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PwC China

WORLD ECONOMIC FORUM

Advancing the Green Development of the Belt and Road Initiative: Harnessing Finance and Technology to Scale Up Low-Carbon Infrastructure

INSIGHT REPORT

JANUARY 2022

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Foreword

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Climate change is one of humanity's greatest challenges. High temperatures and extreme weather events have dramatically increased. While the world's most vulnerable countries have contributed the least to greenhouse gas (GHG) emissions, they are the most at risk and the least equipped to combat climate change.

Infrastructure development plays a key role in both boosting economic recovery from COVID-19 and transitioning to a green future. A massive global infrastructure investment of $66 trillion is needed in emerging economies before 2030. The Belt and Road Initiative (BRI) offers a new development paradigm by investing in green infrastructure in emerging and developing economies, which is necessary to avoid the irreversible carbon lock-in effect on global climate change. The private sector is particularly important in infrastructure construction as it can bridge the investment gap in order to scale up promising green technologies.

The World Economic Forum's Climate Action Platform is striving to deliver a sustainable future through accelerating climate ambition, action and mobilization. The Forum jointly initiated and has been instrumental in implementing the Green Investment Principles (GIP) for the Belt and Road, which requires members to set ambitious green investment targets and invest in the growing pipeline of BRI green projects. GIP membership has expanded to 41 signatories and 12 supporters from 15 countries and regions, 50% of which have developed, or are developing, policies for the total phasing out of coal.

This insight report considers green investments in Belt and Road countries. It identifies gaps and sustainable development opportunities, and assesses how green investments can tackle the challenges of expanding low-carbon and climate-resilient infrastructure. At the same time, it suggests ways to upscale green investments and technologies with reference to engaging case studies that illustrate specific best practices. Above all, it is a call for knowledge development and further action to protect our planet and build a sustainable tomorrow.

Executive summary

At the end of 2015, the Paris Agreement[1] committed global economies to keep warming to well below 2°C, and governments put forward Nationally Determined Contributions (NDCs) to articulate their greenhouse gas (GHG) emissions targets. But even with the full implementation of the 2030 NDCs, it is estimated that global warming will reach 2.4°C this century.[2] In 2021, the Glasgow Climate Pact saw increased ambition across countries, companies and civil society.

While concerted efforts are required globally, the decarbonization challenge is even more pressing for emerging and developing economies (EMDEs), where demand for energy and mobility is growing. Today's infrastructure investment decisions will lock in their emissions trajectories for decades. Under the International Energy Agency's (IEA's) Net-Zero Emissions (NZE) scenario, EMDEs will require annual investments of $157 billion in solar power, $243 billion in wind power, $26 billion in battery storage, $300 billion in transmission and distribution and $133 billion in electric vehicles (EVs) and charging infrastructure during 2026–2030.[3] To capitalize on the global appetite for green assets, host countries can adopt conducive policies that improve conditions for inward investment.

As the world's largest manufacturer of solar panels, wind turbines, batteries and EVs, China is well placed to help deliver low-carbon technologies to EMDEs as part of its Belt and Road Initiative (BRI), one of the largest outbound infrastructure and investment initiatives in history. As the cost of these technologies falls, they are increasingly preferred for economic as well as environmental reasons. A surge in BRI projects deploying these technologies would be in line with China's September 2021 pledge to "step up support for other developing countries in developing green and low-carbon energy and not build new coal-fired power projects abroad".[4]

The Green Investment Principles (GIP) for the Belt and Road was launched in 2018 to accelerate green investments in the BRI. Its three-year "Vision 2023" action plan calls on signatories to assess and disclose strategies for managing their climate risks, set green investment targets, commit to phasing out carbon-intensive investment and invest in the growing pipeline of green BRI projects.[5]

This insight report highlights the low-carbon **technologies** (Section 2), **financial sector players** and **financial instruments** (Section 3) and the **policy environment** (Section 4) that can and need to come together in advancing the green development of the BRI. It does so by showcasing recent and emerging case studies that are based on interviews with GIP signatories, selected companies and market research and analysis.

TABLE 1 **Key takeaways from this insight report**

1	Many low-carbon technologies, from solar and wind power to battery storage and EVs, are technologically feasible and commercially viable. Deploying these to EMDEs should be an important objective of the BRI. Host countries can provide conducive policy frameworks to support the development of "bankable" projects.
2	Financial institutions are coalescing around frameworks such as the Task Force on Climate-Related Financial Disclosures (TCFD) recommendations to measure, manage and disclose their climate risks. Many leading financial institutions are also setting targets through initiatives such as GIP and the Glasgow Financial Alliance for Net Zero (GFANZ) to reduce their exposure to carbon-intensive sectors. These commitments are signalling clearly that financing will shift from brown (fossil fuel-burning) activities to green activities over time.
3	Green finance mechanisms to support infrastructure financing, such as green bonds or green loans, have grown rapidly over the past decade but remain at a nascent stage. Governments and regulators will continue to work on the alignment of standards and taxonomies while instruments such as blue bonds and transition bonds are emerging to address thematic areas. Significant innovation is still needed, however, to transform sustainable infrastructure into a mainstream asset class – especially for projects in EMDEs.

1 The BRI and the need for low-carbon infrastructure

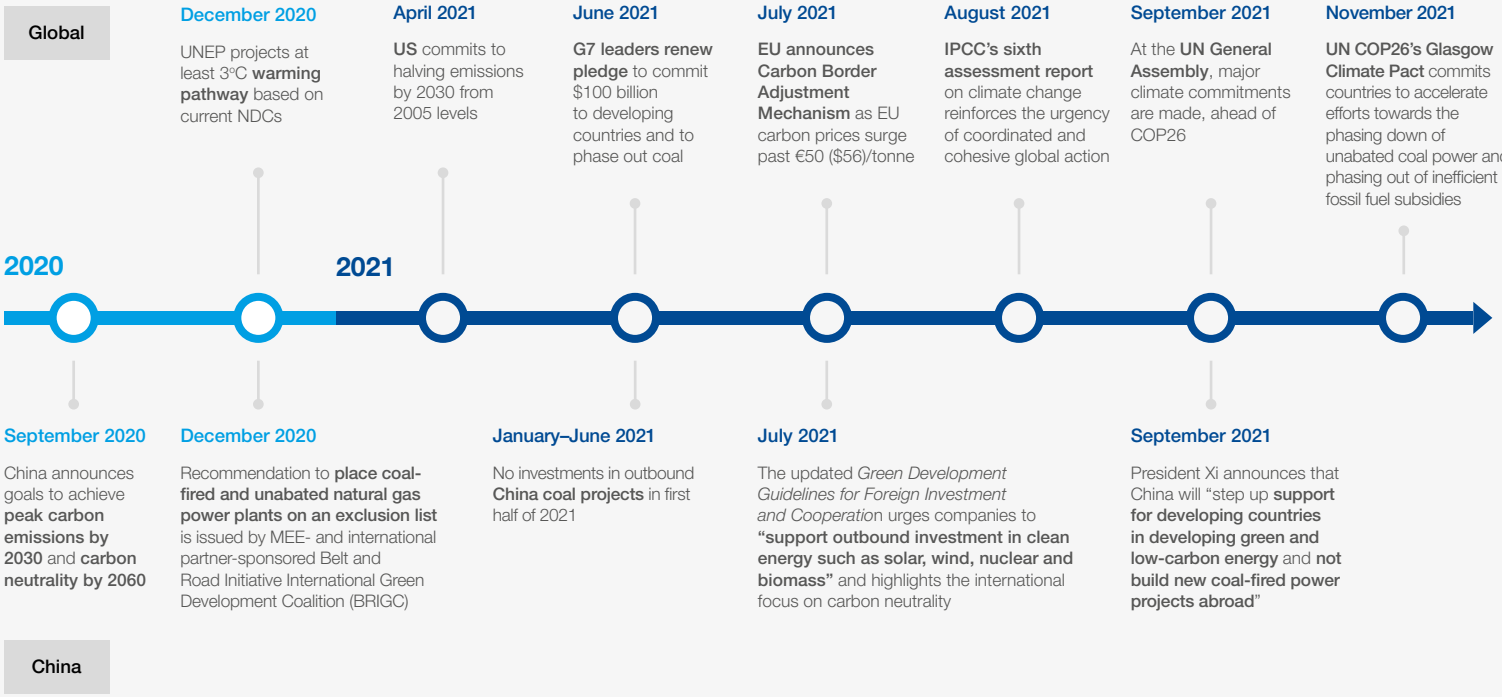
1.1 The global response to climate change is emerging

As the world enters 2022, with major economies working towards a "new normal", the urgency of the climate crisis is growing. Even with the full implementation of the 2030 NDCs, it is estimated that global warming will reach 2.4°C this century over pre-industrial times,[6] far exceeding the Paris Agreement goal of well below 2°C.[7]

The global response to climate change, though much delayed, is emerging. More than 125 countries, representing around 90% of the world's GHG emissions, have announced net-zero or carbon neutrality targets as of November 2021.[8] In the lead-up to and during the UN COP26 conference in Glasgow, more than 100 countries agreed to reduce methane emissions by 30% by 2030,[9] and more than 140 countries committed to work together to halt deforestation by 2030.[10] At the business level, 90 chief executive officers from the Alliance of CEO Climate Leaders committed to reduce annual emissions by more than 1 Gt by 2030 and work side by side with governments to accelerate the race to net zero.[11] More than 1,000 companies globally have committed to science-based targets to reduce emissions.[12] A number of commitments by countries[13] and financial institutions[14] to phase out coal were also announced.

