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AN ELECTRIFIED GLOBAL ECONOMY FOR ALL?

HOW COUNTRIES ARE RESTRICTING OR LIBERALIZING TRADE IN EVS, BATTERIES, WIND, AND SOLAR

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Policy brief

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Thomas Hale and Claas Mertens

Summary

1. Trade in clean technology is a flashpoint ahead of COP31. China, the leading producer, is calling for the free flow of green technology, while many of its trading partners restrict imports. New data from the Oxford Climate Policy Monitor show what 31 jurisdictions, covering 90% of world GDP, are actually doing on EVs, batteries, wind, and solar.
2. Most major economies have some kind of restriction on imports of clean-tech, though some are deploying strategic mixes of restrictions and openness to insert themselves into global value chains. Of the 31 jurisdictions assessed, those with at least one restrictive measure account for 58% of world GDP, and many explicitly target Chinese goods.
3. In contrast, a large number of the smaller economies assessed are liberalizing imports of EVs, batteries, wind, and solar, creating a loose, informal "free trade area" for clean-tech. Outside China, however, these liberalizers account for only about 8% of world GDP.
4. As governments navigate the tensions between climate policy, industrial policy, and geoeconomic security, their existing policies point the way toward building an electrified global economy for all: combining openness with targeted protection for clean-tech industries and setting economic security guardrails.

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Countries are caught between energy shocks and the race to win the electric economy of the future—with China in the lead

In recent years two macrotrends have disrupted many countries' energy systems and industrial bases, with significant implications for national security, economic growth, and global climate goals. The 2022 Russian invasion of Ukraine and the 2026 US-Israeli war against Iran shook oil and gas markets, creating price spikes, life-threatening supply disruptions, and inflationary pressures strong enough to tip elections. Over the same period, extraordinary advances in so-called "electro-tech"—including photovoltaic cells, wind turbines, batteries, and EVs—are creating both enormous opportunities and stark challenges in economies as diverse as Pakistan, Germany, and Nigeria. Meanwhile, growing demand for power to win the AI race, cool overheating cities, or provide for basic needs has made energy security top-of-mind for governments, the private sector, and households around the world.

China's role is key. Looking at some of the core technologies of the energy transition—photovoltaic cells, wind turbines, batteries, and electric vehicles—China is far ahead on production and deployment, and dominates global solar and battery exports (Table 1).

In the run-up to COP31, Beijing has called for the free flow of green technology and condemned "unilateralism and protectionism".[1] One independent report estimated that China's clean-tech exports in 2026 alone would keep about 450m tonnes of CO_2 out of the atmosphere, equivalent to Brazil's annual emissions.[2] But Washington, Brussels, Delhi and others argue that China's lead was built on unfair state support, that it is hollowing out their own industries, and that depending on a single supplier creates chokepoints that Beijing could one day use for leverage.

Navigating the tensions between climate goals, economic development, and geoeconomic security starts with knowing what governments are actually doing. New data from the Oxford Climate Policy Monitor provides that picture, covering 31 jurisdictions and 90% of world GDP.[3] The data reveals a divergence: some jurisdictions, including many large

[1] Li Gao, Vice Minister of Ecology and Environment, press conference, Beijing, 21 October 2026, as reported by Reuters, "China signals intent to push back against cleantech tariffs at COP31", 21 October 2026.
[2] Lauri Myllyvirta, "Analysis: China's clean-tech exports in 2026 to avoid as much CO2 as Brazil emits in a year," *Carbon Brief*, 29 October 2026.
[3] See the annex for details on the Monitor and its methodology.

economies, restrict clean-tech imports in some form, while a broad group of smaller economies is opening up, and a third group combines openness with protection.

