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Photovoltaic Enterprise Environment and Low-Carbon Evaluation Report 2025

July 2025

Executive Summary

In the first quarter of 2025, China added 74.33 million kilowatts of new wind and solar power installations, bringing the total installed capacity to 1.482 billion kilowatts (solar PV accounting for 946 million kilowatts), surpassing coal power capacity for the first time¹. **As of the end of May 2025, China's total solar power installation had exceeded 1 billion kilowatts².** At the same time, China's PV module production accounted for 83.41% of global output.



Figure 1 IPE's Solar Map presents the cumulative grid-connected capacity of photovoltaic power generation in each province of China in the first quarter of 2025³

As clean energy production sector, the PV industry consumes substantial energy and resource and generate significant amount of carbon emissions, wastewater, air pollution, and solid waste from silicon materials, wafers, cells and modules production to the disposal of retired PV modules.

To evaluate the photovoltaic industry's progress in low-carbon transition, and to guide photovoltaic enterprises in improving environmental performance, reducing emissions, and building greener supply chains, the Institute of Public and Environmental Affairs (IPE) and

¹ <https://www.nea.gov.cn/20250425/148efd0ca61148148d285edd438912df/c.html>

² https://www.gov.cn/lianbo/bumen/202506/content_7029794.htm#:~:text=1—5月,累计新增并网规模近2亿千瓦,同比增长57%25,推动中国光伏发电累计装机规模突破10亿千瓦,达10.8亿千瓦%E3%80%82%20这相当于约48个三峡电站的总装机%E3%80%82,光伏装机的快速增长,有力推升中国新能源和可再生能源发电占比,进一步提高中国电力能源消费中的含绿度%E3%80%82%20国家能源局有关负责人说%E3%80%82

³ https://www.ipe.org.cn/MapPowerStation/PowerStation_SpaceV2.aspx

Green Jiangnan (PECC) jointly launched the Photovoltaic Enterprise Green and Low-Carbon Supply Chain Evaluation Project in early 2024.

In 2025, IPE and Green Jiangnan expanded the evaluation to include **55 photovoltaic enterprises across the production of silicon, wafers, cells, modules, thin-film, inverters, glass, as well as construction and operation of solar power plants**. The evaluation is based on publicly disclosed annual reports, ESG/sustainability report and other public information published on company websites, credible third-party data aggregated in IPE’s Blue Map Database, and field research conducted by Green Jiangnan.

The evaluation uses the [Green Supply Chain CITI Index](#) and the [Corporate Climate Action CATI Index](#). The CITI Index includes five dimensions: Management Mechanism, Compliance and Corrective Action, Resource Use and Pollution Release, Energy Use and Climate Action, and Stakeholder Green Choice. The CATI Index also includes five dimensions: Governance, Measurement and Disclosure, Climate Target-setting, Performance against Climate Targets, and Climate Actions.

LONGi Green Energy, JinkoSolar, and Tongwei ranked in the top three for both the CITI and CATI indices. JA Solar, TCL Zhonghuan, Sungrow, Trina Solar, GCL Technology, Canadian Solar, Risen Energy, Xinyi Solar, and Astronergy also entered in CITI and CATI Top 10.



Figure 2 Green Supply Chain CITI Evaluation TOP 10



Figure 3 Corporate Climate Action CATI Evaluation TOP 10

Key Findings

1. The utilization of renewable energy by photovoltaic enterprises has increased significantly, but the decarbonization of the industrial chain still needs to be strengthened

Photovoltaic enterprises have made significant progress in renewable energy use. **Forty of them disclosed renewable energy usage in 2024, totalling 5.71 million MWh, resulting in over 32.55 million tons of CO₂e reductions and offsets combined.** Among 10 companies who disclosed renewable energy targets, Sungrow and Tongwei reported over 60% of total energy consumption from renewable sources in 2024, while LONGi, Tongwei, JinkoSolar, and Daqo Energy exceeded 40%.

Eleven companies, including Astronergy and GoodWe, are building (near-)zero-carbon factories or industrial parks through rooftop PV installations, green electricity purchases, and green certificates.

Despite this, **emissions from photovoltaic enterprises remain high.** Forty-four companies disclosed their Scope 1 and 2 emissions, totalling 105 million tons of CO₂e in the most recent year. Among 24 companies who disclosed three-year data, emissions rose from 45.23 million tons in 2022 to 70.57 million tons in 2024—a 46.6% increase in 2023 and a further 5.7% in 2024—highlighting the urgent need for faster decarbonization.

