CCICED Issues Paper 2025:
Tipping, Turbulent, and Green Transition Points

Overview: *The 2025 CCICED Annual General Meeting takes place at a point of exceptional turbulence and global ecological tipping points. Yet the central message of this year's work is that the green transition has reached its own green tipping point, in which future and more ambitious action will neither be disrupted nor delayed.*

Tipping Points: Scientific evidence unambiguously underscores the need for urgent climate, biodiversity, and pollution action at scale both through domestic measures and renewed international cooperation.

Earth System Science Data concludes that global temperatures in 2024 were "alarmingly exceptional" as the warmest year ever recorded, and global average temperatures exceeding 1.5°C compared to pre-industrial averages[i]. A September 2025 report published by the U.S. National Academies warns of human health, welfare, and security risks due to extreme heat, wildfire smoke and dust, airborne particulate matter, and increased infectious disease—reaffirming the critical endangerment findings of earlier courts. Echoing the 2025 Global Tipping Points conference that the window to reverse runaway climate change is quickly closing, the National Academies report warns of advancing, irreversible global tipping points.

Asia continues to warm at nearly twice the global average (WMO Asia), and extreme weather events, such as typhoons, monsoon, extreme flooding, heat waves, drought, and other impacts directly attributed to climate change, are expected to increase faster than elsewhere[ii].

One example of cascading climate effects is air pollution, which is the second leading risk factor for death.[iii] Recent research confirms worsening health effects from climate change, in which increased wildfires cause 270,000 premature deaths among children annually. Another is a Lancet Planetary Health study that points to increased spreading of pathogenic fungus by warming temperatures, infecting over 1,000 amphibian species as further evidence of the thermal mismatch theory[1].[iv]

Plastics exemplify the triple crisis of climate, biodiversity, and pollution. The annual production of 450 million tons of plastics contributes roughly 3% of global GHG emissions each year (Ritchie) and results in the release of chemicals and other pollutants into the environment. Since less than 20% of plastics are recycled, plastic pollution amplifies other stressors, particularly affecting marine species and aquatic ecosystems (UNEP).

Turbulence: 2025 marks an inflexion point of exceptional international turbulence, uncertainty, and splintering. The rules-based international trading system is largely in tatters, with the Geneva-based World Trade Organization (WTO), and other multilateral organizations, at risk of repeating the fate of the League of Nations.

[1] Pathogens typically have broader thermal limits than hosts; therefore, pathogens would have better performances than their hosts in colder or warmer environments. Climate change shifts hosts away from their optimal temperatures, thus the probability of increased host susceptibility to infectious disease may rise.

Trade protectionism led by higher average tariffs has risen in 2025 to an overall average effective tariff rate of 18.7%, the highest since 1933. One commentator described 2025 as a "tangled web of tariffs that have been imposed, adjusted, revoked and reinstated," leading the WTO to forecast a likely contraction of 0.2% in merchandise trade in 2025 and a 4% decline in services trade, which could rise to 1.5% merchandise trade contraction under its worst case scenario.

External debt levels of developing countries reached a record high in 2024 of USD 11.3 trillion, representing 99% of their combined export earnings (UNCTAD). The convergence of public debt, rising interest rates, and trade protectionism have dramatically narrowed the fiscal space for many developing countries. The spring 2025 IMF Fiscal Monitor bleakly warned that half of all low-income countries face debt distress today, and the situation is likely to deteriorate further.

Of the many effects of trade protectionism and rising debt, none are more pressing than the impact on people. The World Bank reports that all progress in tackling extreme poverty has stalled, with roughly 700 million people today living in extreme poverty and 3.5 billion people considered to be poor. In many countries, debt servicing is higher than public spending on public health and education combined, leaving SDG targets floundering.

The lead-up to the 2025 Financing for Development summit saw a number of pragmatic proposals, while the Seville communique comprised another list of needed reforms, including multilateral development bank reforms to leverage private-public sector spending. Work by Ryder and Hampton points to proven models, such as China's CN¥ 10 trillion debt-relief plan that weaves long-term investments with short-term, proactive financing, as a practical model that could be replicated internationally.