The Glasgow Climate Pact, the key multilateral outcome at COP26, continued to stress the urgency of addressing climate change, including the phasedown of coal, increased financing, and reduction of methane emissions, and encouraged countries to further ratchet up their climate action targets. An agreement on Article 6 on carbon markets will improve predictability for both market and non-market approaches in support of mitigation and adaptation activities.[15]

FIGURE 1 **Recent commitments and policies on climate change**



Source: UNEP, UNFCCC, MEE, MOFCOM, BRIGC, Glasgow Climate Pact, China Daily, public sources

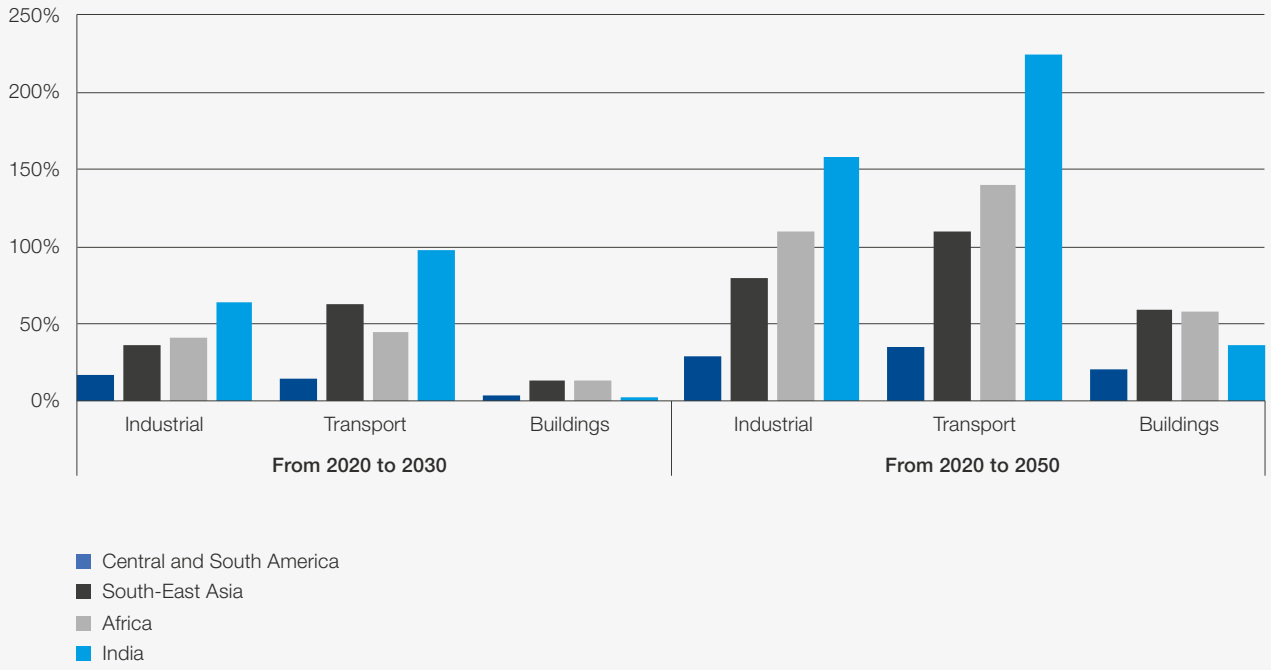
Throughout the document, signatories to the Green Investment Principles for the Belt and Road have been highlighted with **bold** text.

The Green Investment Principles (GIP) for the Belt and Road was launched in 2018 by the China Society for Finance and Banking and the City of London's Green Finance Initiative to accelerate green finance flows to address the infrastructure financing gap and "tackle the great decarbonization challenge for investments along the Belt and Road".[16] It is becoming a global platform for action, with 41 signatories holding or managing combined assets in excess of $49 trillion and providing significant funding to BRI projects.[17] Signatories represent 15 countries and regions in Asia, Europe and Africa, and include commercial, investment and policy banks, insurers, and BRI investors and project developers. In November 2021, the GIP Steering Committee issued a statement of support for COP26 and reaffirmed commitments to support economies along the Belt and Road to develop and implement ambitious climate goals that are aligned with the Paris Agreement towards net-zero emissions.[18]

1.2 Today's infrastructure investments will lock in future emissions pathways

EMDEs face rising energy needs as they grow, industrialize and urbanize. Electricity demand in EMDEs is set to increase at around three times the rate in advanced economies.[19] Between 2020 and 2030, for example, electricity demand is expected to grow by over 50% in South-East Asia and Africa, and by over 60% in India.[20]

FIGURE 2 **Increase in energy consumption by sector in EMDEs**

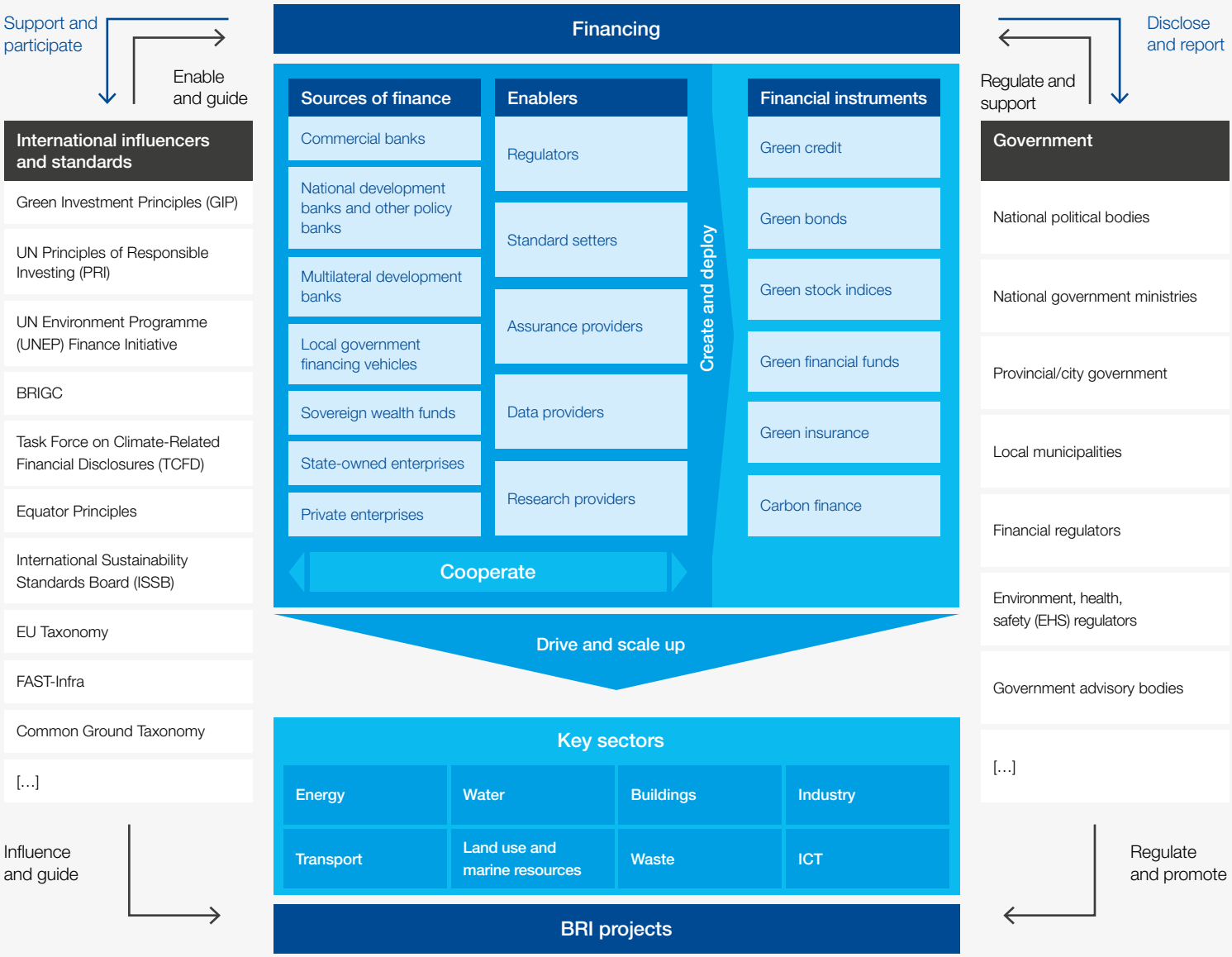


Source: IEA World Energy Outlook 2021, Stated Policies Scenario

Today's infrastructure investment decisions will lock in emissions trajectories for decades and could make or break the world's ability to achieve the Paris Agreement objectives. The coming years need to see the channelling of investments towards wind and solar power, low-carbon transportation and next-generation technologies, such as green hydrogen, sustainable aviation fuel, green steel and green cement, among others.

Against this context, each country will have its own unique circumstances, priorities and resources. A complex ecosystem of public and private stakeholders will be needed to facilitate bankable infrastructure projects, supported by international standards and forward-looking climate policies.

FIGURE 3 | **Infrastructure financing ecosystem**



Source: World Economic Forum and PwC China

BOX 1 | **The BRI is shaping global infrastructure development**

During visits to Kazakhstan and Indonesia in 2013, China's President Xi Jinping introduced the concepts of the Silk Road Economic Belt and the 21st-Century Maritime Silk Road to promote economic development and interregional connectivity.[21] Together, these became known as the Belt and Road Initiative (BRI).

