

2025

迈向绿色贸易新纪元：全球绿色转型的机遇、路径与中国角色

TOWARD A NEW ERA OF GREEN TRADE: OPPORTUNITIES, PATHWAYS, AND CHINA'S ROLE IN THE GLOBAL GREEN TRANSITION

2025年11月

CCG | 全球化智库
CENTER FOR CHINA & GLOBALIZATION

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Introduction

Human society stands at a pivotal crossroads that will shape the trajectory of our collective future. Climate change—once perceived as a distant environmental concern—has now evolved into the most urgent and far-reaching systemic crisis confronting the world today. It transcends borders, ideologies, and stages of development, exerting profound and unprecedented impacts on global economic systems, social structures, and political dynamics. The 1.5°C temperature-control goal set out in the *Paris Agreement* represents the core consensus of the international community in addressing the climate crisis. As underscored by the Intergovernmental Panel on Climate Change (IPCC), achieving this goal is "critical to reducing the risks of climate change for natural and human systems and advancing sustainable development."

Yet the gap between aspiration and reality is widening, and the alarm bells are ringing louder than ever. In its latest *Global Annual to Decadal Climate Update*, the World Meteorological Organization (WMO) issued a stark warning: there is an 80% likelihood that at least one year between 2024 and 2028 will record a global average temperature 1.5°C above pre-industrial levels. This is no longer a projection about the future, but a reality already unfolding before our eyes. The continued rise in global temperatures is triggering cascading and increasingly frequent climate-related events across the world—on a scale and with an intensity without historical precedent.

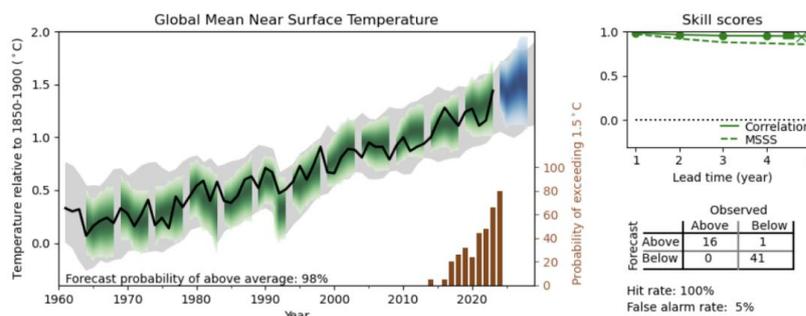


Figure 1. Global Near-Surface Temperature Anomalies and Projected Risks of Exceeding 1.5°C

Note: This figure, published by the World Meteorological Organization (WMO), presents forecasted global near-surface temperature anomalies for the next five years relative to the 1991–2020 average. The red-shaded areas indicate temperature levels significantly above the historical baseline, offering a clear visual representation of the continued and intensifying trend of global warming.

Extreme weather events—including continent-wide heatwaves, superstorms that devastate homes, and severe droughts and floods that threaten global food security—have become the "new normal" in today's world. These climate-induced disasters not only pose direct threats to human life but also inflict severe economic losses worldwide. According to estimates from the World Bank, without urgent action, annual economic damages caused by climate change could reach several trillion dollars by 2050. In this escalating crisis, developing countries, which lack the financial resources, technology, and infrastructure necessary for effective climate response, are facing increasingly severe challenges to both survival and development.

Facing this global challenge that concerns the shared destiny of humankind, a profound and systemic green transformation has become the path we must now choose—a transition that encompasses all dimensions, including energy structures, industrial models, technological pathways, and even lifestyles. However, the realization of this transformation unquestionably requires massive investment. The International Energy Agency (IEA), in its *World Energy Investment Report*, clearly points out that to achieve global net-zero emissions, annual global investment in clean

energy must reach USD 4.5 trillion by 2030. Although clean energy investment worldwide reached a record USD 1.8 trillion in 2023, the figure remains more than USD 2.7 trillion short of what is required each year. This substantial investment gap underscores the urgent need for high-cost-effective products, advanced technologies, and more efficient resource allocation.

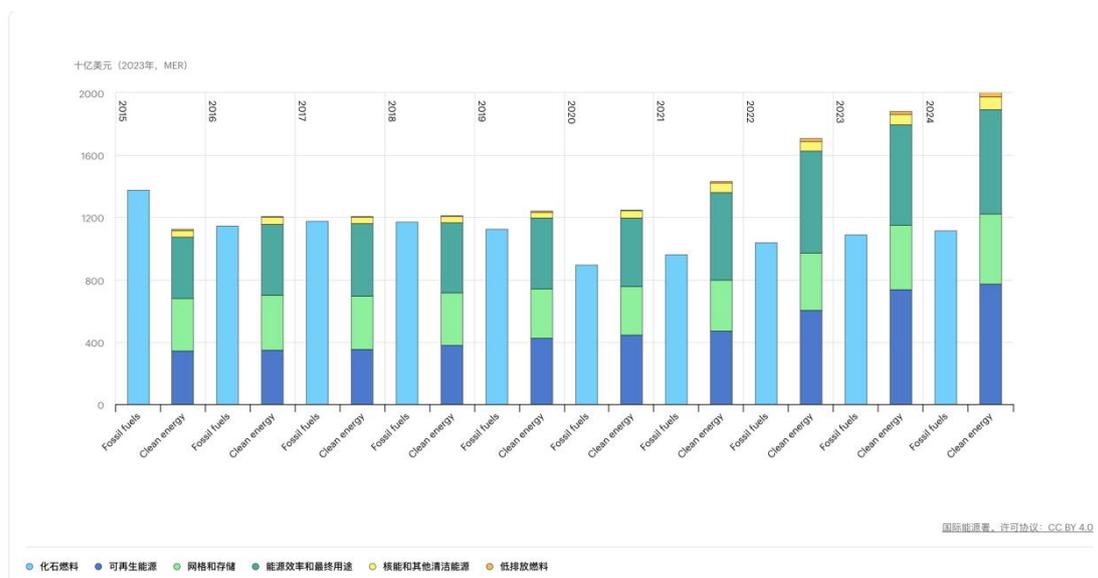


Figure 2. Global Energy Investment Structure, 2015–2024

Note: This figure is based on authoritative data from the International Energy Agency (IEA) and illustrates the structural evolution of global energy investment from 2015 to 2024 (estimated).

Against this backdrop of urgent demand, Green Trade^①, has become a central bridge linking environmental sustainability with economic growth. It has rapidly evolved from a peripheral issue in international trade into a leading and essential force reshaping global trade rules and driving transformative changes in global governance. As green products such as solar panels, wind power equipment, new energy vehicles,

① In policy documents issued by relevant United Nations agencies, green trade primarily refers to the coordination between trade and the environment. Documents such as Agenda 21, the Rio Declaration on Environment and Development, the Report of the World Summit on Sustainable Development, and the Global Sustainable Development Report all emphasize that trade and the environment are complementary, mutually reinforcing, and should be advanced in a coordinated manner. In 2021, the United Nations Environment Programme (UNEP) released Green International Trade: The Way Forward, which repeatedly references green trade and proposes an Environment and Trade 2.0 agenda, including strengthening environment-related trade policies, promoting upgraded environmental regulation through trade policies and agreements, and advancing cooperation on environment–trade linkages. The European Union's policy documents, including Adapting to Climate Change: Towards a Framework for European Action, also highlight green trade, typically referring to two dimensions: green trade measures and trade in green products.

and energy storage technologies are exchanged with increasing frequency in international markets, related industries are breaking through geographic constraints and forming more efficient patterns of resource allocation on a global scale. At the same time, competitive pressure in international markets and the effects of large-scale production have accelerated cost reductions in green technologies, making them more accessible to countries at different stages of development. Moreover, green trade has facilitated technological collaboration and industrial-chain linkages among multinational enterprises and institutions, providing new momentum for innovation and diffusion of green technologies and gradually forming a collaborative network that underpins the global green transition.

In recent years, global green trade has demonstrated exceptionally strong momentum, revealing immense market potential and remarkable resilience. According to joint statistics from the World Trade Organization (WTO) and the International Energy Agency (IEA), the scale of international green trade reached a historic USD 5 trillion in 2024—an extraordinary 85% increase compared with 2020—and its share of total global goods and services trade climbed to 18%. Behind these figures lies the widespread global consensus and firm commitment to pursuing green, low-carbon, and sustainable development pathways.

Amid this sweeping global green transition, the world landscape is undergoing profound changes, and China is experiencing a historic shift from a "participant" to an "important contributor" and an "active leader". Leveraging its full industrial-chain strengths in renewable energy, new energy vehicles, and related sectors, China has not only built a solid foundation for its own green development but has also supplied global markets with large volumes of high-quality and high-cost-effectiveness green products. This has significantly advanced global energy transitions and notably reduced worldwide emission-reduction costs. A new era driven by green trade is emerging—an era whose opportunities, challenges, and far-reaching transformations merit comprehensive and in-depth examination.

Section I: Current State and Emerging Trends of Global Green Trade

Against the broader global narrative of combating climate change and pursuing sustainable development, green trade has transformed from a relatively specialized and marginal field into a core force driving global economic restructuring and reshaping international competitiveness. It not only represents a new engine for economic growth but also serves as a key pathway for achieving the goals of the *Paris Agreement* and building a community with a shared future for mankind. This section provides a systematic overview of the evolution and landscape of global green trade and analyzes the fundamental mechanisms that underpin its development.

I. The Emergence and Evolution of Green Trade

The rise of green trade has not occurred overnight; rather, it has gradually taken shape alongside the deepening global understanding of the relationship between the environment and development. Its conceptual foundations, definitional boundaries, and global significance have all undergone a profound process of evolution.

1. Theoretical Origins: From Sustainable Development to a Global Consensus

The theoretical foundation of green trade is rooted in the concept of "sustainable development." This notion was first introduced in the 1987 report *Our Common Future* by the World Commission on Environment and Development (WCED), which offered the classic definition: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." This marked a revolutionary leap in humanity's understanding of development, placing intergenerational equity and environmental carrying capacity at the core of

development considerations for the first time.

