

Technical Report of China Carbon Neutrality Investor Map

— China SDG Investor Map Phase II

2022

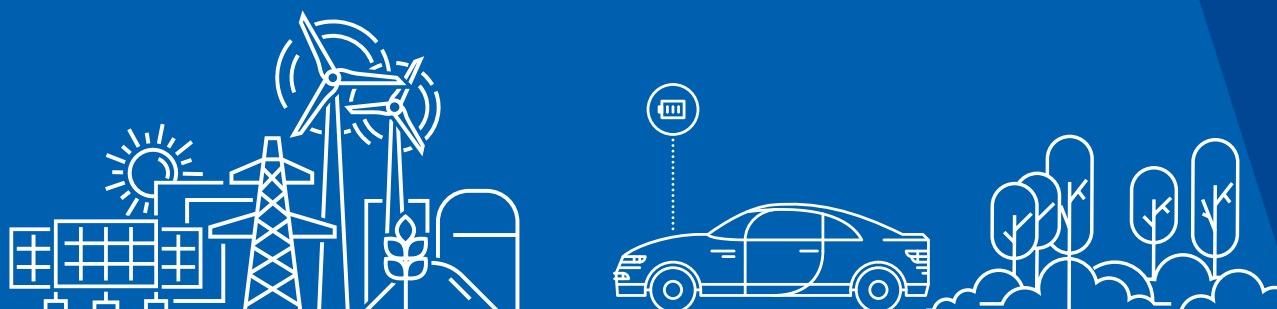


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Foreword



UNDP China Representative
Beate Trankmann

2022 marked 30 years since the United Nations Framework Convention on Climate Change was adopted. Yet, three decades on, instead of navigating away from **climate catastrophe**, we are accelerating ever closer towards it. Extreme weather events have cost lives and livelihoods in almost every corner of the world—from devastating summer floods in Pakistan, to deadly winter storms in the United States. And global **CO₂ emissions have hit their highest levels in history**, with the world on a course to exceed the 1.5 degrees warming target set by the Paris Agreement by **more than double**. With **three-and-a-half billion people** living in countries **highly vulnerable** to climate change, the consequences of this would leave **almost half the global population** at risk of their homes becoming largely uninhabitable.

Humanity and the planet are being pushed to the brink. To ensure the future of both, the world must urgently act—but action is only possible if it is **financed**. 4.4 trillion USD is needed every year to cover the global energy transition compatible with the Paris Agreement. While this sounds like a lot, reallocating roughly **one percent of global financial assets** would suffice. The problem, therefore, is **not a lack of funds, but how they are distributed**. The first step to changing this lies in **altering how we perceive risk and opportunities** in financial decisions.

By hesitating to invest in sustainable projects and worrying about immediate returns, investors overlook the real risk—a growing pile of **stranded assets**. Increasingly frequent natural disasters, evolving environmental policies and disruptive

energy transition technologies mean carbon-intensive and polluting assets are nose-diving in value. Indeed, the Intergovernmental Panel on Climate Change (IPCC) estimates that under a 2-degree global warming scenario, approximately 4 trillion USD worth of fossil fuels and related infrastructure will be redundant. Such a scenario would also jeopardize the environmental stability and natural resources—such as water access—on which businesses depend. Conversely, sustainable finance means investing in the future, and growth. Achieving the SDGs by 2030 opens **12 trillion USD of global business opportunities**, with 2.3 trillion USD in China. By prioritizing nature, businesses could unlock 10 trillion USD in opportunities globally and create **395 million jobs** by 2030.

To help investors capitalize on this potential, UNDP has developed the SDG Investor Map—a market intelligence tool to identify **investment opportunities that can generate both SDG impact and financial returns**. The Map covers around **500 investment opportunities areas (IOAs)** across **around 30 countries**. In China, the initiative launched in 2020 and mapped two sectors in the **first phase—Health and Agriculture**—to support China's efforts to combat Covid-19 and enable an inclusive economic recovery.

With the much-appreciated support from our partner, Industrial Securities and Impact Intelligence, I am happy to announce, as a second step, the release of the **China Carbon Neutrality Investor Map**. Centering on China's dual carbon goals, this map explores investment opportunities in the circular economy and renewable energy sectors.

At the United Nations General Assembly in September 2020, Chinese President Xi Jinping committed to peaking carbon dioxide emissions before 2030 and achieving carbon neutrality by 2060. With the “1+N” policy framework in place—and if supported by future technologies, energy safeguards, carbon sequestration, financial and pricing policies, standards, and measurements—I believe **China can deliver on its promise, making a significant contribution to the global 2030 Agenda**. To finance implementation of the dual carbon goals, **collective efforts across the decarbonisation ecosystem are key**. Yet limited awareness and data among some stakeholders of current and future sustainable financing opportunities have long hindered their expansion. To this end, our map serves as an **important bridge** to fill the information gap between industries and investors, as well as update policy makers and civil society, while connecting stakeholders. I hope that with the help of this tool, all key actors can play their part in decarbonising the financial system—from regulators, to financial institutions, to investors and consumers.

I thank our partner, the China Industrial Securities Co. Ltd, for working with UNDP to jointly develop this investor map. I hope that its findings can **spark dialogue and action across all sectors and players** to redirect financing towards long-term development. Together, I believe it is possible to prosper while protecting our planet and its most vulnerable people, with returns for generations to come.



Foreword



**Secretary of the Party Committee and
Chairman of Industrial Securities
Yang Huahui**

Achieving global goals for sustainable development by promoting harmonious coexistence between humanity and nature is critical in building a shared future for humankind. This has made climate and environmental issues increasingly prominent on the international agenda, which China is stepping up to.

At the General Debate of the 75th Session of the United Nations General Assembly in September 2020, President Xi Jinping committed to peaking carbon dioxide emissions before 2030 and achieving carbon neutrality by 2060. The Chinese government has since made strategic plans to meet these dual carbon goals, including highlighting green and low-carbon development in China's *14th Five-Year Plan for National Economic and Social Development and Long-Range Objectives for 2035*. In October 2022, President Xi reiterated that China will steadily promote realization of the dual carbon goals, as well as actively participate in global governance on climate change. As one of the world's largest economies, China's dual carbon goals have significant ramifications for achieving the Paris Climate Agreement and Sustainable Development Goals (SDGs) for people and the planet. This demonstrates China's responsibility in building a future that includes everyone, and that our earth can sustain.

In this new era, China's accelerated actions in achieving the dual carbon goals with more visible outcomes bring fresh impetus to the development of green finance, unlocking new business opportunities in sustainable investment. Against this backdrop, China Industrial Securities Corporation Limited (Industrial Securities, 601377.SH), as an important participant of China's capital markets as well as a

pioneer, practitioner and explorer of green finance, has actively joined the endeavors of the UNDP in mobilizing private capital towards the SDGs, cooperating with UNDP in developing knowledge products under the initiatives of the SDG Investor Map. It is foreseeable that the process of scaling-up green investment will be further accelerated, with investors' attention and enthusiasm for such investments rapidly growing. As such, I believe the **China Carbon Neutrality Investor Map** comes at the right time.

In response to new opportunities, Industrial Securities has always been dedicated to improving its professional capabilities and conducted systematic research on green finance, carbon dioxide peaking and carbon neutrality, along with other related fields. While constantly expanding exchanges and cooperation with various domestic and international institutions, we are also working to green our own operations. With considerable experience in green securities, we have formed an integrated “four-in-one” service system, consisting of green financing, green investment, green development research and environmental rights trading. Moreover, we have strived to play “four pioneer roles” in the securities industry: 1) integrating ESG into the development strategy and operation management practice, 2) deploying green finance business plans from the top level of organizational structure and institutional design, 3) launching China's first social responsibility fund, first green investment fund, and the first ESG index launched by a security company, and 4) drafting and releasing the company's **Environmental Information Disclosure Report**, as well as setting its own goals on carbon neutrality, green investment

and green financing. In deploying our green finance expertise, we have also carried out in-depth research such as the **Blue Paper of Green Finance Progress in China's Securities Industry** and the **Report on the Securities Industry's Actions to Help Achieve the Carbon Dioxide Peaking and Carbon Neutrality Target**. Those studies have contributed to the formulation of China's green finance standards and received positive feedback.

As the climate crisis intensifies, we are all increasingly affected—from growing heatwaves and drought, to ever more destructive storms—and the fate of humanity has never been more closely connected. As such, President Xi also stressed at Climate Ambition Summit that no one can isolate themselves in meeting the climate challenge, only by upholding multilateralism, unity and cooperation can we deliver shared benefits for all nations. Accelerating action towards the dual carbon goals and SDGs is a sure path towards a future that includes everyone. The **China Carbon Neutrality Investor Map** not only shares the latest achievements in the strategic cooperation between Industrial Securities and UNDP, but also represents a valuable attempt of Industrial Securities in promoting the research and development of green securities. We hope to take this opportunity to further expand cooperation and make new progress in green finance. Industrial Securities will continue researching and innovating in green finance, and consistently contribute to financing a sustainable future and building a better home for all of humankind.



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Acronyms and Abbreviations

BAPV	Building Applied Photovoltaics
BIPV	Building Integrated Photovoltaics
BOT	Build Operation Transfer
CAGR	Compound Annual Growth Rate
CCER	Chinese Certified Emission Reduction
GPM	Gross Profit Margin
GW	Gigawatt
IOAs	Investment Opportunity Areas
IRR	Internal Rate of Return
IRENA	International Renewable Energy Agency
kV	Kilovolt
NLP	Natural Language Processing
OECD	Organization For Economic Cooperation and Development
PERC	Passivated Emitter and Rear Cell
SASB	Sustainability Accounting Standards Board
SDGs	Sustainable Development Goals
SICS	Sustainable Industry Classification System
TOT	Transfer Own Transfer
UNDP	United Nations Development Programme
WCED	World Commission on Environment and Development

The 17 Sustainable Development Goals

SDGs	Description
	End poverty in all its forms everywhere
	End hunger, achieve food security and improved nutrition and promote sustainable agriculture
	Ensure healthy lives and promote well-being for all at all ages
	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
	Achieve gender equality and empower all women and girls
	Ensure availability and sustainable management of water and sanitation for all
	Ensure access to affordable, reliable, sustainable and modern energy for all
	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
	Reduce inequality within and among countries
	Make cities and human settlements inclusive, safe, resilient and sustainable
	Ensure sustainable consumption and production patterns
	Take urgent action to combat climate change and its impacts
	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss
	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
	Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

Executive Summary



The Sustainable Development Goals (SDGs) are a call for action by all countries to promote prosperity, while protecting the planet and its most vulnerable people. They recognize that ending poverty must go hand-in-hand with strategies that build economic growth and address a range of social needs, including education, health, social protection and job opportunities, while tackling climate change and environmental protection.¹

To achieve the SDGs, **finance is a key enabler**. However, **the lack of data along with limited information and awareness among some key players are major challenges** in redirecting financial resources at scale towards the SDGs. To **fill in the data gap**, the United Nations Development Programme (UNDP) developed the **SDG Investor Map** a public knowledge product helping investors and businesses identify potential investment opportunity areas (IOAs) generating both **business returns and development impact**.

The Map is designed for all stakeholders to use for business strategy development, policy-making and consultancy. It can inform investors, enterprises and financial intermediaries in their first steps to **develop project pipelines**. Companies can refer to the impact related data points included in the Map to guide their **environmental and social management and disclosures**. It can also be used to **inform government and policy priorities** by contributing to investment plans.

The Map follows a globally **standardized 8-step methodology** to shape a data matrix with **four key dimensions**: 1. development impact, 2. policy priority, 3. business return profiles, and 4. risk factors. Under the four dimensions, **20 data points** are collected for analyzing the eligibility of each IOA. These data points cover information about industrial landscapes, regional locations, business models, investment returns, policy enablers, market infrastructure, development needs, SDG tagging, impact indicators, etc.



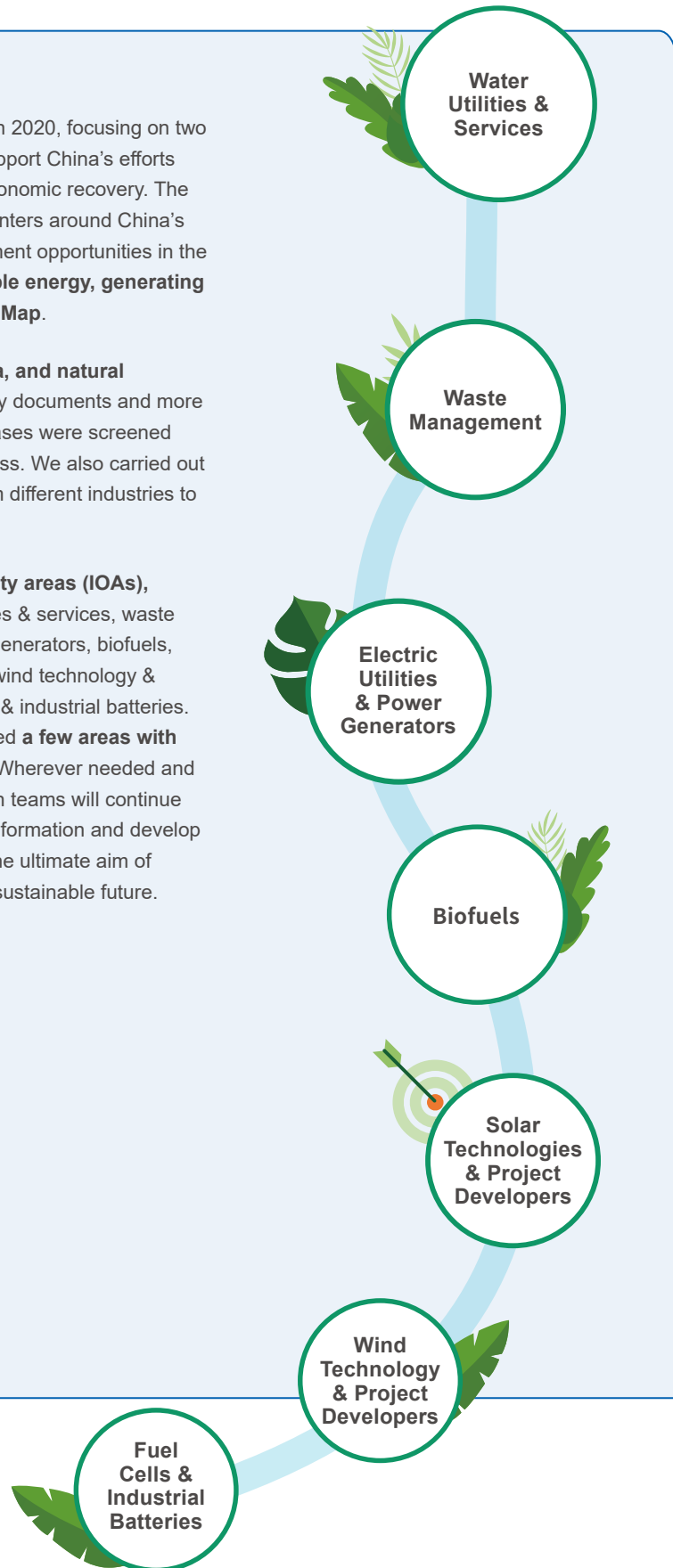
1 <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>



In China, UNDP launched the initiative in 2020, focusing on two sectors—**health and agriculture**, to support China’s efforts in pandemic control and an inclusive economic recovery. The second phase, which began in 2021, centers around China’s dual carbon goals, and explores investment opportunities in the **circular economy, as well as renewable energy, generating the China Carbon Neutrality Investor Map.**

Using technologies such as **AI, big data, and natural language processing (NLP)**, 570 policy documents and more than one hundred thousand media releases were screened and analyzed during the research process. We also carried out **a range of interviews** with experts from different industries to rigorously justify our research findings.

