad.

In fact, most surveyed companies hope that China and the host country will take more actions in formulating and implementing relevant policies, and that China can provide more financing support to enterprises while the host country better its business environment.

**In order to improve the technology and business environment of the host country, we recommend:**

- Host countries to demonstrate stronger wills in energy transition by formulating more favorable policies and implementation measures, while maintaining continuity of these policies.
- The Chinese government to introduce more detailed implementation measures for supporting other developing countries to develop green and low-carbon energy, and make them better aligned with those measures in host countries.

Besides, Chinese enterprises need strategic planning in response to changing political situations in host countries.

**In order to make financing easier and cheaper for private enterprises, we suggest:**

- The Chinese government and regulatory authorities speed up the market reform of energy finance in order to reduce the financing cost.
- Financial institutions to establish asset assessment specified for renewable energy projects in order to support financing for overseas new energy projects, work with development banks and carry out hybrid financing.
- Strengthen cooperation between state-owned and private enterprises and encourage private enterprises to reach out to foreign banks and local consortia.

**In order to promote the sustainable operation of overseas renewable energy projects and cultivate local industries, we recommend:**

- Chinese government to loosen its control and give full play to the private sector.
- Enterprises to integrate ESG and local communities' wellbeing in the early development of projects to formulate business plans with sound market analysis.
- Business societies, industry associations and NGOs to facilitate and foster cooperation in green and low-carbon energy between China and other developing countries.

# Table of Content

---

|                   |   |
|-------------------|---|
| Preface           | 1 |
| Executive Summary | 3 |

---

|           |  |    |
|-----------|--|----|
| <b>01</b> | <b>Background, Objective and Methods</b>   | 9  |
|           | 1.1 Accelerate Global Energy Transition to Address Climate Change  | 9  |
|           | 1.2 China Has the Will and Ability to Cooperate with Developing Countries in Green and Low-carbon Energy | 10 |
|           | 1.3 Research Purpose and Method  | 11 |

---

|           |  |    |
|-----------|--|----|
| <b>02</b> | <b>Trends and Features of China's Overseas investment in Green and Low-carbon Energy</b>   | 12 |
|           | 2.1 Statistical Overview of Surveyed Enterprises Trends and Features of China's Overseas investment in Green and Low-carbon Energy | 12 |
|           | 2.2 Trends of China's Overseas Investment in Green and Low-carbon Energy   | 14 |
|           | 2.3 Sources of Renewable Energy and Geographical Distribution of China's Overseas Investment                                       | 15 |
|           | 2.4 Proactive Performance Achieved by Private Enterprises and Their Trends of Cooperation with SOEs                                | 17 |
|           | 2.5 Mode of China's Overseas Investment in Green and Low-carbon Energy   | 18 |
|           | 2.5.1 Photovoltaic manufacturing enterprises are speeding up the deployment of overseas capacity building                          | 18 |
|           | 2.5.2 Reliance on EPC as a major form of cooperation and extension to the upstream and downstream industries                       | 19 |

---



---

|           |  |    |
|-----------|--|----|
| <b>03</b> | <b>Analysis of Contributing Factors to China's Overseas Investment in Green and Low-carbon Energy</b>  | 20 |
| 3.1       | Analysis on the Decision-making Mechanism and Influencing Factors of Chinese Enterprises' Overseas Investment in green and low-carbon energy | 20 |
| 3.2       | Analysis of the Investment Intention and Influencing Factors of Chinese Enterprises' Overseas Investment in Green and Low-carbon Energy      | 22 |

---

|           |  |    |
|-----------|--|----|
| <b>04</b> | <b>Opportunities and Challenges Faced by China to Increase Investment in Green and Low-carbon Energy in Developing Countries</b> | 25 |
| 4.1       | Major Trend and Opportunities of the Global Energy Transition  | 25 |
| 4.2       | Trade Barriers for China's Solar PV Supply Chains: New Opportunities Hidden in Constraints                                       | 27 |
| 4.3       | Green Finance Accelerated, yet Room Remains for China's Investing and Financing in New Energy Overseas                           | 28 |
| 4.4       | Technological Bottlenecks and Inadequate Supply Chains Encountered in the Host Country   | 30 |

---

---

## 05 Policy Recommendations on Enhancing China’s Investment in Green and Low-carbon Energy in Developing Countries 32

- 5.1 Governments of China and the Host Countries to Provide Greater Support in Terms of Policy, Investment and Financing 32
- 5.2 The Host Country Shall Resolutely Embrace the Energy Transition and Consistently Optimize the Business Environment 33
- 5.3 China Shall Innovate the Mode and Expand the Channels of Financing 34
- 5.4 Focus Shall be Placed on Cultivating Local Industrial Chain and Promoting Sustainable Operation of the Project 36
- 5.5 Facilitating the Communication and Coordination of Relevant Parties and Enhancing the Exchanges and Cooperation in Green and Low-carbon Energy 37

---

### References 39

---

### Annex: Case Studies on China’s Overseas Investment in Green and Low-carbon Energy 40

- Case 1: Concentrating Solar Power Plant Constructed by SEPCO III 40
  - Case 2: Mobile PV Plant Established by JA Solar on the Amazon River 43
  - Case 3: Largest PV Power Plant Ever Invested and Established by GENERTEC China Machinery Corporation in Central Europe 45
  - Case 4: LONGi Positions Module Factory in Malaysia 48
  - Case 5: Yunnan Water Runs Waste-to-Energy Power Plant in Phuket 50
-

# 01 Background, Objective and Methods

---

## 1.1 Accelerate Global Energy Transition to Address Climate Change

June-July 2022 witnessed the hottest summer on record in Europe, the Middle East and Asia. The temperature in Portugal was a record high of 47°C, the highest temperature in Iran reached 52°C, and even Shanghai recorded its highest temperature 40.9°C. The extreme weather brought by climate change has never been so close.

In response to the looming climate crisis, in 2015 the parties to the United Nations Framework Convention on Climate Change (UNFCCC) adopted the Paris Agreement and agreed to “limit the global temperature increase in this century to 2°C while pursuing efforts to limit the increase even further to 1.5°C”. Moreover, the parties adopted National Determined Contributions (NDCs), a bottom-up approach to cut emissions. However, according to the NDCs submitted by countries as of end-Oct, 2021, the global temperature could still rise by 2.7°C, exceeding the climate target<sup>[1]</sup>.

Accounting for 3/4 of global emissions, the energy sector should take timely measures to curb carbon emissions from fossil fuels and address the climate crisis. In recent years, with the global trend of phasing out coal and the declining cost of generating renewable energy, coal-fired power plants have difficulties in receiving financing and continuing growth. Speeding up the development of renewable energy<sup>[2]</sup> is equally important to replace fossil fuels without sacrificing energy security.

---

"We must end fossil fuel pollution and accelerate the transition to renewable energy before we burn down our only home."

—Antonio Guterres,  
United Nations Secretary-  
General

---

---

1. United Nations Environment Programme (2021). Emissions Gap Report 2021: The Heat Is On – A World of Climate Promises Not Yet Delivered. Nairobi.

2. Renewable energy refers to non-fossil fuels, including energy from wind, solar, hydro, geothermal and biomass. "Green and low-carbon energy" appearing in report also refers to the energy above. With relatively low carbon emissions, natural gas is nevertheless not considered as renewable, green and low-carbon energy.

## 1.2 China Has the Will and Ability to Cooperate with Developing Countries in Green and Low-carbon Energy

In the process of energy transition, developing countries need special attention. While many developing countries may have huge potential, their development of renewable energy lags behind due to constraints on market demand, technology, infrastructure, capital and more. South America, Central Asia, Africa, the Middle East and other regions are rich in wind or solar energy, but as of April 2022, their installed capacity of renewable energy is only 245, 116, 56, and 24GW respectively<sup>[3]</sup>.

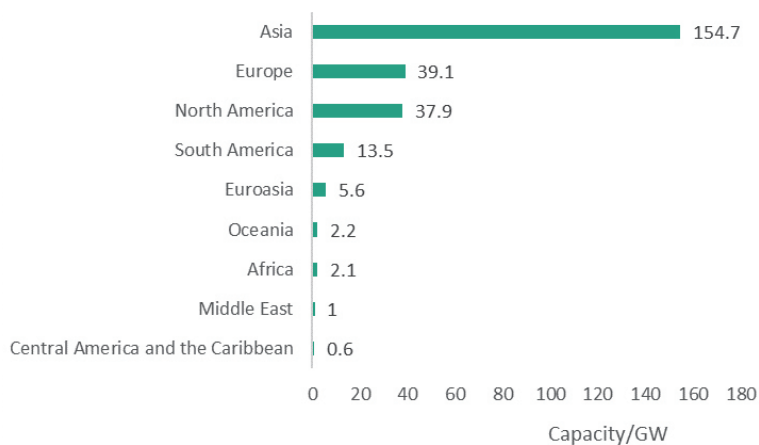


Figure 1 Newly installed capacity of renewable energy in different regions, 2021

China has become a global leader in renewable energy. In 2021, nearly half (47%) of global renewable energy additions came from China. Taking the photovoltaic industry as an example, China has the world's leading technology and manufacturing strength. In 2021, China accounted for 75% of global output in polysilicon, silicon wafers, cells, modules and other photovoltaic products. Affordable and applicable, China's clean energy technology can help developing countries overcome technological barriers and speed up the transition process.

Energy has always been a key area of China's overseas investment and financing. In the past, China's investment outflows mainly focused on

---

“To this end, I would like to propose a Global Development Initiative: ...Staying committed to harmony between man and nature. We need to improve global environmental governance, actively respond to climate change and create a community of life for man and nature. We need to accelerate transition to a green and low-carbon economy and achieve green recovery and development. China will strive to peak carbon dioxide emissions before 2030 and achieve carbon neutrality before 2060. This requires tremendous hard work, and we will make every effort to meet these goals. 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.”

—President Xi Jinping  
at the 76th United Nations  
General Assembly

---

3. International Renewable Energy Agency (2021). Renewable Capacity Highlights.

coal and other fossil fuels, resulting in significant carbon emissions. Wang et al. (2022) has calculated that China financed 307 power plants from 2013 to 2020 in Belt and Road Initiative host countries with fossil fuels (coal, natural gas, oil), making up 73% of installed capacity and 48.7% of investment. Indonesia, which has the largest installed capacity of coal-fired power plants financed by China, has reached nearly 110 million tons carbon emission annually.

As a global leader in the renewable energy industry, China has the ability to help developing countries accelerate carbon emission reduction by greening its overseas energy investment and financing, and has formulated a series of policies for doing so.

For example, on September 21, 2021, Chinese President Xi Jinping announced at the 76th United Nations General Assembly that “China will step up to support developing countries to develop green and low-carbon energy and will no longer build new coal-fired power plants abroad”. In March 2022, China's National Development and Reform Commission, the Ministry of Foreign Affairs, the Ministry of Ecology and Environment, and the Ministry of Commerce jointly issued the "Opinions on Promoting the Green Development of the Belt and Road Initiative", requiring that the Belt and Road Initiative must be aligned with the Paris Agreement. China will "promote all parties to fully implement the United Nations Framework Convention on Climate Change and its Paris Agreement," especially by supporting green energy and green transportation.

### **1.3 Research Purpose and Method**

A year after President Xi's pledge of “stepping up support for developing countries in green and low-carbon energy”, it's instructive to review the progress of China's renewable energy investment in developing countries and understand both the opportunities and challenges for booth Chinese enterprises investing abroad and host countries.

We hope this report can help track the progress of China's green and low-carbon energy investment in developing countries, map out the challenges and needs of China's green energy investment overseas, and promote exchanges and discussions on greening China's overseas energy investment.

Our report is based on desk research, surveys with enterprises and interviews with relevant stakeholders. A total of 52 enterprises responded to the survey, and 7 related institutions including enterprises, financial institutions, industry associations and think tanks were interviewed. At the same time, we collected 5 cases of China's overseas investment in green and low-carbon energy for experience sharing.