The 1992 United Nations Conference on Environment and Development (the Rio Earth Summit) represented a milestone in transforming this idea into global action. *Agenda 21*, adopted at the conference, established a comprehensive action framework for global sustainable development and explicitly recognized the dual role of trade in achieving these goals: on one hand, disorderly trade may exacerbate environmental degradation and resource depletion; on the other hand, an open, fair, and non-discriminatory multilateral trading system can serve as a powerful tool for promoting sustainable development by optimizing resource allocation and enabling the dissemination of environmentally friendly technologies. From that point forward, "trade and environment" became a standing item on the international policy agenda.

Entering the 21st century—and especially with the adoption of the *2030 Agenda for Sustainable Development* and the *Paris Agreement* in 2015—green trade has gained unprecedented political momentum. These landmark agreements established the top-level legal and policy architecture for global climate action and sustainable development, translating mitigation, adaptation, and climate finance commitments into concrete obligations. Within this framework, green trade is no longer regarded merely as an auxiliary tool for environmental protection; rather, it has been elevated to a strategic pillar for achieving Nationally Determined Contributions (NDCs), accelerating the global energy transition, and building green, low-carbon economic systems.

2. Defining the Scope and Expanding the Dimensions of Green Trade

With the deepening of practical experience, the connotations and scope of green trade have continued to expand, forming a diversified and multidimensional framework.

First Stage: Focus on "Environmental Products"

In its early phase, the core concept of green trade was relatively narrow, primarily referring to "environmental products" as defined by organizations such as the Organisation for Economic Co-operation and Development (OECD) and the Asia-Pacific Economic Cooperation (APEC). These products were mainly used for environmental monitoring, pollution control, and resource management—for example, wastewater filtration systems, air purification equipment, and waste recycling technologies. Policy discussions during this stage largely focused on reducing tariff barriers applied to these specific categories of goods.

Second Stage: Expansion to "Green Services" and "Green Technologies"

As the global economy shifted toward greater service orientation, it became increasingly clear that hardware products alone were insufficient. Green services emerged as an essential component of green trade, comprising cross-border services aimed at supporting environmental objectives—such as environmental impact assessments, carbon auditing and consulting, green architectural design, engineering-procurement-construction (EPC) services for renewable energy projects, and green finance and insurance. These high-value-added service sectors are crucial for the implementation and effective operation of green projects. Meanwhile, green technology trade extended beyond physical products to include licensing of environmental patents, transfer of proprietary technologies, and authorization of low-carbon industrial processes, serving as a key channel for technological diffusion and innovation.

Third Stage: Moving Toward "Green Transformation of Entire Value Chains"

Green trade has now entered what can be characterized as its 3.0 era, centered on promoting the overall greening of global value chains (GVCs). This stage shifts the focus beyond whether a final product is "green," emphasizing instead whether its full lifecycle—production, transportation, consumption, and recycling—meets

sustainability standards. Under this broader conceptualization, circular economy products (such as remanufactured components and recycled raw materials), sustainably sourced agricultural and forestry goods, and consumer products with traceable carbon footprints are all included within the expanded domain of green trade. The primary objective of this stage is to transition from isolated product-level trade toward building a closed-loop, sustainable global production and consumption system.

3. The Changing Global Status of Green Trade: From Periphery to Core

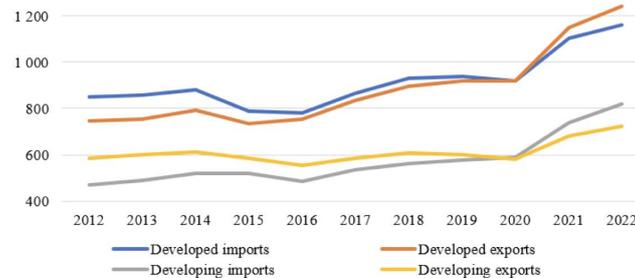
As its connotations continue to expand, the global status of green trade has undergone a historic transformation. At the end of the 20th century, it was largely regarded as an "externality" to be managed within the broader process of trade liberalization. Today, however, it has become a central agenda item in reshaping global economic and trade rules and guiding international economic cooperation. Green trade and sustainable development chapters have become indispensable components in ministerial meetings of the World Trade Organization (WTO), G20 summits, and negotiations on major regional trade agreements. As noted in the introduction of this report, its market size—reaching USD 5 trillion and accounting for 18% of total global trade—demonstrates that green trade has evolved from a former "supporting role" into one of the dual engines driving both global economic growth and the green transition.

II. The Scale, Structure, and Regional Landscape of Global Green Trade

Global green trade is expanding at an unprecedented pace and scale, demonstrating strong market dynamism and clear structural transformation trends.

1. Market Size and Growth Trends

In recent years, global green trade has experienced exceptionally rapid growth, far outpacing the overall growth rate of global goods and services trade during the same period. This reflects its strong counter-cyclical resilience and endogenous growth momentum. According to statistics from the United Nations Conference on Trade and Development (UNCTAD), the latest available data show that global trade in environmental products approached USD 2 trillion in 2022, reaching a historical high. Behind this trend lies the continuous increase in global investment in the green transition.



Source: UNCTAD calculations based on the UN Comtrade Database. Data for 2022 are preliminary.

Figure 3. Global Trade in Environmental Products, 2012–2022 (USD billions)

Source: United Nations Conference on Trade and Development (UNCTAD)^①

2. In-Depth Analysis of Trade Structure

Within the vast USD 5 trillion market, the internal structure of global green trade also reflects diverse characteristics that correspond to different dimensions of the global green transition.

Green products trade (approximately 60%): This constitutes the foundation and main body of green trade. Among these, the most striking performers are the "new trio" of electric vehicles, lithium batteries, and solar cells, which have become the

① United Nations Conference on Trade and Development (UNCTAD). International Trade and Development 2023: Report of the Secretary-General (A/78/230) [EB/OL]. [2025-11-26]. https://unctad.org/system/files/official-document/a78d230_en.pdf.

primary engines of growth. In addition, trade in wind turbine systems, energy storage equipment, energy-efficient appliances, and environmentally friendly materials has also continued to expand.

Green services trade (approximately 25%): This is a rapidly growing sector with even higher added value. As global investment in green projects continues to rise, demand for cross-border services such as green finance, technical consulting, engineering design, certification services, and risk management has increased significantly.

Carbon trading (approximately 15%): With the improvement of global and regional carbon pricing mechanisms (e.g., the EU Emissions Trading System, EU-ETS), cross-border transactions of carbon allowances and carbon credits have become increasingly active. This emerging form of commodity trade, with environmental capacity as its underlying asset, is growing in both market scale and financial sophistication.

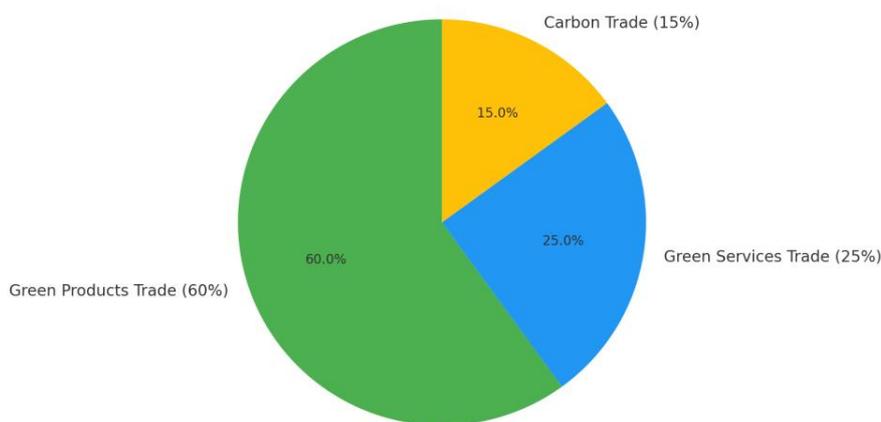


Figure 4. Global International Green Trade Structure in 2024

Source: World Trade Organization (WTO), International Energy Agency (IEA)

3. Regional Landscape and Trade Flows

At present, the geographical landscape of global green trade exhibits a "tri-polar"

structure, with the European Union, North America, and East Asia constituting the core hubs of global green trade. However, the roles and strengths of these three major regions differ significantly, creating a complex web of competition and cooperation.

i. European Union: Rule Setter and Leader of the High-End Market

Driven by the European Green Deal, the European Union acts as a global "rule maker" in the field of green trade. Its introduction of the Carbon Border Adjustment Mechanism (CBAM), the new Battery Regulation, and the Ecodesign for Sustainable Products Regulation (ESPR) has helped shape global standards and thresholds for green trade. At the same time, the EU itself is a major consumer market for high-end green technologies, products, and services.

ii. North America (primarily the United States): A Policy-Driven Domestic Market and Center of Technological Innovation

Through large-scale industrial policies such as the *Inflation Reduction Act* (IRA), the United States has stimulated domestic demand in clean energy manufacturing and the electric vehicle sector with substantial subsidies and tax credits. Meanwhile, the U.S. continues to lead globally in frontier research and innovation in green technologies, including next-generation energy storage, hydrogen energy, and carbon capture technologies.

iii. East Asia (with China at its center): Global Green Manufacturing Center and Key Supply Chain Hub

East Asia, especially China, has become one of the world's most important manufacturing and supply bases for green products, supported by strong industrial

capabilities, comprehensive supply-chain ecosystems, and significant economies of scale. From solar photovoltaic panels to power batteries and wind turbines, China holds a dominant position in the midstream segment of global manufacturing and is rapidly expanding toward both ends of the value chain, including research and development, design, and brand marketing.

In terms of trade flows, the pattern has evolved from the earlier model of "developed countries exporting environmental equipment to developing countries" into a more complex, multidirectional structure. For example, China exports photovoltaic modules and electric vehicles to global markets; the EU exports high-end manufacturing equipment and environmental technologies to China; and the United States attracts large inflows of global green investment. Meanwhile, "South–South green trade" among developing countries is also emerging, with strong growth potential.