The BRI is open to all countries, with a focus on connecting Asia, Africa and Europe. Objectives include promoting "policy coordination, facilities connectivity, unimpeded trade, financial integration and people-to-people bonds".[22]

By 2021, China had signed Belt and Road memorandums of understanding (MOUs) with about 140 countries across Asia, Africa, Europe, Latin America and Oceania, with a combined population of 3.5 billion and a combined GDP of $17 trillion.[23] China's outbound projects and investments have extended to more than 30 additional countries beyond those with MOUs.[24]

Since the launch of the BRI, about 3,800 outbound projects involving contractors and/or financing from China have been announced, with a value of nearly $4.3 trillion.[25] Sectors include transportation, power, oil and gas, water, real estate, manufacturing, mining and communications. China's state-owned enterprises (SOEs) had been involved with 3,400 BRI projects through to the end of 2020.[26]

2 Delivering low-carbon infrastructure and technologies through the BRI

The GIP's Vision 2023 action plan requires signatories to set ambitious green investment targets and to invest in the growing pipeline of BRI green projects.[27]

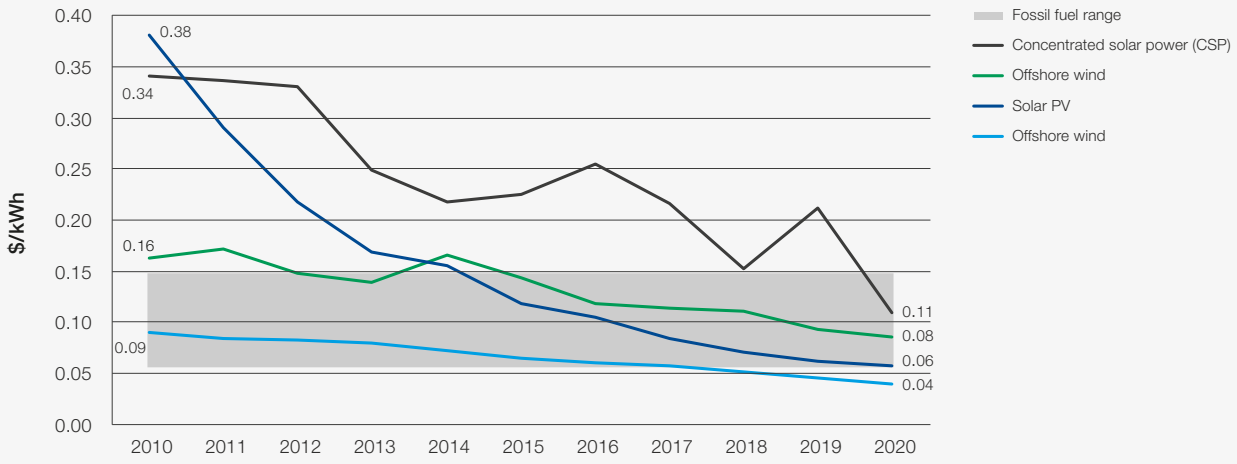
This section highlights a number of low-carbon technologies that have been scaled up in China's domestic market and could play a role in advancing the green development of the BRI. It takes an expansive view of the BRI to include a broad range of China's outbound projects and investments, comprising not only physical infrastructure but also cross-border investments in manufacturing and supply chains. The case studies provide illustrations of the BRI's potential to contribute to the low-carbon transition, as well as the essential supporting roles played by financial institutions.

2.1 Low-carbon energy technologies

Solar and wind power

As the levelized cost of electricity (LCOE) for solar and wind is falling to levels at or below that of electricity produced using fossil fuels,[28] these low-carbon technologies are increasingly preferred for economic as well as environmental reasons. In the IEA's NZE scenario, solar and wind power capacity are expected to increase 20-fold and 11-fold, respectively, by 2050.[29]

FIGURE 4 **Global weighted-average LCOE for wind and solar**



Source: IRENA, Renewable Power Generation Costs in 2020

With considerable manufacturing capacity and domestic engineering and construction experience, leading Chinese companies are well placed to support the global energy transition, domestically and through international collaborations such as the BRI. Domestically, China has installed 36% of the world's total solar photovoltaic (PV) capacity and 39% of the world's total wind power capacity. Of the new concentrated solar power (CSP) capacity installed globally during 2018–2020, one-third was in China.[30] China's solar PV sector supplies about three-quarters of global production[31] and its leading solar PV manufacturers are expanding their overseas production to meet the growing demand from foreign markets.

BOX 2 **Case study: JinkoSolar expands South-East Asia solar PV supply chain**

± Outbound investments in solar PV manufacturing bring economic growth, jobs and innovation[32]

To better meet the world's growing demand for solar power, JinkoSolar has been building up its South-East Asia PV manufacturing and R&D capabilities. These projects reflect JinkoSolar's BRI-aligned strategy of moving beyond global sales to global investment and manufacturing. These investments not only accelerate the global low-carbon transition, they also support economic growth and the ongoing development of local supply chains and skilled workforces.

In 2015, JinkoSolar opened its plant in Penang, Malaysia. In terms of both investment and production value, it has become the largest overseas manufacturing base of any Chinese

PV company. Annual production capacity has grown from 500 MW of PV cells and 450 MW of PV modules to 6 GW each of PV cells and PV modules by 2021, with an annual production value of about $1 billion. The plant has more than 6,500 employees, of whom 80% are local hires.

JinkoSolar has invested about $500 million in its Malaysia production facility, including $30 million financed by the **Export-Import Bank of China** in 2016.

In 2016, JinkoSolar invested more than $2 million to set up its Penang R&D centre, the largest PV R&D centre outside of China. It employs 317 staff and engages in module development, testing and trials.

In 2021, the company began building a $500 million 7 GW monocrystalline ingot and wafer manufacturing facility in Viet Nam, establishing the upstream segment of its overseas supply chain. It will supply JinkoSolar's overseas cell and module factories.

CSP can use its thermal storage capacity to dispatch electricity day or night, enabling networks to increase their share of variable renewable energy (VRE), e.g. solar and wind. CSP is still in the early stages of scaling up, with global installed capacity less than 1% that of solar PV.[33]

BOX 3

Case study: Silk Road Fund invests in renewable power assets across Africa and the Middle East

± A record-breaking hybrid CSP/PV project will deliver 24-hour clean electricity

Dubai's Noor Energy I is a $4.3 billion 950 MW hybrid CSP/PV project. The CSP complex includes a 100 MW tower with 15 hours of molten salt thermal storage and three 200 MW parabolic trough plants with 12.5 hours of thermal storage. The 250 MW PV plant will meet demand during daylight hours and CSP will deliver power between 4.00 pm and 10.00 am.[34]

Noor I will be the world's largest single-site renewable project in terms of investment value and the largest CSP complex in terms of capacity.[35] The CSP LCOE ($0.073/kWh) and the solar PV LCOE ($0.024/kWh) were among the world's lowest when the contract was awarded in 2017.[36] Extending the PPA to 35 years (compared to the standard 20–25 years) helped reduce the CSP LCOE by an estimated $0.02/kWh.[37]

China's **Silk Road Fund** holds a 24% share of the project and Shanghai Electric serves as the engineering, procurement and construction (EPC) contractor. Dubai Electricity and Water Authority (DEWA) and ACWA Power hold 51% and 25%, respectively. CSP projects generally rely on concessional lending,[38] but Noor I obtained financing from 10 commercial banks, including the **Agricultural Bank of China**, **Bank of China**, **First Abu Dhabi Bank**, **ICBC**, **Natixis** and **Standard Chartered**.[39]

The Silk Road Fund also acquired a 49% share of ACWA Power Renewable Energy Holding, which will own 1,668 MW of wind and solar assets in South Africa, Morocco, the UAE, Jordan and Egypt.[40]

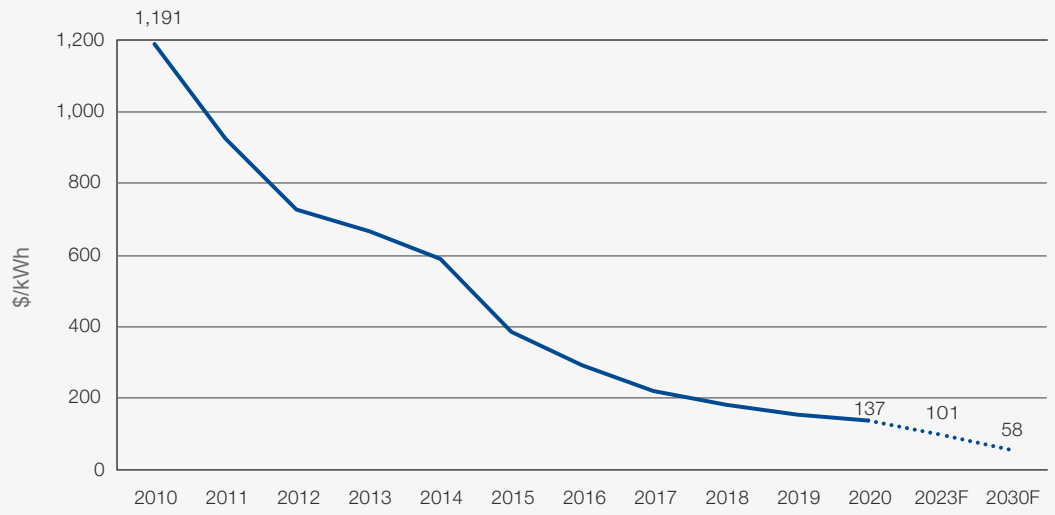
The Silk Road Fund was established in 2014 with capital from the State Administration of Foreign Exchange, China Investment Corporation, China Development Bank and the Export-Import Bank of China to provide investment and financing for trade and economic cooperation and connectivity under the framework of the BRI.[41]

Battery storage

Utility-scale battery storage can help ensure grid stability by compensating for VRE's intermittency. As the share of renewable energy in the power supply grows, the scaling up of energy storage systems is becoming a critical area for infrastructure investment. Global stationary battery storage is expected to grow from 17 GW/34 GWh in 2020 to 358 GW/1028 GWh by 2030.[42]

Battery pack prices fell 89% during 2010–2020 to $137/kWh and are expected to reach $58/kWh by 2030.[43] China accounted for 77% of global manufacturing capacity in 2020,[44] and its battery producers are moving beyond exports to investing in overseas manufacturing.[45,46]

FIGURE 5 | **Lithium-ion battery prices (volume-weighted average)**



Source: Bloomberg

BOX 4 | **Case study: Huaneng finances and builds Europe's largest battery storage project**

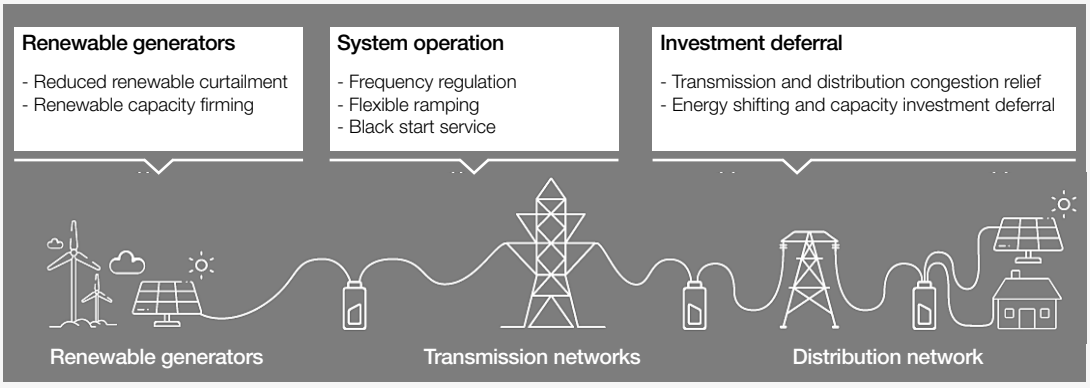
± Enabling the network to integrate more wind and solar PV by managing variability and intermittency

Utility-scale battery storage improves the ability of power grids to manage the instability associated with VRE, facilitating the integration of more wind and solar PV.