Table 1: China's share of world production, deployment and exports, by sector, 2025

Sector	Production	Deployment	Exports
Solar PV	79% of modules produced	62% of capacity added	78% of module export value
Wind	78% of turbines installed worldwide supplied by Chinese manufacturers	73% of capacity added	32% of wind turbine export value
Batteries	>80% of cell production	60% of EV battery deployment	73% of lithium-ion battery export value
EVs	~75% of electric cars produced	~60% of electric car sales	36% of battery-electric car export value

China's share of the world total in 2025. Sources. Production: IEA-PVPS, Trends in Photovoltaic Applications 2026 (modules); Wood Mackenzie, April 2026 (wind turbine supply); IEA, Global EV Outlook 2026 (battery cells, electric cars). Deployment: IRENA, Renewable Capacity Statistics 2026 (solar); GWEC, Global Wind Report 2026 (wind); IEA, Global EV Outlook 2026 (EV battery deployment, electric car sales). Exports: UN Comtrade, 2025 export values for HS 854143 (PV modules), 850231 (wind generating sets), 850760 (lithium-ion batteries) and 870380 (battery-electric cars), as reported by 4 November 2026; world totals exclude intra-EU trade and include Viet Nam's exports imputed from partner-reported imports. Bases differ across cells (output, capacity, value); figures are indicative.

The data show how countries are responding to a common dilemma. On the one hand, they can open their economies and gain the benefits of cheap, effective Chinese imports and thereby secure low-cost, green, and domestically generated energy. This exposes their domestic producers to international competition. On the other hand, they can close their economies to shield domestic producers, but risk falling behind the technological frontier and losing cost-effective ways to reduce emissions and build energy security. At a time of geopolitical tension, for some countries, there is not only an economic but also a security concern. They have voiced the worry that Chinese technologies (e.g., smart EVs or grid management tools) may create informational vulnerabilities and even be switched off remotely. More generally, some countries worry that China's dominant manufacturing power in these sectors will give it greater economic power overall, as restricting the supply of clean-tech may impose high economic costs on countries that lack alternatives.

China, in turn, also faces a dilemma. Exports of clean-tech are one of the brightest spots in a challenging economic landscape. In 2025, clean-energy sectors accounted for 37% of

China's GDP growth, with EVs, batteries, solar and wind contributing most of that.[4] But that very dominance risks creating a backlash as China's export markets seek to protect domestic industries and security interests, and Beijing has itself begun to weaken the incentive to export surplus production at a loss by ending the tax rebate on solar and battery exports.[5] In response, Chinese companies are rapidly investing in manufacturing abroad. But the Chinese government, wary of losing its technological edge, in October 2026 proposed export controls on photovoltaic manufacturing technologies.[6] Others may follow.

All countries therefore face the common problem of how to build a shared and secure electric economy for all. This policy brief frames that challenge by showing where countries' policies are now.

Findings: The electro-trade divergence

The data summarized in Figure 1 and Figure 2 show a divergence between large economies that are restricting clean-tech imports at least somewhat, and smaller economies who are encouraging them. The Monitor records 52 import measures on EVs, batteries, solar, and wind in 25 jurisdictions of 31 assessed (counting the EU once), which cover ~90% of global GDP. We find 22 restrictive, 22 liberalizing, and 8 mixed policies. The Monitor data also assesses carbon border adjustment measures, but these are not included in this brief.

[4] Lauri Myllyvirta and Christoph Schaepe (CREA), "Analysis: Clean energy drove more than a third of China's GDP growth in 2025", Carbon Brief, 5 February 2026.
[5] Ministry of Finance and State Taxation Administration, Announcement No. 2 of 2026, 9 January 2026: the VAT export rebate on photovoltaic products ends on 1 April 2026; the rebate on batteries falls from 9% to 6% from April 2026 and ends on 1 January 2027.
[6] Ministry of Commerce and Ministry of Science and Technology, Announcement No. 48 of 2026, 16 October 2026, draft revision of the Catalogue of Technologies Prohibited or Restricted from Export, open for comment until 15 November 2026.

Figure 1. Clean-tech import measures by jurisdiction and sector (one dot per measure)