Section II: Opportunities and Challenges in Green Trade Liberalization

Promoting green trade liberalization, which refers to the systematic reduction and elimination of tariff and non-tariff barriers on green products, services, and technologies, has become a crucial pathway for the global community to address the climate crisis and achieve sustainable development goals. However, this path is far from smooth. Behind the vast opportunities lie deep structural constraints and increasingly complex geopolitical and economic dynamics. This section provides an in-depth analysis of the dual dimensions of opportunities and challenges associated with green trade liberalization.

I. Opportunities: An Accelerator for Unlocking the Potential of Global Green Transition

Green trade liberalization, at its core, leverages the decisive role of the market in resource allocation to accelerate the diffusion and adoption of green technologies and solutions worldwide in the most efficient and cost-effective manner.

1. Reducing Global Green Transition Costs and Accelerating Technology Diffusion

The essence of the green transition lies in replacing high-energy, high-emission traditional systems with clean and low-carbon technologies and products. However, high upfront costs, particularly for developing countries with limited financial and technological capacity, remain a major barrier. Green trade liberalization provides a powerful tool to overcome this challenge.

According to estimates by the Organisation for Economic Co-operation and Development (OECD), although average tariffs on environmental products are not

particularly high globally, tariff peaks for certain key products and in some countries can exceed 35%. Non-tariff barriers, such as complex certification procedures and discriminatory technical standards, often impose even higher implicit costs. Removing these barriers can therefore generate substantial economic benefits.

First, it directly reduces product prices. Lowering tariffs cuts the cost of importing key products such as solar panels, wind turbines, and energy-efficient equipment, making renewable energy projects and energy-saving upgrades more commercially viable across more countries. A World Bank study shows that fully eliminating trade barriers on environmental products could increase the trade volumes of related goods by more than 15% and significantly reduce countries' compliance costs for emission-reduction commitments.

Second, it promotes economies of scale. An open and integrated global market enables leading green firms to expand production, reduce research and development and manufacturing costs through scale, and drive continuous price declines along the learning curve, which has been one of the key factors behind the sharp reduction in solar and wind power costs over the past decade.

Third, it empowers developing countries. For most developing economies, which are net importers of green technologies, trade liberalization allows them to access advanced technologies and equipment needed for climate action at lower cost. This enables them to leapfrog traditional high-carbon development paths and pursue sustainable, transformative growth.

2. Promoting Global Green Innovation and Industrial Upgrading

An open trade environment is the most effective catalyst for stimulating innovation. Green trade liberalization, by introducing international competition, can break domestic monopolies and inertia, compelling firms to continuously pursue technological innovation, improve energy efficiency, and optimize production processes, thereby enhancing the green competitiveness and value-added capacity of

entire industries.

At the same time, it facilitates the formation and deepening of global green value chains (GVCs). The power battery industry for new energy vehicles offers a strong example: its value chain has become highly globalized. Upstream critical minerals such as lithium, cobalt, and nickel are sourced from Australia, Chile, and the Democratic Republic of the Congo; midstream materials which include cathodes, anodes, electrolytes, and separators, are produced in Japan, South Korea, and China; and final cell assembly and integration take place across major automobile markets worldwide. This global division of labor enables countries to specialize in segments where they hold comparative advantage, while knowledge and technology spillovers collectively accelerate progress in core areas such as battery energy density, safety, and cost control.

3. Creating Large-Scale Green Employment and Emerging Markets

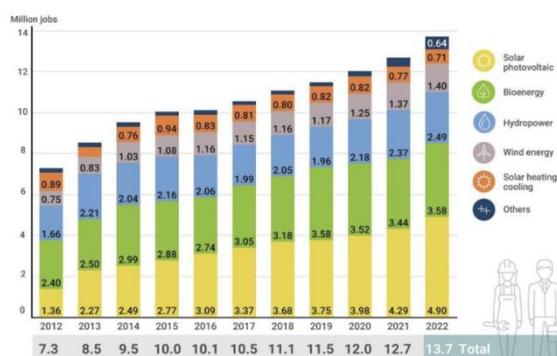
The green transition is not only an environmental agenda but also a powerful engine for a new wave of economic growth and employment creation. Green trade liberalization plays a key role in unlocking this engine.

First, it creates green jobs. According to the latest report by the International Renewable Energy Agency (IRENA), global employment in the renewable energy sector reached 16.2 million ^① in 2023. From 2023 to 2030, employment in renewable energy-related industries will continue to grow. Trade liberalization expands global markets for renewable energy equipment, directly supporting the sustained growth of these jobs.

① IRENA. Renewable Energy and Jobs Annual Review 2024.

https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2024/Oct/IRENA_Renewable_energy_and_jobs_2024.pdf.

Evolution of global renewable energy employment by technology, 2012-2022

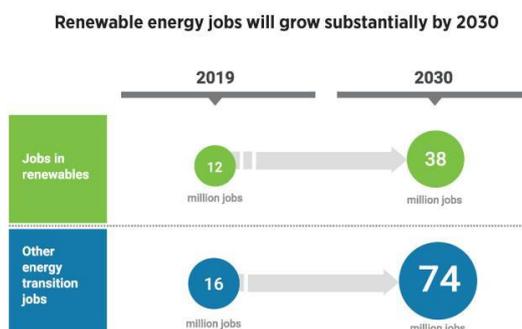


Source: IRENA (2023), *Renewable Energy and Jobs* at www.irena.org



Figure 5. Global Renewable Energy Employment Structure, 2012–2022

Source: International Renewable Energy Agency (IRENA), *Renewable Energy and Jobs* report.^①



Source: IRENA (2022), *World Energy Transitions Outlook* at www.irena.org



Figure 6. Expected Growth of Global Employment in Renewable Energy – Related Industries by 2030

Source: International Renewable Energy Agency (IRENA). *World Energy Transitions Outlook 2022*.^②

^① International Renewable Energy Agency; International Labour Organization. *Renewable Energy and Jobs: Annual Review 2023* [EB/OL]. [2025-11-26]. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2023/Sep/IRENA_Renewable_energy_and_jobs_2023.pdf.

^② International Renewable Energy Agency. *World Energy Transitions Outlook 2022: 1.5°C Pathway* [EB/OL]. [2025-11-26]. <https://www.irena.org/Digital-Report/World-Energy-Transitions-Outlook-2022>.

Second, it is creating trillion-dollar emerging markets. Green trade liberalization paves the way for the commercialization and global deployment of a range of frontier green industries. According to BloombergNEF's Energy Transition Investment Trends 2025 report, global energy transition investment continues to rise, reaching USD 2.08 trillion in 2024; from 2025 to 2030, annual investment will need to average USD 5.6 trillion, and demand will increase sharply after 2030.^① This explosive investment demand will give rise to a number of trillion-dollar emerging industries worldwide, including green hydrogen, long-duration energy storage, sustainable aviation fuel, direct air capture (DAC), and smart grids. An open and non-discriminatory trade and investment environment is the fundamental prerequisite for these emerging markets to attract global capital, develop unified technical standards, and grow at scale.

II. Challenges: Trade Protectionism and Governance

Challenges amid De-globalization

Although green trade liberalization serves as a crucial driver for accelerating the global green transition, the international trade environment is undergoing profound adjustments. Influenced by geopolitical tensions, the restructuring of global supply chains, and the weakening of the multilateral trading system, the development of green trade now faces severe structural challenges. A growing tendency toward "green protectionism", guided by notions of "national security" and "domestic industry first", has become increasingly evident and is creating substantial obstacles to the optimal global allocation of green resources.

1. Intensifying De-globalization Trends and the Rising Costs of Supply Chain Localization

In recent years, the global economic landscape has exhibited clear signs of

^① Seven Global Trends in Energy Transition Investment.
<https://epaper.cnpc.com.cn/sysb/2025-03/23/con-34651.html>.

"de-globalization." According to the World Trade Organization's *Annual Trade Monitoring Report under the Trade Policy Review Mechanism*, since 2009, both the value of global trade covered by import-restrictive measures and its share of global imports have shown a rising trend. In figure 7, the blue bars represent the scale of affected trade, while the green line indicates its share of global imports. Together, they illustrate the continuous increase in global trade protectionism of import restrictions over the past decade.

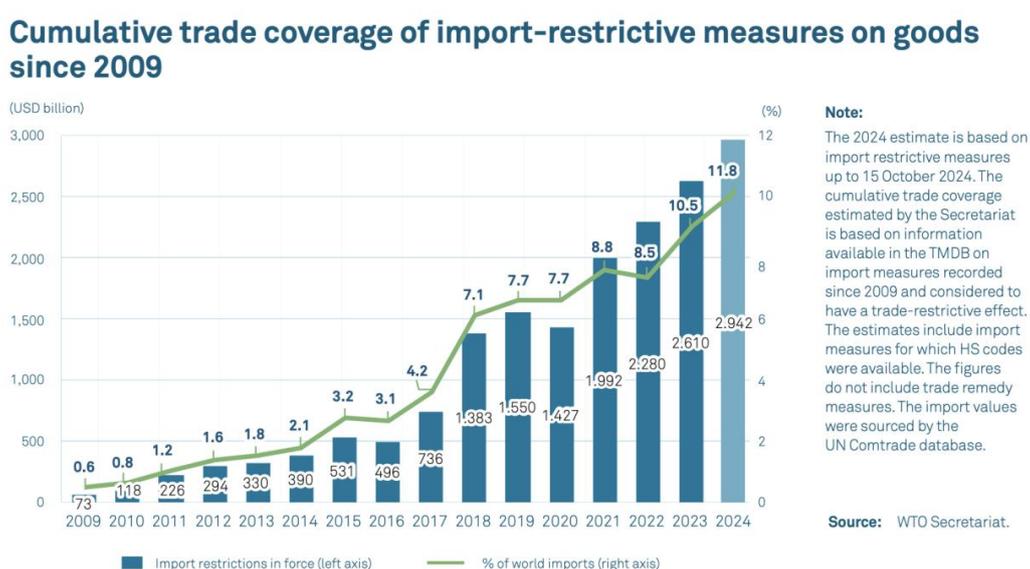


Figure 7. Trade Coverage of Global Import-Restrictive Measures and Their Share in World Imports Since 2009 (WTO)

Source: WTO, Annual Trade Monitoring Report and accompanying factual sheets under the Trade Policy Review Mechanism.^①

i. Supply Chain Fragmentation Leading to Rising Costs

New energy industries, such as solar PV, wind power, and electric vehicles, are characterized by highly globalized value chains. However, some advanced economies, driven by the desire to reduce external dependence, have forcibly promoted

^① World Trade Organization. WTO Trade Monitoring Report – Factsheet: Cumulative trade coverage of import-restrictive measures on goods since 2009 [EB/OL]. (2024-11) [2025-11-26]. https://www.wto.org/english/news_e/news24_e/trdev_13nov24_e.htm.