# 02 Trends and Features of China's Overseas Investment in Green and Low-carbon Energy

---

By referring to the literature review and survey results, we found that:

- Since President Xi Jinping's pledge in the UN General Assembly, the majority of the surveyed enterprises have expressed willingness to consistently invest in the renewable energy sector overseas.
- From 2013 to 2021, China's share of overseas investment in the green energy sector, including photovoltaic and wind power, has increased on an annual basis. Especially since 2019, the proportion of green energy investment has shown a significant increase.
- China's overseas investment in the renewable energy sector is predominantly located in Latin America, Southeast Asia, Africa, Europe and South Asia. Hydropower is the primary type of investment in the renewable energy sector, but its share relative to other types is declining. Photovoltaic and wind power have experienced comparatively stronger growth.
- Private enterprises serve as a pillar for the export of new energy equipment and the construction of photovoltaic power station projects, with strong intention to engage more with state-owned enterprises.
- Engineering Procurement Construction (EPC) is China's major form of engagement in overseas energy projects, and the scope of project implementation tends to expand to include both investment and operation. In addition, the photovoltaic industry has experienced a gradual transition from equipment export to overseas industrial deployment.

## 2.1 Statistical Overview of Surveyed Enterprises

We engaged 52 enterprises in the energy sector in the survey. Specifically, private enterprises (19) and central SOEs (18) each accounted for about 1/3 of the total, whereas the rest were local SOEs (6) and Chinese enterprises with foreign investment (6) as well as three enterprises as others.

Among the surveyed companies, 35 enterprises (67%) are engaged in energy generation and supply, 16 enterprises (31%) are involved in technological investment and R&D, and 14 enterprises (27%) deploy investment throughout the entire industrial chain. In addition, 11 enterprises are engaged in energy machinery and equipment, and 8 enterprises are involved in specific minerals required by the new energy sector.

In the energy sector, the surveyed enterprises mainly invest in solar energy, amounting to 30 enterprises (accounting for nearly 60%). The second and third largest investment targets are wind energy and hydropower, amounting to 17 and 13 enterprises respectively. Rather few enterprises invest in nuclear energy and hydrogen energy, and only a very limited number of enterprises invest in biomass energy, geothermal energy and marine energy.

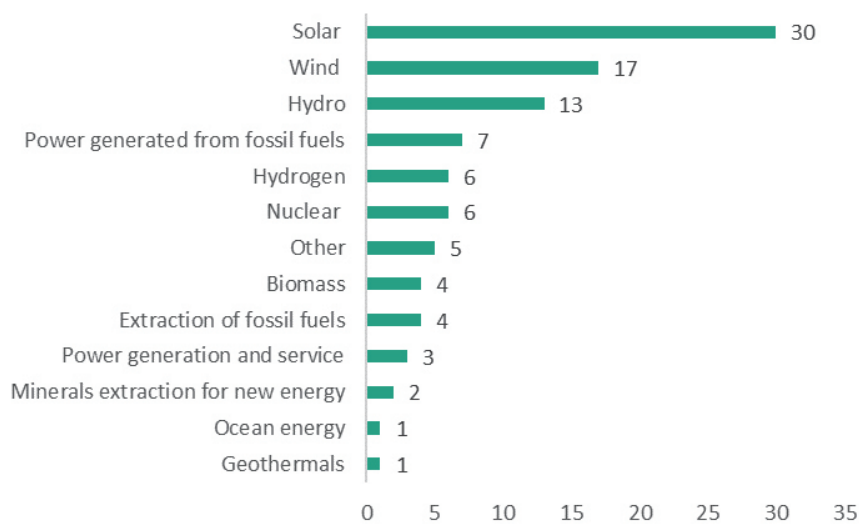


Figure 2 Share of Investment Fields in the Energy Sector of the Surveyed Enterprises

From the aspect of investment scale, investments amounting to over RMB 1 billion account for the largest proportion.

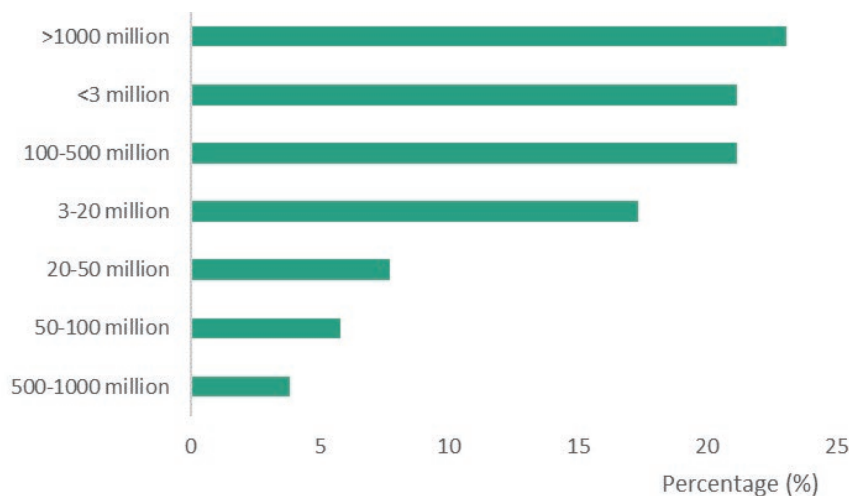


Figure 3 Distribution of Overseas Investment Amount of Surveyed Enterprises

## 2.2 Trends of China's Overseas Investment in Green and Low-carbon Energy

Judging from the data provided by enterprises and the feedback obtained from the survey, China is increasing its investment in the renewable energy sector overseas against the backdrop of a global energy transition and the release of policy signals encouraging overseas investment in the low-carbon energy sector.

According to about 73% of the surveyed enterprises, since President Xi's pledge on September 2021, these enterprises have increased their investment in green and low-carbon energy. More than 53% of enterprises believe that they have increased the number of projects involved in green and low-carbon energy. In addition, most surveyed enterprises (75%) indicate that they would expand overseas investment in green and low-carbon energy, whereas the remaining 25% choose to wait and see.

Judging from the industrial data<sup>[4]</sup>, the share of photovoltaic and wind power among all sources of energy was not high from 2013 to 2021, with an average of about 11%, but it has shown an increasing trend year by year overall. Especially since 2019, with the decline of overall energy investment, the share of photovoltaic and wind power investment increased significantly, reaching 30.75% in 2020 from 12.47% in 2019, and remained at a high level in 2021.

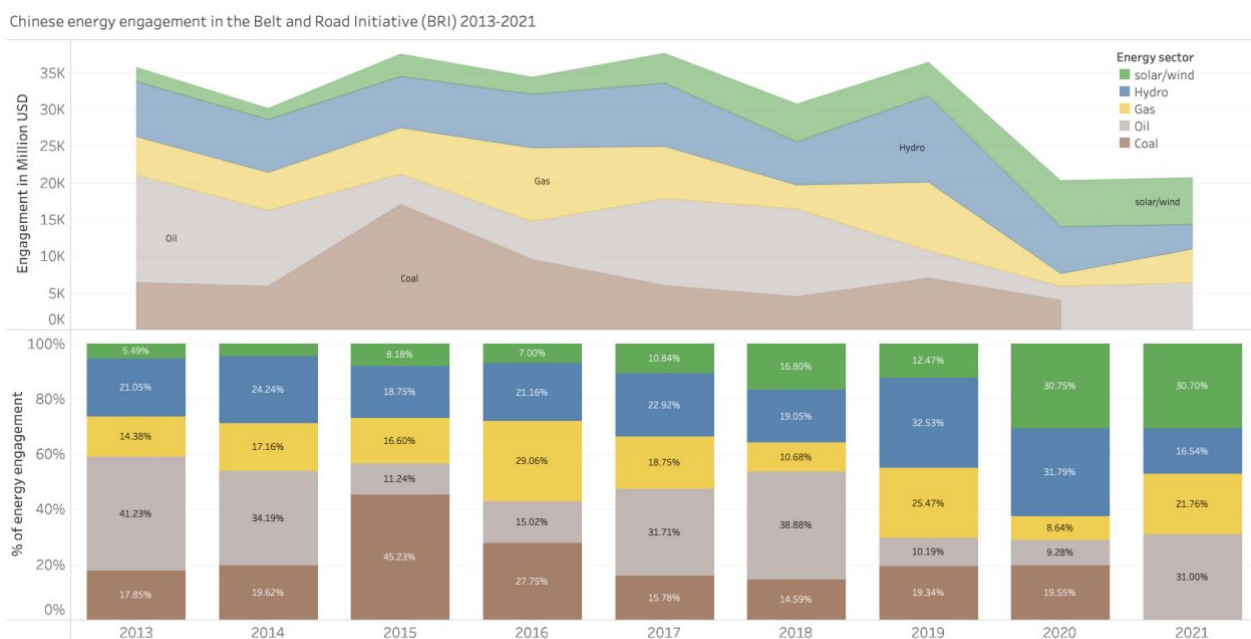


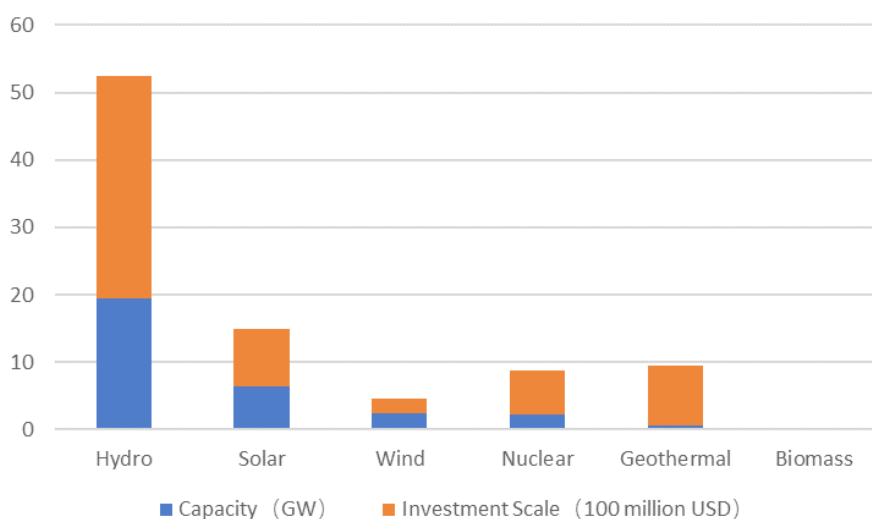
Figure 4 Comparison of Energy Sources of China's Overseas Energy Investment and Construction from 2013 to 2021, quoted from Christoph (2022)

4.Nedopil, Christoph (January 2022): "China Belt and Road Initiative (BRI) Investment Report 2021", Green Finance & Development Center, FISS Fudan University, Shanghai.



## 2.3 Sources of Renewable Energy and Geographical Distribution of China's Overseas Investment

From 2013 to 2020, hydropower accounted for the lion's share of China's investments in the renewable energy sector of the signatory countries of the Belt and Road Initiative, with installed capacity amounting to 19.51 GW, and investment and financing (including debt financing and equity investment) amounting to USD 3.29 billion. In addition, the total installed capacity of photovoltaic and wind power amounted to 8.84 GW, exceeding 1/3 of that of hydropower, and the total investment amounted to USD 1.06 billion. The installed capacity and investment amount in other energy sources are illustrated in the following figure<sup>[5]</sup>.



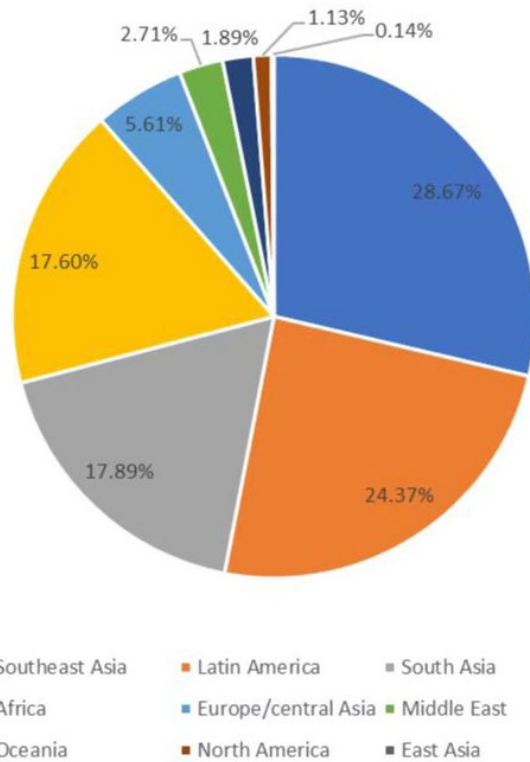
**Figure 5 Installed Capacity, Investment and Financing of China's Power Sector along the "Belt and Road" (2013-2021)**

“In the international arena, awareness of climate change in varying countries has risen, and developing countries have increased their demands for renewable energy. In addition, based on the demands raised by African countries, they have explicitly proposed several areas of cooperation with China, including renewable energy, clean energy and green development technologies. This is the status-quo of the industry from my perspective. Hence, I believe this is an optimal turning point of investment for the whole (overseas energy) sector.”