We identified 18 **investment opportunity areas (IOAs), under seven sub-sectors:** water utilities & services, waste management, electric utilities & power generators, biofuels, solar technology & project developers, wind technology & project developers, along with fuel cells & industrial batteries. Apart from the 18 IOAs, we also identified **a few areas with future potential to mature into IOAs.** Wherever needed and supported by stakeholders, our research teams will continue to follow these areas, update relevant information and develop policy and business suggestions, with the ultimate aim of encouraging financing for an inclusive, sustainable future.



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01

Background



The SDGs Reflected in China's Policy Priorities

The concept of sustainable development arose in response to the environmental crises and social challenges of rapid industrialisation. *Our Common Future*, also called the *Brundtland Report*, released in 1987 by the World Commission on Environment and Development (WCED) introduced the concept of "sustainable development", defining it as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." On 25 September 2015, the 193 member states of the United Nations agreed to the 2030 Agenda for Sustainable Development, setting 17 Sustainable Development Goals (see Fig. 1) with 169 targets.² The 2030 Agenda called for joint global action by 2030 to fully reconcile the three dimensions of sustainable development—economic, social and environmental—by protecting the planet, while leaving no one behind.



Source: United Nations

Fig 1: The UN's Sustainable Development Goals (SDGs)

² UN website. Intro to Sustainable Development Goals <https://www.un.org/sustainabledevelopment/zh/sustainable-development-goals/>



China has taken comprehensive measures to implement the 2030 Agenda.³ In September 2016, *the National Plan on Implementation of the 2030 Agenda* was published, detailing how China would implement the 17 SDGs and 169 sub-targets. Subsequently, a program for the 2030 Agenda "innovative SDG pilots" was produced. Six cities were chosen as pilots with the expectation of providing models that could be replicated elsewhere. In 2017, 2019 and 2021, China published the *Voluntary National Review Report on Implementation of the 2030 Agenda for Sustainable Development*, reporting on the measures taken, progress made and challenges faced. **Since 2016, China has issued medium- and long-term development plans and long-range objectives in various fields and at different levels, covering technological innovation, agriculture, health and poverty reduction and other sectors (See Table 1).** Core content from the 2030 Agenda has been embedded in the strategic documents and national development strategies, such as the *13th Five-Year Plan* and the *14th Five-Year Plan for National Economic and Social Development* and the *Long-Range Objectives Through the Year 2035*, strengthening alignment of China's development concepts—including "innovation, coordination, green development, opening-up, and sharing", as well as "high-quality development," with accelerated achievement of the SDGs.

³ <https://sustainabledevelopment.un.org/memberstates/china>

Table 1: Correspondence Between the UN Sustainable Development Goals(SDGs) and China's Relevant Development Plans

Notice on Consolidating and Expanding Poverty Alleviation Achievements Through Social Security to Fully Implement the Rural Revitalization Strategy, 14th Five-Year Plan to Advance Agricultural and Rural Modernization, the Strategic Plan for Rural Revitalization (2018-2022), etc.

National Plan for High-standard Farmland Construction (2021-2030), the Plan for Distribution and Structure Adjustment of Agricultural Productivity (2021-2030), the Overall Plan of Building a National Food Security Industrial Belt, etc.

Outline of the Healthy China 2030 Plan, the Healthy China Initiative (2019-2030), the 14th Five-Year Plan for National Health, the 14th Five-Year Plan for Environmental Health Work, etc.

Education Modernization Plan 2035, the Implementation Plan of Strengthening Education Project during 14th Five-Year Plan, the Action Plan for the Development and Enhancement of Special Education during 14th Five-Year Plan Period, etc.

Outline of Women's Development in China (2021-2030), Outline on the Development of Chinese Children (2021-2030), etc.

The 14th Five-Year Plan for Water Security, the 14th Five-Year Plan for Urban Sewage Treatment and Resource Utilization Development Plan, the Five-Year Action Plan for Improving Rural Living Environment (2021-2025), etc.

The 14th Five-Year Plan on Renewable Energy Development, the 14th Five-Year Plan on Modern Energy System, the Medium and Long-term Plan for Hydrogen Energy Industry Development (2021-2035), the New Energy Vehicle Industry Development Plan (2021-2035), etc.

The 14th Five-Year Plan for National Economic and Social Development and the Long-Range Objectives Through the Year 2035, the 14th Five-Year Plan for Employment Promotion, etc.

Made in China 2025, Outline of the National Innovation-Driven Development Strategy, China National Highway Network Planning (2013-2030), the National Medium and Long-Term Development Plan for Civil Space Infrastructure (2015-2025), the Outline of a Modern Comprehensive Transportation System during the 14th Five-Year Plan Period, the 14th Five-Year Plan for Cold Chain Logistics Development, the 14th Five-Year Plan for Building a Modern Circulation System, etc.



Opinions of the Central Committee of the Communist Party of China and the State Council on Comprehensively Promoting Rural Revitalization and Accelerating Agricultural and Rural Modernization, the 14th Five-Year Plan for Protection and Development of Disabled People, the 14th Five-Year Plan for Revitalizing and Developing Areas with Special Characteristics, etc.



The 14th Five-Year Plan for Urban Infrastructure, the 14th Five-Year Plan for Urban and Rural Community Service System Construction, the 14th Five-Year Plan for New Urbanization Implementation, Major Tasks in Promoting New Urbanization and Integrated Urban-Rural Development in 2022, etc.

The 14th Five-Year Plan for Circular Economy Development, the Action Plan to Facilitate the Digitalization of the Consumer Goods Industry (2022-2025), the 14th Five-Year Plan for Promoting Clean Production, etc.

Action Plan for Carbon Dioxide Peaking before 2030, the Working Guidance on Fully, Accurately and Comprehensively Implementing the New Development Concept to Achieve Carbon Dioxide Peaking and Carbon Neutrality, the National Strategy on Climate Change Adaptation 2035, The 14th Five-Year Comprehensive Work Plan for Energy Conservation and Emission Reduction, etc.

The 14th Five-Year Plan for Development of the Marine Economy, the 14th Five-Year Plan for Marine Ecological and Environmental Protection, the Action Plan for Comprehensive Management of Key Marine Areas, etc.

The China National Biodiversity Conservation Strategy and Action Plan (2011-2030), the Major Project Construction Plan for Ecological Protection and Restoration Support System (2021-2035), the Master Plan for the Protection and Restoration of Important National Ecosystems (2021-2035), etc.

Opinions on Promoting Urban Safety Development, Opinions on Accelerating the Reform of Judicial Administration, etc.

The 14th Five-Year Plan for High-Quality Development of Foreign Trade, the 14th Five-Year Plan for International Cooperation in Agriculture, the G20 Digital Economy Development and Cooperation Initiative, etc.

Sources: Chinese government official websites and other public information

China's Dual Carbon Goals: Crucial for the Global 2030 Agenda

China renewed the commitment and momentum towards sustainable development and the 2030 Agenda in 2020 when, at the UN General Assembly, Chinese President Xi Jinping declared that 'China aim to have carbon dioxide emissions peak before 2030 and achieve carbon neutrality before 2060' (*hereinafter "dual carbon goals"*), suggesting an acceleration in China's transition towards a green economy. The dual carbon goals will directly help achieve SDG 7 on affordable clean energy (ensure access to affordable, reliable, sustainable and modern energy for all) and SDG 13 on climate action (take urgent action to combat climate change and its impacts). They also indirectly contribute to other SDGs, for example, SDG 8 on decent work and economic growth (promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all), along with SDG 9 on industries, innovation and infrastructure (build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation).

China's dual carbon goals have been followed by a series of implementation plans and supporting measures for key sectors, forming a "1+N" policy framework for achieving carbon dioxide peaking and carbon neutrality. On October 24, 2021, the Communist Party of China Central Committee and the State Council jointly released the *Working Guidance for Carbon Dioxide Peaking and Carbon Neutrality in Full and Faithfull Implementation of the New Development Philosophy* (*hereinafter "Working Guidance"*). The Working Guidance serves as the "1" in "1+N"—the leading document. On October 26, 2021, the State Council released the *Action Plan for Carbon Dioxide Peaking Before 2030* (*hereinafter "Action Plan"*), adding more detailed indicators and guidance towards peaking before 2030. The Working Guidance and Action Plan form a two-stage top-down plan for peaking carbon dioxide emission and reaching carbon neutrality. In response to that guidance, government departments and local governments have been formulating specific implementation plans—the N of "1+N." These focus on sectors such as energy, industry, transportation, urban and rural construction as well as enablers such as international cooperation, technology development, energy safeguards, fiscal and financial pricing policy, standards and measurement, oversight and auditing. Table 2 highlights some of the policy documents included in the "1+N" framework:

Many local governments have responded to the dual carbon goals and associated guidance by producing their own supporting policies. For example, Zhejiang Province has released the *Implementation Guidance for Carbon Dioxide Peaking and Carbon Neutrality in Full and Faithfull Implementation of the New Development Philosophy*; Shanghai Municipality has released the *Shanghai Peak Carbon Implementation Plan*; and Fujian Province the *Implementation Guidance for Carbon Dioxide Peaking and Carbon Neutrality in Full and Faithfull Implementation of the New Development Philosophy*.

Table 2: China's "1+N" Policy Framework for Dual Carbon Goals(non-exhaustive)



"1+N" Top-level Design Documents

- "1": Working Guidance for Carbon Dioxide Peaking and Carbon Neutrality in Full and Faithful Implementation of the New Development Philosophy (October 24, 2021)
- "N": Action Plan for Carbon Dioxide Peaking before 2030 (October 26, 2021)



Top Ten Actions for Carbon Dioxide Peaking (non-exhaustive)

Actions on green and low-carbon energy transition

- The National Development and Reform Commission (NDRC) and National Energy Administration (NEA) issued the Opinions on Improving Institutional Mechanisms and Policy Measures for Green and Low-Carbon Energy Transition (February 10, 2022)
- The National Development and Reform Commission (NDRC) and National Energy Administration (NEA) issued the 14th Five-Year Plan on Modern Energy System (March 22, 2022)
- The National Development and Reform Commission (NDRC) and National Energy Administration (NEA) issued the Medium and Long-term Plan for Hydrogen Energy Industry Development (2021-2035) (March 23, 2022)
- The National Development and Reform Commission (NDRC) and other relevant departments issued the Benchmarks and Benchmarking Levels for Clean and Efficient Utilization of Coal for Major Coal Industries (2022) (May 10, 2022)
- The National Development and Reform Commission (NDRC) and National Energy Administration (NEA) released the Implementation Plan to Promote High-Quality Development of New Energy in the New Era (May 14, 2022)
- The National Development and Reform Commission (NDRC) and other relevant departments issued China's 14th Five-Year Plan on Renewable Energy Development (June 1, 2022)

Actions on energy saving, carbon reduction and efficiency enhancement

- The State Council issued the 14th Five-Year Comprehensive Work Plan for Energy Conservation and Emission Reduction (January 24, 2022)
- The National Development and Reform Commission (NDRC) and other relevant departments issued the Implementation Guidelines for the Transformation and Upgrading of Energy Conservation and Carbon Reduction in Key Areas of High Energy-consuming Industries (2022 Edition) (February 11, 2022)
- The China Banking and Insurance Regulatory Commission (CBIRC) issued Green Finance Guidelines for the Banking and Insurance Industry (June 2, 2022)
- The Ministry of Ecology and Environment and relevant departments jointly issued the Implementation Plan for Synergizing Reduction of Pollution and Carbon Emissions (June 17, 2022)

Actions on carbon dioxide peaking in the industrial sector

- The Ministry of Industry and Information Technology issued the 14th Five-Year Plan on Industrial Green Development Plan (December 3, 2021)
- The Ministry of Industry and Information Technology and other relevant departments jointly issued the 14th Five-year Plan for the Development of the Pharmaceuticals Industry (January 30, 2022)
- The Ministry of Industry and Information Technology, National Development and Reform Council, and Ministry of Ecology and Environment issued Guidance on Promoting the High-Quality Development of the Iron and Steel Industry (February 7, 2022)
- The Ministry of Industry and Information Technology and other relevant departments issued Guiding Opinions on Promoting the High Quality Development of the Petrochemical and Chemical Industry during the 14th Five-Year Plan Period (April 7, 2022)

- The Ministry of Industry and Information Technology, along with the National Development Reform Council, issued Guidance on the High-Quality Development of the Chemical Fiber Industry (April 21, 2022)
- The Ministry of Industry and Information Technology and National Development Reform Council issued Guidance on the High-Quality Development of the Technical Textiles Industry (April 21, 2022)
- The Ministry of Industry and Information Technology and other relevant departments issued Guiding Opinions on Promoting the High-Quality Development of the Light Industry (June 17, 2022)
- The Ministry of Industry and Information Technology and other relevant departments issued the Action Plan on Industrial Water Efficiency Improvement (June 21, 2022)
- The Ministry of Industry and Information Technology and other relevant departments issued the Action Plan on Boosting Industrial Energy Efficiency (June 29, 2022)
- The Ministry of Industry and Information Technology, National Development and Reform Council, and Ministry of Ecology and Environment issued the Implementation Plan for Carbon Dioxide Peaking in the Industrial Sector (August 1, 2022)