The UK's 100 MW/100 MWh Minety Battery Storage Project, Europe's largest, came online in July 2021. An additional 50 MW/50 MWh of capacity is being added. UK regulators aim to create favourable market conditions for green energy to achieve the country's 2050 net-zero target. The UK's VRE is growing quickly: wind and solar PV supplied about 29% of its electricity in 2020, up from 14% in 2015.[47]

China Huaneng Group was the main contractor and financed the project along with China's CNIC, a sovereign wealth fund.[48]

FIGURE 6 | **Benefits of utility-scale batteries**



Source: IRENA, Utility-scale Batteries Innovation Landscape Brief

Utility-scale batteries can accumulate energy when VRE output exceeds net demand, then release it to the grid when demand exceeds supply. This time-shifting capability reduces both curtailment and the need for gas-fired peaker plants (i.e. plants that run only during periods of high net demand).

With response times measured in milliseconds, batteries can provide frequency regulation, flexible ramping and other ancillary services. They can be deployed to defer investment in new transmission and distribution capacity by relieving congestion or by energy shifting during peak demand periods.

Traditional regulations treat generators, load and grids as three separate entities, but battery storage overlaps the functionalities of all three. Profitable investment in utility-scale battery storage requires a regulatory framework that enables monetization of the full range of services and sets rules for financial flows when batteries absorb energy from the grid; otherwise, government mandates or incentives may be necessary.

2.2 Low-carbon transportation technologies

In the IEA's NZE scenario, EVs account for 100% of new car sales worldwide by 2035. Chinese companies have been involved in manufacturing and putting into operation the world's largest fleet of EVs, including 98% of the world's 600,000 e-buses.[49] E-buses are being deployed in many countries to decarbonize metropolitan bus fleets.

Rail transport is the most energy-efficient and least carbon-intensive way to move people and is second only to shipping for carrying goods.[50]

In the IEA's NZE scenario, the shift from regional flights to high-speed rail would necessitate building around 170,000 kilometres of new track globally by 2050 (a tripling of 2020 levels).[51] There are several examples of electrified rail infrastructure projects in the BRI. The Addis Ababa–Djibouti railway was the first electrified standard-gauge railway in Africa.[52] Chinese construction companies are currently involved with BRI rail projects in South-East Asia, South Asia and Africa.[53]

BOX 5

Case study: Santiago's innovative public-private partnership (PPP) financing structure to electrify its bus fleet

± Electrifying Chile's public transport infrastructure to help achieve carbon neutrality by 2050

Santiago plans to fully electrify its fleet of nearly 7,000 buses by 2035.[54] The total cost of ownership for e-buses, measured as the cost per kilometre driven, has already reached parity with diesel buses after accounting for e-buses' longer service life and lower energy and maintenance costs. But e-buses can require two to three times as much upfront investment.[55]

To overcome this challenge and attract private capital, Santiago introduced a financing structure already common in the airline industry by unbundling fleet ownership and operation. Private-sector fleet owners provide buses and charging stations to operators, while the leases are paid by the government. The manufacturer is responsible for maintenance and ensuring bus availability.[56]

Bus fares are collected centrally by the government via prepaid transit cards.

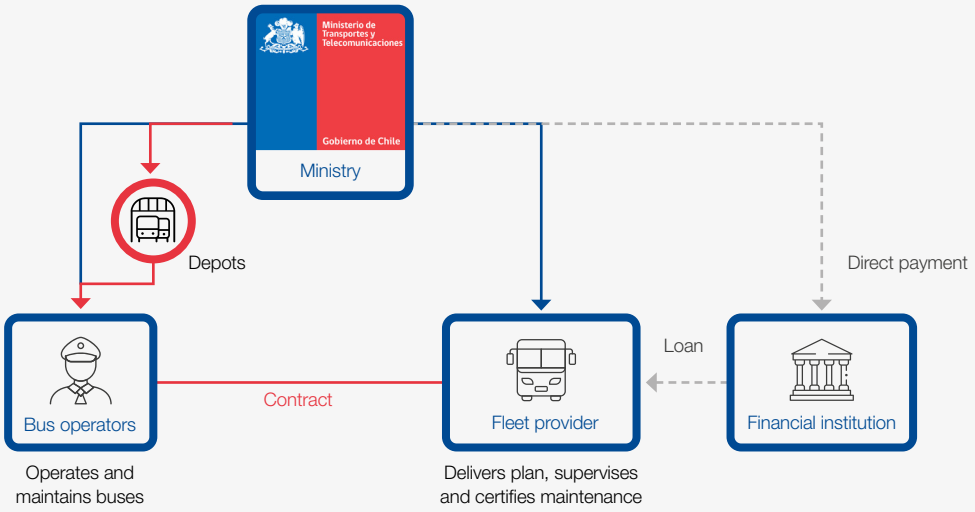
This structure shields lenders from technology risk, demand risk and private operators' credit risk.[57]

As part of this project, **Société Générale** led a $129.5 million green financing for 433 e-buses and the associated charging infrastructure. The buses are manufactured by China's BYD, operated by Metbus (a private operator) and jointly owned by AMP Capital and Enel X.[58] BYD is responsible for certain areas of ongoing maintenance such as battery packs and drive trains.[59]

To achieve true zero-emissions mobility, fossil fuel power must be phased out. Chile has committed to fully decarbonizing its grid by 2040 and achieving carbon neutrality by 2050.[60]

FIGURE 7

Santiago's unbundled e-bus PPP model



Source: C40 Knowledge Hub, "How We Made E-bus a Reality in Santiago, Chile"

2.3 Emerging technologies and innovation

To support low-carbon and sustainable development in EMDEs, new and emerging technologies and infrastructure will be needed. These include the deployment of new clean energy sources, greater resource efficiency and improved circular economy practices in industrial processes, enhanced sustainable sourcing practices and innovative approaches to forestry and agriculture.

Green hydrogen production and distribution

Green hydrogen could potentially address difficult-to-decarbonize sectors such as maritime shipping, long-distance trucking, non-electrified rail transport and industrial processes that require extremely high temperatures. If China succeeds in scaling up and commercializing the relevant technologies, green hydrogen could become an important part of the BRI.

China's 14th Five-Year Plan includes hydrogen as one of several industries for which it will organize incubation and acceleration plans, as well as demonstration projects. More than one-third of China's 96 centrally administered SOEs[61] are said to have plans for various stages of the hydrogen value chain.[62]

Resource-efficient smart industrial parks

China has been advancing environmentally friendly technologies and practices for industrial parks that could be applied in BRI projects. The most notable example is the Suzhou Industrial Park (SIP),[63] which accommodates 25,000 companies and its GDP exceeds $36 billion.

Clean energy accounts for 75% of the SIP's energy consumption. Its distributed clean energy microgrid provides up to 10% of its energy. With its central organic waste-treatment plant, SIP maximizes reuse of by-products such as heat, water, biological waste and sludge by aggregating wastes from one set of industries and transforming them into organic fertilizer, biogas and biodiesel oil for another set of industries. These operations produce enough biogas and other fuels to offset 8,000 tonnes of annual CO_2 emissions. Some 94% of industrial water is reused.

Agriculture, forestry and desert land reclamation

Climate change is accelerating the degradation of ecosystems and agricultural land, and there is increasing awareness of biodiversity's importance to both the economy and our own survival. At the same time, deforestation increases CO_2 emissions.

China's leading role in the cross-border supply chains of the global manufacturing and food sectors provides opportunities to promote climate- and biodiversity-friendly practices in agriculture and forestry via the BRI. Traceability and supply-chain visibility can enable buyers to choose products made from sustainably sourced raw materials and facilitate price discovery for green premiums (i.e. determine the additional cost that customers are willing to pay for green materials and products).