—Li Dan, Executive Secretary General of Chinese Renewable Energy Industries Association (CREIA) under China Association of Circular Economy

5.Wang Jianye, et al. Toward a Green Belt and Road: A Study of China's Overseas Power Financing in Transition. China Financial Publishing House, 2022:50

From 2013 to 2021, China’s overseas investment in the renewable energy sector mainly flowed to developing countries in Southeast Asia (28.67%), Africa (24.37%), Latin America (24.37%), Africa (17.6%), as well as Europe and Central Asia (5.61%).



**Figure 6 Geographical Distribution of China’s Overseas Investment in the Renewable Energy Sector (2013-2021)**

In particular, the investment in hydropower mainly flowed to Latin America, Southeast Asia and Africa. The installed capacity of hydropower in Brazil reached 15.6 GW, accounting for 30.64% of the total installed capacity, followed by Laos (9.8%), Myanmar (9.2%), Pakistan (8.76%) and Nigeria (7.36%)<sup>[6]</sup>.

During this period, China’s investment in solar power mainly flowed to Latin America, North America and the Middle East. The installed capacity of PV in the UAE reached 1,177 MW, accounting for 28% of overseas solar power investment from China, followed by the US (19.8%), Pakistan (11.9%), Brazil (7.17%) and Ukraine (5.07%). The investment in wind energy is mainly concentrated in Europe / Central Asia and Latin America, including Brazil, Poland and Portugal.

6.The China’s Global Energy Finance Database compiled by Boston University covers China’s overseas investment in the energy sector through policy banks and foreign direct investment (FDI).

## 2.4 Proactive Performance Achieved by Private Enterprises and Their Trends of Cooperation with SOEs

China's photovoltaic industry is endowed with competitive technical strengths and a solid manufacturing foundation, and has contributed greatly to global photovoltaic capacity. In 2021, China's total exports of photovoltaic products exceeded USD 28.4 billion, accounting for 28% of global exports<sup>[7]</sup>. It is estimated that China's share in the global production of polysilicon and silicon wafer is expected to reach 95% by 2025<sup>[8]</sup>. This is mainly attributable to private enterprises such as Jinko Energy, Canadian Solar Inc., JA Technology, Trina Solar, LONGi Green Energy Technology and Risen Energy.

In 2021, China's exports of wind turbines continued to grow, reaching USD 7.2 billion<sup>[9]</sup>. In addition, six Chinese enterprises ranked among the top ten global wind turbine manufacturers, including Goldwind Technology, Envision Energy, Mingyang Smart Energy, Windey, Shanghai Electric and CSSC Haizhuang Windpower. There are numerous Chinese private enterprises that excel in the export of wind turbine units<sup>[10]</sup>.

According to a survey of the World Resources Institute (WRI)<sup>[11]</sup>, private enterprises serve as the main pillar to overseas investment in photovoltaic power stations, accounting for over 50% of total investment. Among the primary investors in wind power plants, state-owned enterprises (SOEs) are absolutely the main force, accounting for more than 88% in terms of both the installed capacity and the number of implemented projects.

As can be seen, private enterprises have been actively engaged in the export of new energy equipment and the construction of photovoltaic power stations. Wang Jianye et al. (2022) holds that new energy projects are implemented in a rather small scale with a short construction period, and thus it is easier for private enterprises to gain access to such projects. In addition, in the new energy sector, private enterprises are endowed with more technological and manufacturing advantages than SOEs.

---

“We have basically established a mutually beneficial and win-win partnership between central SOEs and private enterprises. Specifically, central SOEs focus on investment, operation and maintenance, whereas private enterprises center around intelligent manufacturing and technological innovation. Such cooperative structure has been well functioning over the past two years.”

—Zhang Shiguo,  
Executive Director and  
Secretary General of  
China New Energy  
International Alliance

---

7. According to the data published by People's Daily, China's exports of photovoltaic products increased by 43.9% year-over-year, Feb. 24, 2022.

8. IEA (2022), Solar PV Global Supply Chains, IEA, Paris <https://www.iea.org/reports/solar-pv-global-supply-chains>

9. East Asia Energy Industrial Observation, Brief Report on the Trend of China's Wind Turbine Exports in 2021, Apr. 22, 2022.

10. GWEC Market Intelligence, Global Wind Supply Side Data 2021, May 2022.

11. WRI, Towards Green Development: Status-quo, Challenges and Future of Chinese Enterprises' Overseas Investment in the Renewable Energy Sector, Nov. 5, 2021.

As state-owned enterprises (SOEs) are endowed with more capital advantages, there is a trend of collaboration between SOEs and private enterprises.

## 2.5 Mode of China's Overseas Investment in Green and Low-carbon Energy

With respect to wind power and photovoltaic power, the overseas investment modes adopted by Chinese enterprises mainly include green field investment, mergers and acquisitions (M&A), and a mixed approach of “M&A + green field investment”. In particular, the greenfield investment mode is more commonly adopted in the implementation of photovoltaic power projects, whereas M&A investment is more commonly adopted for implementation of wind power projects<sup>[12]</sup>. In addition, China's overseas investment in the renewable energy sector has shown a trend to go beyond EPC and extends to equipment manufacturing capacity and other upstream and downstream industries.

### 2.5.1 Photovoltaic manufacturing enterprises are speeding up the deployment of overseas capacity building

In recent years, a large number of photovoltaic enterprises have accelerated their overseas industrial deployment so as to avoid the anti-dumping and anti-subsidy probe<sup>[13]</sup> launched by Europe and the US against China. In April 2021, Risen Energy announced the construction of a 3-GW module and battery manufacturing plant in northern Malaysia. In September 2021, Jinko Energy invested more than USD 365 million in a silicon chip technology project in Vietnam to manufacture silicon chip products<sup>[14]</sup>. Take the manufacturing base of LONGi Green Energy Technology in Kuching, Malaysia as an example; these products are mainly exported to Europe, the US, Australia and other regions (see Case 4 in the attachment for details).

---

12. China New Energy International Alliance, Research on Promoting the Chinese Enterprises' Overseas Investment in the Renewable Energy Sector, 2021.

13. This refers to the anti-dumping and anti-subsidy investigation on the exporters.

14. China New Energy International Alliance, Report on the International Development of China's New Energy Sector from 2021 to 2022, January 2021.

## 2.5.2 Reliance on EPC as a major form of cooperation and extension to the upstream and downstream industries

EPC is the primary form of cooperation in the energy sector overseas. Based on the results of our survey through questionnaires, more than half of the surveyed enterprises invest in the overseas energy sector in the form of EPC, followed by Build, Operate and Transfer (BOT, 48%), Equity Investment (32.7%) and Public Private Partnership (PPP, 26.9%). In addition, the statistical results of Wang Jianye et al. (2022) indicate that EPC is the dominant contractual form regardless of whether the project is predominantly financed by overseas or domestic funds. Among projects financed by overseas funds, the share of EPC participation amounts to as high as 92.1%, whereas the share of EPC in the projects financed by domestic funds also exceeds 70%.

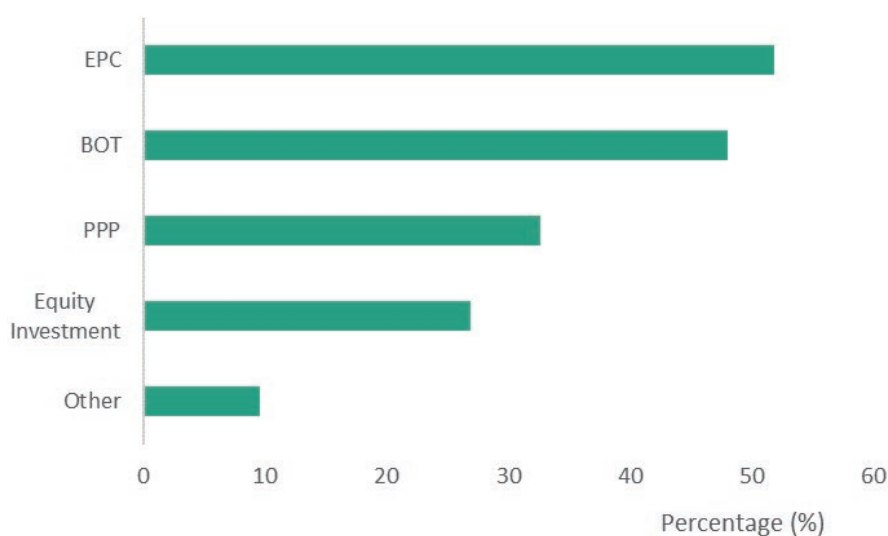


Figure 7 Distribution of the Surveyed Enterprises' Form of Overseas Investment in the Renewable Energy Sector

The mode of operation, investment and financing in the overseas renewable energy sector has also gradually extended from the conventional area of strength in EPC to upstream investment and downstream operation. Such transition has led to the establishment of forms of investment plus EPC and BOT/PPP for the involved parties to obtain greater profit margins. In 2018, SEPCOIII Electric Power Construction Corporation participated in the construction project of the Moroccan Solar Thermal Power Plant, opening doors for post-construction cooperation on power plant operations (see Case 1 in the attachment for details). In 2016, Yunnan Water Investment Co., Ltd. acquired the Phuket Waste To Energy Plant and obtained the operational right for 15 years through BOT (see Case 5 in the attachment for details). In May 2021, GENERTEC China Machinery Corporation invested and built the largest photovoltaic power plant in Central Europe through the BOT mode (see Case 3 in the attachment for details).

# 03 Analysis of Contributing Factors to China's Overseas Investment in Green and Low-carbon Energy

---

Based on the results of surveys among enterprises and interviews with relevant parties, it is found that:

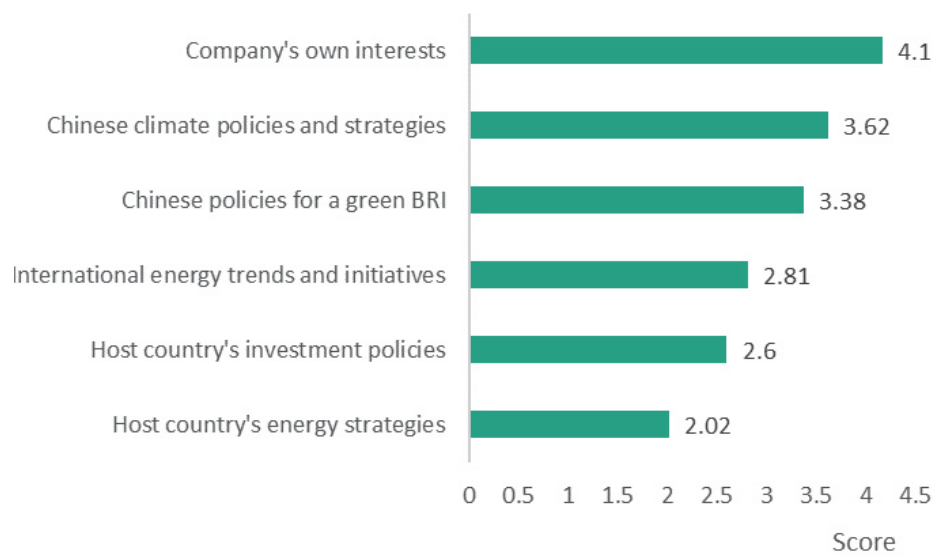
- The majority of enterprises have gained an in-depth understanding of the significance of climate-related strategies, and have formulated policies or strategic plans accordingly. As a result, the general environment of green and low-carbon energy investment has been formed.
- During the formulation and implementation of green and low-carbon energy investment strategies, enterprises are mainly subject to the influence of their own interests. In particular, with respect to strategy formulation, enterprises are mostly affected by China's domestic policies related to climate issues and green investment along the "Belt & Road". With respect to specific implementation, enterprises are mostly affected by the access and feasibility of financing in the host country.
- The investment intention of an enterprise is primarily determined by the political situation of the host country and its relations with China, as well as the relevant policies and regulations implemented by the host country.

## 3.1 Analysis on the Decision-making Mechanism and Influencing Factors of Chinese Enterprises' Overseas Investment in green and low-carbon energy

Out of the surveyed enterprises, 42 (80.77%) claim that they have formulated relevant policies or strategic plans to cope with the issues of climate change / carbon peak and carbon neutrality, with some plans being prepared by the department of strategic planning whereas in a few other cases, such plans are directly developed by the board of directors or the inter-departmental leading group. In addition, 43 surveyed enterprises (82.69%) hold that climate is a crucial part of their business strategy. Hence, the industry has gained a high level of recognition of climate-related objectives, and the general backdrop and ambience has been created to facilitate investment in green and low-carbon energy.