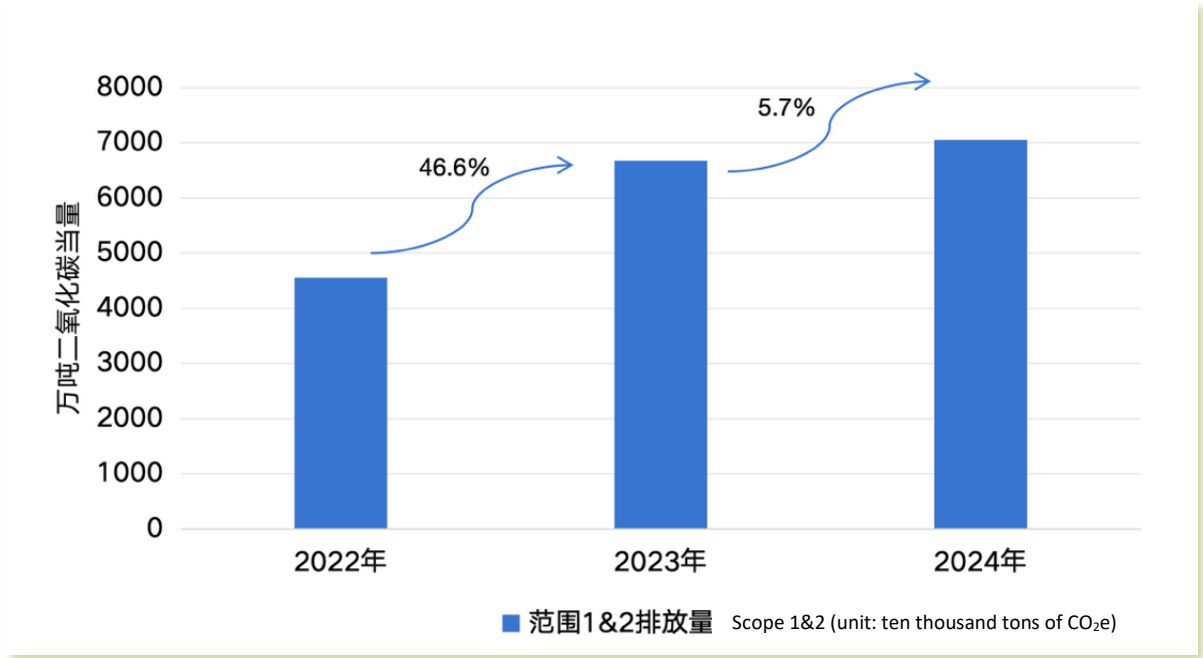


Figure 4 Total Scope 1&2 emissions of 24 photovoltaic enterprises from 2022 to 2024
(Source: IPE)

2. The environmental information and carbon data disclosures have improved, but Chinese photovoltaic enterprises still lag global leaders

Seven companies have committed to achieving value chain carbon neutrality by 2050, and six have set supply chain emission targets. Progress data from LONGi and Tongwei shows a decrease of Scope 3 carbon intensity. LONGi has also required suppliers to conduct carbon accounting and target-setting, and improve Scope 3 data accuracy by collecting data from suppliers.

However, **supply chain carbon management remains limited. Most photovoltaic companies are still in early stages or pilot phases, and supply chain climate transparency needs further improvement.**

Leading companies start to pay attention to product carbon footprints. Twenty-five companies disclosed data for over 80 products including modules, cells, polysilicon, and inverters. This is a response to green access standards in some markets on carbon footprint thresholds and low-carbon certification.

Among 35 companies who produce polysilicon, wafers, and cells, the most water-intensive part of the photovoltaic value chain, 28 disclosed water consumption data. Seven, including Tongwei and GCL, disclosed per-unit water consumption for high-water-use processes. Fourteen companies disclosed water management targets, and five—including LONGi, Trina Solar, GCL, TCL Zhonghuan, and Aiko Solar—set goals for reducing water intensity, with most also reporting on 2024 progress.

3. Leading companies are strengthening supply chain environmental management but the "green manufacturing" of photovoltaic still needs to be strengthened

Over 80% have publicly disclosed green supply chain requirements. Since 2025, Tongwei has required affiliates to publicly disclose rectification measures and compliance status regarding environmental violations. As of June, 24 companies had disclosed such information.

Ten companies extended environmental risk management to upstream raw material suppliers. LONGi, Tongwei, JinkoSolar, and JA Solar also disclosed their attention on the environmental impacts from the mining of energy transition minerals.

On the other hand, field investigations by IPE and Green Jiangnan found recent environmental violations among affiliated enterprises of 12 evaluated companies. This includes excessive air pollutant emissions, unauthorized water withdrawals, and failure to implement emergency pollution control measures during heavily polluting days. Only two companies disclosed rectification measures and compliance updates publicly.