Countries in Africa and South Asia have explored potential cooperation with China to apply the "Kubuqi model" for reclaiming desert lands.[64] Such projects could become part of the BRI in the coming years. This approach for desert reclamation, afforestation and economic development was pioneered in the Kubuqi desert of China's Inner Mongolia and has been promoted by the UNEP as an exemplary PPP approach to fighting desertification.[65]

BOX 6 | **Case study: digital trading platform for sustainable natural rubber**

± Traceability and supply chain visibility could protect tropical forests

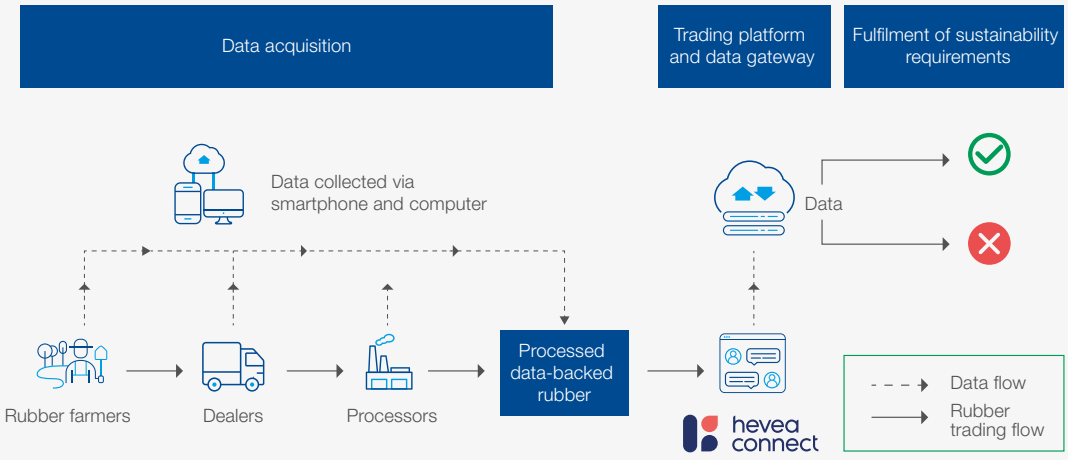
Natural rubber production grew by 90% between 2000 and 2020,[66] with the tyre industry accounting for 75% of consumption.[67] With the number of the world's cars projected to double between 2016 and 2040,[68] rubber plantations will surely continue to expand. If not undertaken responsibly, this growth could accelerate deforestation and the associated climate- and biodiversity-related risks.

Traceability and supply-chain visibility in the natural rubber supply chain could be important tools for identifying and mitigating climate and other environmental, social and governance (ESG) risks. However, a cross-border value chain and a supplier base comprised of more than 6 million farmers make traceability difficult.[69] About three-quarters of the world's natural rubber comes from South-East Asia, while China accounts for about 40% of global consumption.[70]

In 2019, Halcyon Agri (a subsidiary of Sinochem), **DBS** and Itochu collaborated to create Hevea Connect, a digital marketplace for sustainable natural rubber. The platform's vision is to encourage participants in the natural rubber market to make ESG a top priority and enable them to be rewarded accordingly. The platform will provide customers with access to key information on the products they buy, such as the raw materials' origin, risk status (e.g. deforestation risk), product quality, energy use and other ESG-related attributes. Using this platform, customers who value ESG aspects will be able to reward suppliers that follow sustainable practices.[71]

Singapore Exchange invested in Hevea Connect in March 2021, demonstrating confidence in the platform's future development. [72]

FIGURE 8 **Hevea Connect natural rubber digital trading platform design**



Source: DBS

3 Financing the low-carbon transition

Financial institutions have a vital role to play in shifting investment flows from brown to green, facilitating the low-carbon transition. On one hand, this requires deft management of transition risks as the use of fossil fuels declines over time. On the other hand, it will require the development of innovative financing mechanisms and intermediary channels to support the build-out of low-carbon infrastructure.

The Green Investment Principles (GIP) for the Belt and Road

The GIP emphasizes responsible investment practices along the Belt and Road. Its three-year action plan, Vision 2023, depends on signatories taking five key steps:[73]

GIP 1	Assess their exposure to climate and environmental risks
GIP 2	Disclose their strategies for managing these risks in alignment with the TCFD recommendations
GIP 3	Commit to setting green investment targets and phasing out carbon-intensive investment
GIP 4	Invest in the growing pipeline of green projects along the Belt and Road
GIP 5	Work together to grow the overall capability and reach of the GIP

3.1 Assessing and disclosing financial institutions' climate-related transition risks

GIP 1
GIP 2

The recommendations of the Task Force on Climate-Related Financial Disclosures (TCFD) were first published in 2017, with the latest update issued in October 2021. They are structured around four thematic areas that represent core elements of how companies operate: governance, strategy, risk management, and metrics and targets.[74] They require companies to assess and disclose physical risks resulting from global temperature rise, as well as the transition risks associated with moving to a low-carbon economy.

FIGURE 9 **Core pillars of the TCFD-recommended climate-related financial disclosures**

Governance	Strategy	Risk management	Metrics and targets
The organization's governance around climate-related risks and opportunities.	The actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy and financial planning where such information is material.	How the organization identifies, assesses and manages climate-related risks.	The metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material.

Source: TCFD

Five GIP signatories – **BNP Paribas**, **HSBC**, **ICBC**, **Swiss Re** and **UBS** – were part of the 32-member task force; about 20 GIP signatories have signed on as TCFD supporters.

One objective of the TCFD is to "enable stakeholders to understand better the concentrations of carbon-related assets in the financial sector and the financial system's exposure to climate-related risks".[75] The TCFD recommends that banks describe significant concentrations of credit exposure to carbon-related assets in their financial disclosures. The TCFD's October 2021 update expands the definition of carbon-related assets beyond the energy sector to include transportation, materials and buildings, and agriculture, food and forest products,[76] signalling a trend towards increasing breadth and depth in climate-related portfolio analysis and reporting.

The TCFD's October 2021 update also requires the broader financial sector to disclose the extent to which their activities, such as lending, insurance underwriting, investment and asset management, are aligned with a well below 2°C climate scenario (sometimes known as portfolio alignment).[77]

BOX 7

Portfolio alignment with climate scenarios

To maintain alignment of their portfolios with the goals of the Paris Agreement or the Glasgow Climate Pact, financial institutions will have to reduce their financed GHG emissions within a defined budget over time.

Portfolio alignment can be improved by financing fewer carbon-intensive activities (e.g. fossil fuel power), financing more low-carbon activities (e.g. renewable energy projects) or supporting and accompanying clients' transitions from carbon-intensive activities to low-carbon activities (e.g. from fossil fuels to renewables).

Assessing portfolio alignment involves three conceptual steps:[78]

1. Translating scenario-based carbon budgets into normative benchmarks entails selecting a forward-looking climate scenario that fits with a given climate goal, then extracting information (e.g. absolute emissions, emissions intensity or production capacity) on industry and/or regional emissions against which counterparty behaviour can be measured.

2. Assessing counterparty-level alignment involves using a combination of forward-looking and historical data to project the likely emissions performance of a given counterparty over time, and then determining the extent to which that projection diverges from the normative benchmark.

3. Assessing portfolio-level alignment entails weighting counterparty scores according to their contribution to a given portfolio, and then aggregating those scores into a sub-portfolio (e.g. by sector) or overall portfolio score.

Bank of China

> **The Bank of China attaches great importance to the development of green finance. We have formulated a 14th Five-Year Plan for Green Finance and we strive to become the bank of choice for green financial services.**
>
> **To ensure that green finance receives strong support and guidance from the Board of Directors and the highest levels of the organization, the Bank of China has set up a Green Finance and Industry Planning and Development Steering Group at the group level, headed by the Chairman, and a Green Finance Committee, chaired by the President, under the Executive Committee. The bank has issued the Bank of China Green Finance 14th Five-Year Plan and the Bank of China Action Plan for Supporting the Peak Carbon and Carbon Neutrality Targets, clearly setting out green finance as a part of the bank's strategy.**
>
> **The bank has strengthened the identification, analysis, mitigation, control and reporting of environmental and climate risks, and has incorporated environmental and climate risks into the Bank's comprehensive risk management system. Environmental and climate risk stress testing has been conducted on key industries. In addition, the bank has initiated the measurement of its own operational carbon footprint. Based on the mapping of our emissions, we are developing an operational carbon footprint management programme.**
>
> **Since the launch of the Belt and Road Initiative, the Bank of China has used its integrated global network to actively build a financial artery along the 'Belt and Road'. As of the end of 2020, the Bank of China's overseas institutions covered 61 countries and regions.**
>
> **The Bank of China has set a clear strategy to gradually reduce the share of investment in and financing of coal- and carbon-intensive industries in its asset portfolio, especially for new coal-mining and coal-power projects, while increasing support for decarbonization technologies in the Belt and Road Initiative to support the achievement of carbon neutrality targets in Belt and Road countries.**
>
> Liu Shiwei, Chief Risk Manager of Credit Administration Department, Bank of China

3.2 Shifting finance from brown to green

GIP 3

Net-zero commitments and phasing out coal investments

In line with the global movement towards net-zero target-setting, by November 2021, 12 GIP signatories had committed to transition their relevant lending, investment and/or insurance portfolios to net-zero CO_2 emissions by 2050, consistent with a maximum temperature rise of 1.5°C above pre-industrial levels, as part of UN-convened initiatives associated with the Glasgow Financial Alliance for Net Zero (GFANZ).

FIGURE 10 **GIP signatories committed to net-zero GHG emissions for relevant portfolios**

Net Zero Banking Alliance

BNP Paribas
Commerzbank
Crédit Agricole-CIB
DBS
Deutsche Bank
First Abu Dhabi Bank
HSBC
Mizuho
Société Générale
Standard Chartered Bank
UBS Group

Net Zero Asset Owners Alliance

BNP Paribas Cardif
Crédit Agricole Assurances
Société Générale Assurances
Swiss Re

Net Zero Insurance Alliance

Swiss Re Group

As coal is the most carbon-intensive energy source, tackling its use is at the core of climate action. Many GIP signatories have focused their immediate climate action on coal-related activities.

- Most of the GIP's GFANZ initiative signatories, as well as **Natixis**, have pledged to phase out credit, insurance and/or investment exposure to coal-related activities in OECD countries by 2030 and worldwide by 2040.
- **Ping An** set a target date of 2035 for divesting unlisted investments in thermal coal mining and unabated coal power projects and exiting listed securities from companies with over 30% coal-related revenue.[79]
- **Bank of China** announced that it will no longer provide financing for new coal-mining and coal-fired power projects overseas.[80]

These moves are not just about responsible investment and lending, but also about managing risks. In the IEA's NZE scenario, total energy supplied by coal will decline by 89% and supply only 3% of global demand by 2050.[81] Decreasing demand, the phase-out of fossil fuel subsidies, the introduction of carbon pricing, prioritized dispatching of electricity from renewables and climate change litigation risks could affect the profitability of coal-related businesses and their ability to service debt.