Risings tariffs, escalating sovereign debt, and plummeting official development assistance—by as much as 17% in 2025—present additional challenges to the implementation of the Paris Climate Agreement. Tariffs further compound structural barriers by which most developing countries—with the notable exception of China—are locked out of trade in low-carbon technologies. The trade-climate nexus has also become more complex. On one hand, the European Union's CBAM, which intends to curb GHG leakage, is due to take effect in 2026 and will require some importers to disclose the carbon footprint of goods like steel and aluminum. On the other hand, the U.S. administration has threatened retaliatory measures and remedies against countries that pursue low-carbon, multilateral pathways, notably the IMO Net Zero Framework agreed in April 2025.

In addition to these challenges is a growing hostility — both from expected and from surprising quarters — towards carbon neutrality policies. The U.S. Energy Secretary has dubbed climate action a "cult." The Tony Blair Institute dismissed net-zero policies as "irrational," inexplicably ignoring both its excessive costs and inflated long-term outcomes[v]. Voluntary platforms, like the Net Zero Banking Alliance, have collapsed, while ESG goals in some financial markets are in retreat (Harvard Business Review).

Short-term policy regression is hardly new to the environmental agenda. Over decades, environmental policy has faced a wholly predictable playbook of denial, delay, and defunding,

including the denial of scientific evidence backing climate change or evidence that renewable energy is cheaper than most fossil fuels. The central recommendation of CCICED's work in 2025 is that the green transition has reached a point that is unstoppable.

Green Transition: While most biodiversity, climate, and nature updates understandably focus on policy regression and mounting global crises, these reports can often cloud enormous progress and signs of hope. As a foundation of hope and action, there is nothing to add to the memorial plaque at the late Thomas Lovejoy camp in the Amazon that says, "The natural world in which we live is nothing short of entrancing – wonderous really."

Nature Positive Actions: Building hope derived from community-based action underpins initiatives such as the Smithsonian Earth Optimism summit, Conservation Optimism, IUCN's Green List and others. Such hope is grounded in successful action, and there are plenty of recent examples, including the commitment to protect 53% of carbon stocks in the northern Peruvian Amazon; the addition of 12 new protected sites to the IUCN Green List;[vi] the innovative use of open-sourced mapping to bolster efforts of Indigenous youth to safeguard their Guatemalan forest; and progress in advancing scientifically robust, comparable, and accessible biodiversity indicators facilitated by Nature Positive. Among the many examples of nature finance is the Brazil-led Tropical Forest Forever Fund (TFFF), to be launched at COP 30, which aims to generate USD 125 billion in private-public sector financing to protect intact tropical forests.

Renewable Energy: Nowhere is the green, low-carbon transition gaining momentum more than in renewable energy.

Climate finance reached USD 1.9 trillion in 2023 and, according to early data compiled by Climate Policy Initiative, it's likely to surpass USD 2 trillion in 2024. The International Renewable Energy Agency reports a record 582 GW of new renewable energy capacity in 2024, less because of climate concerns and more because of the unambiguous business case that 91% of all new renewable energy capacity is cheaper than fossil fuels, including coal (IRENA 2025).

China leads the world in renewable energy deployment and investment. According to the International Energy Agency (IEA), China accounts for one-third of global annual clean energy investments (2023). In 2024, China increased its renewable energy capacity in 2024 by a reported 23%, with renewables reaching 1.889 billion kW. The IEA anticipates further expansion, including a push in large-scale offshore wind capacity coupled with more "new energy bases" located in desert and non-agricultural areas.

According to the market analyst group Ember, China installed 250 GW of solar power capacity in the first half of 2025, more than double the amount of the rest of the world combined. China's investments in green technologies are now poised to become a major economic driver of GDP growth, jobs, and trade. Colombia University's Adam Tooze described China as the "biggest laboratory of organized modernizations there has ever been or ever will be at this level."

China's CO_2 emissions declined by 1.6% in the first quarter of 2025, and by 1% year-on-year. In turn, the expansion of renewable electricity prompted Carbon Brief and others to speculate that China has passed its peaking target well before the 2030 mark.

Certainly, challenges remain. The IEA notes that due to energy security, coal remains the largest energy source in China, with production reaching a record high in 2023 and approximately 100 GW of new coal-fired power plants approved in 2024 (IEA, 2024).