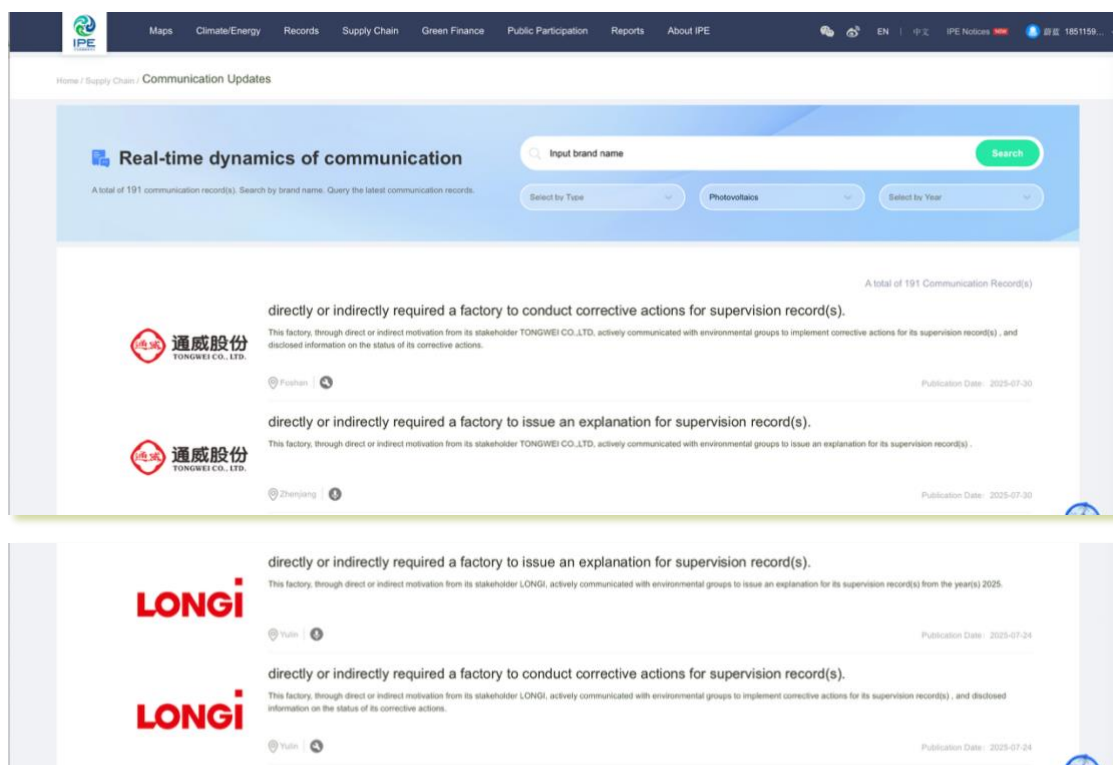


Figure 5 Tongwei and Longi required their suppliers to conduct public explanation⁴

4. Nearly 60% of photovoltaic enterprises who operate solar power station have disclosed the impact of biodiversity, while the upstream production links have received limited attention

Biodiversity impacts from PV power plant development are drawing growing attention. Eleven companies—including JA Solar, Risen Energy, Sungrow, Xinyi Solar, TBEA, and Yicheng New Energy—disclosed efforts to avoid biodiversity-sensitive areas in site planning.

TCL Zhonghuan, JA Solar, Trina Solar, and Risen Energy pledged to address biodiversity in their supply chains, but no companies disclosed actions to mitigate impacts from mining of silicon or critical minerals.

5. The retirement cycle of photovoltaic modules is approaching, but lack of standards, complex technology and high costs remain to be obstacles

According to the China Photovoltaic Industry Association, large volumes of retired PV modules will begin to emerge by 2025, peaking after 2030. Among 31 module manufacturers

⁴ <https://www.ipe.org.cn/GreenSupplyChain/Communication.html>

evaluated, 16 disclosed actions related to module recycling, including **participating in standard drafting, improving recyclability, and building pilot recycling lines.**

However, disclosures and data remain largely focused on the European market. **In China, PV module recycling still faces challenges, including the lack of a mandatory Extended Producer Responsibility (EPR) system, an underdeveloped recycling supply chain, and immature dismantling and recycling technologies.**

The International Renewable Energy Agency (IRENA)⁵ projects that to reach with the global goal to triple installed renewable energy capacity by 2030, renewable capacity must expand by 16.6 % annually until 2030. Amid this opportunity, China's photovoltaic industry has rapidly scaled and emerged as a globally competitive sector with a leading edge.

However, in recent years, this strategic emerging industry has encountered challenges such as disorderly low-price competition. On the international front, amid rising geopolitical tensions, supply chain security has taken on unprecedented importance. Some countries have introduced incentive programs to support local photovoltaic manufacturing capacity to meet the growing demand for renewable energy installations.

In this context, IPE and Green Jiangnan urge **Chinese photovoltaic companies to proactively align with global environmental and climate standards—including those on resource and energy use, GHG emissions, and biodiversity—and to accelerate low-carbon transformation across the value chains. This will enhance global competitiveness and make greater contribution to the energy transition in China and globally.**

IPE and Green Jiangnan also call on all stakeholders to jointly track the sector's decarbonization progress and build accountability mechanisms that encourage photovoltaic companies to conduct "green manufacturing", foster low-carbon supply chains, and contribute to the vision of a Beautiful China and tackling global environment and climate crisis.

Disclaimer: This executive summary has been translated into English by IPE for reference purposes only. If any questions arise related to the accuracy of the information contained in this translated version, please refer to the Chinese version of the report, which is the official version. The right to final interpretation, modification and updating of the executive summary is solely reserved by IPE.

⁵ <https://www.irena.org/News/pressreleases/2025/Mar/Record-Breaking-Annual-Growth-in-Renewable-Power-Capacity>