Whether during the formulation and implementation of investment strategies in overseas

green and low-carbon energy sector, enterprises mainly take into account their own commercial interests, including commercial benefits as well as the demands of management and shareholders. With respect to overseas strategy formulation, enterprises are mostly affected by China’s domestic policies related to climate issues and green investment along the “Belt & Road”. In contrast, they are less affected by global trends of energy development, related international initiatives, investment policies, as well as energy development schemes implemented by the host country. With respect to the specific implementation, enterprises are mostly affected by the access and feasibility of financing in the host country. In addition, the surveyed enterprises take into account the human resources, technology reserves and maturity of host countries to a certain extent. However, they seldom consider the attitudes adopted by the local community, host country’s media and the international community as well as NGOs.



**Figure 8 Comparison of the Importance<sup>15</sup> of Varying Factors during Enterprises' Strategy Formulation on the Overseas Investment in green and low-carbon energy**



**Figure 9 Comparison of the Importance of Varying Factors during Enterprises' Specific Implementation of Overseas Investment in green and low-carbon energy**

15.Importance of Factors = (  $\sum$  Frequency  $\times$  Weight) / Number of People Responding the Question

### 3.2 Analysis of the Investment Intention and Influencing Factors of Chinese Enterprises' Overseas Investment in Green and Low-carbon Energy

75% of the surveyed enterprises indicate that they would expand overseas investment in green and low-carbon energy.

In most cases, an enterprise's decision to whether or not expand its overseas investment depends on the political and business environment of the host country. Among the factors affecting the decision of an enterprise to expand its investment, over 42% are linked with the optimal political environment of the host country and its good relations with China as well as friendly community relations. Nearly 31% are linked with the host country's policies and regulations related to climate and investment.

In comparison, China's relevant policies and industrial bases have limited effects on the investment intentions of Chinese enterprises in green and low-carbon energy overseas. Specifically, China's climate and investment policies account for only 10% of all reasons. China's advantages in human resources, technologies and supply chains account for 8%. Finance accessibility, host countries' human resources, technologies and supply chains play even a lesser role in affecting the intention of surveyed enterprises to expand their overseas investment.

“The most vital driving force for enterprises to go global is the market factor, i.e., whether there is a local demand for new energy development. Other contributing factors include local policies and especially the host country's relations with China since enterprises need to ensure the safety of income and operation during their investment.”

—Zhang Shiguo,  
Executive Director and  
Secretary General of  
China New Energy  
International Alliance

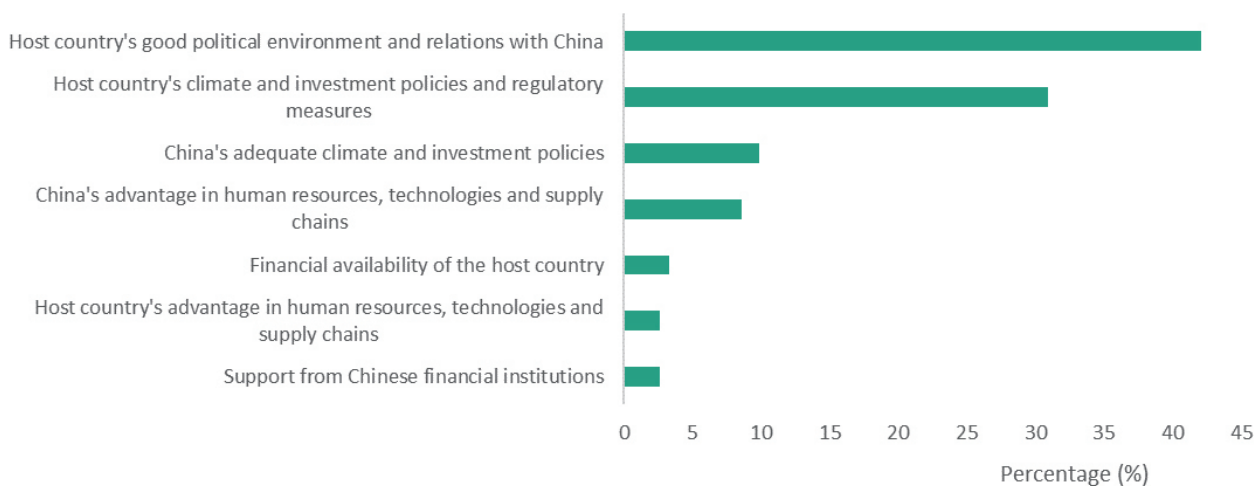
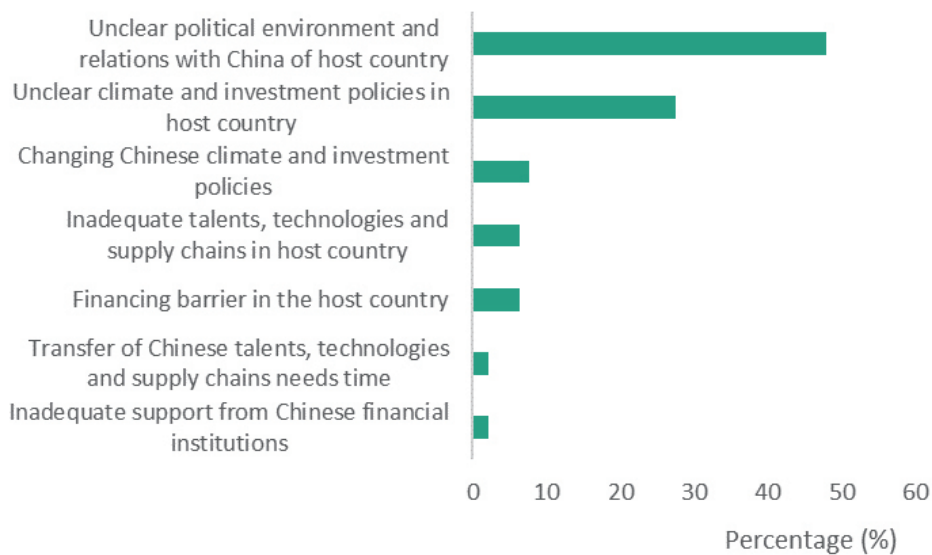


Figure 10 Comparison of Top Reasons for Chinese Enterprises to Expand Overseas Investment in Green and Low-carbon Energy

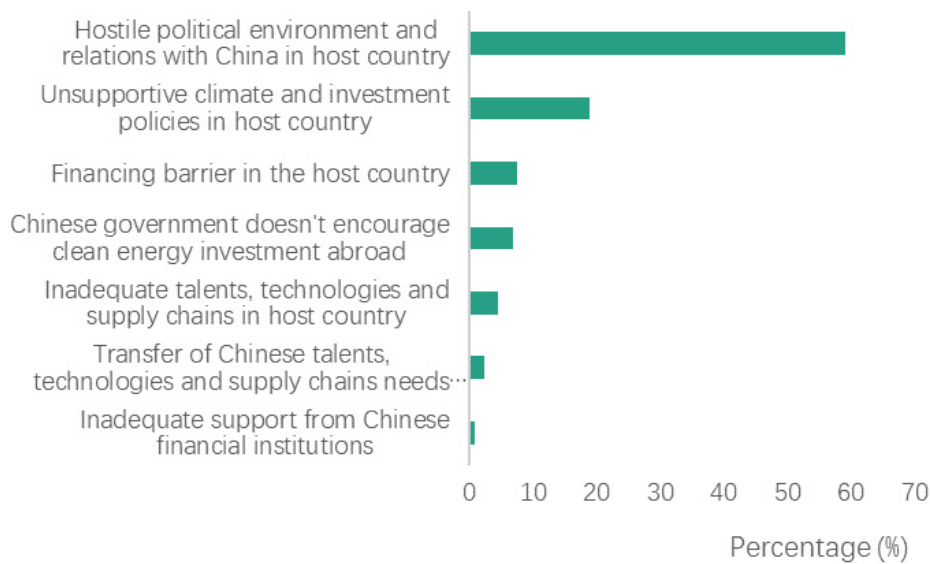


Only 25% of the surveyed enterprises indicate that they would continue to adopt a wait-and-see attitude towards overseas investment in green and low-carbon energy. The unclear political and business environments of the host country are the top reasons for Chinese enterprises to adopt a wait-and-see attitude. Specifically, nearly 48% of the surveyed enterprises attribute their wait-and-see attitude to the unstable political environment in host countries and their relations with China. Nearly 28% are linked with the unclear climate and investment policies in the host country. Enterprises are also concerned about changes taking place in China’s policies, and financing barriers and industrial supply chains of the host country. Nearly 8% of the contributing factors are the changing Chinese climate and investment policies, whereas financing barriers in the host country and inadequate talents, technologies and supply chains in the host country each account for 6%. Comparatively speaking, Chinese enterprises’ intention to invest is less affected by the time needed for transfer of Chinese talents, technologies and supply chains, and inadequate support from Chinese financial institutions.



**Figure 11 Comparison of Top Reasons for Chinese Enterprises to Adopt a Wait-and-See Attitude towards Overseas Investment in green and low-carbon energy**

Although no enterprises decided to curb their investment, certain reasons may still cause them to reduce overseas investment. Therefore, attention shall be paid to such hidden possibilities amongst relevant parties. The political environment of the host country is the decisive factor influencing enterprises' decision to curb investment. In particular, a hostile political environment and relations with China in the host country account for a larger share in the diminishing investment intention of Chinese enterprises, reaching nearly 60%. In contrast, unsupportive climate and investment policies in the host country account for a smaller share, but still reach a level close to 20%.



**Figure 12 Comparison of Top Reasons for Chinese Enterprises to Curb Overseas Investment in green and low-carbon energy**

Judging from the aforementioned analysis, under all the three circumstances of increasing investment, adopting a wait-and-see approach and curbing investment, the political and business environment of the host country is the top reason affecting the investment intention of enterprises, accounting for more than 70%. Moreover, it is more likely for enterprises to determine to wait and see or to curb investment due to the changing political climate of the host country.

The climate and overseas investment policies implemented by the Chinese government have imposed a certain impact on the investment intention of enterprises. The conditions of talents, technologies and supply chains are more likely to be the top reason for enterprises to expand overseas investment than the reason for suspending or curbing investment. On the other hand, the financing barriers in the host country and inadequate talents, technologies and supply chains are more likely to be the reason causing enterprises to wait and see, or curb investment.

# 04 Opportunities and Challenges Faced by China to Increase Investment in Green and Low-carbon Energy in Developing Countries

## 4.1 Major Trend and Opportunities of the Global Energy Transition

In recent years, driven by rapid technological advancement, the costs of renewable energy generation, including photovoltaic and wind power, have been sharply reduced. According to a report jointly released by the International Energy Agency (IEA) and the Nuclear Energy Agency (NEA) of the OECD in 2020, the median of the Levelized Cost of Electricity (LCOE) during the entire life cycle of global wind power and photovoltaic power generation has been lower than or close to the level of coal-fired power<sup>[16]</sup>. This has created conditions for renewable energy sources to replace conventional energy. In 2020, installed capacity of global renewable energy added nearly 280 GW, increasing by 45%. In 2021, the installed capacity of renewable energy added 295 GW, reaching another record high. According to IEA, such a growth trend is likely to become the new normal<sup>[17]</sup>.

In addition, varying countries have reached consensus on facilitating energy transition away from coal-fired power towards clean sources of energy, and the general environment and trend of energy transition have been established. For instance, Bangladesh announced the cancellation of 10 large-scale coal-fired power projects on June 27, 2021. In addition, China, Japan and Korea all announced in 2021 that they would no longer support overseas coal-fired power projects. A consensus on “phasing down” coal consumption was reached at the UN Climate Change Conference in Glasgow (COP26).

The war between Russia and Ukraine arising in March 2022 has indeed posed constraints to the export of Russian natural gas, leading to a global energy supply shortage, and

---

16.IEA(2020), Projected Costs of Generating Electricity 2020, IEA, Paris <https://www.iea.org/reports/projected-costs-of-generating-electricity-2020>

17.IEA (2021), Renewable Energy Market Update 2021, IEA, Paris <https://www.iea.org/reports/renewable-energy-market-update-2021>

conventional energy sources such as coal-fired power seem poised to make a comeback. However, in the long run, the accelerating global energy transition has not slowed down. At present, clean energy has become an investment priority in Europe and the US. In August 2022, the US passed a climate investment plan of USD 369 billion, including a number of tax credit projects in the clean energy sector. In May 2022, the EU launched the REPowerEU program, which entails additional investment of EUR 210 billion by the end of 2027 to wean itself off Russian energy supply and to speed up the EU's energy transition.