Net Zero Grids: An engineering challenge that may have contributed to a cascading series of blunders leading to the April 2025 Spanish blackout involved the possible failure of reactive power systems to compensate for the possible oscillation from intermittent solar and wind power generation.

While remarkable advances continue in expanding renewable energy capacity, equal attention is needed to align electricity grids with the continued expansion of renewable energy. China continues to make among the largest investments in the world in a modern, integrated, national super-grid—the so-called bullet train for power. At the end of 2024, China had 42 long ultra-high-voltage (UHV) electric transmission lines, with an additional 14 under construction or in advanced planning (EnerData, 2025). The vision of a single, inter-connected electricity grid is closer than ever, thereby allowing the further expansion of large-scale solar and offshore wind to be used far from production generation.

Lessons from other jurisdictions, notably California, point to the next stages in enabling a carbon-neutral electricity grid system that include the installation of extensive, large-scale battery storage to address intermittency and oscillation risk, as well as complementing UHVs with micro-grids, vehicle-to-grid flexibility, and demand-side energy efficiency incentives.[2]

Stranded Assets: New investments in coal and other fossil fuels raise the risk of stranded assets, in which fossil fuel assets are gradually impaired by less expensive and more efficient energy sources, such as solar, wind, small nuclear, hydrogen, and other substitutes.

Just Transition: The biggest challenge for coal is neither engineering nor financial but laying out robust, proactive, and equitable just transition programs. CCICED's work in 2025 includes creating a special Just Transition Fund to support more than 2 million workers, their families, and communities in the three-province Coal Triangle.

In his April 2025 speech to the Climate Leader's Summit, President Xi clarified that China's new NDC will include all GHG emissions across all economic sectors, as well as, for perhaps the first time, emphasized the importance of a people-centred just transition. Proactive programs are needed to support communities with action as ambitious as the green technology transition.

Whole-of-Society: China's national Environmental Code,[vii] due to be released in 2026, offers a remarkable opportunity in supporting whole-of-society engagement in the green transition. At the governance level, the Code will consolidate some 30 national laws and regulations,[3] as well as

[2] China was reported to have a battery storage capacity of 31.4 GW in 2023, with two companies—CATL and BYD—holding over 40% of the global market share.

[3] China has enacted some 30 environmental laws covering pollution, water quality, and other areas, around 100 environmental regulations, and over 1,000 local-level laws and regulations.

clarify and enhance enforcement and inspections. A complementary step under the Code could be a new national climate law to further guide provincial, municipal, and county actions.

The greatest promise of the new Environmental Code lies in its potential to engage individuals, households, and consumers. The new Code will roll out more than 100 product-specific carbon footprint consumer labels. Complementary tools include MEE's reintroduction of a voluntary carbon market intending to advance whole-of-society engagement. These and other policies can help to provide the public with practical tools, not only to tackle the triple crisis, but to explain through facts and equitable actions why the green transition matters.

All Sectors: In September 2025, at the United Nations Climate Change Summit (UNFCCC), President Xi Jinping announced China's new round of nationally determined contributions (NDCs): "By 2035, China's economy-wide net greenhouse gas emissions will decline by 7%–10% from their peak level, with efforts to achieve even greater reductions. The share of non-fossil fuels in total energy consumption will exceed 30%. The total installed capacity of wind and solar power will be more than six times that of 2020, striving to reach 3.6 billion kilowatts. Forest stock volume will surpass 24 billion cubic meters. New energy vehicles will become the mainstream of new vehicle sales. The national carbon emissions trading market will cover the major high-emission industries. A climate-resilient society will be largely established."

The next frontier in advancing innovative green development, building on the new trio of solar, batteries, and EVs, is the manufacturing sector. Firms at the leading edge of net-zero steel, aluminum, chemicals, cement, maritime, aviation, and other hard-to-abate sectors stand ready to repeat comparable growth rates of the renewable energy and EV sectors in the decade ahead.