Jurisdiction	EVs	Batteries	Solar PV	Wind	Explicitly targets China?
European Union	🔴🔴🟢		🔴	🔴	**Yes: 3 restrictive, 1 mixed**
Argentina	🟢	🟢	🟢🟢	🟢	No
Australia	🟢	🟢	🟢🟢	🟢🟢	**Yes: 1 liberalizing**
Brazil	🟢🔴	🟢🔴	🟢🔴	🟢🔴	No
Canada	🔴		🟢	🟢	**Yes: 1 restrictive**
China		🟢🟢	🟢		No
Colombia	🔴🟢				No
Costa Rica	🟢	🟢			No
Egypt	🟢		🟢	🟢	No
Ethiopia	🟢🔴	🟢			No
India	🟢🔴	🟢🔴	🔴🔴	🔴	**Yes: 1 restrictive**
Indonesia	🔴🟢		🟢🔴		No
Kenya	🟢🟢🔴	🟢	🟢	🟢	No
Mexico	🔴				**Indirect only (1 measure)**
Nigeria	🟢🔴🔴	🟢🔴	🟢🔴	🟢🔴	No
Philippines	🟢	🟢🟢	🟢	🟢	No
Rwanda	🟢🔴	🟢🔴			No
Saudi Arabia	○	○	○		No
South Africa		🔴	🔴	🔴	No
South Korea	🟢	🟢			No
Thailand	🟢	🟢🟢			No
Türkiye	🔴🔴	○🔴○	🔴🔴🔴🔴	🔴🔴	**Yes: 1 restrictive, 1 indirect**
United Kingdom				🟢	No
United States	🔴	🔴	🔴	🔴	**Yes: 1 restrictive**
Vietnam				🔴	**Yes: 1 restrictive**

🔴 Restrictive 🟢 Liberalizing 🟢🔴 Mixed (one tool with both elements)
○ Restrictive: origin-neutral technical or conformity requirement

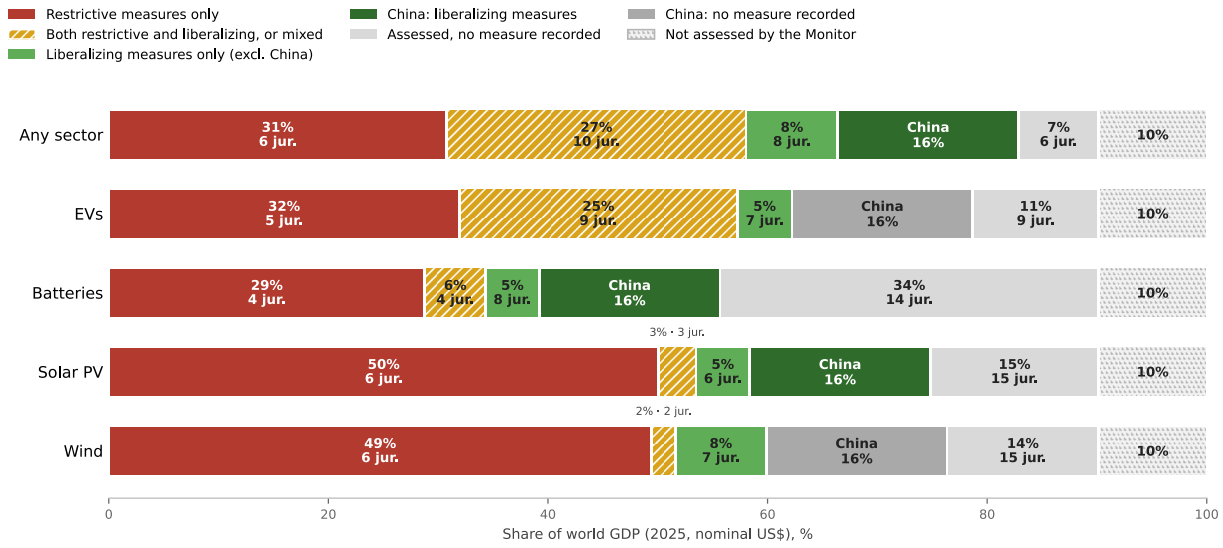
One dot per policy tool per sector covered (a tool covering several sectors appears in each). n = 51 trade tools, 25 jurisdictions.
Direction per Q9.27 (import restriction strengthened or relaxed). Excludes border carbon adjustments (EU and UK CBAM and member-state implementing acts) and tools not specific to the four sectors. "Indirect": duties that fall on Chinese goods without naming China.
Source: Oxford Climate Policy Monitor 2026 dataset (consolidated 2 Nov 2026).

Accounting for economic weight

Counting jurisdictions, liberalization looks widespread: 19 of 25 jurisdictions with measures have at least one liberalizing or mixed measure. Figure 2 shows that weighting by GDP reverses the picture.

