

The Circular Carbon Economy Index 2025

Results

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Key Points

- The 2025 Circular Carbon Economy (CCE) Index results show incremental progress.
- In 2025, there was an average year-on-year improvement of 1.5% in countries' total scores, compared with an increase of 0.8% the previous year. However, progress across technologies, sectors, and countries remains uneven.
- Closing CCE performance gaps will require strengthening enabling policy environments and scaling up clean technologies and finance.
- The results confirm that countries need holistic net-zero strategies for effective progress toward emissions circularity.

Abstract

The year 2025 marks the fifth anniversary of the launch of the Circular Carbon Economy (CCE) Index. Work on the current edition includes a comprehensive update of the indicator framework, with four new indicators introduced and 13 indicators revised across the various dimensions of the index. The CCE Index now incorporates half a decade of data collection, aggregation, analysis, and extensive data stakeholder dialogues into a comprehensive and robust framework for tracking the net-zero transition globally.

The 2025 CCE Index results deliver four headline policy messages:

- Countries need holistic net-zero strategies for effective progress toward emissions circularity.
- A multi-dimensional approach to energy security, underpinned by availability, stability, and fiscal sustainability, is required to allow for successful net-zero transitions.
- Closing CCE performance gaps will require strengthening enabling policy environments and scaling up clean technologies and finance.
- CCE transitions in developing countries can be accelerated with scaled-up implementation support.

Together, findings from analysis of the 2025 CCE Index results underscore that the global net-zero transition is gaining momentum but remains highly differentiated. Going forward, closing performance gaps will require strengthening net-zero transition enablers in developing countries, including expanding access to finance and technology, so that improvements in readiness translate into measurable emissions reductions and removals.

Released at a time of high global uncertainty and fragmentation, the 2025 CCE Index results by and large offer a glimmer of hope for a fledgling global net-zero transition. Future editions will confirm whether high ambition and international cooperation prevail, and whether the fragile progress can be sustained.

Keywords: Circular Carbon Economy, CO₂ Emissions, GHG Emissions, Net-Zero Emissions, Climate Action, Energy Transitions, Energy Transition Finance, Composite Indicator

The year 2025 was a challenging one for climate policy. Evidence from the synthesis of countries' 2025 Paris pledges suggests that the current pace remains far from sufficient: the latest Emissions Gap report estimates that the full implementation of nationally determined contributions (NDCs) submitted by the end of September 2025 would lead to a global warming of 2.3-2.5°C above pre-industrial levels (UNEP 2025).¹ With geopolitics, trade protectionism, and energy security rising on the global agenda, focus on the net-zero agenda seems to be faltering. However, progress has not stalled completely.

The latest Circular Carbon Economy (CCE) Index results show an average year-on-year improvement of 1.5% in countries' total scores, compared with an increase of 0.8% the previous year. This suggests an acceleration of climate change mitigation efforts in the years immediately following the COVID-19 pandemic era.² However, the results also indicate that progress across technologies, sectors, and countries remains uneven.

The year 2025 also marks the fifth anniversary of the CCE Index. Work on the 2025 edition included a comprehensive update of the indicator framework, with four new indicators introduced and 13 indicators revised across the various dimensions of the index. This year's CCE Index incorporates half a decade of data

collection, aggregation, analysis, and extensive data stakeholder dialogues into a comprehensive and robust framework of 38 indicators for tracking the net-zero transition globally.

The major changes in the 2025 CCE Index indicator framework can be grouped into two: the first set completes the picture under the CCE Performance sub-index on tracking country performance in carbon and greenhouse gas (GHG) emissions circularity by refining and adding new indicators to track non-energy sectors – forests, land, agriculture, waste, and materials efficiency. The second set of changes relates to various refinements to net-zero transition enablers under the

¹ Also, the World Meteorological Organization confirmed 2024 as the hottest year on record, with an average global temperature of 1.55°C above pre-industrial levels (WMO 2025).