Among the key enablers of China's multisector decarbonization strategy is its national carbon market.[viii] The sector coverage of its Emissions Trading System has expanded from roughly 2,250 power sector entities to an additional 1,500 entities in the steel, cement, and aluminum-smelting sectors. An additional and crucially important step was taken in August 2025, when the State Council announced the shift from the current intensity-based system to absolute GHG emissions cap by 2027, with a likely hybrid-free allocation and paid auctioning system.[ix] The national carbon market is expected to be further enhanced by recent Chinese judicial opinions.[x]

The tightening of China's compliance carbon market offers opportunities to link it with other compliance markets, not least in unleashing resource allocative efficiencies that arise not only from differences in marginal abatement costs within and between industrial sectors, but also in linkages with high integrity carbon offsets, including maintaining carbon stocks. A September 2025 WEF report analyzes expanding carbon market trends in the Asian region alone, while the World Bank's *State and Trends of Carbon Pricing 2025* report notes that over half of all power sector emissions worldwide are priced through carbon markets. Opportunities in linking China's carbon market with Brazil and others are ripe for action, from technical steps, such as increased to interoperability of MRV systems,[xi] to fuller market cooperation.

***Net-Zero Steel*:** One example is the need to unleash research, development, and applied incentives in low-carbon or net-zero steel. Initiatives like green ore using green hydrogen via green iron offtake agreement are gradually showing commercial viability at scale, thus

accelerating the possibility of net-zero steel manufacturing. Importantly, countries such as Namibia and Mauritania are directly involved as partners in offtake agreements. The U.K.-based group S-Economics proposed at the 2025 London Climate Week practical and worthwhile steps to advance cooperation among China, Australia, Brazil, and others in green steel.

Green Innovation and Productivity: Firms that lead in green development and net-zero pathways are likely to have a longer-term competitive edge over carbon-intensive industries, not least by maximizing green innovation to increase productivity.

International comparisons of total factor productivity are notoriously challenging. Experts generally agree with IMF data that confirms productivity growth remains sluggish in most countries, and for some time. Accordingly, supporting green productivity growth toward decarbonization outcomes is complex. Certainly, new green technology inputs have consistently shown promise. The WEF's annual *Top 10 Emerging Technologies* report regularly lists green technology innovation systems as among the most promising of all technology categories. The 2025 WEF report is no exception in listing batteries, osmotic power systems, green nitrogen fixation, and technology systems.

Yet a long-standing challenge remains—the so-called R&D valley-of-death. A popular image of technology breakthroughs is one in which small, start-up firms invent wholly new technology that transform productivity. However, the reality is that the most productivity gains come from a surprisingly small number of large firms that also tend to be trade exposed.[xii] A practical challenge remains in linking small and mid-sized innovators with large firms. That is exactly the idea behind the Innovandi Open Challenge, in which start-ups are linked with the world's leading cement and concrete companies to advance net-zero solutions. These models deserve replication and scaling, including through mission-led green industrial strategies.

Green innovation also comes from leveraging known technologies and systems. Recent CCICED research highlights the role of industrial heat -pumps to substantially lower GHG emissions, while circular economy systems enhance productivity by reducing energy and other upstream resource inputs and downstream resource reuse and recycling.

Yet scaling green technology innovations has become more difficult because of trade protectionism. Evidence of the macroeconomic effects of high tariffs clearly shows that they negatively affect productivity gains, as well as investment and employment. An important focus of CCICED's work in 2025 involves new forms of international cooperation, including fostering new developments, trade, and investment South-South relationships.

International Cooperation: The sharp rise in international risk, protectionism, and turbulence continues to nurture new forms of international cooperation, including redoubling the commitment of most countries to multilateralism, as well as the blossoming of existing and new avenues of South-South cooperation. As noted above, China reinforced this trend by updating its climate commitments at the September 2025 United Nations Climate Change Summit, announcing a new nationally determined contribution (NDC) to cut economy-wide net greenhouse gas emissions by 7%–10% from their peak by 2035.

At the multilateral level, in September 2025, both the WTO Fisheries Subsidies Agreement and the High Seas Treaty entered into force. A number of concrete initiatives emerged from the UN Oceans Conference in Nice, including increased marine protected areas in support of the Kunming-Montreal Global Biodiversity Framework.

At the April 2025 Climate Leader's Summit, President Xi joined President Lula of Brazil, leaders of the European Union, the ASEAN region, the UN Secretary General, and others, in which China reaffirmed its commitment to multilateralism, the Paris Climate Agreement, and strengthened international cooperation. Similar commitments were echoed at the July 2025 BRICS summit and the Shanghai Cooperation Organization (SCO) Plus meeting, in which China committed to "work with fellow SCO countries to increase the installed capacity of photovoltaic and wind power each by 10 million kilowatts in the next five years."