Most large economies have a degree of closure, with 58% of world GDP sitting in jurisdictions with at least some restrictions. However, this group splits into two subgroups: those who are chiefly or entirely restricting (like the US, the EU, Mexico, Türkiye, and South Africa) and those that are pursuing mixed strategies, like restricting finished products but liberalizing components, seeking to insert themselves into existing value chains (Nigeria, Kenya) or pursuing an "openness for investment" strategy (open to import finished products in exchange for commitments to invest in local manufacturing) like Indonesia.

Figure 2. Share of world GDP in jurisdictions with restrictive, mixed or liberalizing clean-tech import measures, by sector (2025 GDP).



Segment labels: share of world GDP and number of jurisdictions. 31 jurisdictions assessed (EU counted once; California excluded); 52 trade tools; border carbon adjustments (CBAM) excluded. Classification per sector from the direction of each tool (Q9.27). GDP: World Bank WDI, 2025 (UAE 2024; EU27 aggregate). Source: Oxford Climate Policy Monitor 2026 dataset (consolidated 2 Nov 2026).

Three strategies: restrict, mix, or liberalize

The Oxford Climate Policy Monitor is designed not only to allow high-level comparison across jurisdictions but also to enable deep dives into individual policies. In the following, we look behind a selection of the dots in Figure 1, drawing on the 2026 survey across the four clean-tech sectors and 31 jurisdictions.

Among the jurisdictions that are chiefly restricting, the US has imposed Section 301 tariffs on Chinese EVs (raised to 100%), solar cells and wafers (50%) and batteries (25%), Section

232 tariffs on autos, and anti-dumping and countervailing duties on solar from Cambodia, Malaysia, Thailand and Vietnam. The EU applies countervailing duties of 7.8–35.3% on Chinese battery EVs and anti-dumping duties on Chinese wind towers and solar glass. Türkiye records seven restrictive measures across all four sectors, including anti-dumping duties on Chinese PV components and an anti-circumvention extension to imports routed via five third countries. South Africa has published a draft review of the tariff structure across the renewable energy value chain to build local manufacturing, and Mexico's decree of December 2025 raised import duties on goods from countries without a trade agreement with Mexico, including a 50% duty on electric vehicles and 25% on EV motors, in force since January 2026.

The second group pursues mixed strategies. One variant restricts finished goods while opening inputs: Nigeria's ECOWAS common external tariff sets higher bands on finished goods and reduced duties on renewable-energy inputs, and Kenya's 2026 e-mobility policy combines duty and tax cuts on EVs and parts with local assembly and standards requirements. The other variant trades openness for investment: Indonesia cut the import duty on fully built EVs from 50% to 0% for firms committing to build locally as many units as they import (the import window closed in December 2025; production commitments run to 2027).

Mixed strategies are particularly common in EVs, but nearly totally absent in wind and solar. Nine jurisdictions combine restrictive and liberalizing measures in EVs (25% of world GDP), against three in solar (3%) and two in wind (2%). In solar and wind, restrictions are rarely combined with openness: jurisdictions with only restrictive measures hold about half of world GDP in each sector, against 32% for EVs.

Meanwhile, outside this group of "restrictors," a number of smaller economies are actually liberalizing imports in these four sectors, creating something of a "de facto free trade area" in clean-tech. However, this group is not a large share of the global economy. Not counting China, it is only 5-8% of world GDP in each sector. The liberalizers other than China are South Korea, Australia, Argentina, Thailand, the Philippines, Egypt, Costa Rica, and the UK. Examples include Philippine zero MFN duties on EVs and parts, Argentina's 0% duty on EVs within an annual quota, Costa Rica's EV incentives law, Egypt's duty cut on electric buses and the UK's removal of import duties on offshore wind components. Most of this liberalization is unilateral. Only a few measures are reciprocal (Australia's FTAs with

China and the EU), so we use “free trade area” as a metaphor, not a legal regime. China itself (16.5% of world GDP) records liberalizing import measures, such as its encouraged-imports catalogue and 2026 tariff cuts on battery inputs, though in practice it imports very small volumes.