Actions on carbon dioxide peaking in urban-rural construction

- The General Office of the CPC Central Committee and General Office of the State Council issued Guidance on Promoting Green Development of Urban and Rural Construction (October 21, 2021)
- The Ministry of Housing and Urban-Rural Development issued the 14th Five-Year Plan for the Development of the Construction Industry (January 25, 2022)
- The State Council issued the 14th Five-Year Plan to Advance Agricultural and Rural Modernization (February 11, 2022)
- The Ministry of Housing and Urban-Rural Development issued the 14th Five-Year Plan on Technological Development of Housing and Urban-Rural Construction (March 11, 2022)
- The Ministry of Housing and Urban-Rural Development issued the 14th Five-Year Plan on Development for Building Energy Conservation and Green Building (March 11, 2022)
- The Ministry of Agriculture and Rural Affairs and National Development and Reform Council issued Implementation of Agricultural and Rural Emission Reduction and Carbon Sequestration (June 30, 2022)
- The Ministry of Housing and Urban-Rural Development and National Development and Reform Council issued the Implementation Plan for Carbon Dioxide Peaking in Urban and Rural Development (July 13, 2022)

Green and low-carbon actions in transportation

- The State Council issued the 14th Five-Year Plan on Development of a Modern Comprehensive Transportation System (January 18, 2022)
- The Ministry of Transport issued the 14th Five-Year Plan on Development of Green Transportation (January 21, 2022)
- The Ministry of Transport, the National Railway Administration, the Civil Aviation Administration of China and the State Post Bureau issued opinions on implementing the Working Guidance for Carbon Dioxide Peaking and Carbon Neutrality in Full and Faithful Implementation of the New Development Philosophy (June 24, 2022)

Actions on reducing carbon dioxide emissions through the circular economy

- The National Development and Reform Commission (NDRC) issued the 14th Five-Year Plan for Circular Economy Development (July 1, 2021)
- The Ministry of Industry and Information Technology and other relevant departments issued the Implementation Plan for Accelerating the Comprehensive Utilization of Industrial Resources (February 10, 2022)

Actions on green and low-carbon technology innovation

- The National Energy Administration and the Ministry of Science and Technology jointly issued the 14th Five-Year Plan for Scientific and Technological Innovation in the Energy Sector (April 2, 2022)
- Nine central departments, including the Ministry of Science and Technology, jointly issued an Action Plan from 2022 to 2030 on Supporting the Country's Carbon Reduction Goal by Science and Technology Measures (August 18, 2022)
- The Ministry of Industry and Information Technology, the Ministry of Finance, the Ministry of Commerce, the State-owned Assets Supervision and Administration Commission of the State Council (SASAC), along with the State Administration for Market Regulation, issued the Action Plan for Accelerating the Green and Low-carbon Innovation and Development of Electric Power Equipment (August 24, 2022)

Actions on consolidating and enhancing carbon sink capacity

- The State Administration for Market Regulation and the Standardization Administration of China issued Guidelines on the Examination and Certification of Forestry Carbon Sink Projects (GB/T 41198-2021) (December 31, 2021)
- The Ministry of Natural Resources issued the Method for Assessing the Economic Value of the Ocean Carbon Sink (February 21, 2022)

Green and low-carbon national actions

- The Ministry of Education of China issued the Construction Plan for Carbon Dioxide Peaking & Carbon Neutrality Higher Education Training System (May 7, 2022)



Relevant Supporting Policy Documents (non-exhaustive)

- The State-owned Assets Supervision and Administration Commission (SASAC) issued Guiding Opinions on Promoting the High-Quality Development of Central Enterprises towards Carbon Dioxide Peaking and Carbon Neutrality (November 27, 2021)
- The Ministry of Ecology and Environment issued Key Work Related to the Management of Enterprise Greenhouse Gas Emissions Report in 2022 (March 15, 2022)
- The Ministry of Finance issued the Guideline on Fiscal Policies to Achieve Carbon Dioxide Peaking and Carbon Neutrality Goals (May 30, 2022)
- The State Taxation Administration of China issued Guidelines on Preferential Tax Policies for Supporting Green Development (May 31, 2022)
- The China Banking and Insurance Regulatory Commission (CBIRC) issued Green Finance Guidelines for Banks and Insurers (June 2, 2022)

Notes: As China's carbon dioxide peaking and carbon neutrality strategy is still ongoing, supporting policy documents continue to be introduced. If there is any incomplete information above, please refer to the official releases of the Chinese government.

Sources: Chinese government official websites and other public information

Finance and China's Dual Carbon Goals

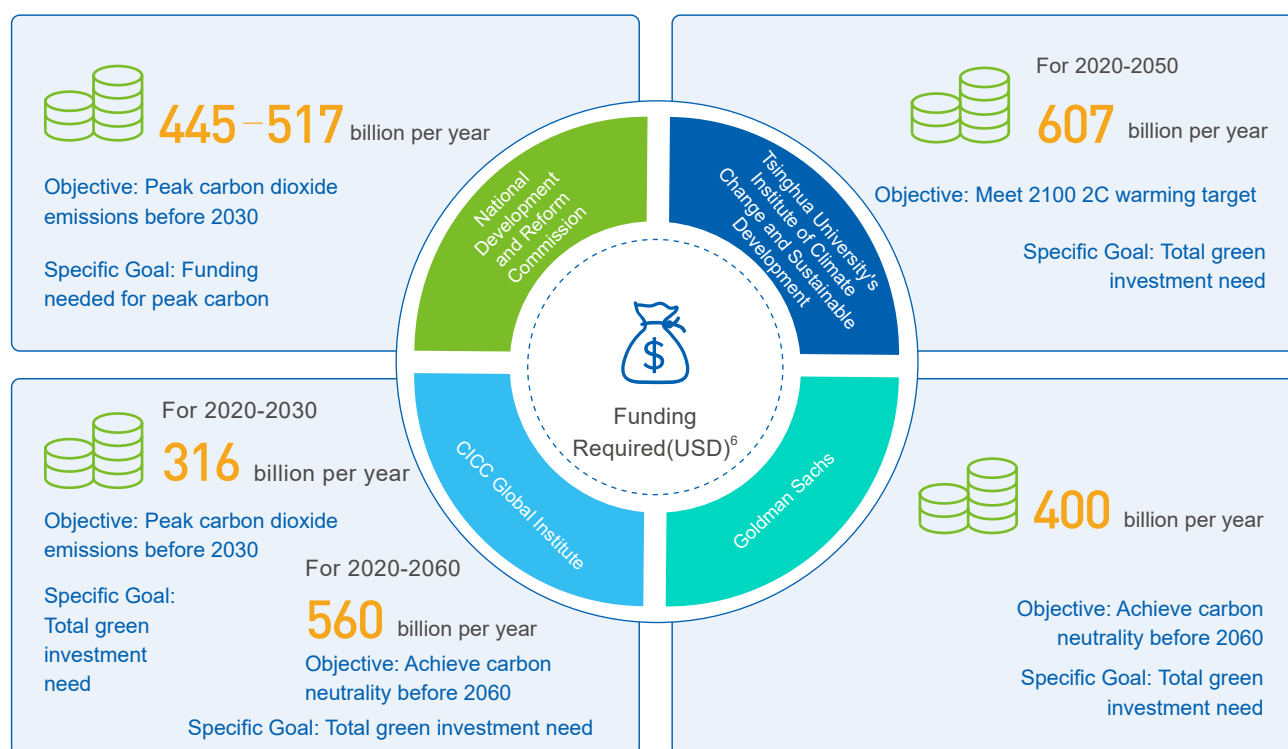
China is one of the world's largest economies, and one of the largest emitters of greenhouse gases of the world.

Since 2016, China's GDP growth has been above the global average, contributing about 30 percent to world economic growth, while the annual GDP per capita has surpassed the \$10,000 threshold.⁴ Economic achievements however came at a cost. It is indicated by the International Energy Agency that China emitted 11.9 billion tonnes of carbon dioxide in 2021, marking 33 percent of the global total and a per capita average of 8.44 tonnes.

The success of China's dual carbon goals is vital to the global low carbon transition and 2030 Agenda. **Achieving these targets requires deep and wide-ranging systemic reforms**, policy support in green and low-carbon technologies, effective safeguards for those impacted by the transition, as well as redirecting financing flows for just and inclusive development that leaves no-one behind.

Various estimates indicate that China will need CNY 100 trillion to CNY 170 trillion (approximately USD 14 to 24 trillion) to meet its dual carbon goals during 2020 and 2060. That mean an annual cost of 2%-3.5% of current GDP level⁵. Public resources can only provide a small portion of the funding needed; the bulk of the funding will need to be filled by the private sector. This will require all of society to work together—from governments, to development bodies, corporate financial institutions, businesses and civil society—to guide private capital towards the low carbon transition and the SDGs.

Table 3: Estimates of the Cost of China's Dual Carbon Goals



Source: Sequoia China: Towards Zero Carbon—A tech-based Green Revolution

4 Ministry of Foreign Affairs of the People's Republic of China, 2021-09, Voluntary National Review Report on Implementation of the 2030 Agenda for Sustainable Development (2021), https://www.mfa.gov.cn/web/ziliao_674904/zt_674979/dnzt_674981/qtzt/kjgzbdffyq_699171/202109/P020211019172481946233.pdf

5 According to the official data from Chinese government, China's gross domestic product (GDP) in 2022 is 121020.7 billion CNY, http://www.gov.cn/shuju/2023-01/17/content_5737514.htm

6 The numbers are converted from CNY to USD with UN operational rate of exchange effective on 31 Dec 2022 (US\$ 1 to CNY 6.964).

Investing in the low carbon transition has the potential to unlock wide-ranging opportunities. Globally, nature-positive business activities could unlock USD **10** trillion and create **395** million jobs.⁷ The International Renewable Energy Agency predicted that the additional renewable energy capacity in 2020 alone will save emerging economies up to USD **156** billion, while the additional 534 gigawatts of renewable energy installed in those same economies since 2010 has saved around USD **32** billion in electricity costs annually.⁸ In 2021, the renewable energy sector employed **12.7** million people directly or indirectly worldwide—creating **700,000** new jobs in only twelve months.⁹

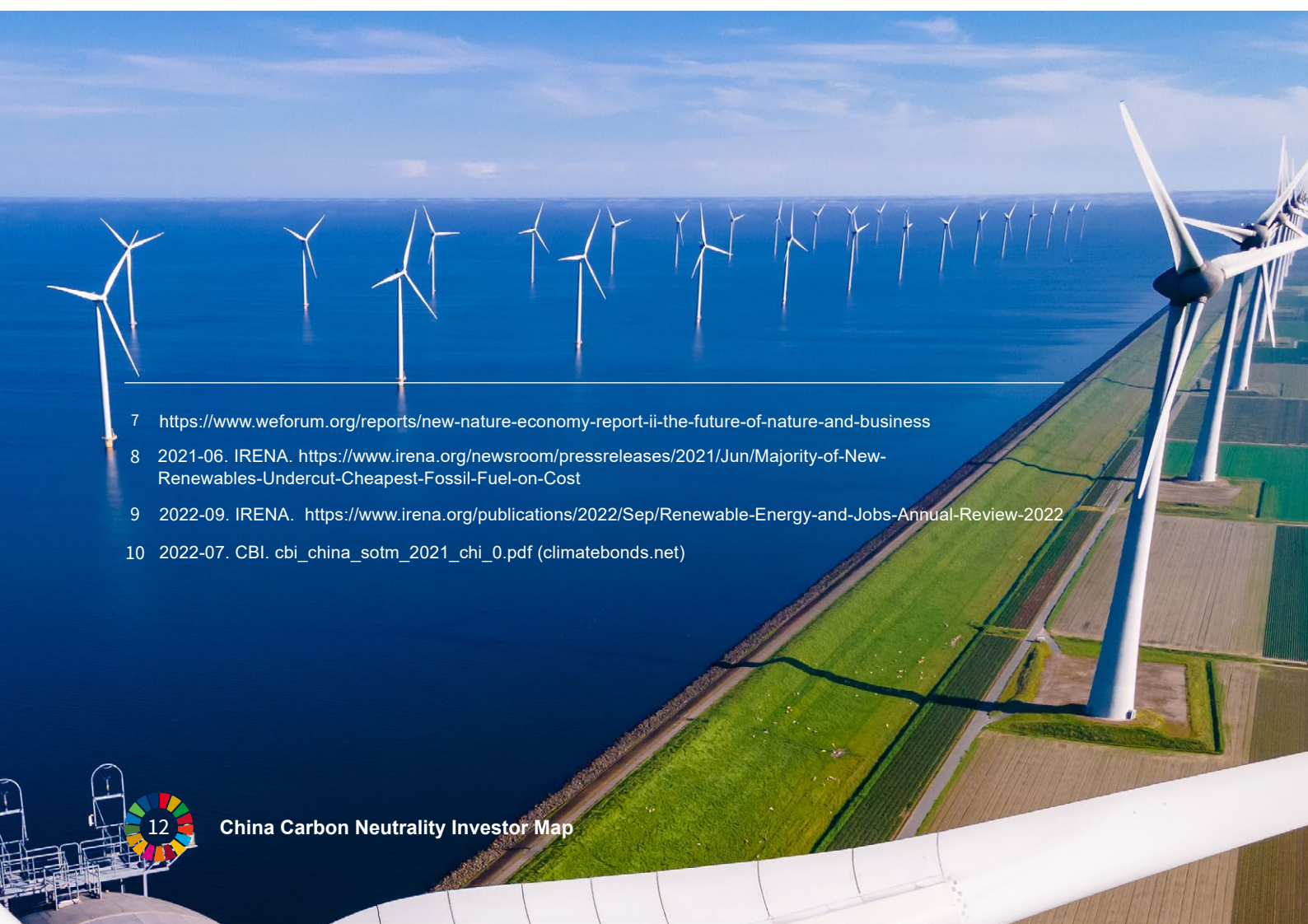
China's issuance of green bonds has taken on a rising momentum since 2016 when the country established the green financial system, apart from 2020 when the COVID-19 ravaged the country. In 2021, Chinese labelled green bonds recorded its fastest annual growth to date: Total issuance at domestic and international markets grew **140** percent, to USD **109.5** billion.¹⁰

7 <https://www.weforum.org/reports/new-nature-economy-report-ii-the-future-of-nature-and-business>

8 2021-06. IRENA. <https://www.irena.org/newsroom/pressreleases/2021/Jun/Majority-of-New-Renewables-Undercut-Cheapest-Fossil-Fuel-on-Cost>

9 2022-09. IRENA. <https://www.irena.org/publications/2022/Sep/Renewable-Energy-and-Jobs-Annual-Review-2022>

10 2022-07. CBI. [cbi_china_sotm_2021_chi_0.pdf](https://www.cbi.china-sotm.com/2021_chi_0.pdf) (climatebonds.net)



Sizeable opportunities are emerging in China's green industries.