In September 2025, at the Shanghai Cooperation Organization (SCO)+ meeting, President Xi proposed a "Global Governance Initiative." Its core points would include the following: "Upholding sovereign equality, abiding by international rule of law, practicing multilateralism, advocating a people-centred approach, and emphasizing action-orientation."

One means of reinforcing political commitments is from overseas investments. The first half of 2025 saw the highest level of Chinese overseas investments ever, with the Green Finance and Development Centre estimating a total of USD 66.2 billion in overseas financing, largely via the Belt and Road Initiative.[xiii] CCICED's work in 2025 has identified specific, concrete opportunities from expanded Chinese leadership, including the following:

***Science and monitoring*:** China's satellite system (DQ-1) is best-in-class due to its revolutionary LiDAR technology capable of penetrating cloud cover that hinders regular measurement from other platforms (including NASA's OCO-2). China could make its DQ-1 an open source for climate scientists, given the curtailing of climate research and data elsewhere. The 2024 China-Brazil agreement to jointly develop a high-resolution earth observation satellite to support biodiversity goals and explore adapting the ecological redline system could be replicated.

Green overseas financing: China could increase the proportion of renewable energy overseas investments in tandem with declining the share of fossil fuel investments to developing countries, supported by an early project pipeline facility to jointly identify green development opportunities.

In conclusion, CCICED's work in 2025 has focused on the current and emerging opportunities of green development.

ENDNOTES

[i] Total greenhouse gases (GHGs) again increased in 2024, with CO2 levels more than 50% above pre-industrial levels, reaching 420 parts per million. Other GHGs included methane emissions increase of 266% and nitrous oxides of 124% compared to pre-industrial levels.

[ii] Like neighboring countries, China faces increased extreme weather events in the first half of 2025, including extreme flooding in Gansu and Hebei provinces, Beijing and elsewhere, record-breaking temperatures exceeding 40°C in Shanghai, and other climate shocks. Climate change is complicating food security objectives: in 2024, some 335,000 hectares of Chinese crops were affected by extreme events. (WMO, 2025).

[iii] The *Global Burden of Diseases* Index ranked exposure to ambient and indoor air pollutants as the leading Level 2 risk factor among all environmental and occupational risks, contributing to 236 million disability-adjusted life years (DALYs) and over eight million deaths.

[iv] Climate change is generally amplifying other stressors commonly termed the triple global crises of climate, biodiversity and pollution. The WWF 2024 Living Planet Report, notes that the average size of wildlife populations has decreased by 73% between 1970 and 2020, with freshwater populations suffering the worst declines of 85%[iv]. A recent meta-analysis suggests a high degree of heterogeneity in local species loss[iv] (Keck 2023), underscoring the critical importance of standardized and comparable biodiversity indices, such as those being developed by the Nature Positive initiative.

[v] For example, in a September 2025 Nature article, estimated Gidden et. al estimate a planetary limit of 1,460 Gt of CO_2 storage (with a variance of (1,290–2,710), far below previous estimates of up to 40,000 Gt. Gidden, M.J., Joshi, S., Armitage, J.J. *et al.* A prudent planetary limit for geologic carbon storage. *Nature* **645**, 124–132 (2025). https://doi.org/10.1038/s41586-025-09423-y

[vi] China added four sites, including the Wuyishan National Park , Nanshan National Park and two National Nature Reserves. In 2023, China finalized its system of ecological redlines, with the aim of using large-scale spatial planning to delineate areas with crucial ecological functions linked to conservation targets for water, biodiversity, soil and water, rocky desertification.

[vii] In May 2025, the draft of the Environment Code was released for public comment. The Code sets legal basis to establish carbon emission accounting system for more than 100 products. Based on pilot projects, the first batch of carbon footprint product categories are expected to cover eleven trade-intensive groups such as steel, lithium batteries, textiles and cement. This initial coverage offers interoperability opportunities to calculate embedded carbon with CBAM and other systems.