Nevertheless, coal phase-out plans need to be developed and implemented within the context of the national climate policies and the energy mix of financial institutions' relevant jurisdictions. For example, countries such as China and Indonesia rely on coal for around 60% of their electricity, while about 85% of South Africa's electricity comes from coal. In contrast, Japan and Germany rely on coal for 20–30% of their electricity, and power grids in France and Switzerland are broadly coal-free.[82] With different starting points and stages of economic development, the transition pathway away from coal will inevitably vary from country to country. Reliable and affordable electricity is vital to economic activity and livelihoods; a "just transition" entails expanding access to affordable, reliable energy, while at the same time reducing reliance on fossil fuels.

In this context, many financial institutions with coal phase-out targets are taking a two-pronged approach. First, they generally refuse to accept new coal-related clients or projects. Second, for existing clients, an engagement-focused approach is typically preferred, with an emphasis on supporting those clients during their transitions. The acceptable levels of coal-related activities are reduced over time. This approach is complementary to government net-zero or carbon neutrality commitments that provide clear long-term policy direction, giving companies time to plan orderly transitions to low-carbon activities.

BOX 8 | **Case study: DBS to exit coal and support clients' low-carbon transitions**

± DBS commits to exit thermal coal by 2039 and implements the world's first bank-issued sustainable and transition finance framework and taxonomy

DBS has committed to exit thermal coal by 2039. This will be no simple task – the bank's core markets include China, India and Indonesia, three of the world's largest coal-producing countries, where coal accounts for over 60% of electricity production.[83]

The commitment will be achieved through specific measures: [84]

- From April 2021, DBS ceased onboarding new customers who derive more than 25% of their revenue from thermal coal. The threshold will be lowered over time.
- From January 2026, DBS will stop financing customers who derive more than 50% of their revenue from thermal coal (except for their non-coal or renewable energy activities.) These conditions will be reflected in legally binding documentation. The bank will also stop general purpose financing, which can be fungible. The threshold will be lowered over time.

Not all companies can decarbonize immediately, and it would not be responsible to immediately dismiss clients who are still part of the mainstream economy. To engage with and support clients establishing their transition strategies, DBS developed the world's first bank-issued sustainable and transition finance framework and taxonomy.[85]

"The taxonomy helps DBS take a prudent, scientific approach to evaluate the transitional qualities of economic activities and whether or not clients have a strategy to adapt their businesses to achieve the ambition of the Paris agreement," said Yulanda Chung, Head of Sustainability, Institutional Banking Group, DBS Bank.

It outlines the way DBS manages transactions that are classified as "green", "transition" or contributing to the UN Sustainable Development Goals (SDGs).[86]

- The "green" taxonomy includes activities aligned with the EU Taxonomy for environmentally sustainable activities, the Climate Bonds Initiative (CBI) Taxonomy, the International Capital Market Association (ICMA) Green Bond Principles and the Loan Market Association (LMA) Green Loan Principles.
- The "transition" category considers an activity's degree of decarbonization compared to industry norms. In line with the principle of the EU Taxonomy, it recognizes that "the nature of transition in each country is influenced by evolution of the entire system, including local strategies and policies". It refers to the IEA's Sustainable Development Scenario as a guide for different regions of the world to evaluate when emissions need to peak and subsequently fall rapidly. For this category, DBS evaluates each transaction or service on a case-by-case basis.
- The taxonomy serves to make potential trade-offs explicit; for example, "where an activity that contributes to the UN SDGs may not be aligned with the Paris Agreement".
- For corporate-level financing with unspecified uses, companies must have demonstrated recent actions towards exiting or decommissioning carbon-intensive assets, decreasing their share of revenue from carbon-intensive activities over time, or demonstrate an overall reduction in GHG emission intensity with independent verification.

Managing exposure to oil and gas

While coal has been a primary focus, managing down other fossil fuel emissions is also critical. Oil and gas account for about 30% and 21%, respectively, of global CO_2 emissions from energy use.[87] Many GIP signatories have begun to reduce their exposure to certain oil and gas activities, e.g. the most carbon-intensive producers or activities involving hydraulic fracking, oil sands or Arctic regions.

BOX 9 | **Case study: reducing insurance and investment exposure to the most carbon-intensive oil and gas production**

± Swiss Re begins shifting away from the most carbon-intensive producers[88]

In 2018, Swiss Re established its thermal coal policy, which aims to achieve total phase-out of thermal coal-related re/insurance in OECD countries by 2030 and worldwide by 2040.

In 2021, the insurer began shifting away from the world's most carbon-intensive oil and gas production. Based on value-chain analysis of emissions associated with global production, the world's producers were ranked by CO_2 intensity per unit of oil or gas produced (kg CO_2/boe).[89] The results showed that a small proportion of companies produce hydrocarbons with a disproportionately high CO_2 intensity.

Beginning in July 2021, Swiss Re stopped providing individual insurance covers for those oil and gas companies that are responsible for the world's 5% most carbon-intensive oil and gas production. From July 2023, this policy will extend to the top 10%. On the asset side of its business, Swiss Re began avoiding investments in the sector's 10% most carbon-intensive producers.

3.3 Investing in and scaling up green finance for low-carbon infrastructure

GIP 4

Under the IEA's NZE scenario, EMDEs will require annual investments of $157 billion in solar power, $243 billion in wind power, $26 billion in battery storage, $300 billion in transmission and distribution, and $133 billion in EVs and EV chargers during 2026–2030. These average annual investments are more than 500% higher than those for 2016–2020 in these sectors.[90]

Green bonds and green loans will be important intermediary channels for such investments. By the end of 2020, more than $1.1 trillion worth of labelled green bonds had been issued by more than 1,400 issuers in 71 countries and 42 currencies,[91] but they still account for only about 1% of the $120 trillion global bond market.[92] Forecasts suggest that growth will accelerate, with annual issuance expected to grow from $293 billion in 2020 to $1 trillion in 2022.[93] Labelled green loans have also been showing double-digit growth in recent years, seeing issuance of $80 billion in 2020.[94]

While the US and Europe continue to lead in green bonds and labelled green loans, Chinese issuance has been growing. China's outstanding green loans, defined as loans to sectors designated as green by the China Banking and Insurance Regulatory Commission (CBIRC), are close to $2.2 trillion and outstanding green bonds are close to $156 billion, according to the People's Bank of China (PBoC).[95,96] By the end of November 2021, **ICBC** had issued more than $13.06 billion equivalent of offshore green bonds.[97] During the first half of 2021, **China Development Bank** was the world's seventh largest issuer, with $3.1 billion of green bonds.[98]

Chinese regulators have actively promoted green finance. Published in early 2020, *The Guiding Opinions of the CBIRC on Promoting the High-quality Development of the Banking and Insurance Industry* called for active development of green bonds, green credit asset-backed securities, green development funds and new green financial products such as carbon finance, climate bonds, climate insurance and blue bonds. In April 2021, the PBOC published the *Green Bond Endorsed Projects Catalogue* (2021 edition). Carbon-intensive projects such as cleaner use of coal are no longer supported and the principle of "do no significant harm" is respected.[99]

Major financial centres and economies, including the EU, UK, Japan and Singapore, are actively promoting their domestic green finance markets. Alignment and comparability across international markets or taxonomies can be challenging for investors. In November 2021, the International Platform on Sustainable Finance (IPSF) published *Common Ground Taxonomy – Climate Change Mitigation*, which identified areas of commonality and differences between the EU's and China's taxonomies.[100] Guides such as this help potential cross-border green bond investors to navigate the rapidly evolving regulatory landscapes.

BOX 10 | **Case study: Finance to Accelerate the Sustainable Transition–Infrastructure (FAST-Infra)**

± Transforming sustainable infrastructure into a deep and liquid mainstream asset class

At COP26, FAST-Infra[101] launched its Sustainable Infrastructure (SI) label. It aims to provide consistency regarding the quality and sustainability of assets in the market, drawing in more institutional investors at the post-construction phase and scaling up private financing for projects in emerging markets.

The label will facilitate due diligence processes and structuring of investments for sustainable infrastructure assets, reducing transaction costs. Information on labelled assets will be available via a data repository, providing a transparent platform to disclose, report and measure performance of sustainable infrastructure assets over time. It will promote consistent reporting under frameworks such as TCFD.

SI-labelled projects must satisfy 14 baseline criteria under four dimensions: environmental, social, governance and climate resilience, and should provide a statement on the project's life-cycle contribution to the transition towards net-zero emissions. Assets should demonstrate compliance with minimum safeguards and risk-management requirements and periodically report (as appropriate) on sustainability performance.

GIP signatories **BNP Paribas** and **HSBC** are represented on the FAST-Infra leadership team.

BOX 11 | **Case study: blue bonds promote clean oceans and offshore wind power**

± Thematic bond demonstrates innovation in green finance

Blue bonds are a thematic subset of green bonds. The **Bank of China** issued $942.5 million of blue bonds in September 2020, consisting of a three-year $500 million bond and a two-year RMB 3 billion bond, respectively issued by the bank's Paris branch and its Macau branch. This was Asia's first blue bond and the first issued by a commercial bank.[102] It is aligned with ICMA Green Bond Principles, and the proceeds will be used to finance marine-related sewage treatment projects and offshore wind projects located in China, the UK and France.[103]

China's **Industrial Bank** issued a $450 million blue bond in November 2021, focusing on marine renewable energy, sewage treatment, shipping and port pollution prevention, as well as urban flood control in coastal areas.[104]

Crédit Agricole provided green and sustainability structuring advisory for both of these blue bonds.