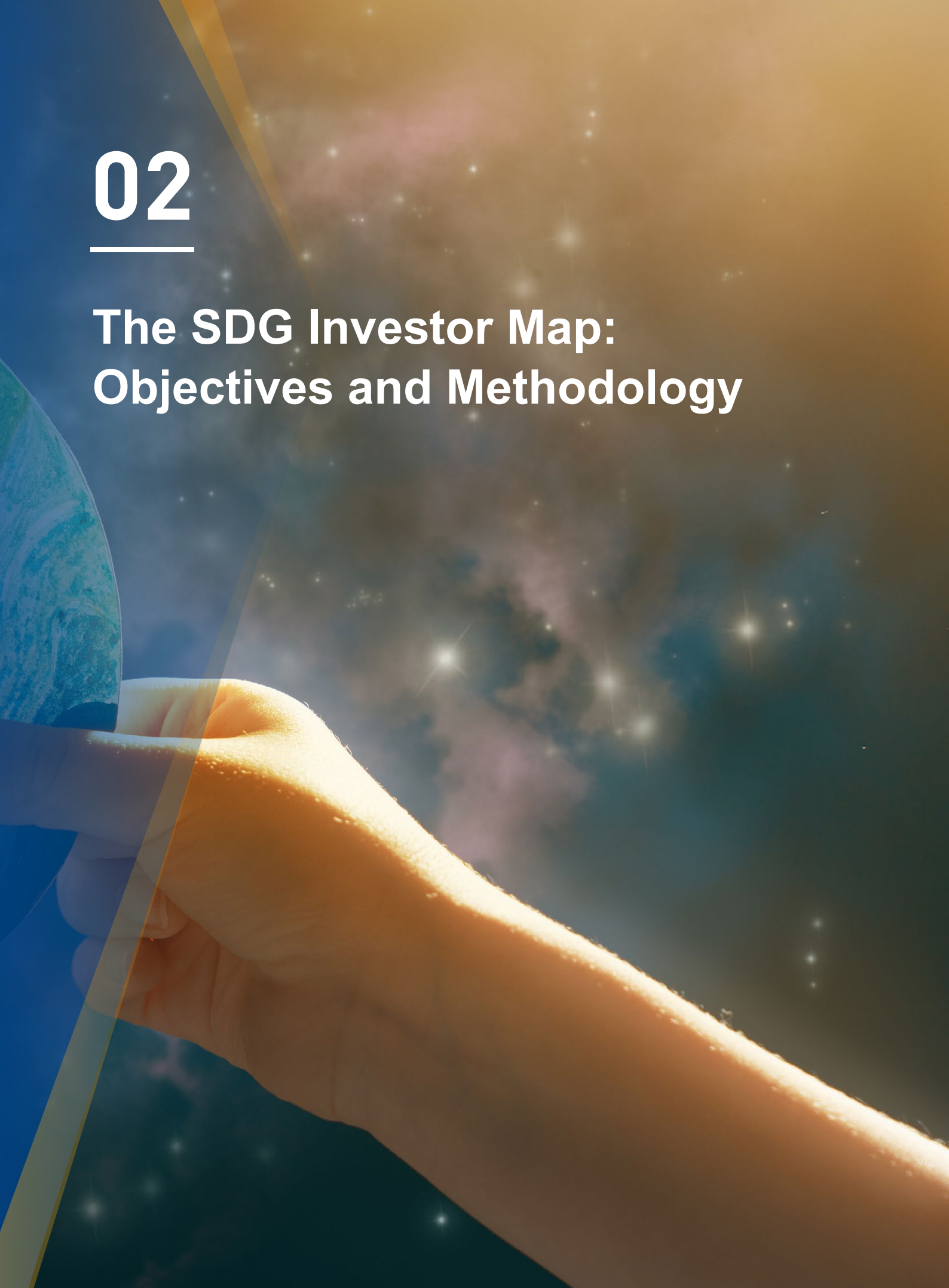
It is found that China's renewable energy sector dominated by wind power and photovoltaics is expected to bring about USD **13** billion¹¹ in annual investment opportunities.

Increasing demand for renewable electricity, renewable energy for buildings and clean energy for transportation are translating into new investment opportunities. Industrial policies are also encouraging companies to increase the proportion of renewable electricity they use by, for example, purchasing green electricity on the market. This will shift consumption towards low and zero-carbon energy and further increase the need for renewable electricity generation. The use of smart technology in heating buildings is also creating opportunities for solar, geothermal and bioenergy, with the possibility of integrating solar power applications into buildings. In the transportation sector, policies are also encouraging the switch to clean energy. Consequently, the market for electrified public transportation and vehicles powered by electricity, hydrogen and advanced biofuels is expected to expand. This is also anticipated to help the market grow for scaled investment in associated infrastructure: charging and battery-changing stations, hydrogen and natural gas filling stations, etc.

¹¹ Solarbe.com, 2021, Huge scope to increase China's 2030 wind and solar targets, <https://news.solarbe.com/202102/05/334646.html>

02

The SDG Investor Map: Objectives and Methodology



Providing Market Intelligence to Bridge the Information Gap

Limited information on green and inclusive investment opportunities among some key parties has been a major problem for mainstreaming sustainable finance. With the lack of adequate data and commonly accepted standards and frameworks, financial institutions, investors and governments are faced with a challenge: how to select projects which make business sense, while contributing to the environment and our society, as well as how to scientifically calculate the associated costs and risks. Meanwhile, companies and project owners lack the awareness and capacity to improve their impact disclosure. They can benefit from methodologies guiding them on what and how to disclose, to attract responsible investors.

UNDP developed the SDG Investor Map as public goods to bridge the information gap between industries and investors. The Map helps investors to identify investment opportunities which generate both business returns and SDG impact. The Map covers over around 30 countries (including China) in an effort to turn national development needs and policy priorities into concrete investment opportunity areas (IOAs).

This initiative in China was launched in 2020. In January 2021, UNDP China published its *SDG Investor Map in China Summary Report*, identifying four development priorities based on Chinese national development needs as entry points: eco-agriculture and rural development, health care, circular economy, and renewable energy. These correspond to relevant sectors as defined by the Sustainable Industry Classification System (SICS) Sustainability Accounting Standards Board (SASB), namely: food and beverage, health care, infrastructure, renewables and alternative energy (Fig. 2)¹². Work on the Map continued in two stages. The first was completed by December 2021, with analysis of IOAs in agriculture and rural development, along with healthcare. The second is the *Carbon Neutrality Investor Map* discussed herein, which looks at IOAs in the circular economy and renewable energy.

China's Development Priorities				
	Eco-agricultural & Rural Development	Health Care	Circular Economy	Renewable Energy
Sub-sector	Agricultural Products	Biotechnology & Pharmaceuticals	Water Utilities & Services	Electric Utilities & Power Generators
	Meat, Poultry & Dairy	Medical Equipment & Supplies	Waste Management	Biofuels
	Processed Foods	Health Care Delivery	Gas Utilities & Distributors	Solar Technology & Project Developers
	Non-Alcoholic Beverages	Health Care Distributors	Engineering & Construction Services	Wind Technology & Project Developers
	Alcoholic Beverages	Managed Care	Home Builders	Fuel Cells & Industrial Batteries
	Tobacco	Drug Retailers	Real Estate	Forestry Management
	Food Retailers & Distributors		Real Estate Services	Pulp & Paper Products
	Restaurants			

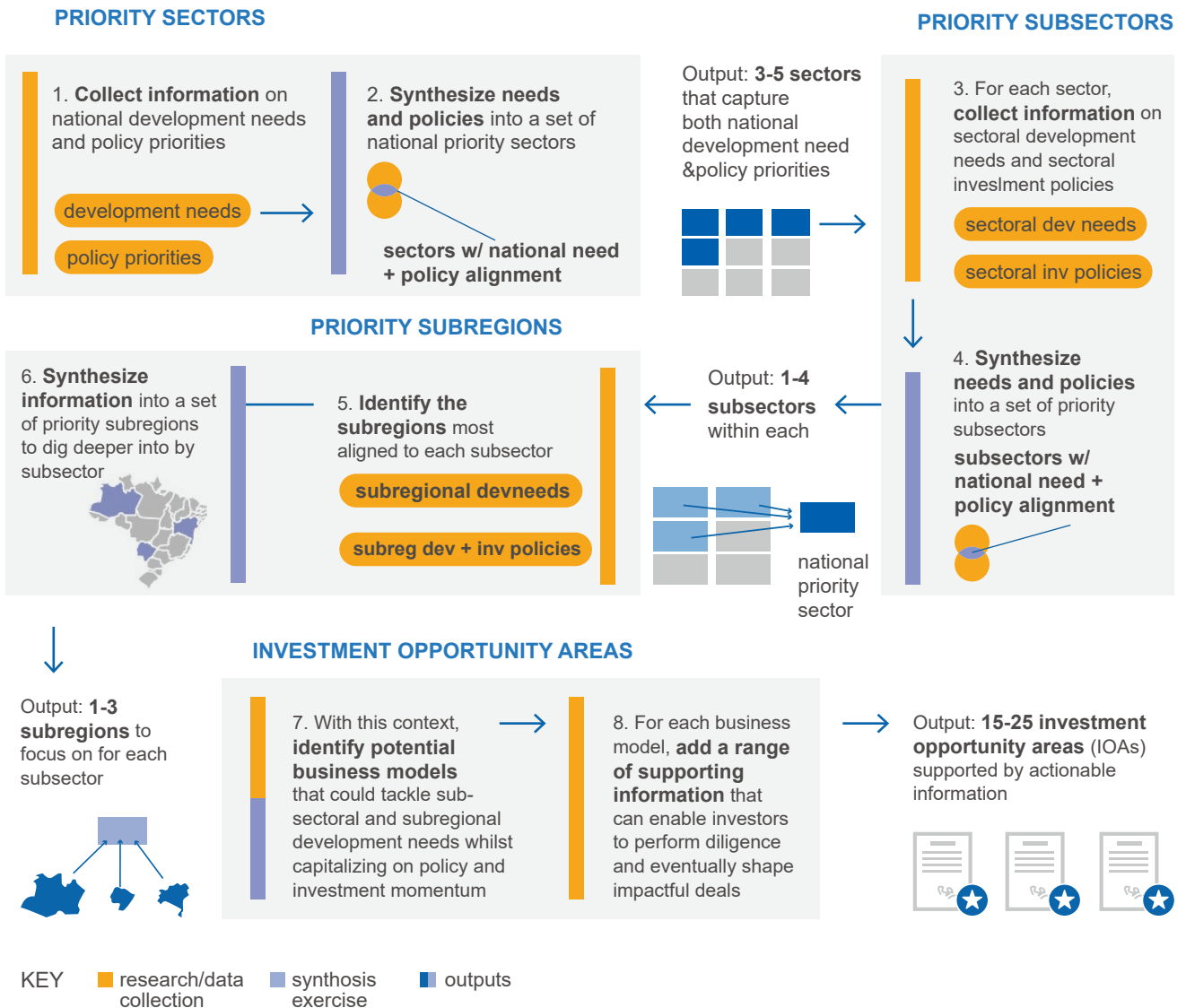
Source: UNDP, *SDG Investor Map in China Summary Report*

Fig. 2: Development Priorities and Key Sectors and Subsectors Identified by the SDG Investor Map in China

12 Initially five development priorities were identified, the four mentioned and technological innovation. However, due to overlap with the first four development priorities no separate analysis was carried out.

A Standardised 8-Step Methodology

Standardization is critical to developing the SDG Investor Map, to ensure the data comparability across the globe, a **standardised 8-step methodology** is used to identify IOAs in different sectors, with a dataset comprising 20 data points compiled for each, covering the business model, policy and market environment, sustainable development needs, SDG labelling and impact indicators. The Map is developed through in-depth desk research and consultations with stakeholders, as well as a few rounds of verification. The objective is to identify and validate overlaps between development needs and policy priorities, as well as to further narrow these down into specific investment opportunities meeting local sustainable development needs. The procedure for producing an SDG Investor Map is shown in Fig 3.



Source: UNDP

Fig. 3: The Standardised 8-Step Map Process

Step 1 to Step 4: Identify Sectors and Subsectors with China's Development Priorities and Focus

The first four steps in developing the Map synthesize national development needs and policy priorities, to identify sectors where there is both significant policy commitment and the potential to drive sustainable development. To do this, almost 100 policy documents were studied. This includes the *14th Five-Year Plan for National Economic and Social Development and the Long-Range Objectives Through the Year 2035*, the *Guiding Opinions of the State Council on Accelerating the Establishment of a Sound Economic System with Green, Low-carbon and Circular Development*, and *China's Voluntary National Review Report on Implementation of the 2030 Agenda for Sustainable Development*. The review also covered development assessment reports published by international organisations, such as UNDP's China National Human Development Reports.

Inclusion criteria¹³ were also used to identify sectors and subsectors which meet China's development needs while benefiting sustainable development. These were then categorised according to the Sustainability Accounting Standards Board's Sustainable Industry Classification System. According to the "exclusion criteria" (Fig. 4), some industries and sub-industries are excluded. For example, according to "Do No Significant Harm", the map excludes all fossil energy-related industries. According to the principle of "no alternatives," although some industries (eg: waste incineration for electricity generation) might be able to reduce carbon dioxide emissions to a certain extent, they are excluded because often they have better alternatives with less negative impact on society or other environmental aspects (eg: pollution).