"manufacturing reshoring" or "nearshoring" through administrative measures. These practices—contrary to the principles of comparative advantage—artificially disrupt previously efficient global production networks, hindering the cross-border allocation of key raw materials (such as lithium, cobalt, and nickel) and critical components. The non-market restructuring of supply chains not only reduces production efficiency but also directly increases the cost of adopting green products and technologies, slowing down the global green transition, particularly in developing countries.

ii. Market Fragmentation Weakening Economies of Scale

The fragmentation of global markets prevents green enterprises from leveraging large, unified global markets to achieve economies of scale. As countries build independent industrial loops, repeated investments and redundant capacities proliferate. This keeps research and development and manufacturing costs high, costs that could otherwise be shared across international markets, and impedes the rapid diffusion of green technologies.

2. Proliferation of "Green Barriers": Rising Risks of Abuse in Trade Remedies and Industrial Policy

With tariff barriers gradually declining, non-tariff barriers (NTBs) and domestic regulatory measures have become the primary constraints on green trade. Meanwhile, the deep integration of climate policy with trade instruments in some countries has triggered widespread concern over the rise of "green protectionism."

i. Hidden Thresholds in Technical Barriers to Trade (TBT)

Some developed economies, leveraging their technological advantages, have formulated complex and non-universal environmental standards, carbon-footprint accounting rules, and conformity assessment procedures. These standards often fail to consider the practical capacities of countries at different development stages and lack

transparency and mutual-recognition mechanisms. For enterprises in developing countries, such asymmetric compliance burdens constitute de facto market entry barriers, limiting their ability to participate in global green value chains.

ii. Discriminatory Subsidy Policies Distorting Fair Competition

New policy tools represented by the U.S. *Inflation Reduction Act* (IRA) and the EU Carbon Border Adjustment Mechanism (CBAM), though framed as climate actions, have raised significant concerns regarding trade fairness.

Exclusivity of subsidies: For instance, the IRA imposes strict local content requirements for electric vehicle tax credits, mandating that battery components and critical minerals must be sourced from North America or specific trade partners. Such requirements are suspected of violating WTO national treatment principles and compel global firms to distort their investment decisions merely to qualify for subsidies, resulting in inefficient flow of global industrial capital.

Controversy over unilateral carbon tariffs: As a unilateral mechanism introduced in the absence of a global carbon pricing regime, CBAM may impose disproportionate burdens on exports from developing countries whose carbon market remain underdeveloped, thereby creating risks of retaliatory trade measures.

3. Restrictions on Technology Exchange Undermining Global Green Innovation Cooperation

Technological innovation is the core driver of green development. However, the current international environment for technology cooperation has become increasingly complex, with geopolitical tensions significantly constraining the free flow of knowledge and technology.

First, export controls on key technologies are becoming normalized. Some countries, expanding the scope of "national security," impose stringent export controls and investment screening measures on technologies crucial for the energy transition,

such as advanced chips, EDA software, and high-end manufacturing equipment. These measures cut off channels for technological spillovers, forcing latecomer countries to undertake redundant research efforts in a technological vacuum, thereby lowering the overall efficiency of global green innovation.

Second, tensions between intellectual property protection and technology diffusion are intensifying. In the green sector, the balance between IP protection and wide technology dissemination is even more delicate. Strict technology blockades and frequent IP disputes restrict developing countries' access to advanced and applicable technologies, exacerbating the "North-South technology divide" at a time when global cooperation is urgently needed to tackle climate change.

4. Weakening of the Multilateral Trading System and the Limited substitutability of Regional Governance Mechanisms

The sustainable growth of global green trade requires strong and effective multilateral rules, yet the current global economic governance system is facing severe stress.

First, the effectiveness of the WTO mechanism has been weakened. The World Trade Organization has shown clear limitations in addressing contemporary green trade disputes. On the one hand, the paralysis of the dispute settlement mechanism, particularly the Appellate Body, has made it difficult for trade disputes among member states to receive legally binding rulings, thereby encouraging the use of unilateral measures. Meanwhile, multilateral trade rules have struggled to keep pace with emerging green policy issues; negotiations under the *Environmental Goods Agreement* (EGA) remain stalled, leaving the international community without unified guidance on carbon border adjustments, environmental subsidies, and other new topics.

Second, regional trade agreements (RTAs) offer only partial solutions. As

multilateral mechanisms stall, countries are turning to regional frameworks. Agreements such as the *Regional Comprehensive Economic Partnership* (RCEP) and the *Comprehensive and Progressive Agreement for Trans-Pacific Partnership* (CPTPP) have indeed facilitated intra-regional tariff reduction and green investment. However, RTAs cannot establish globally unified standards, such as harmonized carbon accounting rules, and divergences among regional regimes may further fragment global markets. Moreover, regional arrangements prioritize member-state interests and cannot systematically address the global public goods deficit in the way that a functioning multilateral system can.

Section III: China's Role and Practices in Green Trade

In the grand landscape of the global green transition, China's role is undergoing a profound and historic transformation. Once known as the "world's factory" and long associated with high energy consumption and high emissions, China is now rapidly emerging as a global hub of green innovation, a key supplier of green products, and an active participant in global green governance. This transformation is not only reshaping China's own economic structure and development trajectory but is also exerting a decisive influence on the global landscape, costs, and future direction of green trade. This section provides an in-depth analysis of China's evolving role and practices in this historic transformation.

I. China's Green Trade Policy Framework and Green Trade Practices

China's development of green trade is grounded in strong national strategic guidance and an increasingly comprehensive policy support system, and it has achieved remarkable achievements in both domestic and international practices.

1. A Comprehensive Policy System: From Top-Level Design to Concrete Implementation

As the world's second-largest economy and the largest trader of goods, China has elevated green development to a core national strategy and has constructed a relatively complete policy framework to support green trade.

At the top-level design stage, China has introduced a number of major policy documents—such as the *Guiding Opinions on Promoting High-Quality Development of Trade* and the *Guidelines for Green Development in Foreign Investment and*

Cooperation—which explicitly call for integrating green principles into all stages of trade and investment. These documents establish strong strategic direction for advancing green trade.

At the implementation level, policy tools have become increasingly targeted and effective. Notably, the newly released *Administrative Measures for Central Budgetary Investments in Energy Conservation and Carbon Reduction Projects (2025)* explicitly provides central fiscal support for energy-saving, carbon-reducing, and circular economy projects in key sectors. This demonstrates China's determination to leverage public investment as a powerful instrument to guide and accelerate the nationwide green transition.

In terms of statistical monitoring, China is actively addressing the long-standing gap in "measurement frameworks" for green trade. The latest *Implementation Opinions on Expanding Green Trade issued by the Ministry of Commerce* in October 2025 propose to "research and establish a continuously improving statistical monitoring and analytical system for green trade" and to "explore statistical and analytical practices relevant to green trade." This indicates that China's green trade governance is transitioning from broad industrial promotion toward a more refined, data-driven approach.

2. Active International Cooperation: Advancing the Green Agenda on Multilateral Platforms

China recognizes that the development of green trade depends on an open and cooperative multilateral environment. Accordingly, China has taken on the role of an active contributor and system builder in international cooperation.

In multilateral negotiations, China is not only an important participant in the WTO Environmental Goods Agreement (EGA) talks but also an advocate for green trade liberalization in platforms such as APEC and BRICS, consistently opposing all forms of green protectionism.

In institutional platform-building, China continues to host world-class exhibitions and forums such as the China International Import Expo (CIIE) and the Hongqiao International Economic Forum, providing global showcases for cutting-edge green products and technologies. At the 8th Hongqiao Forum, the "Open Development" track further highlighted "green and sustainable development," placing green trade and climate cooperation at the core of discussions—once again demonstrating China's openness and determination to drive global green cooperation.

3. Significant Practical Progress: From Product Exports to Integrated Solutions

Despite increasingly complex international rules and rising trade barriers, China has achieved remarkable progress in green trade and accumulated extensive data and successful cases.

The most prominent characteristic of China's green trade development is its comprehensive upgrade from single-product exports to fully greened supply chains and integrated solution offerings.