Targets, instruments, and motives

Some restrictors target China explicitly (India, the US, the EU, Türkiye, Canada and Vietnam) while others (Brazil, South Africa) do not. Jurisdictions with restrictive measures explicitly targeting China account for 61% of world GDP outside China. Most China-targeted measures are trade remedies (anti-dumping and countervailing duties in the EU, India, Türkiye and Vietnam), plus US Section 301 tariffs and Canada’s EV quota. Mexico’s new tariff reaches Chinese goods by another route: it applies to all countries without a trade agreement with Mexico. Targeting is also moving beyond China. Türkiye and the US apply duties to solar imports from Southeast Asian countries where Chinese firms have relocated production. As noted, not all China-specific measures restrict trade. Australia’s FTA with China, for instance, eliminates tariffs on solar and wind goods.

Beyond policies targeted at China, many of the restrictions we identify are not traditional ‘trade’ policies, but tax policies, standards, or local content benefits in green industrial policies, and other measures. Of the restrictive policies identified, almost half are entirely or partially non-trade measures: of 22, 7 rest only on non-trade law and 3 mix trade and non-trade legal bases. Local-content conditions attached to subsidies or procurement are a distinct pattern: India’s approved-model lists and EV subsidy scheme and Indonesia’s local-content rules for EVs and power projects. Standards and conformity requirements are counted as restrictive but are often origin-neutral and low-intensity (for example Saudi Arabia’s product registration system and Türkiye’s battery import inspection).

Despite geopolitical tensions, national and economic security concerns are only cited in US restrictions. There, Section 232 auto tariffs invoke national security, while Section 301 actions cite unfair practices, including forced technology transfer. The gap between security rhetoric and legal basis is notable. Concerns about connected vehicles and grid equipment, and about dependence on Chinese supply for components that have no substitute at scale, have not (yet) translated into security-based import measures.

What next?

Going forward, countries need to decide how they want to balance the tension between openness and restrictiveness, navigating between three goals:

1. Effective climate policy
2. Economic growth
3. Geoeconomic security

Often, the same policies can advance governments' ambitions on all three. Creating a stable and abundant supply of domestically generated clean electricity not only advances climate goals but also reduces external dependencies on fossil fuels that have cost many countries dearly. Mitigating such vulnerabilities to economic chokepoints also lays the foundation for future growth and prosperity.

But hard trade-offs and conflicting interests also exist among the three goals and between governments. China's advances in clean-tech have drastically reduced the costs of generating and deploying renewable energy. The economically cheapest way of reaching climate goals would be for countries around the world to double down on importing Chinese clean-tech. But a further increase in the reliance on Chinese imports risks eroding countries' industrial bases—potentially creating politically risky job losses—and could also leave countries exposed to coercion down the line. That exposure differs to fossil-fuel dependence but is important nevertheless. Chinese export restrictions would not disrupt direct energy flows but would still impede new projects as well as the maintenance of existing assets, for instance, through the supply of spare parts for solar and wind farms as well as EVs. In theory, China could use such chokepoints for geopolitical leverage, as it has done with critical minerals, and as the United States and many other countries also have done in domains from finance to semiconductors.

Despite these tensions, it is in the interest of all countries to find arrangements in which geopolitical competition does not destroy economic value and undermine the world's electrification. Large economies such as the United States and the European Union are unwilling to become more dependent on Chinese supplies. Given China's current ultra-competitive market position, building their own capacity requires restrictions and industrial policy, and the price is slower, costlier deployment—a price the data show they are accepting. The choice is not binary, however. Mid-sized economies such as Brazil and

Indonesia show that restricting finished products but liberalizing components, or opening to imports in exchange for investment commitments, keeps more of the benefits of openness than blanket restriction.

China, in turn, will need to find ways to ensure its very success does not undermine itself, and to share the value chain with others. Signals are mixed. Chinese firms are building plants abroad, and Beijing has ended the tax rebate that made its solar exports cheaper, while in October 2026 MOFCOM proposed export controls on solar manufacturing technology. A recent agreement with the EU to limit imports of hybrid cars shows the potential for compromise.[7]

Smaller countries that do not aspire to become self-sufficient along entire clean-tech value chains face a different challenge. They must navigate between the competing larger economies and carve out niches in which to add value through specialized domestic production and remain open to trade in other components—a strategy that our findings highlight many smaller countries have begun to implement.