Even in developing countries, relentless efforts have been made in investment and plant construction in the renewable energy sector. At the 4th new energy auction held recently in Brazil, five photovoltaic power companies won the bid for power generation projects with a total capacity of 166 MW. At present, hydropower (110,000 MW), wind power (22,000 MW) and photovoltaic power (16,000 MW) account for Brazil's top three energy sources in terms of installed capacity. Chile has set the goal that by 2025, renewable energy shall account for 20% of national energy consumption<sup>[18]</sup>. Guided by the Bio-Circular-Green Economic Model (BCG) promoted by the Thai government, the National Energy Policy Council (NEPC) has adopted a new quota plan for renewable energy, which plans to purchase 5.2 GW of renewable energy between 2022 and 2030. Recently, Malaysia has also handed over projects of power generation with a total capacity of 2.2 GW to photovoltaic power companies in four batches for construction and operation, and has published a renewable energy roadmap for Malaysia to provide more detailed guidelines for carbon reduction in the power sector by 2035<sup>[19]</sup>.

Therefore, although there have been minor twists and turns in parts of the world, the general global trend of an energy transition towards green renewable energy has not been reversed. China's investment in green and low-carbon energy in developing countries is a general trend with bright prospects.

---

“While phasing down thermal power, China is still encountered with numerous business opportunities of energy development in terms of small-scale hydropower, wind power, photovoltaic power, biomass energy and geothermal energy. With respect to the new energy development along the 'Belt & Road', apart from the investment in developing power plants, there are also vast amount of opportunities for comprehensive energy services, including the integrated utilization of digital energy and varying energy resources, and the improvement of energy efficiency and expansion of scale. Therefore, abundant opportunities are available in the green energy sector.”

—Zhang Shiguo,  
Executive Director and  
Secretary General of  
China New Energy  
International Alliance

---

18. <https://www.natlawreview.com/article/renewable-energy-latin-america-updates-august-2022>

19. <https://ihsmarkit.com/research-analysis/which-asean-countries-will-be-the-frontrunners-to-decarbonize.html>

## 4.2 Trade Barriers for China's Solar PV Supply Chains: New Opportunities Hidden in Constraints

In recent years, especially since the outbreak of the COVID-19 pandemic and the tensions between Russia and Ukraine, demand for localization of manufacturing industry and independence of energy supply has become increasingly prominent in Europe and the US. As specified in the European Solar Initiative proposed in February 2021, Europe aims to re-develop 20-GW manufacturing capacity of solar PV supply chain by 2025. In June 2022, the US announced plans to triple its domestic photovoltaic manufacturing capacity to 22.5 GW by 2024. These moves by Europe and the US tend to restrict China's photovoltaic exports for the purpose of protecting their domestic industries and employment.

Will the pursuit of localization of photovoltaic manufacturing industry in Europe and the US be transmitted to developing countries as well? There is such likelihood. In July 2022, the IEA released the *Special Report on Global Solar PV Supply Chains*<sup>[20]</sup>, calling on all countries to support the local PV manufacturing industry to forestall the risks caused by the excessive concentration of the current PV supply chains in China. As early as April 2021, India launched an anti-dumping investigation against Chinese PV enterprises. The move indicates that other developing countries may also protect their manufacturing industries through similar anti-dumping measures.

How will this trend affect Chinese enterprises' export and investment in renewable energy in developing countries? The anti-dumping and anti-subsidy probe launched in 2012 led to the shut-down of numerous Chinese photovoltaic plants, but also promoted China's development of its domestic market and the industry's strategies in emerging economies like India and Brazil. In addition, numerous photovoltaic enterprises have built production bases overseas to circumvent the anti-dumping and anti-subsidy probe. For instance, JA Solar has successively set up production bases in Penang, Malaysia and Bac Giang Province, Vietnam, and gradually established a complete overseas industrial chain integrating silicon wafers, batteries and modules. The current restrictions imposed on photovoltaic exports in Europe, the US and some developing countries may pose challenges to the export of Chinese photovoltaic enterprises overseas, but also brings opportunities for investment deployment in developing economies as well.

Zimbabwe issued their National Renewable Energy Policy in 2019, which clearly encourages foreign investment in renewable energy power projects, production and assembly of relevant equipment, battery storage systems and other aspects. This is realized through varying sorts of beneficial policies, including favorable policies on land use and taxation. In

---

20. IEA (2022), Solar PV Global Supply Chains, IEA, Paris <https://www.iea.org/reports/solar-pv-global-supply-chains>

this way, the government aims to ensure that the installed capacity of renewable energy will reach 16.5% of the total energy mix in 2025, and that such ratio shall increase to 26.5% by 2030<sup>[21]</sup>.

### 4.3 Green Finance Accelerated, yet Room Remains for China's Investing and Financing in New Energy Overseas

Chinese financial institutions have accelerated the supply of green finance products and services by strengthening risk management and providing targeted support to new energy projects, thus becoming a constructive contributor to the green Belt and Road Initiative.

For example, in terms of fostering mechanisms for international cooperation, the Industrial and Commercial Bank of China (ICBC) has been building consensus with stakeholders and promoting the pragmatic cooperation through international platforms it has initiated or helped to establish. In 2017, under the guidance of the People's Bank of China, ICBC proposed the establishment of the Belt and Road Bankers Roundtable (BRBR) Mechanism. As of the end of June 2022, a total of 157 member and observer institutions from 71 countries or regions have joined the BRBR Mechanism. ICBC also assisted with the drafting of the Green Investment Principle (GIP) for the Belt and Road Initiative (BRI) that was jointly launched by the Green Finance Committee of China Society for Finance and Banking and the City of London Corporation's Green Finance Initiative in 2018. In 2019, ICBC released the Belt and Road Green Finance (Investment) Index, which has been included in the Second Belt and Road Forum for International Cooperation's deliverables list. Following an improvement and update, this index was published at the 4th China International Import Expo in 2021.

In terms of risk management in investment and financing, China Export & Credit Insurance Corporation (Sinasure) plans to continuously improve its underwriting policies, and is considering measures such as providing preferential rates and relaxing underwriting conditions to support the green transformation of trade and investment along the "Belt and Road". For example, Sinasure will be engaged in the design of financing schemes at the bidding stage and issue the bidding intention with supporting conditions to investors, so as to support Chinese enterprises' bid for financing new energy projects<sup>[22]</sup>. Sinasure also focuses on whole-process risk management and no longer provides insurance support for projects with high environmental and social risks.

---

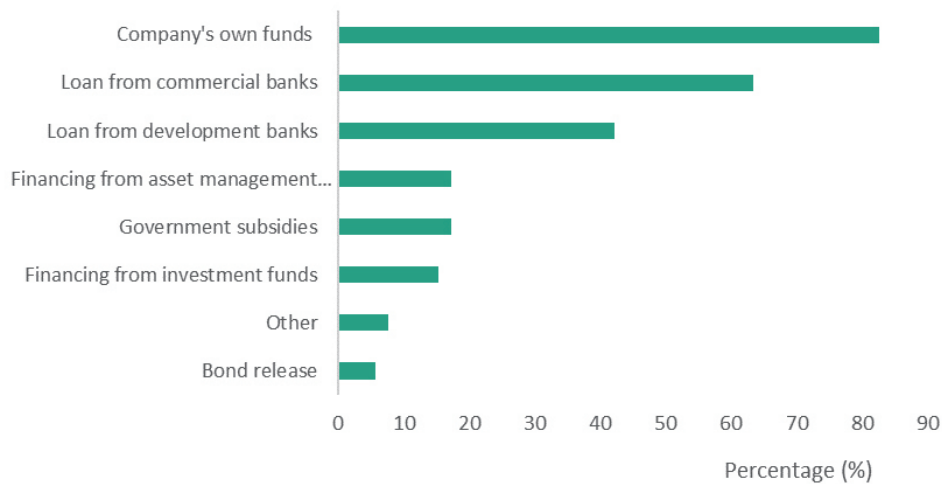
21. <https://www.theindependent.co.zw/2022/08/26/renewable-energy-policy-boon-for-investment-in-power-sector/>

22. Official WeChat Account of the Information on Going Global. Sinasure will launch a new model to support investment in the new energy sector overseas. Nov. 18, 2021

In the field of project financing, the Silk Road Fund has become a 49% shareholder of ACWA Power Renewable Energy Holding Ltd (ACWA Power RenewCo) to provide investment support for new energy power plants in emerging countries. Currently, it has involved 5 countries: South Africa, Morocco, the United Arab Emirates, Jordan and Egypt<sup>[23]</sup>.

These measures from financial institutions will provide opportunities to overcome financing difficulties in new energy projects, which is the most important reason hindering China's overseas investment in green and low-carbon energy.

According to the survey, the financing dilemma still exists. Nearly 50% of enterprises believe that it is still difficult for them to raise funds in the host country, and 20% of surveyed enterprises have listed financing difficulties as the main reason for the expected reduction of investment. About 83% of the surveyed enterprises report that they have used their own funds while investing in green and low-carbon energy overseas. A large share of enterprises have also used loans from commercial banks (63.46%) and development banks (42.31%), whereas only a few enterprises have leveraged government subsidies, financing from investment funds and asset management companies.



**Figure 13 Comparison of Chinese Enterprises' Financing Sources for the Investment in New Energy Overseas**

23. Wang Jianye, et al. *Toward a Green Belt and Road: A Study of China's Overseas Power Financing in Transition*. China Financial Publishing House, 2022

In certain regions, monetary policies have also become major issues that heighten the costs of Chinese projects. According to Li Dan, in certain African countries, if the RMB cannot be converted into foreign exchange unless being converted into USD first, these locally-controlled foreign exchange regimes drive costs much higher. “Therefore, the conversion capacity of RMB into foreign exchange will directly provide a guarantee of income from China’s overseas investment.”

According to Wang Jianye et al.(2022), compared with central SOEs and large-scale local SOEs, private equipment suppliers that are endowed with competitive advantages in overseas investment in the new energy sector often find it hard to satisfy the capital requirements in terms of qualification, mortgage or guarantee. As a result, it is more difficult for these enterprises to obtain mid-to long-term loans from Chinese-funded financial institutions, and they are faced with higher interest rates. In addition, the current mode of corporate financing is unfriendly towards private enterprises, and the application of project financing is fraught with difficulties. According to research conducted by the Center for Green Finance Research (CGFR) of Tsinghua University, the mode of corporate financing is not applicable to private enterprises without very high bank credit limits given that these enterprises need to provide guarantees for overseas project companies. However, renewable energy projects are usually implemented in a tight schedule, and there is not enough time to have all the conditions and terms of agreements required for non-recourse project financing met. Moreover, under circumstances where many countries are unable to provide sovereign guarantees, it is difficult for financial institutions to accept project financing modes without any recourse.

In the future, financial institutions need to continue to pay attention to industrial development and policy changes, and carry out product and service innovations in green finance targeted for overseas green and low-carbon energy investment to support the green and low-carbon energy development in emerging economies.

#### **4.4 Technological Bottlenecks and Inadequate Supply Chains Encountered in the Host Country**

Due to high demands for energy storage and power grid in the new energy sector, numerous developing countries have failed to realize adequate coverage of energy storage technologies and new power systems. Consequently, some of these countries do not have the technical expertise to ensure stable production of new

---

“We need to adopt a long-term perspective while looking at the cooperation with developing countries in the energy sector. One of the reasons why China's overseas investment is sometimes criticized is that our projects are mostly of a development and resource-based nature. In contrast, we have done little to cultivate local industries or nurture ties with local communities.”

—Li Dan, Executive Secretary General of Chinese Renewable Energy Industries Association (CREIA) under China Association of Circular Economy

---



energy , thus posing risks to China's local investment in the sector. For example, Eskom, the state-owned power company of South Africa, experienced power failures on a frequent basis and cannot guarantee a stable power supply. As a result, the company started a new round of power rationing in June 2022.