- national development strategies and policies
- international best practices for social development
- provide social benefits in SDG-concerned sectors for SDG-targeted groups

Inclusion criteria (Sectors/Projects that are included must align with)



Source: UNDP



Exclusion criteria (a three-step approach)

- Exclude projects that the national government discourages. Excluded sectors include gambling, weapons, adult entertainment and projects violating human rights
- Exclude projects that risk doing significant harm to the SDGs
- Exclude projects where alternatives with fewer negative impacts are feasible at equal or lower costs

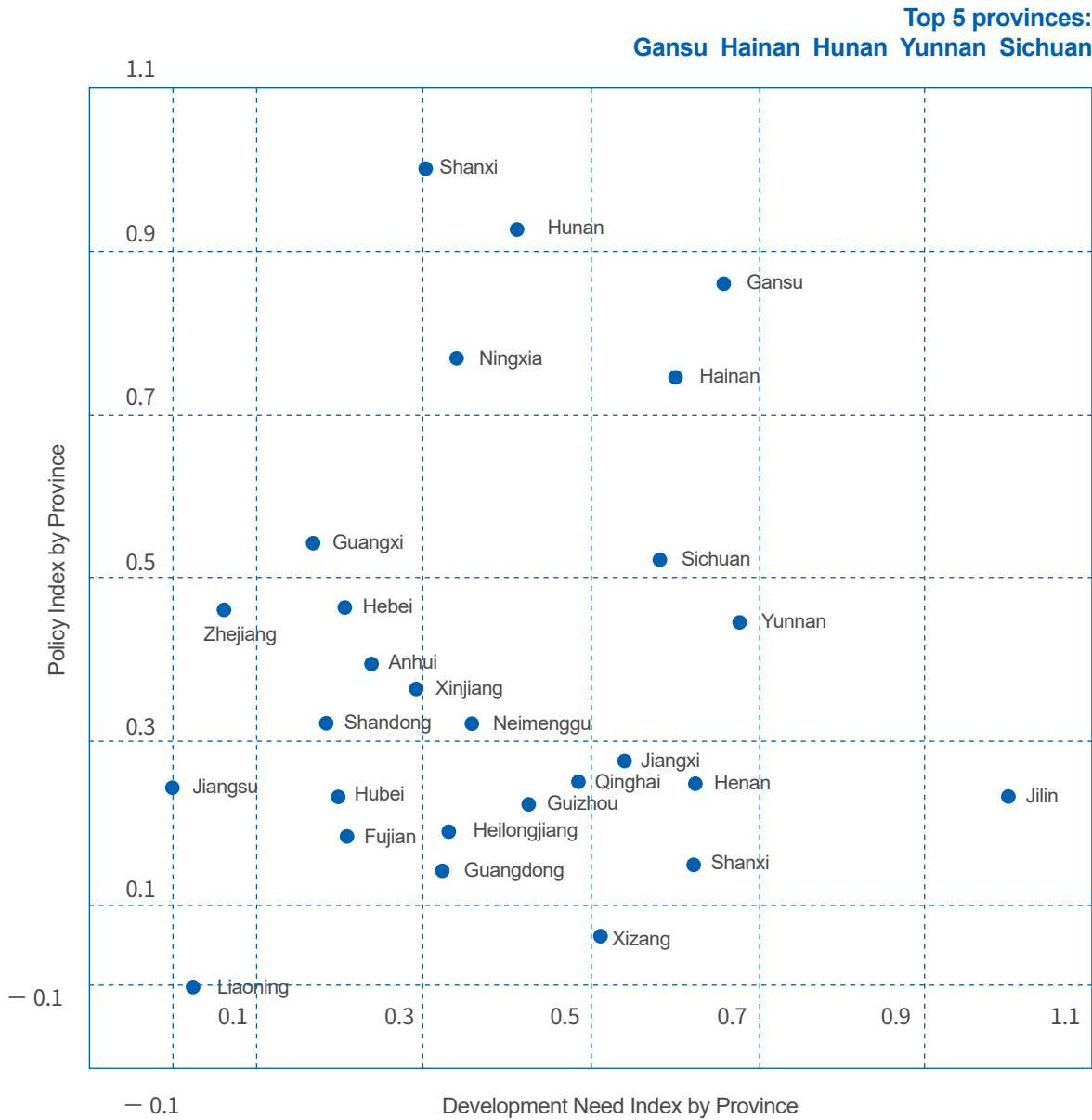


Fig. 4: Criteria for Selecting Sectors and Subsectors

Using the above selection criteria, we identified seven circular economy and renewable energy subsectors. These are: water utilities & services, waste management, electric utilities & power generators, biofuels, solar technology & project developers, wind technology & project developers, and fuel cells & industrial batteries.

13 The inclusion and exclusion criteria were drawn from the Technical Report on SDG Finance Taxonomy (China)

Steps 5 and 6: Identify Priority Subregions to Focus on



Source: Impact Intelligence

Fig. 5: Index Matrix with Example of Water Service Industry

Steps 5 and 6 compare China’s provinces to identify those with high development needs and potential, as well as the strong political/financial commitment to spur the subsector growth. We mined data from approximately 570 relevant provincial-level policy documents and 1,500 other documents (found via 116,000 Chinese-language news items) to build a matrix comprising a Policy Index and a Development Need Index (Fig. 5). Natural language processing was used to extract relevant content and compare levels of policy and institutional support for different subsectors across provinces.

Steps 7 and 8: Derive IOAs and Collect Supporting Information

All preliminarily identified IOAs were assessed based on their sustainability impact, market potential and policy support. The sustainability impact selection criteria include an evaluation of the contribution of the IOAs to the SDGs, whether vulnerable and underserved groups (e.g., people living in rural areas, people with disabilities, senior citizens, and children) can be better served with enhanced investments in the IOAs, and if the IOAs may cause harm to other SDGs. On market potential, key elements for selection include market size, return profile and growth potential, while policy support tracks government efforts to promote the development of the IOA. Key IOAs in each subsector were selected for more detailed analysis based on their market potential, a clear link to development priorities and pressing development needs. We also presented risk factors as a dimension for investors and project owners to consider, allowing for continued improvement of impact management through the life-circle of a project in certain IOAs.

An in-depth analysis of policy documents and market data was carried out, aided by artificial intelligence and big data techniques. Wide-ranging interviews with experts were then used to verify the findings. Ultimately, 18 IOAs across the circular economy and renewable energy sectors were chosen. A dataset comprising 20 datapoints for each IOA was compiled, covering the subsector, subregion, business model, policy and market environment, sustainable development needs, SDG labelling and impact indicators (see Fig. 6).



Source: UNDP

Fig. 6: The 20 IOA Datapoints

03

Key Findings



China's Carbon Neutrality Investor Map identified the 18 IOAs in the circular economy sector and renewable energy sector (See Table 4). Please see the Annexes or the UNDP's online database (<https://sdginvestorplatform.undp.org/market-intelligence>) for specific impacts, business models, risk factors, etc.

Table 4: IOAs Summary

Sector	SASB Classification	Subsector	IOAs	Market Size	Returns	Payback Period (years)	Investment Scale (\$M)
Circular economy	Infra-structure	Water utilities & services	Waste water treatment	> USD 1 billion 4-year CAGR 5%-10%	GPM > 25%	> 10	> 10
			Production and supply of piped water	> USD 1 billion, 5-year CAGR 10% - 15%	GPM 20% - 25%	> 10	> 10
			Smart water services	> USD 1 billion, 6-year CAGR 20% - 25%	GPM 20% - 25%	< 5	1 - 10
		Waste management	Treatment and utilisation of hazardous industrial waste	> USD 1 billion	GPM 20% - 25%	5 - 10	> 10
			Supply of alternative fuel sanitation vehicles	USD 100 million - USD 1 billion	GPM > 25%	< 5	> 10
		Electric utilities & power generators	Smart meters & construction of systems to collect data on power usage	> USD 1 billion, 3-year CAGR 20% - 30%	GPM > 25%	5 - 10	> 10
			Ultra-high voltage (UHV) power transmission	4-year CAGR 5% - 10%	GPM 15% - 20%	< 5	> 10
			Charging infrastructure for EVs	6-year CAGR > 25%	GPM 20% - 25%	5 - 10	> 10
			Biofuel	Biodiesel from waste cooking oil	USD 100 million - USD 1 billion	GPM 10% - 15%	< 5
		Renewable Energy	Renewable and Alternative Energy	Solar technologies & project developers	N-type solar cells	5-year CAGR > 25%	IRR 15% - 20%
Distributed solar power generation	5-year CAGR > 25%				GPM > 25%; IRR 5% - 10%	5 - 10	> 10
Wind technology & project developers	Building-integrated photovoltaics (BIPV)			USD 100 million - USD 1 billion, 5-year CAGR > 25%	IRR 10% - 15%	5 - 10	> 10
	Offshore wind			4-year CAGR > 25%	GPM > 25%	< 5	> 10
	Large turbine wind manufacturing			> USD 1 billion	GPM 20% - 25%	5 - 10	> 10
Fuel cells & industrial batteries	Turbine bearing manufacturing			> USD 1 billion, 4-year CAGR 5% - 10%	GPM > 25%	5 - 10	> 10
	Carbon fibre for turbine blades			5-year CAGR 20% - 25%	GPM > 25%	5 - 10	> 10
	Battery recycling and utilisation			> USD 1 billion, 9-year CAGR > 25%	GPM 10% - 15%	5 - 10	> 10
	Building/operating of battery swap stations	> USD 1 billion, 4-year CAGR > 25%	IRR 10% - 15%	5 - 10	> 10		

Source: Compiled based on public information

Notes: 1) CAGR: Compound Annual Growth Rate; 2) GPM: Gross Profit Margin; 3) IRR: Internal Rate of Return; 4) The market data of IOAs were calculated based on historical figures and public information; 5) The sectors of the Carbon Neutrality Investor Map (the first column) are according to China's development priority, thus not completely corresponded with the SASB classification (the second column).



Water Utilities & Services

Sustainable use of resources is integral to climate change mitigation and adaptation. Water utilities need to develop new green and low-carbon technologies to cut emissions and achieve synergies between reductions in carbon and pollution, contributing to China's dual carbon goals.



Wastewater treatment field

Efficient and low-energy equipment and technologies are needed



Water supplies

Awareness of water conservation and reuse of water is required

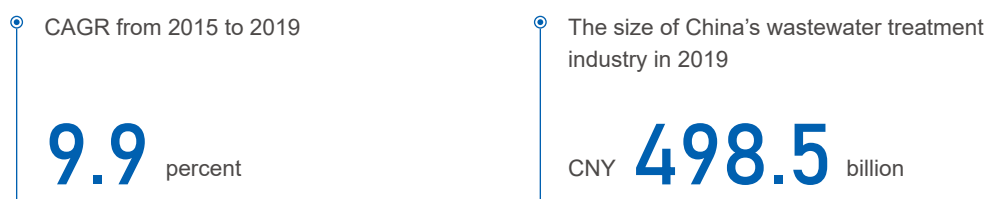


Smart water services

Digital technology must also be built into infrastructure, to increase efficiency of management and allow for smart water services

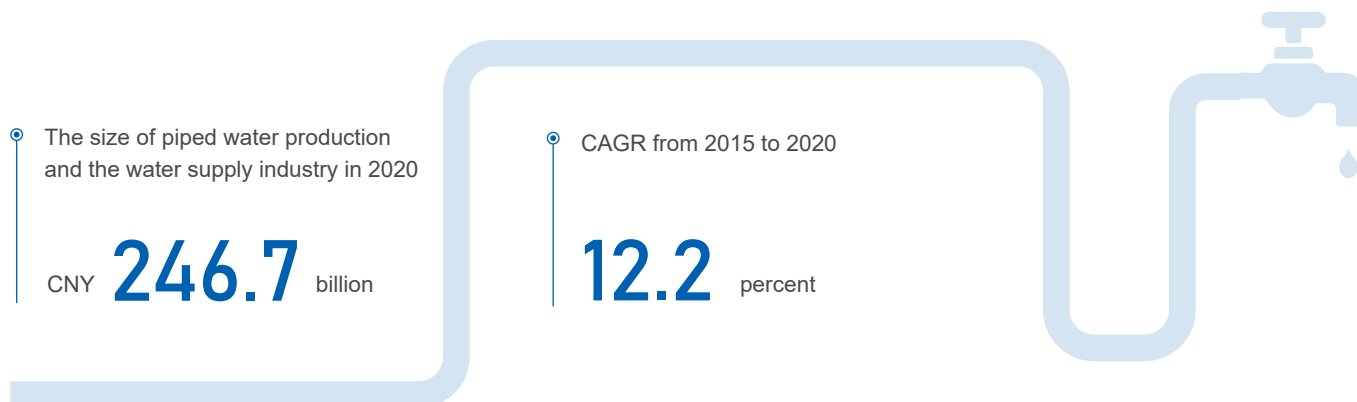
Wastewater Treatment

China's production of wastewater has risen in line with urbanisation and economic growth. In response, Chinese cities have built wastewater treatment plants and infrastructure. In China, wastewater treatment is usually run as a franchise, with companies signing BOT (build, operate, transfer) or TOT (transfer, operate, transfer) deals with local governments. Those deals set quantities of wastewater to be treated, an overall rate of return, payment methods and periods, along with pricing mechanisms. They usually last 25 to 30 years, with the fixed fee deals enabling stable prices and profitability. There is significant potential for growth here, mostly in four areas: urban sewer networks, wastewater treatment facilities, water recycling equipment and sludge treatment. Meanwhile, rural wastewater treatment mostly still relies on primitive approaches such as evaporation, meaning the market there is in nascent stages with great potential for growth. The size (calculated by income) of China's wastewater treatment industry has increased from CNY 341.9 billion (USD 49 billion) in 2015 to CNY 498.5 billion (USD 71.6 billion) in 2019, with a CAGR of 9.9 percent.¹⁴



Production and Supply of Piped Water

Water supplies support economic and social development and are essential for daily life. They are important both as a public service as well as for environmental protection, and are mainly owned and operated by state-owned enterprises. However, the role of the market has increased in recent years, via policies incentivising investment and reforms. With the increase in water prices, there is a potential for growth, particularly in built-up rural areas, smaller villages and the vast rural areas of central and western China. Moreover, China is creating a unified water rights trading market to promote water conservation and recycling. The size (calculated by income from large scale enterprises in the industry) of piped water production and the water supply industry in China has increased from CNY 123.7 billion (USD 18 billion) in 2015, to CNY 246.7 billion (USD 35 billion) in 2020, with a CAGR of 12.2 percent.¹⁵



14 National Energy Information Platform, 2020, 2020 China sewage treatment industry market status and development trend analysis, <https://baijiahao.baidu.com/s?id=1681510465354422954&wfr=spider&for=pc>

15 Forward Industrial Research Institute, 2021, China Water Production and Supply Industry Market Outlook and Investment Analysis Report, <https://www.qianzhan.com/analyst/detail/220/210804-d6e76b4e.html>



Smart Water Services

Smart water services are driven by both business demands and data, making full use of new-generation information and Internet of Things (IoT) technologies. These technologies upgrade the traditional water infrastructure to equipment that can produce vast amounts of data, thus improving efficiency and reducing energy use. Smart water services combine sensors, communication networks and water information systems to make better use of IT in providing water services, realising management synergies, more efficient use of resources and more convenient services. In China, management of water services remains focused on tackling issues such as leaks, but developing technologies such as the IoT, 5G networks and cloud computing create enabling environment for smart water services. Additionally, the subsector is also exploring the use of artificial intelligence. The outlook for smart water services in China is bright: the size of China's smart water services market will grow from CNY 12.48 billion (USD 2 billion) in 2020, to an estimated CNY 37 billion (USD 5 billion) in 2026, with a CAGR of 20 percent.¹⁶

The size of China's smart water services market in 2020

CNY **12.48** billion

The size of China's smart water services market in 2026

CNY **37** billion

CAGR from 2020 to 2025

20 percent

16 Forward Industrial Research Institute, 2021, 2021 Overview of Smart Water Services in China, <https://iot.ofweek.com/2021-07/ART-132200-8420-30512202.html>

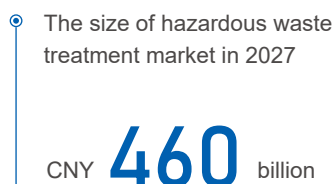
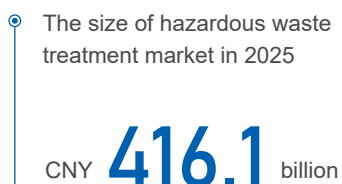


Waste Management

Sustainable management of waste can reduce the quantities produced, increase recycling and reuse, as well as reduce carbon dioxide emissions, contributing to achieving the dual carbon goals. There is a trend towards at-scale, industrialised and higher-tech approaches in the treatment and utilisation of hazardous industrial waste. There is also huge potential for the supply of alternative fuel sanitation vehicles.