"These inaugural blue bonds not only set a new benchmark for the market, but also send a message on the importance of protecting our precious ocean and marine resources. The trending blue bond label is bound to help channel much-needed funding and attention for the protection of our nature and biodiversity through promoting a sustainable blue economy," said Nicolas Vix, President of Crédit Agricole China.

4 Creating an enabling environment to attract green BRI investments

4.1 National policy changes to foster investment in green energy

To capitalize on the increasing global appetite for green investments, host countries need to provide a conducive policy and regulatory framework, and improve the conditions that help make projects "bankable". Low-carbon energy and transportation infrastructure is increasingly competitive with fossil fuel alternatives, but usually entails higher upfront investment costs that are offset over time by lower operating and fuel expenses. Thus, financing costs are often the decisive success factor for green infrastructure investments. But for EMDEs, debt financing costs can be 700–1,500 basis points[105] higher than those in the US and Europe.[106] Project-specific risks related to policy, currency, curtailment, etc. can further increase the cost of finance.

To manage these risks, a supportive enabling environment is needed, which includes effective national policies on climate change and green finance, supplemented by sectoral legal and regulatory frameworks in energy, transport and other relevant sectors.

Each country has a unique set of political, financial, economic and natural resource conditions. There is no single set of measures or recommendations that can be applied to every market. The Viet Nam, Kazakhstan and Morocco case studies below illustrate how these various elements interact to influence low-carbon infrastructure outcomes.

FIGURE 11 **National and sectoral policies to foster domestic and inward infrastructure investments**

National policy framework	National climate change targets	– Set national net-zero or GHG emissions commitments that set expectations for the public and private sectors on the level of ambition, time frame and major policy levers.
	Energy transition strategy	– Develop an integrated energy transition strategy that takes a cross-agency approach and goes beyond power generation to address issues such as grid infrastructure modernization as well as major economic sectors , e.g. transportation and industry. – Provide clear targets and plans, e.g. on renewable energy growth and coal plant decommissioning, to demonstrate commitment and support long-term planning.
	Market mechanisms (carbon pricing and energy tariffs)	– Develop carbon-pricing mechanisms, such as carbon taxes or emissions trading systems, to provide clear price signals. – Phase out inefficient fossil fuel subsidies or inefficient tariffs while promoting universal access to energy. – Introduce appropriate incentives or feed-in-tariffs to support new markets and innovations, e.g. near-commercial renewable energy sources.
	Green finance strategy and policies	– Promote local development of green finance markets, including increased awareness, skills development and local green finance products. – Encourage alignment with global green finance developments (e.g. taxonomies, ESG safeguards and principles) to develop trust, credibility and interoperability, expanding the international pool of potential investors.
Sector-level regulations and policies	Procurement and regulatory frameworks	– Provide clear visibility into green energy and transport procurement pipelines, with transparency on procurement mechanisms and revenue models. – Develop implementation rules for instruments such as tariffs, subsidies, renewable energy certificates (RECs) and long-term power purchase agreements (PPAs). – Reduce risks to project developers through provisions on curtailment, currency risks, grid connections and land tenure.
	Policy and regulatory clarity	– Develop clear regulatory accountability for new and emerging sectors, e.g. regulatory frameworks for utility-scale battery storage, smart grids and alternative fuel vehicles. – Address related or competing regulatory considerations through inter-agency cooperation, e.g. land use and allocation for low-carbon infrastructure developments.

Source: PwC China

In addition to creating overarching enabling environments, governments may also step in on large, nationally significant infrastructure projects to address specific project-level risks. This could involve working directly with multilateral development banks (MDBs) or national development banks (NDBs) to crowd in private capital.

MDBs and NDBs play a critical role in helping to improve confidence and de-risk financing, mobilizing investments towards projects that are otherwise unable to attract funding from capital markets and commercial lenders. Their roles in infrastructure financing include:

- **Reducing the risks and cost of long-term funding:** MDBs and NDBs can often offer cheaper and longer-duration funding. MDBs frequently co-finance projects with donor trust funds. Preferred creditor status helps mitigate transfer and convertibility risks for MDB-led syndications.
- **Providing technical expertise and project development:** MDBs have their own sector and country specialists, engineers, and monitoring and evaluation experts to prepare projects and bring them to market for funding, providing a degree of comfort for commercial banks that lack these resources.
- **Managing ESG risks**: Participation of MDBs, with their rigorous approach to identifying and managing ESG risks, can provide comfort to co-investors and lenders that environmental and social risks are managed.

BOX 12

Case study: the Asian Infrastructure Investment Bank (AIIB) helps investors manage climate and other ESG risks

± Strict ESG approach helps make projects into bankable investments

The AIIB's Environmental and Social Framework (ESF)[107] is applied to projects financed by the bank. In particular, the Environmental and Social Policy, Standards and Exclusion Lists provide a set of tools and requirements for addressing key environmental and social risks that are typical of large infrastructure projects as well as other projects financed by AIIB. As a result, AIIB's participation in project finance provides comfort to co-investors as well as to the client that environmental and social risks are being adequately identified, managed and mitigated.

This approach is aligned with the AIIB's initiatives to mobilize private capital into emerging market investments with high environmental and social standards and positive impacts. For example, the AIIB uses a tool called the Climate Change Investment Framework (CCIF)[108] to provide a holistic issuer-level assessment of both climate change risks and opportunities in line with the objectives of the Paris Agreement. Co-developed with Amundi, an asset manager, the CCIF has been applied to AIIB's own investments though the Asia Climate Bond Portfolio to demonstrate proof of concept.

4.2 International collaboration to support green infrastructure development

GIP 4

GIP 5

To support and nurture domestic enabling environments along the Belt and Road, the GIP plans to launch regional chapters through close collaboration with the World Economic Forum and other local partners in key regions with great potential and imminent needs for green investment. The first of these, the GIP Regional Chapter in Central Asia, was launched in May 2021. It aims to establish closer ties with local financial institutions and regulators and contribute to the local sustainable development agenda. These regional chapters envision developing better understanding of local contexts, increasing engagement with local stakeholders, disseminating knowledge and expertise for environmental and climate risk analysis and management, and accelerating the flow of private capital into green projects on the ground.[109]

Countries could also benefit from collaboration with the Belt and Road Initiative International Green Coalition (BRIGC), an international cooperation platform jointly initiated by the Ministry of Ecology and Environment (MEE) and international partners to "promote international consensus, understanding, cooperation and concerted actions to achieve green development of the BRI, to integrate sustainable development into the BRI through joint efforts, and to facilitate BRI participating countries to implement strong integration of environment and development elements of the SDGs". It serves as a platform for policy dialogue and exchange of ecological knowledge and green technology.

BOX 13 | **Case study: Viet Nam mobilizes private-sector investment in solar PV**

± Policies capitalize on market developments

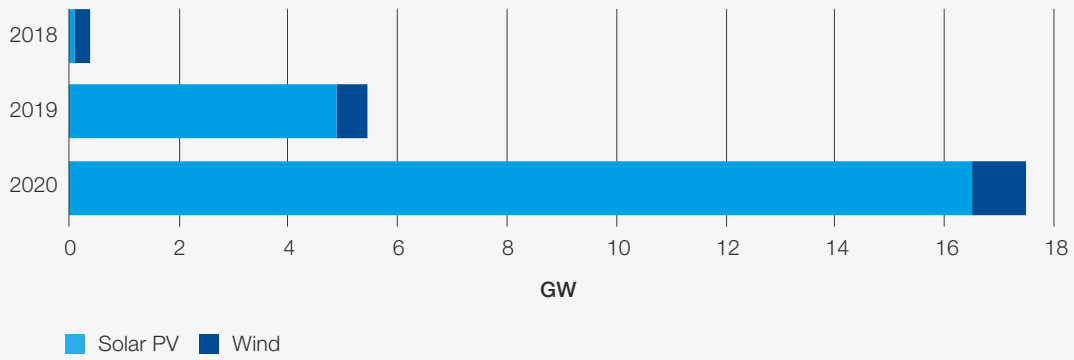
Viet Nam has demonstrated that appropriate incentives can drive rapid scale-up of renewable energy, and that policies need to evolve with the market conditions. Against a backdrop of falling solar PV costs and increasing challenges for coal-fired power, Viet Nam added 16 GW of solar capacity during 2019 and 2020. Nearly all of it came from privately funded and managed IPPs, with financing mobilized from domestic and overseas lenders.[110]

Electricity demand has grown by about 10% annually for the past two decades, with this demand mainly being met with new coal, natural gas and hydroelectric capacity.[111] During 2010–2020, electricity generated from coal plants grew from 16 TWh to 141 TWh, and from 18% to more than 50% of annual production.[112] However, development of coal plants has become challenging: loan spreads for coal-fired plants in ASEAN have increased,[113] banks have pulled out from new coal projects due to concerns over climate change and stranded assets[114] and there has been local opposition based on air pollution.[115] From 2016 to 2020, only 52% of planned coal-fired generation capacity was realized.[116]

A generous feed-in-tariff (FIT) was introduced in 2017, resulting in a surge of installations. Rates have been reduced over time to take advantage of falling solar PV costs. Utility-scale and rooftop solar projects that were operational by June 2019 could sell electricity to Viet Nam Electricity (EVN) for $0.0935/kWh for 20 years. The rate was reduced to $0.0838/kWh for rooftop panels, $0.0769/kWh for floating PV and $0.0709/kWh for ground-mounted PV that were operational by December 2020.[117] The rates reflect a preference for installations that do not require land allocation.