In addition, Chinese renewable energy companies have not yet nurtured or established a sound production and assembly chain in developing countries. On the one hand, consequently, these one-off projects fail to provide new opportunities for local employment and industrial deployment; and on the other hand, there is a lack of opportunities to grow and cultivate enterprises as the downstream users within the whole industrial chain of the energy sector:

Although China has implemented certain projects in Africa, some government-led projects lack good business models. As a result, these projects cannot generate sustainable profits, and thus enterprises are unmotivated to ensure sustained operation and maintenance, leading to a lack of project sustainability. In the meantime, enterprises may be unaccustomed to the local environment. In other words, the Chinese experience cannot be directly applied to the host country.



# 05 Policy Recommendations on Enhancing China's Investment in Green and Low-carbon Energy in Developing Countries

As Chinese new energy enterprises attempt to realize the commitment made by the state to “step up support for other developing countries in developing green and low-carbon energy”, they need to gain support from the host country, the Chinese government, financial institutions and other vital stakeholders in terms of improved business environment, investment and financing, and local industry cultivation. This paper aims to facilitate China's support for the growth of green and low-carbon energy investment in developing economies, help the country better embrace the opportunities brought along by global energy transition, and cope with the challenges posed by the international situation, financing, technology and other aspects. As such, we have analyzed the expectations of the surveyed enterprises in detail and put forward policy recommendations to all relevant parties.

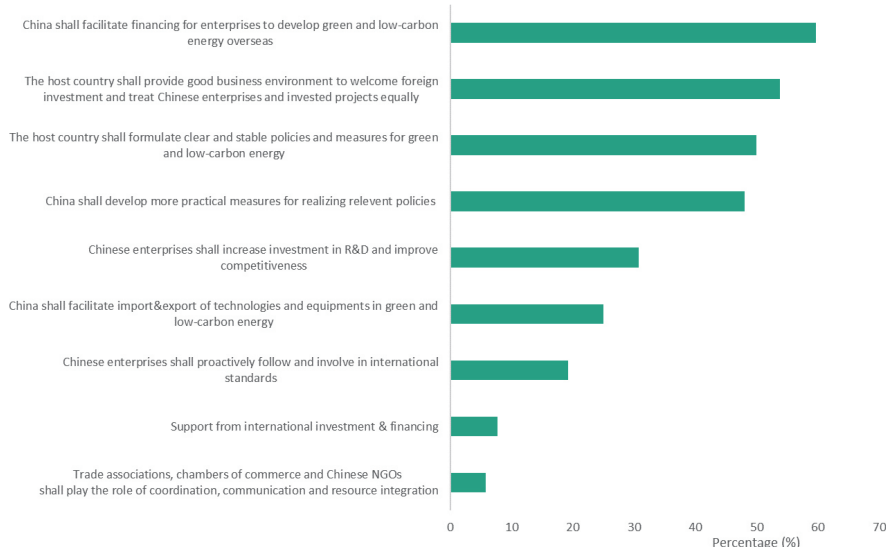
## 5.1 Governments of China and the Host Countries to Provide Greater Support in Terms of Policy, Investment and Financing

Most of the surveyed enterprises advocate that to increase overseas investment in green and low-carbon energy, both China and the host country need to take actions in the formulation and implementation of policies. Moreover, China needs to provide greater support in terms of investment and financing, whereas host countries need to improve local business environment.

Nearly 60% of the enterprises surveyed believe that the most urgent challenge that needs to be tackled is investment and financing availability. In this respect, China need to help enterprises get access to financing, whereas the financial institutions should also enhance support for the overseas development of green and low-carbon energy. More than 48% of enterprises hold that relevant policies and measures rolled out by the Chinese authorities need to be more practical for easier implementation. More than 50% of enterprises advocate that the host country needs to foster a better business environment and formulate clear and stable policies and measures related to green and low-carbon energy development.

In addition, about 20% or more of the surveyed enterprises believe that companies need to increase R&D investment to enhance competitive advantages, and China needs to facilitate the import and export of relevant equipment in the fields of intellectual property rights. Furthermore, Chinese enterprises should proactively follow international industry standards and engage in the formulation of such standards.

A few enterprises believe that they need to urgently win investment and financing support from international funds, and that industry associations, non-profit organizations (NGOs) and other institutions should play a proactive role in terms of communication and coordination.



**Figure 14 Comparison of the Most Urgent Issues That Need to be Tackled in Increasing Overseas Investment in Green and Low-carbon Energy Development by the Surveyed Enterprises**

Since President Xi made the commitment on green development, in case that more supporting policies can be rolled out in China to lower the financing costs of new energy projects overseas, such measures will facilitate Chinese enterprises' overseas investment in the green and low-carbon energy development to a significant extent."

—Remarks from an anonymous department head of a central SOE

## 5.2 The Host Country Shall Resolutely Embrace the Energy Transition and Consistently Optimize the Business Environment

The host country's own will is crucial to the success of energy transition. At present, host countries need to resolutely embrace the energy transition and formulate strategic plans and policies in favor of the development of renewable energy. In addition, local authorities in host countries are recommended to roll out supporting policies from the aspects of taxation and investment to attract investment from enterprises, so as to speed up the energy transition locally. Furthermore, the host country needs to ensure the continuity of policies and avoid the impact imposed by geopolitical factors,

trade protectionism and other constraints on the supply chain, which may incur greater political risks to enterprises.

To fill the gap of weak infrastructure and backward technologies in the host country, China has proposed in the “14th Five Year Plan for Modern Energy Systems” issued in January 2022 that the scope of cooperation shall be extended to energy storage and smart grid, among other fields. This plan is expected to promote the effective installation and output of renewable energy in the host country, realize large-scale grid connection and speed up the transition towards green and low-carbon energy sources in the host country. Nevertheless, the implementation of these policies, plans and visions advocated by China needs to coordinate with relevant policies and plans by the host country.

For enterprises, it is necessary to analyze the investment environment and market changes of the host country so as to optimize the risk management measures. Internally, enterprises need to “hone their internal skills”. In particular, they should speed up technological innovation, proactively adapt to international green standards and rules, and enhance their competitive advantages and voice in the international arena. Externally, against the general backdrop of coping with climate change and energy transition, enterprises should better leverage macro policies such as China’s “Dual Carbon” targets (peak by 2030 and neutrality by 2060) and the greening of overseas investment. In addition, they are recommended to gain stronger support from China International Development Cooperation Agency (CIDCA) and South-South Cooperation Assistance Fund (SSCAF), among other government, financial and development institutions.

### 5.3 China Shall Innovate the Mode and Expand the Channels of Financing

Against the backdrop that the COVID-19 pandemic has heightened the external debt risks of numerous low-and middle-income countries, the investment and financing support provided by China increasingly holds the key to accelerating green and low-carbon energy investment in these countries. To tackle the financing dilemma faced by private enterprises that serve as a pillar of the new energy sector’s efforts to “go global”, the Chinese government and regulatory authorities are recommended to speed up the market-oriented reform of energy investment and financing. The authorities need to transform the investment and financing of overseas power projects

---

“Chinese enterprises engaged in the clean energy sector are especially required to maintain friendly ties with the host country and consolidate their local foundation. While strengthening cooperation with the EU and Latin America in the new energy sector, we also need to expand and consolidate our foundation in certain African countries where there is vast potential for the growth of renewable energy, but conditions are not good enough at the moment.”

—Zhang Shiguo,  
Executive Director and  
Secretary General of  
China New Energy  
International Alliance

---

from the corporate financing mode with official participation to the project financing or mixed financing mode with a higher degree of marketization, so as to fully leverage the advantages of China's new energy sector, and support private enterprises in reaching out to overseas markets.

As such, financial institutions should establish an asset appraisal mechanism for new energy power plant projects overseas to facilitate the transition of the financing model to a new model based on project risks and assets, and to create favorable conditions for the issuance of non-recourse bank loans<sup>[24]</sup>. Given that renewable energy projects are often implemented on a rather small scale with a short construction period, and the construction risks of such projects are relatively controllable, financial institutions should identify the risks of projects with an approach different from traditional projects. In November 2020, China General Technology Group obtained a loan from Bank of China's Hungary Branch to finance the 100-MW PV power plant established in Kaposvar, Hungary, through the mode of non-recourse project financing.

Chinese commercial financial institutions should also enhance cooperation with multilateral development financial institutions and adopt the mode of mixed financing. In recent years, multilateral development financial institutions such as the Asian Infrastructure Investment Bank (AIIB), the Asian Development Bank (ADB) and the World Bank (WB) have been exploring ways to use syndicated loans to provide financing services for clean energy projects and lower the construction costs of overseas EPC projects. Furthermore, the political influence of multilateral development financial institutions can help enterprises reduce risks, increase the chance of obtaining non-recourse project financing, and lower comprehensive financing costs.

In addition, cooperation shall be enhanced between SOEs and private enterprises in the new energy sector. SOEs shall leverage their financing advantages, and private enterprises shall make better use of their technological advantages. Moreover, SOEs shall give full play to their risk control capabilities, whereas private enterprises shall further enhance their strengths in terms of efficiency. Both types of enterprises shall cooperate more closely on new energy projects. SOEs are recommended to streamline

---

“To facilitate the transition of China's overseas investment and financing in the power sector, the most fundamental solution is to shift away from the conventional mode of corporate financing based on official participation, SOEs and guarantee mortgage into the market-oriented financing model with joint participation of private enterprises and SOEs and based on risks, assets and income of new energy projects.”

—Excerpts from **Toward a Green Belt and Road: A Study of China's Overseas Power Financing in Transition**

---

---

24. Also known as project financing. Under this mode, the lender provides financing according to a loan agreement for a specific engineering project, enjoys the right of debt repayment for the cash flow generated by the project, and takes the project assets as the subsidiary guarantee. Unlike the corporate financing mode, the sponsor of the project is not required to provide any credit guarantee. Under circumstances of any incident or business failure of the project, the lender is not entitled to recover losses from the sponsor of the project.

their internal procedures, reduce the delay and uncertainties of approval, and improve the rate of success during cooperation.

In the meantime, enterprises may cooperate more closely with foreign banks (such as Deutsche Bank and HSBC) to make full use of their advantages in terms of interest rates and risk control capabilities, and better adapt to international standards and rules while addressing project financing issues. Enterprises may also consider collaborating with local consortia to promote local participation so as to alleviate finance pressures.

## 5.4 Focus Shall be Placed on Cultivating Local Industrial Chain and Promoting Sustainable Operation of the Project

China's investment in the renewable energy sector overseas is expanding from project contracting to upstream investment and downstream operation. Unlike pure exports of equipment and turnkey projects, the combination of investment, construction and operation is faced with greater risks, but the market prospects and profits are also enhanced by a large margin. Participants in the renewable energy industry need to adopt a long-term view and take into account subsequent long-term management and engagement during the operation and maintenance of renewable energy projects as well as energy services.

As enterprises are going global, they should pay closer attention to cultivating local industries. To cope with potential trade barriers of developing countries and meet demands of local employment and industrial deployment, enterprises should also foster capabilities in the downstream of the energy sector, and address the back-end consumption issue in the renewable energy sector.

To cultivate local industries and ensure the sustainable operation of projects, the Chinese government needs to provide stronger guidance and less direction. The government should provide start-up fund support for enterprises, whereas enterprises should take charge of the local implementation of business and technological models, and decide whether to obtain subsequent loan support based on operating conditions.

In addition, during the early stage of project design, enterprises should fully take into account the reality of developing countries and assess the business model of the project. Rather than investing in projects with large investment

---

“This is related to the changes of management thinking. If the enterprise managers believe that they are only implementing a project locally, they are likely to focus only on how to maximize the benefits during the project implementation at the expense of the interests of others. If the managers are able to regard themselves as citizens of a country and focus on how to integrate with the relevant subjects of the project while playing their due role, they will be able to promote the local development, and correspondingly, enterprises will have a high chance to grow and thrive locally since a group of people will gather to form a community of shared interests.”

—Li Dan, Executive Secretary General of Chinese Renewable Energy Industries Association (CREIA) under China Association of Circular Economy

---

volume but high technical requirements and poor conditions of operation and maintenance in the later stage, enterprises are recommended to invest in “small but beautiful” projects with smaller investment volumes but optimal business models and ideal technical conditions consistent with the public needs of developing countries. For example, in South Africa where there is often a power outage crisis, off-grid PV projects with a capacity of less than 100 MW are deemed to have brighter prospects as investment opportunities.

These “small but beautiful” projects have not only won support from Chinese leadership, but have also been recognized by relevant media as a new trend of China’s investment along the “Belt & Road”<sup>[25]</sup>. President Xi remarked on the 3rd Symposium on the Belt and Road Initiative that “small but beautiful” projects shall be on top of the agenda in overseas cooperation<sup>[26]</sup>.