² In similarly positive news, a recent study by the Energy & Climate Intelligence Unit (2025) confirmed that, since the birth of the Paris Agreement in 2015, economies covering 92% of the global economy have decoupled carbon dioxide (CO₂) emissions from economic growth.

CCE Enablers sub-index, including introducing new indicators to track the adoption of corporate environmental, social and governance (ESG) disclosures, and the robustness of digital infrastructure and cybersecurity frameworks. These reflect the growing importance of ESG disclosures in driving investment decisions and the increasing reliance of energy systems on robust and safe information and communication technology (ICT) frameworks. Revisions to the CCE Enabler indicators were also undertaken to improve conceptual focus, data timeliness, and coverage of new developments, such as the Paris Agreement's full operationalization.

With historical index scores now available for five years (2021-2025), the full CCE Index dataset has grown to comprise more than 24,500 individual indicator scores, underpinned by an even larger amount of data points. The available time series allow the

uncovering of broader patterns and trends in this transition, providing important findings and lessons for climate policy stakeholders worldwide.

The remainder of the paper is structured as follows: Section 2 presents the indicator framework updates introduced in the 2025 edition of the CCE Index, followed by the 2025 CCE Index results and rankings, which are presented in Section 3. Section 4 provides analytical highlights from indicators in two areas of the index – namely, non-energy sector carbon circularity and energy security. Section 5 provides an analysis of changes in CCE Index scores from 2021 to 2025, focusing on both global and country levels. Section 6 presents highlights from two add-on scores – the Oil Producers Lens and the new Forest Industry Lens. Section 7 concludes with a summary of the major messages from the 2025 edition.

2025 CCE Index Indicator Framework

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This section provides an overview of the CCE Index methodology and the 2025 indicator updates, presents the 2025 results, and identifies indicator-level insights in two areas of the index where major revisions were introduced.

The CCE Index is a composite indicator that benchmarks 125 of the world's largest economies, which collectively account for 96% of global GHG emissions.³ Its methodology and original indicator framework were introduced in the first CCE Index edition in 2021 (Luomi, Yilmaz, and Al Shehri 2021).⁴ The 2025 CCE Index edition indicator framework comprises 38 indicators (see Figure 1), divided into two sub-indices: CCE Performance and CCE Enablers. Similar to previous years, the CCE Performance sub-index measures the depth and breadth of countries' engagement with the major climate change mitigation technologies and approaches. The CCE Enablers continue to gauge the strength of the key factors that countries need to have in place (policies, technology, finance, business environment) or to manage (system resilience) for successful net-zero transitions.

For each country, the nine Performance indicators are weighted equally to calculate the CCE Performance score. A similar aggregation logic applies to each Enabler dimension and, subsequently, the CCE Enablers sub-index. A country's total CCE Index score is comprised of the simple average of the CCE Performance and the CCE Enablers scores. The values for each indicator are normalized on a scale of 0-100. For most indicators, a score of 100 is assigned to the average value of the top-five

countries, and a score of 0 to the average value of the bottom five countries. The full aggregation logic is available in Luomi, Yilmaz, and Al Shehri (2021), and Figure 1 visually represents the weight of each indicator to the dimension, sub-index, and total index scores.