Table 1. Overview of China's Key Green Products, Green Services, and Industrial Foundations in 2024

Major Area	Representative Categories	2024 Performance & Scale	Data Source / Notes
Green Products	Green Energy <ul style="list-style-type: none"> Wind power components Photovoltaic products Lithium batteries 	<ul style="list-style-type: none"> Export value of wind power equipment and components increased by 71.9% YoY PV product exports exceeded RMB 200 billion for four consecutive years Lithium battery exports reached 3.91 billion units, a record high 	General Administration of Customs of China; industry public reports. Indicates China's significant advantages across the green energy supply chain.
	Green Transportation <ul style="list-style-type: none"> Electric 	<ul style="list-style-type: none"> EV exports exceeded 2 million units for the first time Export value of electric 	China Association of Automobile Manufacturers; General

Major Area	Representative Categories	2024 Performance & Scale	Data Source / Notes
	vehicles • Electric two-wheelers	motorcycles and bicycles surpassed RMB 40 billion	Administration of Customs. Reflects explosive global demand for green mobility solutions.
Green Services	Environmental Rights Trading • Green Electricity Certificates (GECs)	• Annual GEC trading volume reached 446 million certificates (up 364% YoY) • Cumulative issuance reached 4.955 billion by the end of 2024 • Recognized by international initiatives such as RE100	National Energy Administration. GECs are a core element of market-based environmental rights services, supporting emission reduction in export-oriented supply chains.
	International Green Cooperation • Outward direct investment • Overseas engineering contracting	• USD 2.55 billion in outward direct investment in energy conservation, environmental protection, and clean energy sectors • New overseas engineering contracts in energy-saving, environmental protection, and clean energy reached nearly USD 50 billion, accounting for over 18% of total contracts	Ministry of Commerce. Demonstrates China's transition from product exporter to provider of integrated "products + services + solutions."
	Environmental Industry Services • Technology research and development, consulting, operations	• China's environmental protection industry has maintained annual revenues above RMB 2.2 trillion for three consecutive years	China Environmental Protection Industry Association. A strong industrial base underpins the expansion of green services.
Industrial Foundations	Green Manufacturing System • Green factories and industrial parks	• 6,430 national green factories and 491 national green industrial parks established cumulatively • Output of national green factories exceeded 20% of China's total industrial output	Ministry of Industry and Information Technology (MIIT). A robust green manufacturing base ensures upstream support for green trade and green services.

In terms of product exports, growth momentum remains strong. According to the latest data, in the first three quarters of 2025, exports of wind turbine units and components increased by 23.9%^①; while the export value of photovoltaic products has exceeded RMB 200 billion for four consecutive years^②.

In terms of solution offerings, Chinese enterprises are no longer merely exporting standardized products; instead, they are increasingly providing an integrated "green products + green services" ecosystem that includes green finance, technical consulting, engineering construction, and post-project operation and maintenance. This represents a strategic upgrade from participating in a single value-chain segment to becoming a comprehensive value-chain integrator.

4. China's Substantive Contribution to the World: More Than Just Products

China's contribution to the global green transition extends far beyond supplying affordable and high-quality products; its impact is profound and multidimensional.

First, China serves as a "stabilizer" and "cost reducer" for the global green transition. According to estimates by the International Renewable Energy Agency (IRENA), the levelized cost of electricity (LCOE) for global photovoltaic power has fallen by nearly 90% over the past decade, with more than 60% of this decline attributable to technological progress and large-scale production within the China-centered global PV supply chain. "Made in China" has enabled clean energy to achieve grid parity at unprecedented speed worldwide, significantly reducing the economic cost of achieving global carbon neutrality.

① State Council Information Office Press Conference on Import and Export Performance in the First Three Quarters of 2025.

<https://www.cccme.org.cn/news/details.aspx?id=E1B9D156135A80B97AD4288B1AF54A50&classid=8C92359A9456952E&xgid=F868932F64EB7AAF>.

② https://paper.people.com.cn/zgnyb/pc/content/202502/17/content_30058311.html.

Second, China is an "enabler" for developing countries. China exports not only to advanced economies but also to a broad range of Global South countries, supplying them with affordable green technologies and products. Under the Belt and Road Initiative, Chinese enterprises have built numerous photovoltaic power stations, wind farms, and hydropower plants in partner countries, helping them establish modern clean energy systems and realize the dual goals of economic development and environmental protection.

Third, China has achieved a transformation from "product exporter" to "solution provider". Chinese enterprises are evolving from supplying standalone products to becoming system integrators capable of delivering comprehensive packages that include investment and financing, technology, equipment, engineering construction, and long-term operations and maintenance. This model effectively addresses the financial, technical, and managerial constraints faced by many developing countries, accelerating the rollout of green projects.

II. China's Competitive Advantages and Challenges in the Green Industry

China's competitive performance in green trade is underpinned by a robust industrial base.

At the same time, however, domestic and international challenges remain significant.

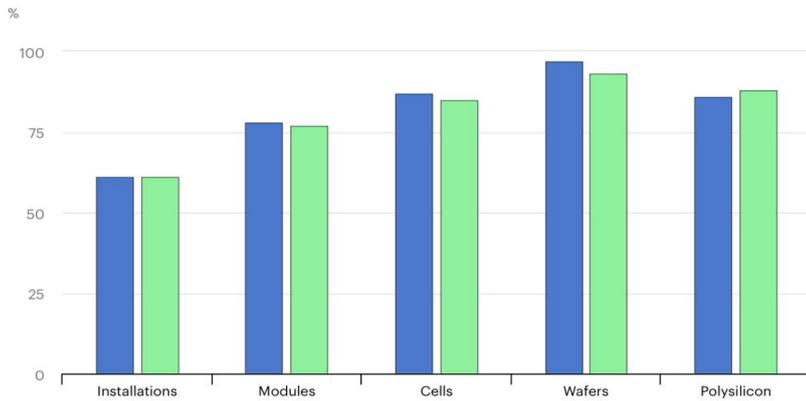
1. Globally Leading Competitive Advantages

After years of development, China has established an unshakable global competitive edge in several key green industry sectors.

In the field of renewable energy, China currently accounts for over 80% of global PV manufacturing capacity, maintaining dominant positions across the entire value chain from polysilicon to module manufacturing. China also leads the world in

wind power equipment manufacturing capacity, particularly in the research, development and manufacturing of large-capacity wind turbines, where it has achieved multiple record-setting advances. The core of this advantage lies in China's ability to build a closed-loop industrial ecosystem characterized by continuous technological self-iteration and persistent cost reduction. In the PV sector, China's dominance is reflected in strong coordination across the entire value chain: from upstream high-purity polysilicon, to midstream solar cells, where China holds more than 95% of the global market and maintains the fastest technology iteration speed, to downstream module production. This robust vertical integration enables China to rapidly commercialize next-generation high-efficiency N-type cell technologies, positioning it as a principal contributor to the nearly 90% reduction in global PV electricity costs over the past decade.

In the wind sector, China has shifted from a follower to a global leader. Beyond cost and scale advantages in onshore wind, China has also made major breakthroughs in the more technologically demanding offshore wind sector. The clearest example is China's astonishing pace in the global race toward turbine "mega-sizing": mainstream turbine models have rapidly progressed from the 5–8 MW range to 16–18 MW. Behind this leap are China's systematic breakthroughs in critical components across the entire supply chain, including ultra-long blades exceeding 100 meters and high-torque gearboxes. These advances are reshaping the global cost curve of renewable energy.



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● 2024 ● 2030

Figure 8. China's Capacity Share Across Segments of the Global Solar Photovoltaic Supply Chain (2024 and 2030 Projections)

Source: International Energy Agency (IEA) ^①

In the field of new energy vehicles (NEVs), China has become not only the world's largest production and consumption market but also the global leader in supply chain completeness—especially in power batteries, where it has built a fully integrated closed-loop ecosystem spanning upstream materials, cell manufacturing, and end-of-life recycling. The rise of China's NEV sector is fundamentally rooted in the creation of a highly resilient and exceptionally efficient industrial ecosystem, with the power battery, often regarded as the very heart of the industry, representing the most concentrated embodiment of China's competitive strength. China is home to global battery giants such as CATL and BYD, which together account for nearly half of the global market. More importantly, China has achieved a high degree of autonomy and control over the entire battery value chain. Upstream, China holds more than 60% of the world's refining and processing capacity for critical battery materials. In the midstream manufacturing stage, China's sustained innovation in lithium iron phosphate (LFP) technologies, such as the Blade Battery and cell-to-pack

^① International Energy Agency. Solar PV Global Supply Chains [EB/OL]. (2023) [2025-12-04]. <https://www.iea.org/reports/solar-pv-global-supply-chains>.

(CTP) architecture, has opened a competitive pathway characterized by high safety, long lifecycle, and low cost. Downstream, a nationwide power battery recycling network is rapidly taking shape, enabling the circular use of critical metals. This "cradle-to-cradle" closed-loop system gives Chinese automakers unparalleled advantages in cost control and supply chain stability, positioning China as an indispensable driving force in the global automotive industry's transition toward electrification.

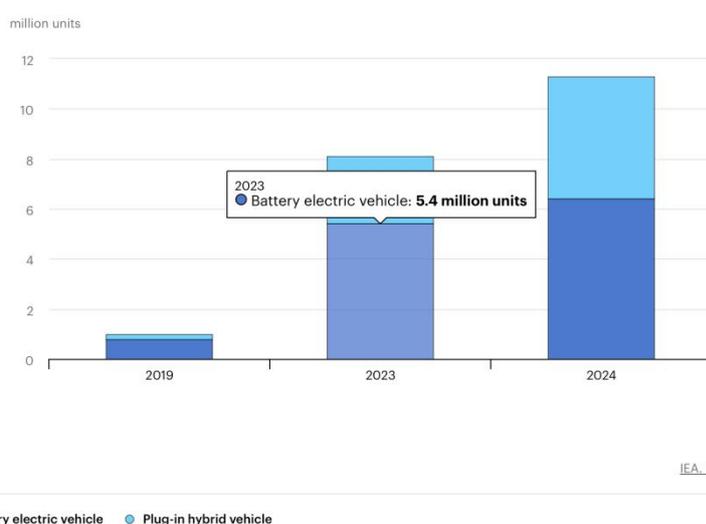


Figure 9. China's New Energy Vehicle Sales and Growth Trends (2019, 2023, 2024)

Source: International Energy Agency (IEA)^①

These competitive advantages not only meet China's extensive domestic demand for green transformation but also supply the global market with a large volume of high-quality and relatively low-cost green products, thereby significantly accelerating the global green transition.

2. Multiple Challenges Ahead

Despite remarkable achievements, China's green industries and green trade still

^① International Energy Agency. Electric car sales in China, 2019–2024 [EB/OL]. (2025-03-12) [2025-12-04]. <https://www.iea.org/data-and-statistics/charts/electric-car-sales-in-china-2019-2024>.

face significant challenges.