[viii] Like other markets, a well-functioning ETS relies on quality climate data to support investor confidence. 2024 has seen a steady increase in market transaction volumes and increasing carbon allowance prices. For the first time, in April 2024, the closing price exceeded 100 RMB/ton, before dropping back to around 90 RMB/ton. Forecasts by Clear Blue Markets expect the average price will hover around 100 RMB in 2025, and then steadily rise to 200 RMB by 2030.

[ix] The State Council notice states that "by 2027, the country's carbon trading market will encompass all major industrial sectors, and the national voluntary greenhouse gas emission reduction trading market will expand to include all key fields. By 2030, China will have essentially established a national carbon trading market based on a cap-and-trade system with both free and paid allocations."

[x] In February 2023, the Supreme People's Court of China issued the country's first judicial opinion to encourage and guide case handling on carbon emissions, strengthening the role of courts in meeting carbon targets. The Opinion set a series of guidance on carbon market-related disputes. A landmark judicial interpretation jointly issued by the Supreme People's Court and the Supreme People's Procuratorate addressed the handling of criminal cases involving environmental pollution.

[xi] In support of general MRV systems, MEE has issued a number of Emissions Allowance Notices (October 2021, March 2023, July 2023), accounting and verification guidelines (for example February 2023 for the power generation industry) as well as rules for registration, trading and settlement (May 2021). In 2023, over 50 consulting firms, 450 inspection and testing institutions, and nearly 100 verification agencies provided

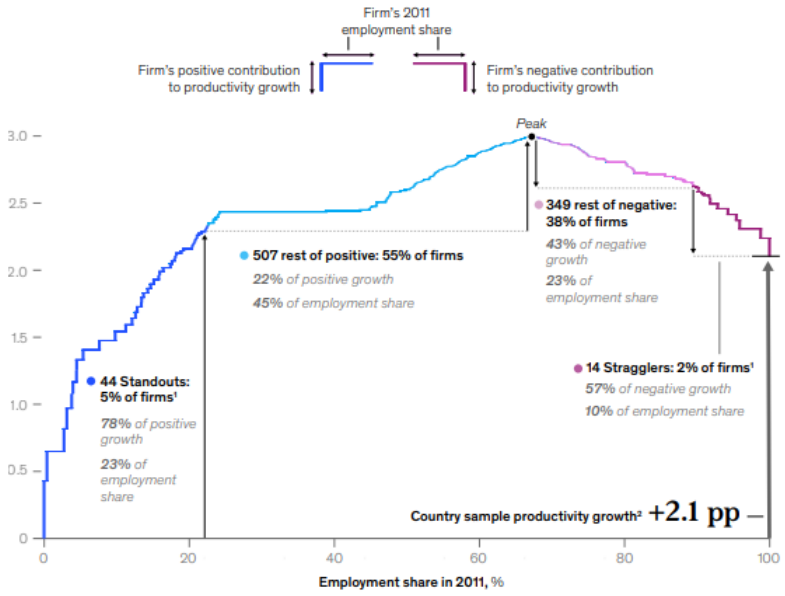
third-party services in support of the national ETS. These figures include increased market activity and verification by provincial and municipal authorities, leading to over 16,000 carbon credit evaluations. (MEE 2024)

[xii] A report by McKinsey Global Institute sampled some 8,300 firms, showing that fewer than one hundred accounted for two-thirds of all productivity gains. In the case of the U.S. which leads in TFP, roughly 5% of firms comprised over 70% of the sample's productivity growth.

Exhibit 2

In the United States, 44 firms (5 percent) accounted for nearly 80 percent of the sample's positive productivity growth.

Firm contribution to US sample productivity growth, 2011–19, pp



Note: US country sample of ~900 firms 2011–19 (productivity growth snapshot not representative of years before and after).
¹Positive and negative contributors are firms that add +/- basis points to country sample productivity growth.
²Sum of firms' contributions to country sample productivity growth, in a sector.
Source: 2025 Moody's Investors Service, Inc. and/or its affiliates and licensors; EU KLEMS; US Bureau of Labor Statistics; Capital IQ; McKinsey Global Institute analysis

McKinsey & Company

[xiii] Approximately US$30billion of that total involved oil and gas, and approximately US$9 billion involved renewable energy investments, resulting in an increased installed capacity of 11.9 GW of solar and wind in developing countries.