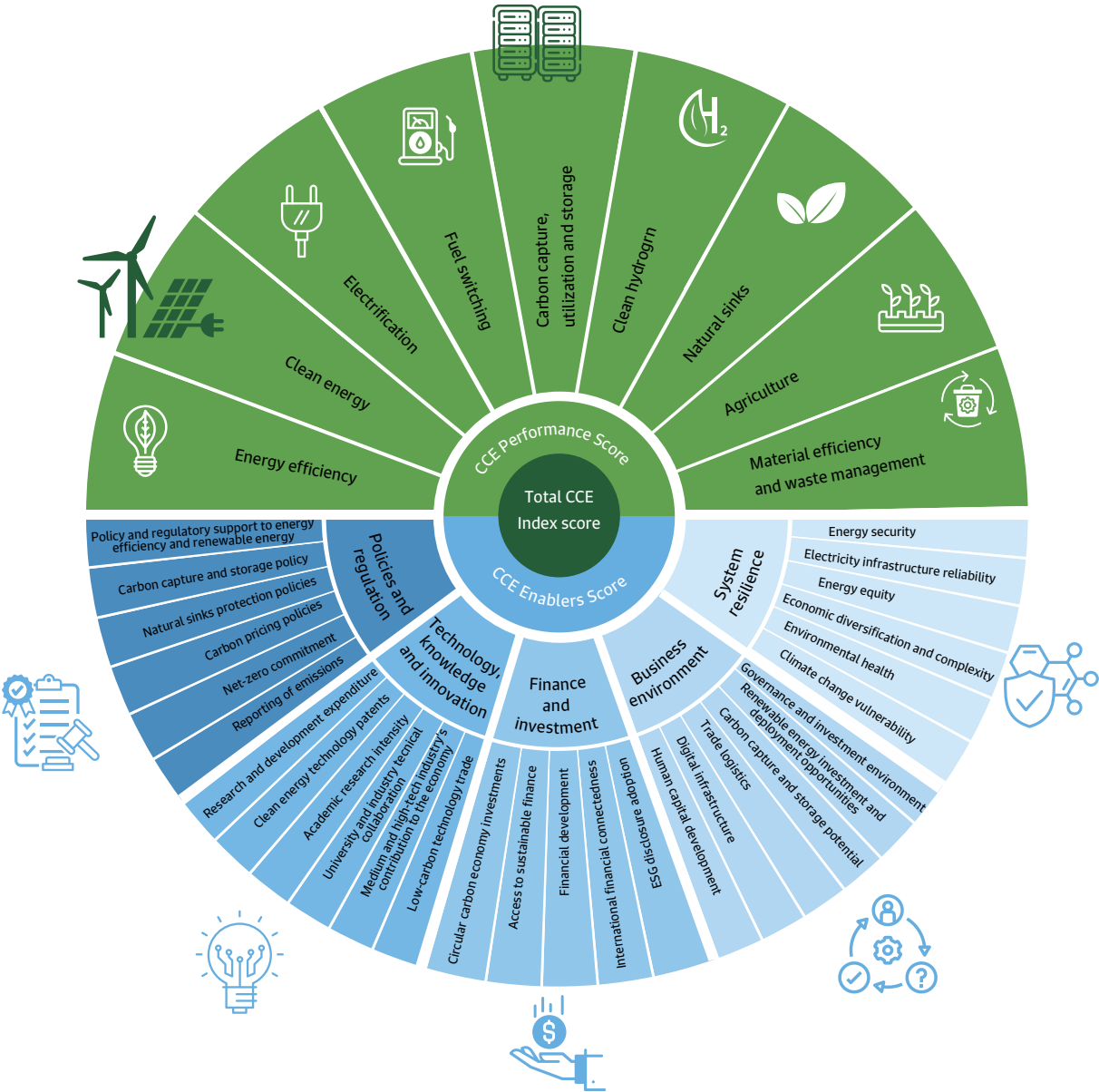
A small change to the methodology, namely changing scoring ranges' reference year from the first to the last year of the index results, was made in the 2025 edition, and it is explained in Appendix A. This change anchors scores to the most recent data year, improving cross-country comparability and making results easier to interpret in the context of current conditions rather than historical baselines.

While minor updates to the indicator framework have been made in each edition, a systematic effort to review the framework in three areas was undertaken as part of developing the fifth edition in 2025. This review sought to ensure that the concepts embedded in the CCE Index framework reflect countries' current performance on, and enabling factors for, carbon circularity and net-zero transitions, and that the datasets underpinning each indicator provide the most accurate and timely information available. The indicator framework changes introduced in the 2025 edition are detailed in Table 1.