At the industrial level, certain green products remain positioned at the lower end of the value chain., and China continues to show relatively high external dependence on core technologies (such as advanced chips and industrial software) and critical components (such as specialized bearings). The security and resilience of the industrial chain require further strengthening.

At the external environment level, Chinese enterprises continue to encounter various forms of green trade barriers. For example, the EU's Carbon Border Adjustment Mechanism (CBAM) and the new Battery Regulation, though framed as environmental measures, create stringent requirements and higher compliance costs that create substantial obstacles to China's green product exports. Meanwhile, as more countries introduce their own green industrial support policies (such as the U.S. IRA), international competition facing China's green products is intensifying, requiring continuous industrial upgrading and innovation to maintain global leadership.

III. Global Green Expansion Practices of Chinese Enterprises

In response to the evolving landscape of globalization, leading Chinese green enterprises are integrating their green capabilities with global markets through increasingly diversified and sophisticated pathways.

1. Strategic Integration: Aligning "Green Transformation" with "Internationalization"

In the globalization strategies of Chinese firms, green transformation and internationalization are becoming deeply intertwined.

For instance, TCL's "Glocalization" model combines global resource integration—such as establishing research and development centers worldwide—with localized market responsiveness, including setting up factories in Poland and Mexico to meet regional market demand. TCL's global development path illustrates a shift

from the early stage of "product internationalization" (primarily through exporting standardized products) to a new phase of "hyper-globalization," in which enterprises strategically deploy research, development, manufacturing, and marketing networks worldwide. This enables the global optimization of green innovation resources.

2. Diversified Pathways: Mergers & Acquisitions, Greenfield Investment, and Standards Leadership

Chinese enterprises are pursuing green globalization through a variety of pathways.

First, acquiring advanced green technologies through international mergers and acquisitions.

The most prominent example is Geely's acquisition of Volvo, followed by Geely's strong support for Volvo's transition toward full electrification. This strategic move not only revitalized the Volvo brand but also significantly enhanced Geely's technological capabilities and global reputation in the NEV sector.

Second, establishing overseas green production bases through greenfield investment.

Companies such as Envision Energy and CATL have invested in factories across Europe and North America—not only to be closer to end markets and mitigate trade barriers but also to foster international cooperation in green production and integrate more deeply with local supply chains.

Third, actively participating in international standard-setting.

Enterprises like Huawei and Sungrow, leveraging their technological advantages in PV inverters and smart photovoltaic solutions, have become active contributors in organizations such as the International Electrotechnical Commission (IEC). Their participation helps internationalize Chinese green technologies and standards. These practices not only enhance the global competitiveness of Chinese enterprises but also bring advanced green technologies, investment, and employment opportunities to host countries, generating mutual benefits.

Section IV: Policy Recommendations for Advancing Green Trade Liberalization

Amid the complex landscape in which opportunities and challenges coexist in the process of green trade liberalization, no single-dimensional approach can effectively address the systemic issues at hand. The international community urgently needs to develop a comprehensive, multi-level, and multi-stakeholder collaborative framework to dismantle structural barriers, build global consensus, and restore multilateral trust.

This section proposes policy recommendations across five dimensions—global governance, domestic policy, international cooperation, digital empowerment, and standards development—to guide the global green trade system toward greater openness, inclusiveness, fairness, and efficiency.

I. Accelerating the Improvement of Green Trade Rules under the Multilateral Framework

The central constraint facing the development of green trade today lies in the lagging rulemaking and functional limitations of the multilateral governance system—particularly the WTO-centered framework. Repairing and strengthening the multilateral rules system is the cornerstone for establishing a global green trade order.

1. Building a More Inclusive Multilateral Trade Framework

To overcome institutional barriers, the international community should adhere to the principle of "common but differentiated responsibilities" and strengthen the multilateral framework from the following three dimensions:

First, restart and update the Environmental Goods Agreement (EGA)

negotiations. The prolonged stagnation of the EGA negotiations has increased the cost of global green transition. It is recommended to draw lessons from past experiences and adopt a pragmatic and incremental negotiation strategy—moving away from the pursuit of a one-off comprehensive agreement toward establishing a dynamically adjustable product list. This list should balance the interests of both developed and developing countries, incorporating not only high-tech products such as carbon capture, utilization and storage (CCUS) equipment and high-precision monitoring devices, but also climate adaptation-oriented products urgently needed by developing countries, such as high-efficiency drip irrigation systems and distributed photovoltaics. This would enhance the agreement's inclusiveness and operability.

Second, implement substantive differential treatment mechanisms. Given the diverse stages of green industrial development across countries, rigid "equal-opening" requirements should be avoided. Next-generation trade agreements should include robust Special and Differential Treatment (S&DT) provisions, granting developing countries longer transition periods and more flexible timetables for market opening. Within the bounds of WTO rules, they should also retain moderate policy space—such as in government procurement—to support their emerging green industries and protect them from premature exposure to competition from mature markets.

Third, establish a "code of good practice" for mutual recognition of green standards. To address the proliferation of technical barriers to trade (TBT) due to inconsistent standards, a green standards mutual-recognition mechanism should be promoted under the WTO framework. Members should be encouraged to adopt multilateral or bilateral Mutual Recognition Agreements (MRAs) covering environmental labels (e.g., China's Ten-Ring Certification, the EU Ecolabel), energy-efficiency ratings, and carbon-footprint verification. Achieving "one certification, multi-country acceptance" would significantly reduce compliance and transaction costs for enterprises.

2. Strengthening the Coordination Between Trade and Environmental Policies to Prevent the Distortion of Unilateral Measures

To prevent the spread of "green protectionism", it is essential to enhance multilateral oversight and coordination regarding unilateral environment-related trade measures.

First, establish non-discriminatory principles for policy implementation. When designing carbon border adjustment mechanisms (CBAM), green subsidies, or other environment-related trade measures, countries must strictly adhere to the WTO's non-discrimination principles—namely, national treatment and most-favoured-nation (MFN) treatment. Policy design should ensure transparency and incorporate advance notification and review mechanisms. Meanwhile, when developed countries introduce high-standard environmental policies, they should provide corresponding technical assistance and capacity-building support to help developing countries improve compliance capabilities, thereby avoiding de facto market-entry barriers.

Second, explore the establishment of a fast-track mechanism for resolving environment-related trade disputes. Given that green trade disputes are characterized by both technical complexity and time sensitivity, it is recommended that a dedicated expert panel or fast-track dispute-settlement channel be established within the WTO.

This mechanism should involve experts with dual backgrounds in environmental science and trade law, and—while safeguarding the authority of the multilateral rules system—seek to balance environmental protection rights with trade-liberalization obligations, preventing the abuse of unilateral trade-remedy measures.

II. Optimizing Domestic Policy Support Systems

The effective implementation of multilateral rules requires strong domestic

policy foundations. Countries should, based on their own resource endowments, build policy systems that align with international rules while effectively stimulating market vitality.

1. Designing Domestic Policy Frameworks That Promote Green Trade Development

First, leverage the multiplier effect of public fiscal funds. Drawing on practices such as China's Administrative Measures for Central Government Budget Investment for Energy-Saving and Carbon-Reduction Projects, governments should optimize fiscal expenditure structures and provide targeted support for green technology, low-carbon process upgrading, and green supply-chain development. Through instruments such as tax credits and research and development subsidies, governments can reduce the sunk costs associated with corporate green transition and help channel social resources into green and low-carbon sectors.

Second, improve the green finance system. Governments should vigorously expand green credit, green bonds, and green insurance markets, while strengthening green finance standards and regulatory systems. By offering risk-sharing mechanisms (such as government guarantees) and improving the investment and financing environment, private capital can be mobilized at scale to participate in green industries, providing enterprises with low-cost and long-tenor financing.

Third, establish a one-stop green trade service platform. To address information asymmetries faced by enterprises expanding abroad, governments should collaborate with industry associations to build public service platforms. These platforms should offer information on environmental regulations, market-entry standards, certification procedures, and trade-risk alerts of target markets, helping enterprises, particularly small and medium-sized firms, lower their barriers to international market entry.

2. Optimizing China's Green Trade Policies

As the world's largest producer and trader of green products, China should deepen policy innovation in the following areas:

First, upgrade industries from "cost advantages" to "technology advantages". Under the guidance of the "dual-carbon" goals, China should strengthen the integration of industry, academia, research, and application, focusing national resources on overcoming bottleneck technologies in areas such as energy-storage materials, core components, and industrial software. This will enhance the technological value and global brand influence of green products. At the same time, China should optimize its export structure by strictly limiting the export of high-energy-consumption and high-emission primary products, while vigorously developing green technology and services trade.

Second, build full life-cycle green supply chains. Industry-leading enterprises should be encouraged to play the role of "chain leaders", establishing green supply-chain management systems covering procurement, production, logistics, and recycling. China should actively participate in international rulemaking, transforming its industrial practices in sectors such as new energy vehicles and photovoltaics into proposals for international standards, thereby strengthening China's voice in global green governance.

III. Strengthening International Cooperation and Knowledge Sharing

Facing the global climate crisis, zero-sum games offer no solution. International cooperation is essential to advancing green trade liberalization.

1. Key Drivers for Promoting Green Trade Liberalization

First, deepen North–South cooperation and fulfill technology-assistance

commitments. Developed countries should genuinely implement the commitments under the Paris Agreement by transferring environmentally friendly technologies to developing countries through joint research, development, patent licensing and expert deployment. They should refrain from using intellectual property rights as an excuse to impose additional market barriers that hinder the global diffusion of green technologies.

Second, expand South–South cooperation and the Belt and Road Initiative. Leveraging similarities in resource endowments and development stages among developing countries, China should promote highly applicable green solutions. Through the Belt and Road Initiative, cooperation should be strengthened in distributed energy, low-cost pollution control, green agriculture, and other areas. Establishing green-trade demonstration zones can enhance the green-development capacity of the Global South.

Third, enhance policy coordination among major economies. Support WTO, UNCTAD, UNEP, and other international organizations in conducting policy dialogues. Particularly, China, the United States, and the European Union should establish regular communication mechanisms to coordinate on key issues such as subsidy policies and carbon-pricing mechanisms, reducing trade frictions stemming from policy spillovers.