To ensure the sustainable operation of the project, enterprises need to adopt a long-term view and truly integrate into the local communities while achieving a mutually beneficial win-win situation. During this procedure, enterprises are expected to improve local performance in environmental, social and governance (ESG) aspects, so as to better adapt to local and international standards related to the environment and labor.

## 5.5 Facilitating the Communication and Coordination of Relevant Parties and Enhancing the Exchanges and Cooperation in Green and Low-carbon Energy

To better realize the commitment made by President Xi in “stepping up support for other developing countries to develop green and low-carbon energy”, it is necessary to enhance the exchanges and cooperation amongst government, industry associations, enterprises, non-profit organizations and other stakeholders.

Due to their neutrality and close ties with enterprises, industry associations are able to play a critical role in building communication platforms and promoting international exchanges and coordination. Therefore, it is recommended to better leverage the coordinating role of industry associations to facilitate information sharing, project coordination and promotion between China and other developing countries in green and low-carbon energy.

It is easier for NGOs to implement “small but beautiful” aid projects, and pay closer attention to the management of community relations and the exchanges among stakeholders.

---

25.South China Morning Post. China finds small is beautiful for African projects under belt and road  
<https://www.scmp.com/news/china/diplomacy/article/3187214/china-finds-small-beautiful-african-projects-under-belt-and>

26.New Observation on the Silk Road. Belt & Road: Small But Beautiful Projects Shall be on Top of the Agenda in External Cooperation  
<http://cms.siluxgc.com/public/BeltRoad/20211122/28371.html>

Therefore, they can enhance mutual trust and cooperation between China and other countries. In the meantime, non-governmental exchanges can also enhance multi-level communication and understanding, thus effectively addressing a series of environmental and social issues.

Industry associations and non-profit organizations can play the role of “lubricant” during exchanges and cooperation in green and low-carbon energy. We need to make good use of the communication and coordination capabilities of industry associations and NGOs, so as to improve the international image and soft power of China’s overseas energy investment, while forming a greater synergy for global energy transition.



## References

- [1] East Asia Energy Industrial Observation, Brief Report on the Trend of China's Wind Turbine Exports in 2021, Apr. 22, 2022.
- [2] Center for Green Finance Research (CGFR), Mode of Investment and Financing, Issues and Suggestions of Renewable Energy Projects under the BRI Initiative. Dec. 27, 2019
- [3] South China Morning Post. China finds small is beautiful for African projects under belt and road  
<https://www.scmp.com/news/china/diplomacy/article/3187214/china-finds-small-beautiful-african-projects-under-belt-and>
- [4] People's Daily, China's exports of photovoltaic products increased by 43.9% year-over-year, Feb. 24, 2022.
- [5] World Resources Institute (WRI), Towards Green Development: Status-quo, Challenges and Future of Chinese Enterprises' Overseas Investment in the Renewable Energy Sector; Nov. 5, 2021.
- [6] New Observation on the Silk Road. Belt & Road: Small But Beautiful Projects Shall be on Top of the Agenda in External Cooperation  
<http://cms.siluxgc.com/public/BeltRoad/20211122/28371.html>
- [7] Wang Jianye, et al. Toward a Green Belt and Road: A Study of China's Overseas Power Financing in Transition. China Financial Publishing House, 2022
- [8] China New Energy International Alliance, Report on the International Development of China's New Energy Sector from 2021 to 2022, January 2021.
- [9] China New Energy International Alliance, Research on Promoting the Chinese Enterprises' Overseas Investment in the Renewable Energy Sector, 2021.
- [10] Official WeChat Account of the Information on Going Global. Sinosure will launch a new model to support investment in the new energy sector overseas. Nov. 18, 2021
- [11] International Renewable Energy Agency (2021). Renewable Capacity Highlights.
- [12] IEA (2022), Solar PV Global Supply Chains, IEA, Paris <https://www.iea.org/reports/solar-pv-global-supply-chains>
- [13] Nedopil, Christoph (January 2022): "China Belt and Road Initiative (BRI) Investment Report 2021", Green Finance & Development Center, FISF Fudan University, Shanghai.
- [14] GWEC Market Intelligence, Global Wind Supply Side Data 2021, May 2022
- [15] IEA(2020), Projected Costs of Generating Electricity 2020, IEA, Paris <https://www.iea.org/reports/projected-costs-of-generating-electricity-2020>
- [16] IEA (2021), Renewable Energy Market Update 2021, IEA, Paris <https://www.iea.org/reports/renewable-energy-market-update-2021>
- [17] United Nations Environment Programme (2021). Emissions Gap Report 2021: The Heat Is On – A World of Climate Promises Not Yet Delivered. Nairobi.

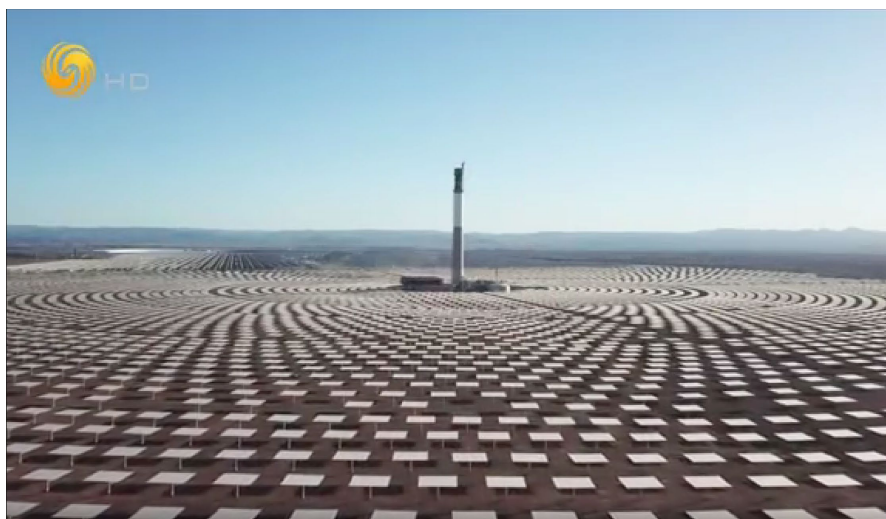
## Annex:

# Case Studies on China's Overseas Investment in Green and Low-carbon Energy

### Case 1:

### Concentrating Solar Power Plant Constructed by SEPCO III

“Noor” refers to “light” in Arabic. In Morocco, sunshine duration lasts for 3,000 to 3,600 hours per year, and potential solar power generation amounts to 2,600 kwh/m<sup>2</sup>, twice that of European countries. Due to the lack of conventional sources of energy, the Moroccan government decided to develop the new energy sector. Thanks to its unique geographical location and access to abundant light, the Noor project commenced construction in 2013 as a crucial part of Morocco's new national energy program.



This project is located in the city of Ouarzazate in the Sahara Desert in southern Morocco. Since the establishment of the world's largest solar power plant, it is no longer as desolate as before. 7,400 pieces of heliostats are like sunflowers that consistently follow the sun, improving the efficiency of solar panels to absorb sunlight and heat at the maximum level.

Noor II covers an area of 690 hectares with an installed capacity of 200 MW, whereas Noor III covers an area of 750 hectares with an installed capacity of 150 MW. Phase II and Phase III of the

concentrating solar power plant project have attracted a total investment of USD 2 billion, and the project is jointly funded and constructed by Moroccan Agency for Solar Energy (MASEN), Saudi Hydrodynamics Co. Ltd. and a Spanish company. The Chinese company SEPCO, along with the Spanish company Sener, that has mastered the core technologies of solar power, have formed an EPC joint venture project together:



The open and inclusive spirit shown in the team cooperation of varying countries is deemed as a vital factor for the success of the Moroccan project. During the collaboration, SEPCO intends to learn from Sener in terms of core technologies related to solar power plants. It is reported that the on-site construction team has set up a special task force to carry out the project and master the technical details. In the meantime, the team has accumulated rich experience and data during the process, thereby gaining more insights and providing more services for partners.

Furthermore, the project team focuses on training local teams. The major construction projects of the power plant are built by local subcontractors. From civil construction to equipment installation, more than 60 local subcontractors and sub-suppliers have been engaged in the project construction, driving hundreds of local enterprises to participate in the project construction accordingly. This has invigorated the local economy and brought a vast amount of employment opportunities. Based on incomplete statistics, the project construction has already added nearly 14,000 local jobs to the employment market.



Noor II and Noor III power plants have been in operation since 2018. After the two phases of the power plant commenced operation, 12.3 TWh of clean power is transmitted on an annual basis, enabling more than 1 million Moroccan households to use clean energy. In the meantime, the surplus power can be transmitted to Europe, thus reversing Morocco's persistent dependence on electricity imports.

SEPCO III entered into partnership with Sener to establish an operating company in charge of the power plant's three-year trial operation. Upon confirmation that the power plant can reach expected levels of power generation, it will be returned to the final owner. Such methods of participating in project's later operation will be the future orientation of the development of Chinese enterprises. In the meantime, SEPCO III aims to proactively expand to the upstream of the industrial chain and participate in the investment and financing procedure.

At present, most raw materials for the Noor project still need to be imported. SEPCO III intends to promote the export of domestic electromechanical equipment and raw materials through EPC, so as to benefit China's entire electromechanical industrial chain.

With cooperation among SEPCO III, Sener and the Moroccan government, the concentrating solar power project has become a best practice of the principle of "Consultation, Contribution and Shared Benefits", thus providing valuable guidance for the cooperation in the clean energy sector under the Belt and Road Initiative.

**Source of Information:**

Previous interview materials filmed for the program of the Odyssey of the Dragon

## Case 2:

### Mobile PV Plant Established by JA Solar on the Amazon River

Transportation accounts for a vital part of carbon emissions. A “shipboard factory” for processing acai berries on the Amazon River is equipped with PV power generation system provided by JA Solar, thus ensuring zero emission during the processing and storage of fruit pulps as well as ship operation, while improving the living standards of residents along the river in the meantime.



The acai berry is a specialty fruit grown in the Amazon rainforest, and is hailed as the “mysterious fruit of life” by the Indians. Thanks to its unique taste and rich nutritional elements, it has become popular among local residents. In recent years, acai berries have been increasingly sought after by a variety of consumers, but the high transportation costs are somewhat intolerable.



Acai berries.  
Source:  
[belezaesauade.com](http://belezaesauade.com)

The ship located on the Amazon River as shown below is a “shipboard factory” for processing acai berries. On top of the ship, there is a PV power generation system composed of 675 high-efficiency PV modules manufactured by JA Solar. Supported by abundant sunshine and an efficient energy storage system, the PV power plant system provides adequate power supply for the operation of the factory and the ship. This shipboard factory is able to satisfy capacity demands of processing 20 tons of acai berries per day, and storage demands of preserving 300 tons of frozen products in the warehouse. Prior to discharge, wastewater generated during production and operation is treated by the sewage treatment system established on the ship. The shipboard “sewage treatment plant” is capable of treating 15,000 liters of wastewater per day.

In addition, the PV powered shipboard processing plant creates 50 opportunities for direct employment for local people through fruit pulp processing, with an average annual income amounting to USD 20,000 per person.



The small factory contributes to the formation of a large circulation. In this small shipboard factory, a mature operation system is established, which is composed of varying links including the procurement, processing, storage and sewage treatment. While protecting the ecosystem of the Amazon River Basin, the factory helps to effectively improve the living standard of the inhabitants residing along the river. Moreover, it has innovated the mode of development according to local conditions and achieved harmonious unity of development and environmental protection, thus providing new insights into the application of PV power.

**Source of Information:**  
Unless otherwise specified, the relevant information is provided by JA Solar

## Case 3:

# Largest PV Power Plant Ever Invested and Established by GENERTEC China Machinery Corporation in Central Europe

Hungary is a small landlocked country in Central Europe with rather limited energy reserves. As such, Hungary is proactively promoting energy transition under the climate target set by the EU. Therefore, it has become a priority task for Hungary to facilitate the construction of renewable power projects so as to improve the energy structure, enhance energy self-sufficiency and ensure climate security.

In addition, Hungary is a crucial comprehensive strategic partner under the framework of the China-CEEC Cooperation Platform. The 100-MW PV power plant project located in Kaposvar, Hungary, which was invested in and established by GENERTEC China Machinery Corporation affiliated with China General Technology Group, has become a paradigm of clean energy cooperation between China and Hungary as well as the CEEC.