The outline of an arrangement that serves all three groups—a shared electric economy for all—is visible in the data. Restricting countries should selectively engage with, not simply block, China's leading industries. Autarky is a recipe for falling behind the technological frontier, and it is hard to envision decarbonization at the required pace without Chinese equipment. For its part, China will need to lay fears of industrial collapse and new energy chokepoints to rest with more than rhetoric: credible commitments not to restrict supplies, production abroad, and technology sharing. At the same time, all the large economies can gain from bringing smaller states into clean-tech value chains rather than cutting them out or leaving them to choose sides. A combination of domestic production and a wider set of suppliers is the best answer to fears of dependence, and new markets are also what China needs.

None of this requires a grand bargain, and the data suggest the pieces are at hand. Despite increasingly fraught geopolitical tensions, countries are both liberalizing and restricting, which shows that there is space for further dialogue and cooperation, and the mixed strategies show that openness and protection can be combined rather than traded off wholesale. As countries strive to find the right balance of openness and restrictiveness for

[7] Brad W. Setser, "Europe's Deal Limiting Chinese Auto Imports," *Council on Foreign Relations, 2 Nov 2026.*

their goals, they can benefit from building coalitions across boundaries on areas of mutual interest. Starting points include plurilateral tariff cuts on clean-tech goods building on the APEC environmental goods list, and guardrails, agreed across geopolitical divides, against using clean-tech supplies as a geoeconomic weapon. The WTO's trade and environment discussions and the UNFCCC dialogue on trade and climate that COP31 continues are the venues where both could be taken up.

Transparency is a precondition: few governments or observers have a cross-country view of these measures. The Monitor's trade data can serve as a shared baseline for the policy decisions ahead. How the clean-tech trade regime is built will decide whether geopolitical rivalry slows the transition, and how fast and how cheaply the world cuts emissions this decade. The goal, for restrictors and liberalizers alike, is a shared, prosperous and secure electric economy for all.

Annex: Methodology

1. All data and full methodological details will be available at climatepolicymonitor.ox.ac.uk from 12 November 2026.
2. The Oxford Climate Policy Monitor tracks climate policy in 39 jurisdictions (32 counting the EU as one; the trade analysis uses 31, excluding California, whose trade policy is set federally). A Legal Expert Network of more than 80 law firms completes a standard survey for each policy tool; the Monitor team reconciles and reviews responses.
3. The 2026 edition adds a trade domain. Scope: tariffs and non-tariff import restrictions on EVs, solar PV, wind and batteries (including direct upstream components), plus border carbon adjustments, which are surveyed but excluded from this brief. Export restrictions are not covered.
4. Scope rules applied in review: measures must refer to at least one of the four sectors; domestic tax incentives are included only where the tax is levied at the border or domestic production is negligible; general countermeasure laws are excluded.
5. Each policy tool is coded as liberalizing, restrictive or mixed (survey Q9.27), with its legal basis (Q9.25), country targeting (Q9.19) and tariff or non-tariff form (Q9.31, Q9.34).
6. Jurisdiction classification: for each sector, a jurisdiction is “restrictive only”, “liberalizing only”, “both or mixed”, or has no recorded measure. The EU counts as one jurisdiction.
7. GDP weighting: nominal GDP in current US$, World Bank WDI, 2025 (UAE 2024). Shares are of world GDP; about 10% of world GDP is in jurisdictions the Monitor does not assess.
8. Data as of 2 November 2026: 52 trade measures, excluding border carbon adjustments; 31 jurisdictions assessed, 25 with at least one measure. Responses were collected between April and August 2026 and do not reflect subsequent measures.
9. Data interpretation notes
    a. Counts measure the presence of policies, not their stringency or trade impact.

b. Each measure has one direction code, so packages with both restrictive and liberalizing parts are coded “mixed”.
c. Origin-neutral standards and conformity requirements are counted as restrictive (3 measures).
d. Six assessed jurisdictions (Chile, Japan, Russia, Singapore, Tanzania, UAE) record no trade measures; the absence of a record is not proof that no measure exists.