2. Leveraging International Platforms as Bridges for Cooperation

China should make full use of high-level platforms such as the China International Import Expo (CIIE) and the Hongqiao International Economic Forum to build new hubs for global green-trade dialogue and cooperation.

As one of the largest and highest-level import-themed expos in the world, CIIE naturally brings together global green supply and demand. By establishing thematic sections such as "Green Trade," "Green Technologies and Innovation," and "Zero-Carbon Supply Chains," CIIE can not only showcase frontier green solutions in

the world—including next-generation photovoltaics, advanced energy storage, green hydrogen, and digital carbon-management tools—but also serve as a systematic platform for governments, international organizations, multinational enterprises, and think-tank scholars to engage deeply in discussions on green-trade rules.

The Hongqiao International Economic Forum, the "intellectual engine" of CIIE, has become an important public good for multilateralism, open cooperation, and trade-policy coordination. Its sub-forums under themes such as "Open Development" and "Green and Sustainable Development" provide institutionalized venues for agenda-setting, policy advocacy, and rule innovation in global green-trade governance. For example, issues such as "international mutual recognition of green standards," "low-carbon supply-chain development," and "green finance and investment mechanisms" can be prioritized for future discussions, allowing continuous dialogue to build cross-country consensus and generate replicable, scalable institutional outcomes.

On this basis, it is recommended to use such comprehensive international platforms to advocate for the establishment of a Global Green Technology Sharing Mechanism. This mechanism should be based on the principle of 'balancing intellectual property protection with accessibility'. It should protect innovators' rights while lowering access costs for developing countries through differentiated licensing, tiered authorization, and green-cooperation funds. Drawing on the "patent pool" model in the pharmaceutical sector, a Green Technology Patent Pool could be created by multilateral institutions to make selected patents in renewable-energy equipment, energy-efficiency retrofits, water-saving agriculture, and climate-adaptation technologies available to developing countries at reasonable fees.

Furthermore, the platform mechanism could coordinate with existing international financing instruments—such as the Belt and Road Green Development Initiative, the South–South Cooperation Assistance Fund, and the World Bank's Climate Investment Funds (CIF)—to provide financial support for developing countries in introducing, adapting, and localizing low-carbon technologies.

Multinational enterprises should also be guided to implement demonstration projects under this mechanism, offering integrated packages of technology + equipment + standards + operations, helping more developing countries build green-industry capacities and enhancing their participation and competitiveness in the global green-trade system.

IV. Leveraging Digital Technologies to Empower Green Trade

Digitalization is an accelerator of greening. Deeply integrating digital technologies with green trade will provide strong technical support for improving trade transparency and efficiency.

1. Enhancing Transparency and Credibility Across the Entire Trade Chain

Blockchain, Internet of Things (IoT), and other technologies should be widely promoted in green supply-chain management to build tamper-proof, full life-cycle traceability systems. Carbon emissions and energy-consumption data from raw-material extraction, production and processing, logistics and transportation, and recycling should be recorded and archived in real time. This not only helps effectively combat greenwashing but also provides reliable data support for carbon-footprint certification and green labeling.

2. Developing Digital Green-Trade Platforms to Reduce Transaction Costs

The development of cross-border e-commerce and digital services trade should be accelerated to reduce the transaction and circulation costs of green products. Building online marketplaces for green-technology transactions can remove

geographical barriers and promote the global flow of innovative resources. Meanwhile, countries should strengthen coordination on digital-trade rules and, under the premise of safeguarding national data security and personal privacy, establish mechanisms for managing cross-border data flows to ensure the smooth circulation of data needed for product traceability and carbon accounting.

V. Accelerating the Development of a Global Unified Coding System

The absence of standardized classification is one of the root causes of disorder and friction in current green trade. Establishing a global unified coding system is a foundational project for making green trade more rule-based and transparent.

1. Taking the Lead in Formulating Chinese Standards and Contributing "China's Proposal"

Given that global consensus on unified standards is unlikely in the short term, China—as the world's largest producer and trader of green products—should take proactive steps. It is recommended that the Ministry of Commerce and the General Administration of Customs jointly lead efforts with top think tanks and industry associations to develop a "China Green Trade Statistical Classification Reference Standard" that is internationally compatible while reflecting China's national conditions. This work directly echoes the tasks outlined in the Implementation Opinions on Expanding Green Trade. The resulting framework can guide domestic policymaking and contribute an evidence-based "China solution" to future international negotiations.

2. Promoting Mutual Recognition in Key Sectors to Drive Broader Consensus

Since pursuing a fully unified global system is unrealistic at this stage, a pragmatic approach should be taken. Priority should be given to sectors where China holds clear industrial advantages, such as photovoltaics, wind power, and new-energy vehicles, or sectors involving globally prioritized resources such as recycled metals. China should actively promote bilateral or plurilateral mutual-recognition arrangements with major trading partners on standards, certification, and labeling. Breakthroughs in these focal areas can generate demonstration effects, thereby expanding consensus gradually from point to area.

3. Actively Participating in International Rulemaking and Promoting a "Living List" Approach

China should make greater use of international platforms such as the WTO and APEC to bring domestic research findings and practical experience into global discussions. China can advocate for and participate in the development of a globally unified green-trade coding framework and promote the establishment of a "living list" mechanism—allowing the classification system to be regularly updated and dynamically adjusted to accommodate rapid technological iteration and innovation in green sectors.

4. Strengthening the Data Foundation and Analytical Research

A unified classification system requires a strong data foundation. Domestic and international research institutions should be encouraged to conduct deep cleaning and enhancement of global trade databases such as UN Comtrade, identifying and tagging potential green products to support the creation of a more reliable classification

framework. Institutions such as the Chinese Academy of Sciences are already engaged in improving foundational international-trade datasets, and such fundamental public-good efforts should continue to receive strong support.

Section V: Outlook

Human society is entering an era of green transition filled with both challenges and promise. This profound transformation, driven primarily by the imperative to address climate change, is comparable in scope, depth, and impact to the most significant industrial revolutions in history. Within this sweeping transformation, green trade has moved unmistakably from the periphery to the center. As the key link connecting global innovation, production, and consumption, it has become a decisive variable shaping the success or failure of the global green transition. Following a systematic analysis of global green trade trends, opportunities and challenges, China's role, and future pathways, this chapter provides an outlook and summary of the road ahead.

I. The Inevitable Outlook for Global Green Transition and Green Trade Liberalization

The global green transition is an urgent task that concerns the shared future of humanity, while the liberalization of green trade serves as a critical lever for accelerating this process. This core conclusion reflects a deep insight of the severe climate realities facing the world today, as well as the internal logic of achieving the Sustainable Development Goals.

As noted in the introduction to this report, the continued rise in global temperatures is no longer a distant risk but an ongoing crisis. The resulting surge in extreme weather events is directly threatening global economic stability, food security, and human well-being. Against this backdrop, accelerating the green transition—centered on clean energy development and low-carbon economic transformation—is not only the best choice for the international community but the only correct one.

However, one of the greatest obstacles to this transition lies in the substantial

costs and the wide technological divide. Green trade liberalization offers the most effective and market-consistent tool for addressing these challenges. By lowering trade barriers for green products and technologies, the international community can allocate global green innovation resources more efficiently, reduce global mitigation costs, and strengthen the ability of all countries—especially developing countries—to respond to climate change. Its transmission mechanisms and transformative potential can be understood on several levels:

First, green trade functions as a "cost reducer" for global emissions mitigation. Free trade promotes global specialization and cooperation, maximizing economies of scale and learning-curve effects. As analyzed in detail in Part III of this report, China's photovoltaic industry provides a compelling example. A globally open market enabled China to translate its manufacturing capacity and continuous technological innovation into affordable clean electricity for the world, reducing the levelized cost of solar power by nearly 90% over the past decade. Removing remaining tariff and non-tariff barriers will further accelerate this trend, enabling key green product, such as wind turbines, electric vehicles, and energy-storage systems, to benefit consumers worldwide at lower prices. This allows the same amount of capital to deliver larger emissions reductions, thereby directly reducing the overall global economic cost of achieving the Paris Agreement targets.

Second, green trade acts as an "optimizer" of global green innovation resources. An open trade and investment environment directs capital, technology, and talent toward regions and industries where they can be used most efficiently and create the greatest value, thereby fostering a dynamic global green value chain. Through competition and cooperation, firms across countries are incentivized to continuously pursue technological advancement and business-model innovation, accelerating the upgrading of the global green technology ecosystem. Conversely, protectionist barriers fragment markets, lead to inefficient duplication, and weaken incentives for innovation.

Third, green trade serves as an "enabler" of capacity building in developing

countries. Developing countries are among the most direct victims of climate change yet often lack the financial resources and technologies needed for effective response. Green trade liberalization allows them to access advanced clean-energy technologies, water-efficient irrigation systems, disaster-early-warning equipment, and more at affordable costs. This supports them in pursuing economic development while building more climate-resilient societies and advancing the United Nations Sustainable Development Goals.

At present, although green trade liberalization faces headwinds such as the rise of "green protectionism" and intensifying geopolitical competition, the outlook remains promising as global consensus on green development continues to strengthen and disruptive green technologies continue to advance. These challenges are temporary, while the long-term trajectory toward green development is irreversible. The "hard constraints" of climate and the "hard logic" of technological progress will ultimately breaking through the "soft barriers" of protectionism and keeping the global green trade vessel moving forward.

II. China's Role and Commitment in Advancing Global Green Trade Liberalization

As a major participant and contributor to global green trade, China is well positioned to play a greater role in promoting green trade liberalization by leveraging the mutually reinforcing dynamics of its domestic and international "dual circulation". China is not a bystander or a passive recipient, but a core actor that has deeply integrated into—and is actively shaping—the global landscape of green trade. Anchored in its new development paradigm, China possesses both the capacity and the responsibility to assume a greater role in global green governance.