Treatment and Utilisation of Hazardous Industrial Waste

Dealing with hazardous waste is an important part of China's environmental efforts. Industrialisation has led to large production of hazardous waste, much of which has not been handled properly, producing leachate or hazardous gases, along with polluting soil and groundwater. In general, there are two ways of treating hazardous waste: One is to make it become harmless waste (a service for which the government sets prices). The other is to treat it and reuse part of it as new resources (in which case the new resources are sold at market prices). Three principles—harmless treatment, waste reduction and recycling resources—are applied. This requires facility operators to have comprehensive capabilities and work across the industrial chain to increase efficiency and control costs. With China's priority of achieving the national goal of "zero-waste city" construction under its ecological civilisation vision, it is important for industries to grow and improve capacity in comprehensively and safely managing hazardous waste, as well as improving the rate of hazardous waste disposal. Against this backdrop, it is estimated that the hazardous waste treatment market will reach CNY 416.1 billion (USD 60 billion) in size by 2025 and may pass CNY 460 billion (USD 66 billion) in 2027.¹⁷



17 Proresearch, 2022, Analysis of driving factors in China's new energy sanitation vehicle industry, http://www.360doc.com/content/22/06/10/16/13672581_1035470835.shtml



Supply of Alternative Fuel Sanitation Vehicles

Sanitation vehicles are street cleaning vehicles, garbage trucks and road maintenance vehicles. There is growing potential for these vehicles to be powered by non-traditional energy sources. Local governments prefer to acquire electric vehicles over other non-fossil fuel alternatives, as these vehicles make shorter, slower trips on regular routes at regular times, with the technology found in electric-only vehicles simple, established and easy to recharge. With zero emissions and little noise, they also greatly reduce emissions and disturbance. In 2020, the alternative fuel sanitation vehicles market size was worth CNY 6.51 billion (USD 0.9 billion), 80 percent smaller than traditional fuel-based vehicles. However, it is estimated that market for alternative fuel sanitation vehicles will grow to CNY 40 billion (USD 6 billion) by 2025.¹⁸

The alternative fuel sanitation vehicles market size in 2020

CNY **6.51** billion

Market for alternative fuel sanitation vehicles in 2025

CNY **40** billion

18 Proresearch, 2022, Analysis of driving factors in China's new energy sanitation vehicle industry, http://www.360doc.com/content/22/0610/16/13672581_1035470835.shtml



Electric Utilities & Power Generators

Steadily growing demand for electricity and the urgent need to restructure the energy mix present challenges for China's electricity systems. A new energy system built around renewables will require more stable, secure and smart supplies. Three IOAs were chosen in this subsector, in alignment with guidelines included in the 14th Five Year Plan and supporting a low carbon transition. Based on the Five-Year Plan, by 2025 China aims to improve the utilization rate of UHV power transmission channels, as well as accelerate the smart transformation of power grid infrastructure and the construction of smart microgrids. It also aims to improve power system complementarity and intelligent regulation capabilities, strengthen the connectivity of power sources, grids, loads and storage, enhance clean energy consumption and storage capabilities, as well as boost transmission and distribution capacities to remote areas.

Smart Meters & Construction of Systems to Collect Data on Power Usage

Smart meters are a basic component of smart grids and Internet of Energy advanced metering infrastructure. These devices gather, measure, transmit and process data on electricity usage, and are essential to enabling smart grids and the Internet of Energy to manage loads, measure distributed energy generation, manage power grids, trade on power markets and monitor power quality. These data-collection systems are an important part of smart grids reducing the use of non-renewable energy sources and thus emissions. Demand for investment in smart meters and construction of systems to collect data on power usage between 2021 and 2026 is estimated to be over CNY 200 billion (USD 29 billion). The smart power market is expected to see 20-30 percent annual growth for the next 2-3 years.¹⁹

① Demand for investment in smart power between 2021 and 2026

over CNY **200** billion

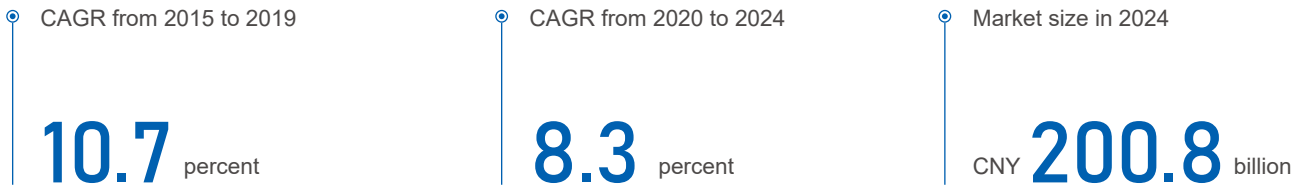
② CAGR for the next 2-3 years

20-30 percent

¹⁹ Forward Industrial Research Institute, 2021, A panorama of China's smart grid industry in 2022, <https://www.qianzhan.com/analyst/detail/220/211110-9f5f794b.html>

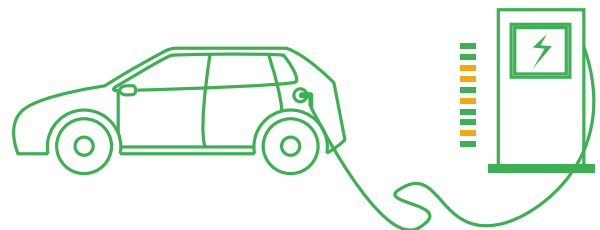
Ultra-High Voltage (UHV) Power Transmission

UHV refers to currents of over 1000 kV AC or ± 800 kV DC. UHV transmission is one of the world's most advanced power transmission technologies and can transmit large quantities of power over long distances, with little transmission loss and a small covering. UHV and long-distance power lines can therefore make transmission more efficient. In China, the east of the country needs much more power than it generates, while central and western China generate a surplus. More UHV lines running west to east and north to south are needed: taking hydropower from the southwest and renewable energy from the north to load centres in the east—the Pearl River and Yangtze River deltas and the Beijing-Tianjin-Hebei region—will help resolve that mismatch and consume renewable energy generation. From 2015 to 2019, the market size of China's UHV electrical device industry increased from CNY 89.59 billion (USD 13 billion) to CNY134.55 billion (USD 19 billion), with a CAGR of 10.7%. From 2020 to 2024, the market size is expected to grow with a CAGR of 8.3%, to around CNY 200.8 billion (USD 29 billion).²⁰



Charging Infrastructure for EVs

Charging points for EVs can be installed in public spaces such as public buildings, car parks, shopping malls and commercial vehicle charging stations; or in private locations, such as apartment complexes. More charging points make recharging EVs more convenient and encourage purchases, driving decarbonisation of the transportation sector. Charging points can also be used to supply electricity from vehicle batteries to the grid, turning EVs into mobile power storage units and helping regulate loads, improve power quality and consume renewable energy. However, public and private charging points are failing to keep up with the output of EVs. Enhancing the charging infrastructure will be necessary if China is to achieve its EV goals, meaning huge space for growth in this subsector. By 2020, there were 1.68 million of electric vehicle charging points in China. It is estimated that by 2026, China will need over 10 million charging points, with a CAGR of 37 percent from 2020 to 2026.²¹



20 Huajing Information Network, 2020, Analysis of the development status and trend of China's UHV electrical industry, and continuous improvement of industrial technology, <https://baijiahao.baidu.com/s?id=1686756165366566025&wfr=spider&for=pc>. Toubao Research Institute, 2020, 2020 China UHV electrical industry overview, <https://www.leadleo.com/report/details?id=5ea65fc54d4eff21508e9057>

21 Forward Industrial Research Institute, 2022, Development prospect forecast and investment strategic planning analysis report of China's electric vehicle charging pile industry, https://www.hemeirv.com/cars_1024527

Biofuels

Biofuels have huge potential as a source of renewable energy, allowing for large quantities of environmentally friendly material to be used as fuel and providing one of the technological pathways to the dual carbon goals. Biodiesel from waste cooking oil has the advantage of being clean and renewable—reducing both carbon dioxide emissions and air pollution. It also has food safety benefits, by preventing waste cooking oil from finding its way back into food. Additionally, there is huge market potential. In the short term, subsidy policies making biodiesel from waste cooking oil profitable are expected, in order to encourage R&D and investments. In the long-term, investment value in biodiesel from the waste cooking oil sector should come from technological advances, cost reductions, expansion of production and overseas demand.



Biodiesel from Waste Cooking Oil

Biodiesel, a form of bioenergy, can be made from animal and plant oils or fats, or waste cooking oil. Fatty acid methyl or ethyl esters made from methanol or ethanol via transesterification or esterification can substitute for traditional diesel, but are renewable. Biodiesel has become one of the main pathways for decarbonisation of transport and is internationally recognised as a renewable and clean source of energy. It is mostly used either as fuel for engines or as a bio-based material. Biodiesel from waste oil from the catering industry and food processing plants can cut emissions by as much as 80 percent compared with traditional diesel.²² Increasing the use of biodiesel has the potential to raise the percentage of renewable energy used in the transportation sector, cutting emissions from diesel vehicles, and helping China to reach its dual carbon goals. Boosting demand is also likely to open new opportunities for biodiesel production, particularly for Chinese firms exporting biodiesel from waste cooking oil. With consideration of potential resources, in 2021 China's actual diesel consumption may have been as much as 190 million tons.²³ Based on the B5 diesel blending ratio (i.e. 5 percent biodiesel additional ratio), the potential growing space for China's biomass diesel market will be about CNY 70 billion (USD 10 billion) to CNY 90 billion (USD 13 billion).

China's actual diesel consumption in 2021

190 million tons

The potential growing space for China's biomass diesel market

CNY **70-90** billion

22 China National Petroleum Corporation News Centre, 2021, Promoting the Biodiesel from Waste Cooking Oil Industry, <http://news.cnpc.com.cn/system/2021/09/28/030045895.shtml>

23 China Petroleum and Chemical Industry Federation Chemical Data Network, 2022, 2022 Diesel Market Development Report, https://mp.weixin.qq.com/s?__biz=MzlwNDE4OTE3Mw==&mid=2652358505&idx=1&sn=c5f463ad5652e005826e660678f2d8b7&chksm=8d209bf3ba5712e54efd9612cb668b1c88fd11fd8a61f823f40458b356138b756c46a268d420&scene=27



Solar Technologies & Project Developers

Solar is one of the main forms of renewable energy. PV solar generation in China is maturing, with costs falling quickly. Thermal solar power generation, heat use technology and applications are also expanding. Both will help China achieve its dual carbon goals. It is expected that N-type solar cells will gradually replace the current P-types, giving a boost in conversion efficiency. Investment and construction of distributed PV solar generation should expand, making better use of solar potential. Meanwhile, new building-integrated photovoltaics (BIPV) materials have a central role to play in making buildings more economic to run.

N-Type Solar Cells

Solar cells can be classed as P-type or N-type, depending on the technology used: P-types use silicon doped with boron, N-types with phosphorous. Currently, the industry relies mainly on P-type cells (mostly Passivated Emitter and Rear Contact (PERC) cells). N-type cells may gradually replace those, as they improve conversion efficiency, reduce generation costs and raise availability of renewable energy. Roll-out of N-type solar cells will raise conversion efficiency and generation, which in turn increases total lifespan power generation and minimises the cost of power. That means more clean energy for more people at lower prices. Manufacturing capacity for N-type cells was 14 gigawatts in 2020. Estimates say that it will reach 136 gigawatts in 2025, with a CAGR of 58 percent.²⁴

Manufacturing capacity for N-type cells in 2020

14 GW

Manufacturing capacity in 2025

136 GW

CAGR from 2020 to 2025

58 percent

²⁴ Cai Lian News, 2021, 2022 will be the first year of N-type modules The industrial chain may usher in an explosive period in the next 5 years, <http://news.hexun.com/2021-12-15/204935928.html>

Distributed Solar Power Generation

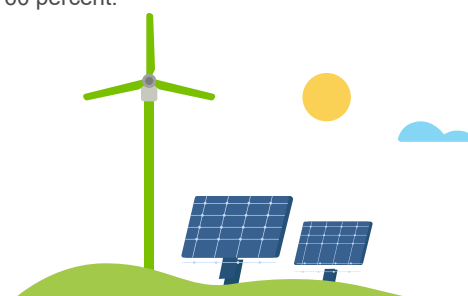
Distributed solar installations are small PV systems that can supply local power users, or export electricity to the grid. They produce relatively small amounts of power, but pollute very little, have strong environmental benefits and can help reduce localised power shortages by generating power where it is needed. Building distributed solar will allow for more intensive use of resources, reduce peak loads, save and optimise investments in transmission networks and encourage residents to use green energy. As such, it is an important measure for achieving the dual carbon goals. There are more rooftops and land available, at lower cost, in county-level towns than in larger cities, which is where the greater potential for distributed solar lies. From 2016 to 2021, the newly-added installed capacity of distributed photovoltaic in China grew from 4.24 GW to 29 GW, while the cumulative installed capacity increased from 10.32 GW to 107 GW, with a five-year CAGR of 60 percent.²⁵