The project is located in the city of Kaposvar in the southwest of Hungary. It commenced construction in June 2019 and was officially put into operation in May 2021. This is one of the key projects showcasing enhanced exchanges and cooperation between China and Hungary in preserving the ecological environment and improving the green development under the Belt and Road Initiative. It is the first European PV project invested and developed by GENERTEC China Machinery Corporation, and it is also one of the largest PV projects ever implemented in Central and Eastern Europe.



Aerial View of the Completed Power Plant, extracted from the official account of China General Technology Group in The Paper

GENERTEC China Machinery Corporation undertook the investment, financing, construction and operation of the PV power plant project, thus contributing to the exploration of the integrated mode of BOT.

The equity capital of the project company is independently raised by investor, whereas the debt capital is financed through the mode of non-recourse project financing based on the loan agreement between the project company and Bank of China Hungary Branch. The project shareholders are exempt from providing any form of guarantee and repayment commitment. Instead, they only need to take the equity and assets of the project company as the guarantee, and use the future revenue of power supply generated by the project company as the primary source of repayment, thus realizing project financing in the real sense.

The main equipment of the project is purchased from first-class equipment manufacturers around the globe, and JA Solar also supplies 54-MW modules for the PV power plant project. The project construction is undertaken by high-quality construction entities in Hungary and Europe, and local resources in Hungary are used to the maximum extent. In addition, the construction party of the PV power plant attaches great importance to environmental protection. For example, to minimize the damage incurred to soil and vegetation, spiral ground piles were selected due to the convenience of installation despite higher costs. Furthermore, the company hired landscape experts to conduct greening planning for the project site.



**In July 2020, the project commenced construction in the power plant area, and the news was released by the Official WeChat Account of the Information on Going Global.**



After the project is connected to the grid, it is capable of generating 130 million kwh of power every year. This helps save 45,000 tons of standard coal and reduce 120,000 tons of carbon dioxide emissions, while significantly improving the level of clean energy use in Hungary and even in Central and Eastern Europe. The project also showcases the achievements made by China and Hungary during coordination of the Belt and Road Initiative and the “Looking East” Strategy.

**Source of Information:**

**Jun. 3, 2021, extracted from the official account of China General Technology Group in The Paper. Project put into operation! China General Technology Group invested in the construction of the largest PV power plant in Hungary, triggering media reports in China and Hungary**

**Nov. 3, 2021, extracted from the Information on Going Global. Financing closed: GENERTEC China Machinery Corporation’s 100-MW PV project obtained approval on the first loan**

**Aug. 2, 2021, Xinhua News Agency, Anonymous head of Chinese Enterprises: the Kaposvar PV power plant is expected to bring more clean energy to Hungary**

**Jun. 19, 2021, State-owned Assets Supervision and Administration Commission (SASAC). Hungary’s largest PV power plant entered into the construction stage and was invested by China General Technology Group**

## Case 4:

### LONGi Positions Module Factory in Malaysia

Since the beginning of 2011, Europe and the US have initiated an anti-dumping and anti-subsidy probe against China's PV products. In response to this, Chinese PV companies have stepped up efforts in strategic overseas deployment.

Situated in Southeast Asia, Malaysia boasts abundant sunlight, a favorable condition for developing the PV industry. In 2011, aimed at promoting Malaysia's PV industry, the Malaysian government enacted the Renewable Energy Act, executed power buybacks, launched mega solar power generation projects and introduced tax-free schemes for green investment. In addition, Malaysia's comparatively cheap labor cost, favorable tax policies, good relationships with Western countries and large stock of English-speaking engineering talents all act as a magnet for Chinese companies.

In light of this, since 2015 LONGi has been working on its deployment in the Malaysian market in hopes that it can set up an overseas manufacturing base and further expand its overseas market. In 2016, LONGi opened a PV battery module factory in Kuching, the capital city of the Malaysian State of Sarawak. By October 2019, the aggregate capacity of the three battery factories invested by LONGi reached 3.3 gigawatts. On top of that, these factories produce nearly 1 gigawatt modules and 500 megawatts silicon wafers, which has created a prototype PV industrial chain. In 2019, the PV modules manufactured by this Chinese company were mainly exported to Europe, the US and Australia, with roughly 15% of all its exports going to the US.



As the whole industrial chain entails purchasing multiple raw materials, LONGi has made remarkable efforts in the localization of purchasing. Since the Malaysian industry is not as advanced as the Chinese one, 80-90% of the industrial chain was supported by Chinese

products at the early stages while only 10% were backed by local products. With its supply chain streamlined and continuous efforts by their local colleagues, the proportion of locally supplied products reached 40% by the end of 2019. For instance, the glass needed for PV production used to be imported from China. With the PV glass factory built by Xinyi Solar in Malaysia going into operation, LONGi has been able to purchase glass from local suppliers. “This is a driving force for the local Malaysian economy and is the greatest contribution we have made,” said one of LONGi’s purchasing directors.

LONGi is on its way to developing its own localized team and creating job opportunities for the local people. As LONGi is relatively new to Kuching, many of its employees are not extremely experienced. By providing its employees with training courses on their corporate development concept and vocational skills, LONGi encourages its employees to seek self-improvement and make bigger strides. As a result, the performance of its local team has undergone notable progress, including having remarkably shortened the purchasing cycle so as to better meet procurement requirements. “I hope that I can become a true expert in what I am at now,” said Ain, an engineer who has worked for LONGi for three years at a battery factory in Kuching, with overwhelming confidence.



LONGi’s local purchasing and team in Kuching have promoted the local economy and provided more than 2000 jobs for local people. In February 2020, LONGi took another step and acquired a PV manufacturing base in Vietnam. Behind LONGi’s global deployment is its goal to share the dividends of energy transition with its host countries.

**Source of Information:**

Previous interview materials filmed for the program of the Odyssey of the Dragon

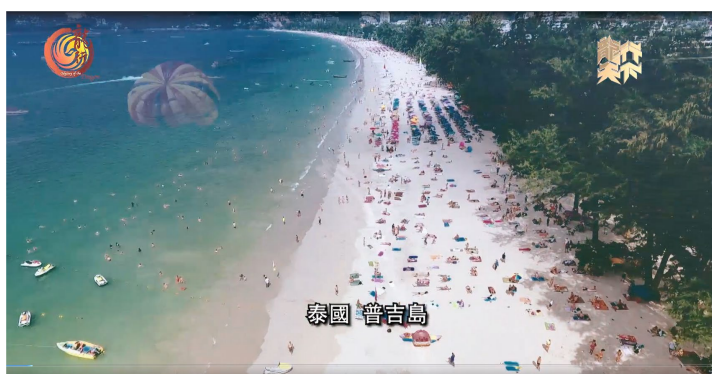
**Source of pictures:**

xueqiu.com, CCTV | “Belt and Road” × LONGi, Kuching LONGi With a Radiant Glow

## Case 5:

### Yunnan Water Runs Waste-to-Energy Power Plant in Phuket

A world-renowned holiday resort, the Island of Phuket receives tens of millions of tourists every year. In proportion, it generates a staggering amount of waste every day. In 1992, Phuket had its own environmental act which forbade dumping waste into the sea or creating waste piles. Landfill is not on the table due to high land prices. Therefore, the government went for incineration as a major means of waste treatment and funneled private capital into projects that use the BOT, viz. build-operate-transfer, model.



This has grabbed the attention of Chinese companies. Specializing in sewage treatment, waste-to-energy power generation and hazardous waste treatment, Yunnan Water has gathered some clout by virtue of its running water project in Chiangmai. In early 2016, it acquired the PJT solid waste treatment plant in Phuket. The plant is capable of burning nearly 1000 tonnes of household waste and generating 10MW on-grid power every day, which helps dispose waste produced by 900,000 people and meet the demand of power of 48,700 people. How can this company be run in a sustainable manner? How do we cultivate local talents and win the support of the local communities?



Adopting the BOT model, the approved Phuket PJT waste-to-energy power plant intends to pool social capital, advanced technology and professional operational teams in order to better deal with environmental and energy issues. Under this model, the company gets its revenues from two business activities: one is the waste treatment fee, which is paid by the local government; the other is the subsidized on-grid electricity rate, which is paid directly by the power companies. The waste treatment fee is subject to adjustment based on the consumer price index (CPI): if CPI exceeds a certain percentage, the company may apply for adjusting the waste treatment fee. In addition, the waste treatment fee and on-grid electricity rate are complementary. If the rate is low, the fee will be raised; if the fee is low, the rate will be increased. These measures make sure that the company can enjoy sustainable profit. According to Yunnan Water, “profits now look good.”



At the early stage after the acquisition, Yunnan Water decided to cultivate local technical talents in order to support localized management. To this end, it took on all the company’s existing employees and increased the proportion of local staff with a Bachelor’s degree. At the same time, it improved the theoretical and practical knowledge of the local employees by sending in professional personnel to offer on-site guidance and providing training.



How can communication with the local employees be facilitated? Yunnan Water upholds the principle of “understanding with respect” as it moves step-by-step towards integrating

its corporate culture with its work system. In the beginning, the local employees found it hard to align themselves with the company's performance management system and found salary deduction repugnant. In response to this, the company shifted to a scoring system by which the employees' performance is quantified so that they would become self-motivated. Currently, the development of local talents have started to pay off and the power plant is now operated with greater stability. "The waste-to-energy capacity of our plant has been up by 50-60 kW, which is a considerable improvement," said the plant manager.

By encouraging community participation and enhancing supervision, the local government seeks to win the support of the local communities. Before building the plant, the Phuket government had held public hearings so that it could hear the voices of the communities. At the same time, it ensures harmless disposal of the cinder and fly ash produced by the plant so that the residents can actually feel how much the environment has improved with the shift from landfill to incineration. As to the issue of gas and smoke emission, which is a great concern for the residents, the municipality will send the relevant data to the departments in charge while making the data available to the public. In addition, the municipality responds to problems reported by the people so as to eliminate the concerns of the local residents.

It has been proven that, compared to landfill which causes environmental pollution, the PJT solid waste treatment factory really is a better solution to Phuket's garbage problem and has reduced the amount of waste by 70-90%. Through recycling hazardous waste and simple waste sorting, the Phuket government has also improved waste-to-energy power generation efficiency and reduced the amount of hazardous substances released in the forms of smoke and cinder by waste incineration plants. On November 2, 2020, the Deputy Prime Minister and Minister of Energy of Thailand visited the factory and pointed out that its experience was worth promoting across the other provinces of Thailand. Currently, Yunnan Water is making plans for the second phase of the Phuket waste-to-energy power plant project. It has also built Asia's largest waste-to-energy power generation project in Indonesia using pyrolysis and gasification technology.

The hazardous substances generated during waste incineration are inevitable, though they meet the set standards. The government still has a lot to do in terms of reducing waste at its source, waste sorting and encouraging alternative methods of harmless waste disposal. Yunnan Water's waste-to-energy power generation project should make continued contribution to the prevention and control of pollutants by improving its technologies so as to facilitate waste calorific value transformation and reduce hazardous waste emission.

**Source of Information:**

**Previous materials filmed for the program of the Odyssey of the Dragon.**

"The key to the low-carbon transformation of China's overseas energy investment lies in the capability and willingness of the host countries. A large-scale energy transformation requires the host countries' openness and initiative, a sound energy planning system, and a large energy consumption demand."

—Jianyu Zhang, Executive Director of BRI Green Development Institute



## About the Odyssey

The Hong Kong-based Odyssey team provides services in research, consultation, marketing and public relations in sustainable investment to Chinese investors and their partners by means of three virtual and physical instruments: "Odyssey App"; "Bon Café +", a social enterprise and a UN Global Compact member; and "Phoenix Odyssey of the Dragon", a video archive. The team is an official partner of UN agencies in China and a co-producer of Phoenix Satellite TV to create products related to the Belt and Road Initiative and China's overseas investment. In addition, Bon Café + is a social enterprise specialising in Burmese alternative plantation coffee beans.

## About People of Asia for Climate Solutions

People of Asia for Climate Solutions (PACS) is a Manila-based NGO that aims to inspire climate hope and promote climate actions in Asia, by working with and for people, from climate victims to renewable energy technicians, from energy consumers to investors, from journalists to governments. With the world's largest population and the fastest growing economies and cities, Asia is at a historical moment with historical obligation to turn the climate crisis into an unprecedented opportunity for a cleaner, fairer, safer, and stronger global future.



### Authors of the Report:

Li Wenxiu, Zhang Hongfu, Zhang Xiaowen  
(Affiliated with the Odyssey)

### Reviewer of the Report:

Wang Xiaojun  
(Affiliated with PACS)