Domestically, continuing to optimize green industrial policies and improving systems that facilitate green trade form the foundation of China's domestic "internal circulation" for contributing to global progress.

At the industrial-policy level, China—guided by its "dual carbon" strategic goals—has shifted from pursuing sheer expansion of scale to prioritizing quality enhancement and greater resilience and security. This requires sustained investment in basic research and critical technologies, addressing bottlenecks in high-end materials, core components, and industrial software, and elevating China's position within global green value chains. It also calls for accelerating the establishment of a comprehensive green supply chain management system that covers raw material procurement, production, consumption, and recycling, thereby strengthening the overall sustainable competitiveness of its green industries.

At the trade-facilitation level, China should expedite the alignment of its green trade standards, certification systems, and statistical-monitoring mechanisms with international norms. As recommended in Part IV, taking the lead in establishing a scientific "China Green Trade Statistical Classification Reference Standard" would not only improve the precision of domestic policymaking but also provide a well-founded "Chinese proposal" for future international negotiations. In addition, the government should continue to build high-quality public service platforms that offer one-stop services—such as overseas market environmental standards, compliance requirements, and risk alerts—for enterprises, especially small and medium-sized firms entering overseas markets.

Internationally, deepening multilateral, regional, and bilateral green cooperation and fostering fair and inclusive global green trade rules constitute the "external circulation" through which China can exercise greater global influence.

At the multilateral level, China should continue to firmly safeguard the WTO-centered multilateral trading system, actively promote the resumption and upgrading of Environmental Goods Agreement (EGA) negotiations, and advance constructive proposals in new platforms such as the Trade and Environmental Sustainability Structured Discussions (TESSD), particularly on issues such as regulating unilateral environmental measures and establishing mechanisms for mutual recognition of policy "equivalence".

At the regional and bilateral levels, China should promote deeper green cooperation under frameworks such as the Regional Comprehensive Economic Partnership (RCEP) and pursue high-standard free trade agreements with more partners, making green trade and sustainable development key chapters within those arrangements.

Through hosting major events such as the China International Import Expo (CIIE) and the Hongqiao International Economic Forum, China is opening new spaces for global dialogue and cooperation on green development. These platforms not only serve as global launchpads and showcase venues for green technologies and products, but also provide invaluable arenas where policymakers, business leaders, and scholars discuss key issues—including green trade rules, standards harmonization, and supply chain cooperation—and build consensus. China should continue to leverage these platforms to demonstrate its commitment to building an open world economy and a clean, beautiful world.

III. Joint Actions and Shared Vision for the Future of Humanity

Looking ahead, as the global green transition accelerates and new technologies continue to emerge, the scope and content of green trade will expand significantly. As analyzed in this report, future competition will shift from the products themselves to the standards, data, and services underpinning them. Service sectors such as carbon-footprint management, green finance, and circular-economy solutions will grow in importance. Digital green trade, underpinned by emerging technologies including blockchain, the Internet of Things (IoT) and artificial intelligence (AI), is poised to exert a profound transformative impact on the structure and operational efficiency of the global trade system.

In this rapidly evolving environment, isolationism and protectionism run counter to the tide of history and offer no viable path forward. Governments, businesses, and

international organizations must uphold the vision of a community with a shared future for humankind, remain committed to multilateralism, dismantle green trade barriers, and work together to build a cleaner and more beautiful world, thereby achieving the global climate objectives set in the Paris Agreement and creating a more sustainable future for generations to come.

For governments, this requires demonstrating foresight and resolve beyond short-term domestic political interests, placing climate security and sustainable development at the top of the international agenda. It calls for the restoration of confidence in multilateralism, a return to the negotiating table, and collective endeavors to establish a new global green trade governance order that balances the right to development with environmental obligations and reconciles innovation incentives with equity guarantees.

For global enterprises, this means embedding ESG (environmental, social, and governance) principles deeply into corporate strategy and daily operations. Firms must not only pursue their own green and low-carbon transitions but also drive emissions reductions across their supply chains, turning sustainability into a core source of long-term competitiveness.

For international organizations, this means playing a more active role as knowledge hubs, coordination platforms, and guardians of global rules. Institutions such as the WTO, UNCTAD, and UNEP should enhance cooperation to provide more authoritative data analytics, more rigorous policy recommendations, and more impartial dispute-settlement mechanisms for global green trade.

In sum, advancing green trade liberalization is not a zero-sum contest but a positive-sum endeavor from which all participants can benefit. It is not merely a commercial choice tied to economic growth, but a moral imperative concerning the shared destiny of humanity and the well-being of future generations. There is only one Earth, and all nations inhabit a common world. Only through openness, cooperation, and mutual benefit—by jointly dismantling barriers and sharing the fruits of green innovation—can we seize the historic opportunity presented by the green transition,

turn the vision of the Paris Agreement into reality, and safeguard our blue planet, leaving behind a clean, beautiful, and prosperous sustainable future for generations to come.

References

29. World Meteorological Organization. WMO Global Annual to Decadal Climate Update 2024–2028 [EB/OL]. (2024) [2025-11-26].
<https://library.wmo.int/idurl/4/70338>.
30. World Bank. Climate Change Overview [EB/OL]. (2023) [2025-11-26].
<https://www.worldbank.org/en/topic/climatechange>.
31. International Energy Agency. World Energy Investment 2024 [EB/OL]. (2024) [2025-11-26]. <https://www.iea.org/reports/world-energy-investment-2024>
32. United Nations Conference on Trade and Development. Global Trade Update 2023 [EB/OL]. (2023) [2025-11-26].
<https://unctad.org/publication/global-trade-update-2023>.
33. United Nations Conference on Trade and Development. Trade in Environmental Goods, 2012–2022 [EB/OL]. (2023) [2025-11-26]. <https://unctad.org>.
34. International Energy Agency. Solar PV Global Supply Chains [EB/OL]. (2023) [2025-12-04].
<https://www.iea.org/reports/solar-pv-global-supply-chains>
35. International Energy Agency. Electric car sales in China, 2019–2024 [EB/OL]. (2025-03-12) [2025-12-04]. <https://www.iea.org/data-and-statistics/charts/electric-car-sales-in-china-2019-2024>
36. Bloomberg New Energy Finance. New Energy Outlook 2024 [EB/OL]. (2024) [2025-11-26]. <https://about.bnef.com/new-energy-outlook>.
37. World Trade Organization; International Energy Agency. WTO-IEA Joint Report on Trade and Clean Energy Transition 2024 [EB/OL]. (2024) [2025-11-26].
<https://www.wto.org>.
38. Organisation for Economic Co-operation and Development. Environmental Goods: Tariff Structures and Trade Patterns [EB/OL]. (2023) [2025-11-26].
<https://www.oecd.org>.

39. World Bank. The Economic Case for Removing Barriers on Environmental Goods [EB/OL]. (2022) [2025-11-26]. <https://www.worldbank.org>.
40. World Trade Organization. WTO Trade Monitoring Report – Factsheet: Import-restrictive Measures in Force Since 2009 [EB/OL]. (2024-11) [2025-11-26]. https://www.wto.org/english/news_e/news24_e/trdev_13nov24_e.htm.
41. European Commission. EU Carbon Border Adjustment Mechanism (CBAM) Explained [EB/OL]. (2023) [2025-11-26]. <https://ec.europa.eu>.
42. U.S. Department of Energy. Inflation Reduction Act Guidebook [EB/OL]. (2023) [2025-11-26]. <https://www.energy.gov>.
43. OECD. International Regulatory Cooperation for the Green Transition [EB/OL]. (2023) [2025-11-26]. <https://www.oecd.org>.
44. World Trade Organization. Dispute Settlement Annual Report 2023 [EB/OL]. (2023) [2025-11-26]. <https://www.wto.org>.
45. General Administration of Customs of China. China Customs Statistics 2024 [EB/OL]. (2024) [2025-11-26]. <http://www.customs.gov.cn>.
46. China Association of Automobile Manufacturers. New Energy Vehicle Market Report 2024 [EB/OL]. (2024) [2025-11-26]. <http://www.caam.org.cn>.
47. National Energy Administration of China. China Green Electricity Certificate Issuance and Trading Bulletin 2024 [EB/OL]. (2024) [2025-11-26]. <http://www.nea.gov.cn>.
48. Ministry of Commerce of China. China Foreign Direct Investment Statistical Bulletin 2024 [EB/OL]. (2024) [2025-11-26]. <http://www.mofcom.gov.cn>.
49. China Environmental Protection Industry Association. China Environmental Industry Development Report 2024 [EB/OL]. (2024) [2025-11-26]. <http://www.caepi.org.cn>.
50. Ministry of Industry and Information Technology of China. National Green Factory and Green Industrial Park List Bulletin 2024 [EB/OL]. (2024) [2025-11-26]. <https://www.miit.gov.cn>.
51. International Energy Agency. Solar PV Global Supply Chain Review

- 2024 [EB/OL]. (2024) [2025-11-26]. <https://www.iea.org>.
52. International Energy Agency. Global EV Outlook 2024 [EB/OL]. (2024) [2025-11-26]. <https://www.iea.org/reports/global-ev-outlook-2024>.
53. World Trade Organization. Trade and Environmental Sustainability Structured Discussions (TESSD) Progress Report 2024 [EB/OL]. (2024) [2025-11-26]. <https://www.wto.org>.
54. UN Environment Programme. Global Environment Outlook [EB/OL]. (2024) [2025-11-26]. <https://www.unep.org>.
55. UNCTAD. Sustainable Freight and Logistics Report 2024 [EB/OL]. (2024) [2025-11-26]. <https://unctad.org>.
56. APEC Secretariat. APEC Environmental Goods List and Cooperation Update [EB/OL]. (2023) [2025-11-26]. <https://www.apec.org>.

About CCG and Our Team

About CCG

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This report has benefited greatly from the strong support of the Secretariat of the Hongqiao International Economic Forum, to whom we extend our sincere appreciation.

Due to the tight schedule under which this report was drafted and edited, errors or omissions may be unavoidable. We welcome comments and suggestions from all sectors of society to help us improve our future research.