Viet Nam's new solar PV installation in 2020 ranked third in the world, after China and the US.[118] Its cumulative solar capacity now accounts for 70% of ASEAN's solar capacity and ranks eighth globally.[119]

FIGURE 12 **Case study: Viet Nam's installed solar PV and wind capacity**



Source: IRENA

The rapid growth in solar PV brings new challenges. In some locations, Viet Nam's grid faces capacity constraints. Although the FITs are guaranteed for 20 years, the current PPA model lacks a take-or-pay provision, allowing for unlimited curtailment due to lack of grid capacity or other technical reasons.[120] EVN issued a warning for 180–400 GWh of renewable curtailment during the second half of 2021.[121]

Electricity demand is expected to grow by 8% annually in the future.[122] Policy measures will now be required to attract investments in utility-scale battery storage, grid capacity upgrades and flexible power sources to accommodate the growing share of VRE in the power mix.[123]

At COP26, Viet Nam pledged to achieve net-zero emissions by 2050[124] and signed the Global Coal to Clean Power Transition Statement, which includes pledges to stop building new coal-fired power generation projects and to transition away from unabated coal power generation by the 2040s.[125]

BOX 14 | **Case study: Kazakhstan advances its transition from fossil fuels to green energy**

± Policy updates improve investor confidence for wind and solar projects

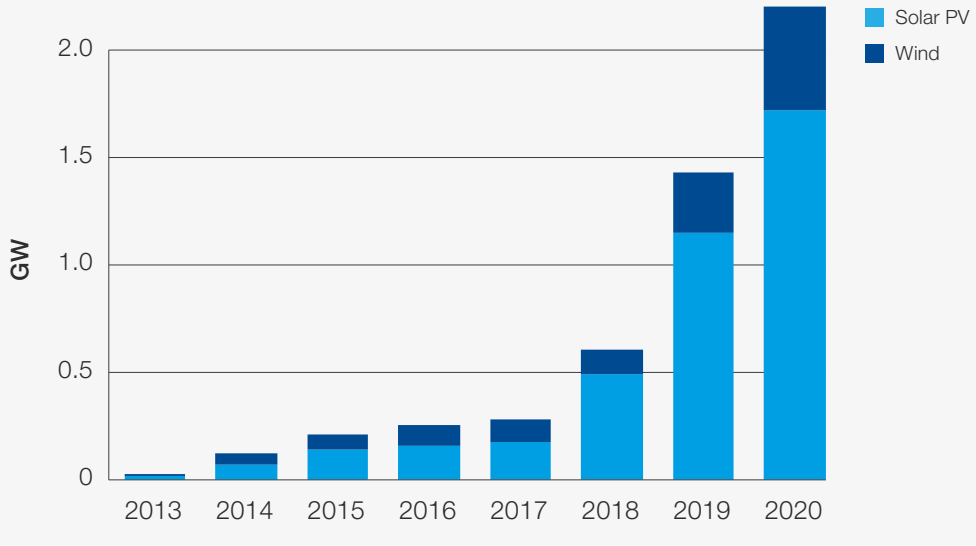
Kazakhstan has both abundant fossil fuel reserves and vast solar and wind potential, but also ageing power plants and transmission infrastructure.[126] The government has set goals of generating 15% of the country's electricity from renewables by 2030 and achieving carbon neutrality by 2060.[127] In 2020, about 2% of the country's electricity came from wind and solar.[128]

Despite its enormous potential, Kazakhstan faces challenges in attracting green energy investment. It has some of the lowest retail electricity tariffs in the world due to fossil fuel subsidies, fully depreciated power plants and non-cost-reflective tariff pricing.[129] Investors also face currency risk; the tenge has fluctuated significantly and depreciated by 25% between May 2017 and November 2021.[130]

To overcome these challenges, the government established the Financial Settlement Centre (FSC) to act as the centralized buyer of renewable energy, signing contracts with investors that obligate it to purchase the entire volume of produced electricity at a guaranteed fixed tariff for 20 years. The system operator is obliged to connect renewable power sources to the grid and to prioritize their electricity when dispatching. Renewable energy projects do not pay transmission fees[131] and receive many tax and import duty exemptions.[132] In 2018, the government replaced procurement by FITs with tariff-based auctions to take advantage of falling renewable energy prices. The auctions were held for specified locations and capacity levels.[133] To help mitigate currency risk, tariffs are indexed to the USD exchange rate (70%) and inflation (30%).[134]

The combination of these measures has successfully attracted private-sector project sponsors. Kazakhstan's installed wind and solar capacity has grown from about 0.3 GW in 2017 to 2.2 GW in 2020.[135]

FIGURE 13 **Kazakhstan's installed wind and solar capacity**



Source: IRENA

But challenges remain. Nearly all debt financing has come from development banks and donor trust funds. **ICBC**'s loan for the recently commissioned Zhanatas wind farm was the first Chinese commercial bank participation in the financing of a Kazakhstan renewable energy project.[136] The remainder of the project's lending was provided by the AIIB, the European Bank for Reconstruction and Development (EBRD) and the Green Climate Fund (GCF).

Kazakhstan's grid lacks flexible generating capacity, significant battery storage and an interconnected balancing electricity market to manage VRE intermittency. A surcharge on electricity tariffs was recently announced to help grid operators cover the cost of electricity from renewable sources, which is still higher than that of existing coal-fired plants.[137]

In addition to meeting domestic electricity demand, Kazakhstan's renewable energy resources could fuel new industries – for example, the German developer Svevind recently signed an MOU to install 45 GW of wind and solar capacity to power green hydrogen production.[138]

BOX 15 | **Case study: Morocco's PPP approach to expand wind and solar power**

± Government-backed one-stop shop improves ease of doing business for developers and lenders

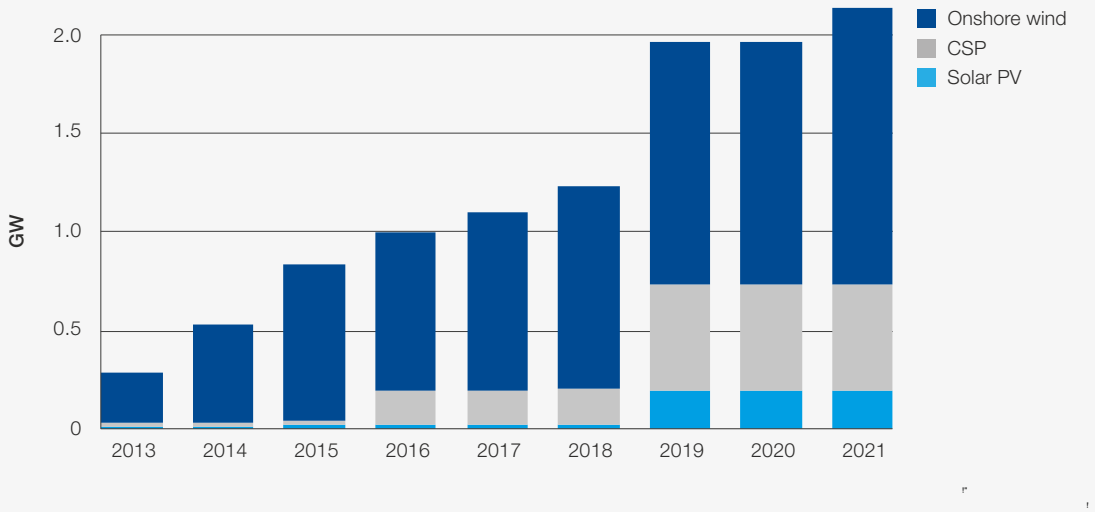
Morocco depends on fossil fuel imports for about 80% of its electricity. In 2009, it adopted an energy strategy to increase the share of renewables (i.e. wind, solar and hydro) to 42% of the country's generation capacity by 2020, and later upgraded this target to 52% by 2030.[139] With growing electricity demand, this would entail installing an estimated 4.6 GW of solar and 4.2 GW of wind power during 2016–2030,[140] and about $30 billion of investment. In June 2021, Morocco revised its NDC to reach a 45.5% reduction in GHG emissions by 2030.[141]

In 2010, the government established the Morocco Agency for Sustainable Energy (MASEN), an SOE that serves as a one-stop shop for renewable energy developers, bringing together permitting, land acquisition and financing. MASEN organizes competitive tenders for specified sites and capacities, signs PPAs with IPPs and sells the electricity to the national grid operator. MASEN also organizes and signs concessional lending agreements with development banks and donor trust funds. Its government backing reduces counterparty risk for both developers and lenders. MASEN also takes equity stakes in projects. In addition, Morocco has issued a legal framework for IPPs to develop projects based on corporate PPAs.

Wind and solar capacity grew from 0.3 GW to 2.1 GW between 2012 and 2020.[142] To accommodate increased VRE, Morocco has been developing flexibility options, including CSP plants with thermal storage, interconnectors with Europe, pumped hydro storage and gas-fired plants.

Morocco's vast wind and solar resources offer the potential to use green energy for desalination, industrial processes and the export of electricity and hydrogen.

FIGURE 14 **Morocco's installed wind and solar capacity**



Source: IRENA

5 Conclusion: collaborative efforts to scale up the green BRI

The next decade represents a crucial period in which countries engaged with the BRI can facilitate transformative development and upgrades of their infrastructure that can both benefit their societies and protect the environment and climate.

Even before the Glasgow Climate Pact, there was an increased focus on scaling up investments in green and low-carbon infrastructure in the context of the BRI, spurred by initiatives such as the GIP. The journey has clearly started, with commercially viable and near-commercial technologies, innovative green finance products and clear signs of shifting investor preferences. At the same time, conducive policy frameworks are being put in place by many EMDEs. Collaborative multilateral public-private solutions will be needed to overcome the substantial risk premiums that hinder mobilization of private-sector funding to support EMDEs' low-carbon infrastructure projects and adaptation efforts.

This insight report highlights these technologies, green finance developments and enabling environments as well as the broader stakeholder ecosystem, as illustrated by the case studies. Going forward, policy-makers, infrastructure developers, financiers and investors, and civil society can further cooperate to promote the rapid piloting, demonstration and scale-up of projects in green infrastructure and their broader ecosystem, supported by conducive policies and financing mechanisms.

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Endnotes

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