The cumulative installed capacity in 2021

107 GW

CAGR from 2016 to 2021

60 percent



Building-Integrated Photovoltaics (BIPV)

BIPV uses solar panels as a building material, integrated at the design and construction stages. The integrated material provides shelter and insulation as normal, but also generates power. The cost and lifespan of BIPV systems make them affordable and can reduce overall construction and installation costs, as well as returning a profit. As PV solar generating costs continue to fall, BIPV will continue to play a central role in providing clean energy. In 2020, China's BIPV market was worth about CNY 5 billion (USD 718 million). It is estimated to reach nearly CNY 50 billion (USD 7 billion) in 2025, with a five-year CAGR of 58 percent.²⁶

China's BIPV market in 2020

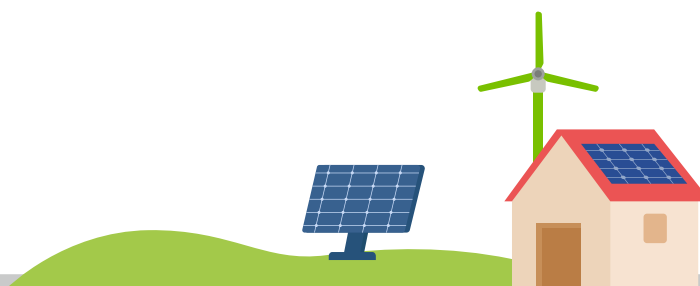
CNY **5** billion

China's BIPV market by 2025

CNY **50** billion

CAGR from 2020 to 2025

58 percent



25 Huatai Securities, 2022, Distributed photovoltaics: the next blue ocean market, <http://finance.sina.com.cn/stock/stockzmt/2022-02-16/doc-ikyamrna0999864.shtml>

26 Xiuqiang Shares, 2021, 2021 plan for issuing A-shares to specific targets (three revisions), https://pdf.dfcfw.com/pdf/H2_AN202204211560688787_1.pdf?1650570201000.pdf



Wind Technology & Project Developers

Given its vast landmass and coastline, China is now the world leader in combined installed onshore and offshore wind power—with more than a quarter of total capacity, at 342 gigawatts, more than doubling the country's total wind capacity since 2015²⁷. Thus, **China has promising prospects in developing wind power**. The *14th Five Year Plan* includes guidelines for wind farms built where there is plentiful wind, the necessary conditions for construction, potential for further expansion and where regional environmental protection requirements are met. Offshore wind is also considered for its great potential, including higher efficiency and durability than onshore options. Demand is expected to grow for turbine bearings, carbon fibre materials for turbine blades and large turbine fabrication, to support the expansion of wind power generation.

Offshore Wind

Offshore wind is a relatively new clean energy trend, as land for commercial wind power development is increasingly scarce. Offshore wind farms have several advantages versus onshore farms: they extract 20-40 percent more energy²⁸, enjoy higher wind speeds with less damaging sand in the air, run more stably and produce no dust. Offshore installations also mean less wear and tear on machinery and so extend lifespans. Additionally, they can reduce transmission costs: China's southern and eastern coasts have plenty of wind and lie next to China's power-hungry developed regions. Reduced transmission distances will save money. In 2021, the newly-added offshore wind power installed capacity in China was 16.49GW, and the cumulative offshore wind power installed capacity 26.39GW. It is estimated that from 2022 to 2025, the newly-added offshore wind power installed capacity in China will be about 73.6GW, with a CAGR of 40 percent from 2021 to 2025.²⁹



27 2022-03-29. Weforum. <https://www.weforum.org/agenda/2022/03/offshore-onshore-wind-power-auction-capacity/>

28 Hunan Ecology and Environment Department, 2015, What is Offshore Wind?, http://sthjt.hunan.gov.cn/sthjt/ztlz/lwhjr/hbzs/201506/t20150603_4632725.html

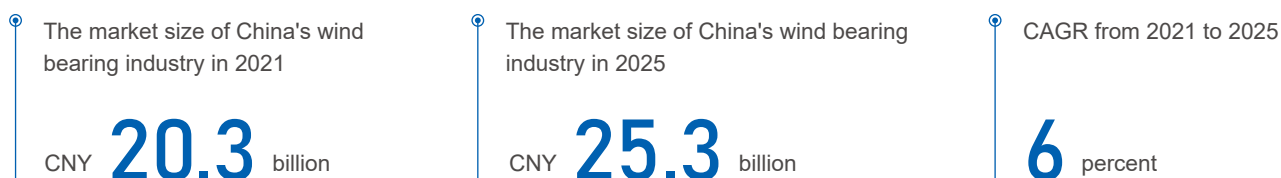
29 China Securities News, 2022, The installed capacity of the 14th Five-Year Plan is expected to exceed expectations, and the offshore wind power industry is booming, <http://www.zqrb.cn/finance/hangyedongtai/2022-11-16/A1668550698416.htm>

Large Wind Turbine Manufacturing

Wind turbines are expected to become larger over time, leading to cheaper power. At the manufacturing stage, larger turbines mean more generation per unit of materials, helping to reduce costs. When wind farms are being built, larger turbines require fewer resources for foundations, cables and electrical equipment. Fewer, larger turbines also mean lower construction and maintenance costs.

Turbine Bearing Manufacturing

Bearings are a key component of wind turbines. Technological requirements for their manufacture are high, as is the value added. The bearings are used at pitch and yaw points and in the main transmission shaft, usually with one set of main shaft bearings, one set of yaw bearings and three sets of pitch bearings. The physical demands on these bearings are huge, so longevity and stability are vital. The complex technology means that the Chinese industry regards this as one of the most challenging components to manufacture. The market size of China's wind bearing industry was CNY 20.3 billion (USD 3 billion) in 2021. It is estimated to reach CNY 25.3 billion (USD 4 billion) in 2025, with a CAGR of 6 percent from 2021 to 2025.³⁰



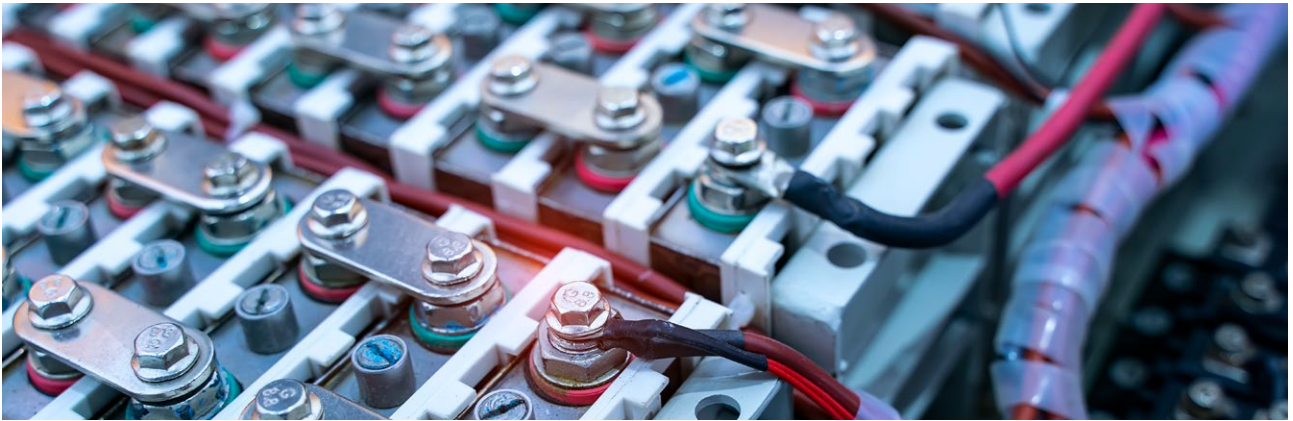
Carbon Fibre for Turbine Blades

The blades in a turbine account for 22 percent of its total cost, with their size and shape determining how much of the energy in the wind is converted into electricity, and thus the power and performance of the turbine. The blades are, therefore, central to turbine design. Turbine blades made from carbon fibre - which is light, strong and stiff - are better able to capture wind energy and provide both the strength and rigidity needed to withstand high loads, without deforming and potentially striking the turbine tower. According to one of our anonymous interviews with industry players, carbon fibre turbine blades may be more than 30 percent lighter than their fibreglass equivalents, for the same rigidity and strength and that the diameter of a turbine rotor can now reach 120 metres, with fibreglass blades weighing 18 tonnes. Replacing those with carbon fibre blades would reduce the overall weight by 38 percent, and cut costs by 14 percent. 40.9 percent of the downstream market needs for carbon fibre went to wind turbine blades in 2020, totalling 20,000 tons, growing by 45 percent year-on-year.³¹ With turbines getting bigger, demand for carbon fibre material for turbine blades is set to increase.



30 Panorama.com, 2022, Wind power bearings: the only remaining value depression in the wind power industry chain is also about to start? https://www.sohu.com/a/593448866_115124?spm=smcpc.author.fd-d.5.1667197148972lg30TVj

31 Chujiang New Material, 2022, carbon fiber industry: wind power leads, downstream application market booming, <http://www.ahcjxc.com/news/577248.htm>



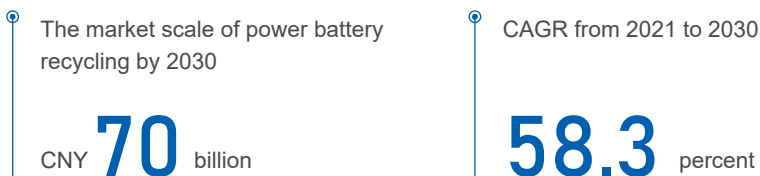
Fuel Cells & Industrial Batteries

In 2020, the transportation sector accounted for 10 percent of all of China's carbon dioxide emissions. Alternative fuel vehicles are vital for that sector's green transition.³² Battery technology has always held electric vehicles (EVs) back—it determines range and impacts on overall quality and cost. With the EV fleet expanding rapidly, there has been an associated increase in demand for battery recharging, recycling and disposal. Battery recycling and reuse makes better use of rare metal resources and reduces pollution due to waste. Battery swap stations benefit vehicle owners by cutting recharge times and saving wear on batteries, taking up less space and offering great potential for accelerating the electrification of transportation.

Battery Recycling and Utilisation

Battery repurposing and recycling brings prominent environmental, social, and economic gains. The expansion of EV sector unlocks high potential for battery repurposing and recycling. In China, the total volume of EV batteries reaching end-of-life is expected to reach 137.4GWh in 2025, with the market predicted to exceed CNY 100 billion (USD 14 billion). Even by a moderate estimate the market scale of power battery recycling will exceed CNY 70 billion (USD 10 billion) by 2030, with a CAGR of 58.3 percent from 2021 to 2030.³³

Of the various options under development, there are two major approaches to deal with used batteries: 1) repurposing them through a tiered approach to meet different energy storage demand in different sectors, 2) recycling them for dismantling and extraction of raw materials such as lithium, cobalt, nickel etc. Although the former is more environmental beneficial, the market is leaning towards the latter. This is due to the surge in price of raw materials as well as the lack of standards for assessing the value of used batteries and steps for preparing them for repurposing. Moving forward, to boost the sector of battery repurposing, it is important to strengthen regulatory environment to improve standardization, enhance benign competition and collaborations across the value chain, and leverage policy and fiscal incentives for scaled up financial support for companies in need.



32 State Council, 2022, Accelerate use of green and low-carbon transportation, http://www.gov.cn/xinwen/2022-01/14/content_5668085.htm

33 Cai Lian News, in 2022, China's retired power batteries may reach 137.4GWh in 2025 Battery recycling output value can exceed 100 billion, https://www.sohu.com/a/593504605_121335114



Building / Operating Battery Swap Stations

China is exploring the battery swap model for EVs. Battery swapping has benefits in terms of power requirements, grid management, footprint, infrastructure needs and battery management. The resulting advantages—time saved, lower costs of grid adjustments, smaller footprint—can overcome some of the difficulties of recharging which have hampered expansion of the EV fleet and encourage wider electrification of transport. Policy incentives have seen China's EV fleet grow rapidly, with investment into the sector accelerating. This means a wider market and more profit for battery swap stations serving commercial vehicles. It is estimated there could be 22,000 battery swap stations by 2025, with business worth CNY 263.1 billion (USD 38 billion). The market for battery swap equipment could reach CNY 69.3 billion (USD 10 billion). The CAGR of station construction, operation and battery swap equipment is expected to reach 80-107 percent between 2021 to 2025, a high-speed growth period during the 14th Five Year Plan period.³⁴

Business worth for battery swap stations serving commercial vehicles by 2025

CNY **263.1** billion

Market size for battery swap equipment by 2025

CNY **69.3** billion

CAGR of station construction, operation and battery swap equipment from 2021 to 2025

80-107 percent

34 China Times, 2021, the 100 billion market is ready to go, and the new energy vehicle battery swap mode is coming? http://www.cnenergynews.cn/peixun/2021/10/23/detail_20211023109159.html

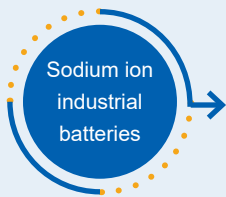
Areas with Potential yet to Be Qualified as IOAs

Alongside the 18 key IOAs, the Map also identifies areas with potential for future exploration. Despite the high environmental and social benefits, there exist obstacles hampering large-scale investments. One common challenge many of them face is the cost disadvantages. To break through this bottle neck and translate the future potential into real market expansion, policy and regulatory innovation are crucial to further improve current pricing mechanisms—make it more effectively incorporate the positive environmental externalities of the low carbon sectors and translate them to the cost advantages. These can be achieved by a series of policy tools, such as properly designed fiscal interventions and green finance policy incentives.

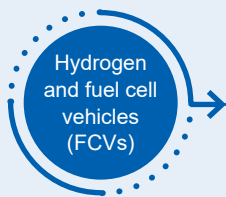
With sufficient capacity, as well as interest and support among stakeholders, the three research teams (UNDP, Industrial Securities, and Impact Intelligence) would continue to look into these areas and the associated policy and sustainability factors, and, where possible, provide more targeted recommendations on policies and business models.

Some of these potential opportunity areas are as follows:

Areas with Environmental and Social Benefits but Uncertain Return Profiles



These are cheap, safe and have certain electrochemical advantages. There is broad potential for their use in energy storage, commercial vehicles and some passenger vehicles, and the relative abundance of sodium could speed up electrification in a number of fields. In July 2022, a CNY 588 million (USD 84 million) gigawatt-hour scale sodium ion battery production line—the world's first—was completed in Fuyang. That said, the subsector is new with limited data and market information. Materials are not yet ideal, costs are high and standards have not been set. It is expected it will be some time before sodium ion batteries can compete with their lithium alternatives, while more likely they serve as supplementary or back-up choices.

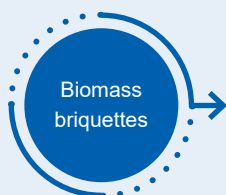


Although the economic viability requires further improvement, green hydrogen³⁵ based solutions open a new sphere for social and environmental benefits in three major sectors—transport, industries, and energy. In the transport sector, the deployment of fuel cell vehicles will grow and eventually complement battery electric vehicles for the sector's decarbonisation. However, fuel cell systems are still expensive. Countries including China are only just starting to manufacture FCVs commercially i.e. at the size of only 1,000-3,000 sales per annum in the past 4 years in China.

That said, rapid growth in its market size is expected due to China's need for decarbonizing its transport sector and the clear target of reaching a total deployment of 50,000 vehicles by 2025 set in the *Medium and Long-term Plan for Hydrogen Energy Industry Development (2021-2035)* by the National Development and Reform Commission (NDRC) and National Energy Administration in March 2022. The Plan also went beyond the transport sector, but also in industries and energy, with an emphasis on renewable energy-based hydrogen as the long-term direction.

While the cost of green hydrogen remains high in general, companies are starting to invest in production plants located close to end-users, for example, chemical industrial parks in areas with rich and cheap renewables. Such measures can help phase out fossil-fuel based hydrogen with stronger economic viability.

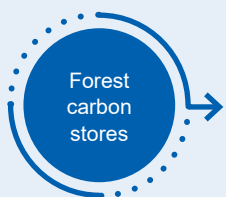
35 By the definition of International Renewable Energy Agency, Green hydrogen, also referred as “clean hydrogen”, is produced by using clean energy from surplus renewable energy sources, such as solar or wind power, to split water into two hydrogen atoms and one oxygen atom through a process called electrolysis. <https://www.irena.org/publications/2020/Nov/Green-hydrogen>



Biomass
briquettes

Biomass briquettes are a new type of clean fuel made from agricultural and wood waste. They represent a good alternative to fossil fuels, as they have high calorific value, burn efficiently, are easy to make, save energy and are renewable. Biomass briquettes can be used in the pharmaceuticals, textiles, dyeing, food, paper-making, plastics and chemical industries. Globally, these briquettes are used mainly for heating and power generation. In Europe the biomass briquette subsector is mature and profitable, but China lags behind, with a smaller market and limited data on returns and payback periods, among other challenges, implying an uncertain outlook for investment. There are also significant impact risks to be considered and managed: raw material inputs and the equipment and techniques used in their manufacture can reduce quality and lead to issues such as air pollution.

Areas with Development Impact but Lack of Policy Support



Forest
carbon
stores

Developing forest carbon stores can encourage forest managers to run and protect their forests better, with larger forests more able to purify the air, act as wind and dust breaks, regulate the climate and absorb carbon dioxide. It is also a way to revitalise underdeveloped forest regions and the natural assets of mountain regions in western regions, supporting socio-economic development by increasing the value of their ecological assets. As China's forest stock and coverage increases, the amount of carbon dioxide sequestered will rise, highlighting the emissions offsetting role of forest carbon. However, China's market for forest carbon credits is struggling to grow, accounting for only a small part of China Certified Emission Reduction (CCER) projects. Of the CCER projects registered with Chinese authorities, only 15³⁶, or 2 percent³⁷ of the total, involve forest carbon, while in 2017 the NDRC suspended registration of CCERs. As of yet, no updated rules for the process have been released and the national CCER trading centres remain in their planning stages. Finally, the market in forest carbon credits is also hampered by issues including a lack of standardised accounting and auditing methods, surplus supply and low liquidity. For the sector to effectively contribute to low carbon transition efforts and provide solid business opportunities, these challenges would need to be successfully addressed.

36 2021-12-30. National Forestry and Grassland Administration, National Park Administration. <http://www.forestry.gov.cn/main/586/20211230/090440470184605.html>

37 Referring to the research report of Southwest Securities, starting from March 2017, new CCER projects are no longer approved and old projects can still run. There were 861 projects on record in total by then, and 15 forestry CCER projects have been filed, accounting for 15/861=2%.

An aerial photograph showing a two-lane asphalt road with a motorcycle in the distance. The road is flanked by dense green forests. In the foreground, there is a body of water with ripples. A semi-transparent diagonal band runs across the image from the top-left to the bottom-right.

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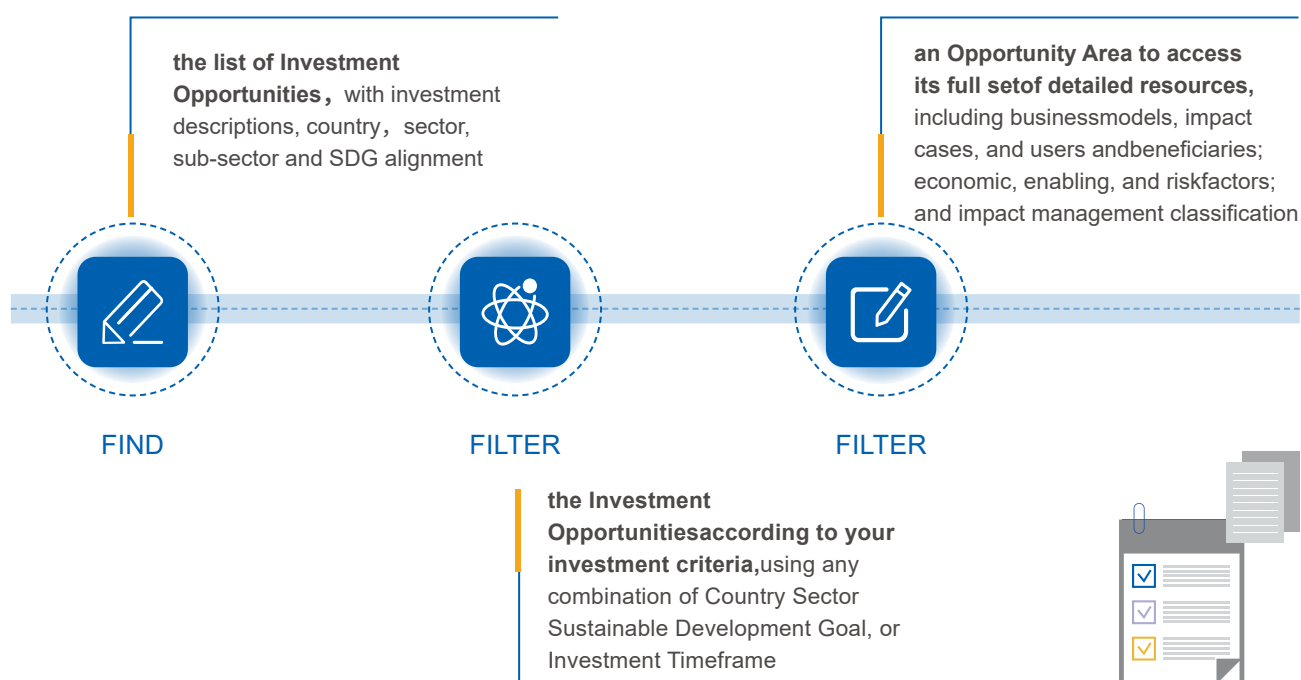
Audience and Use

As the world's roadmap towards sustainable development, the SDGs provide a framework for tracking and evaluating non-financial performance. They also help to balance the pros and cons of different approaches to sustainable development and guide efficient allocation of capital. The comprehensive and multi-dimensional challenges to achieving the 17 SDGs require all stakeholders to act, using the goals as a common language around which consensus and collaboration are formed for a sustainable future.

The **SDG Investor Map**, including the **Carbon Neutrality Investor Map** discussed here, can serve as a tool for **strategy setting, decision-making, tracking and reporting throughout the project lifecycle. The Map can provide valuable impact intelligence for various stakeholders and help investors and decision-makers contribute to the SDGs.** Below are our suggestions on how different audiences can use the Map.

Financial Institutions and Investors

Financial institutions and investors can treat the Map first as a pre-investment decision-making tool, to identify opportunities and develop strategies. The information provided on locations, policy environments, business models, social and environmental impacts, stakeholders and risk factors will help investors to weigh up pros and cons, in selecting the optimal mix of investments. However, limits on granularity mean the Map cannot provide all the fine details needed for investment decisions. Financial institutions and investors should use other sources of information as appropriate.



Source: SDG Impact: Investment Solutions for Global Impact

Fig. 7: How Investors Use the Map

Next, the Map can be used to control investment risks, as well as to track, manage and report on impacts. While maximising availability of data, we presented "impact cases" for each IOA, including development need, expected SDG impacts, a gender and marginalised groups lens, along with quantified impact indicators. Meanwhile, risk factors listed include financial risks, as well as social and environmental risks. Investors can consider these datapoints and use them to improve existing risk management, due diligence and impact reporting models, to strengthen alignment with the SDGs.

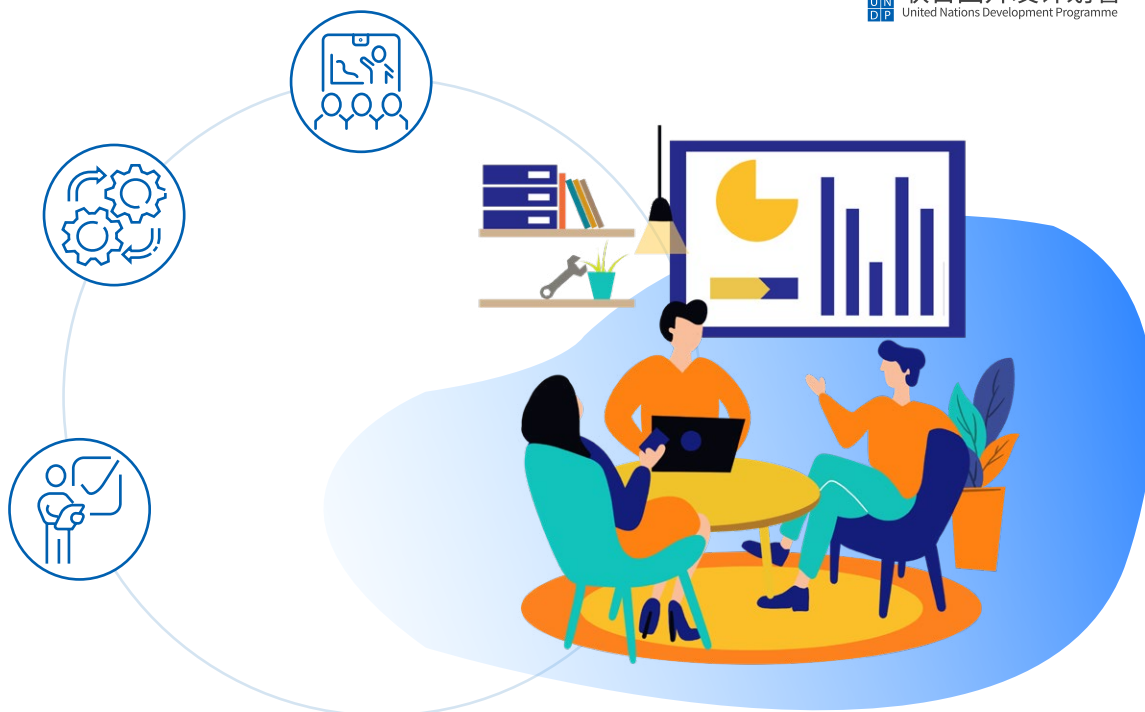


Companies and Project Owners

For companies and project owners, the Map are first a tool to navigate the SDGs and how they can support them.

Studying the Map's different impact case datapoints will improve companies understanding of the SDGs, as well as facilitating changes to management structures and better integrating impact management into processes. Taking the SDGs into account during company operations, strategic decisions and budgeting will meet stakeholders' demand for the sustainable transition of companies. In practice, improved impact management means, for example, working with small and medium enterprises (SMEs), hiring those who have been excluded from social and economic development, giving women equal opportunities to engage in economic activities, reducing emissions in supply chains, and increasing green as well as sustainability awareness among suppliers.

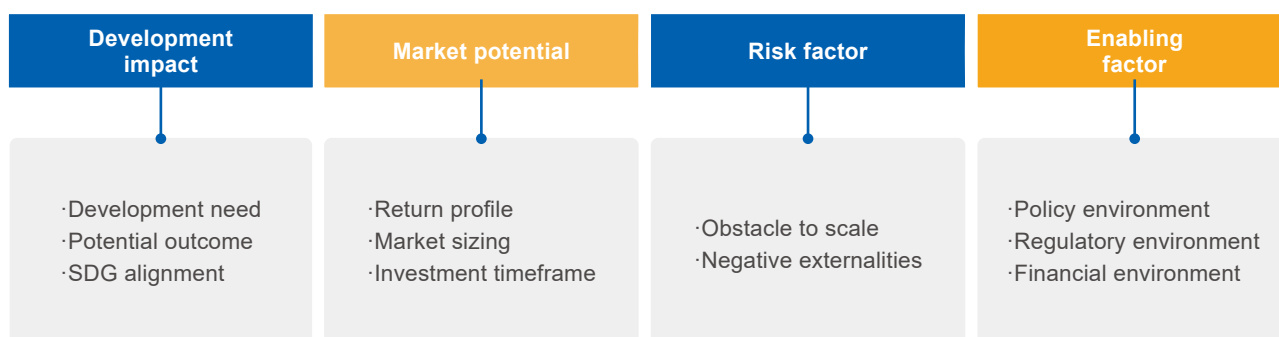
The Map can also serve as a reporting tool. Companies can use key elements of impact cases to build and improve on their own social and environmental impact assessment and reporting frameworks. Proactive transparency will attract more responsible investors and open-up funding opportunities for sustainable projects and activities.



Policymakers, Industry Associations, Think Tanks and social Organisations

For these stakeholders, the Map can serve as a diagnostic and analytical tool.

All IOAs featured in the Map must have three factors helpful for development: 1) development need and potential positive impacts; 2) policy support; and 3) a good market outlook suitable for investment. Datapoints for IOAs not on the map can be collected and analysed to identify obstacles to development and formulate targeted solutions.



Source: UNDP

Fig. 8: The 4 Dimensions for Identifying IOAs

The "impact cases" for IOAs on the Map cover risk factors such as policy barriers, pricing mechanisms and technical bottlenecks. Policymakers and intelligence providers can use those risk factors as an entry point for research into scaling up those IOAs.