³ According to Climate Watch (2025), in 2021, the 125 countries represented 96.12% of global GHG emissions including land use, land use change and forestry (LULUCF) and 96.69% excluding LULUCF.

⁴ Minor updates to the methodological approach were made in the 2023 edition (Luomi, Yilmaz and Al Shehri 2024, section 4).

Figure 1. 2025 CCE Index indicator framework.



Source: KAPSARC.

Table 1. Changes to indicators in the 2025 CCE Index edition.⁵

CCE Performance	
Clean energy	The indicators on renewable energy and nuclear energy were combined to capture countries' utilization of these mainly power sector-focused mitigation technologies under one indicator. Notably, only a limited number of countries have access to nuclear energy technology, and related generation rates vary little over time.
Carbon capture, utilization, and storage; clean hydrogen	The scope and weighting in the indicators on carbon capture, utilization, and storage (CCUS) and clean hydrogen were revised to remove credit given to projects in the preliminary stages of the pipeline, only recognizing projects that have obtained permits or secured financing or that were under construction (90% weight of total capture capacity), or projects that were fully operational (100% weight of total capture capacity).
Natural sinks	The indicator was improved to provide a more accurate picture of the carbon circularity performance of countries' forests, and land use was integrated into its scope.
Agriculture; material efficiency and waste management	Two new indicators were introduced to complete the coverage of all major sources of GHG emissions globally.
CCE Enablers	
Policies and Regulation	
Natural sinks protection policies	The indicator was improved with revised metrics for measuring protected areas' coverage, and components measuring countries' medium- and long-term policy ambition under the Paris Agreement in this area were incorporated.
Carbon pricing policies	The indicator, previously housed under the Finance and Investment dimension, was moved to under this dimension to reflect its focus on measuring carbon pricing policy instruments, and participation in Paris Agreement Article 6 cooperation was incorporated.
Reporting of emissions	Reporting under the Paris Agreement Enhanced Transparency Framework was incorporated into the indicator.
Technology, Knowledge and Innovation	
Low-carbon technology trade	This indicator replaces a previous indicator on high-technology trade, providing a more CCE-specific metric.
Finance and Investment	
International financial connectedness	The indicator was revised to focus on the stock of financial assets held by residents inside and outside of a country, which expands its asset coverage and reduces its vulnerability to short-term global financial fluctuations.
ESG disclosure adoption	This new indicator expands the conceptual scope of the Finance and Investment dimension by providing a proxy measure for characteristics valued by sustainability-focused investors (i.e., corporate transparency, risk management practices, regulatory alignment, and openness to stakeholder engagement).

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In addition to the changes listed in the table, the indicator on adjusted national income was removed from the System Resilience dimension given its high correlation with various other macroeconomic indicators. While income generally influences countries' performance in net-zero transitions, it does so via multiple channels and its interactions with other indicators that complicate measuring its individual impact, meaning it is best suited for use as a comparative statistic rather than a component of the index itself.

Table 1. Continued.

Business Environment	
Digital infrastructure	This new indicator complements the conceptual coverage of this dimension by bringing in this increasingly critical area for sustainable energy transitions via metrics covering information and communication technologies (ICT) infrastructure and cybersecurity regulations.
Governance and investment environment	The revised indicator represents an improvement on two previous related indicators: focusing on countries' investment profile (contract viability/expropriation, profits expatriation, and payment delays), government stability (government unity, legislative strength, and popular support), and corruption levels, it provides a focused measure of the enabling policy, regulatory, and governance environments that governments provide for private finance.
Human capital development	The indicator now uses the Human Development Index as a proxy for measuring labor productivity and capacity, replacing the highly correlated Human Capital Index and providing more recent data in this area.
System Resilience	
Energy security	The indicator was expanded from only covering trade-related fiscal security aspects to self-sufficiency and diversity of the energy mix.
Climate change vulnerability	The conceptual scope of the indicator was expanded to cover the exposure, sensitivity, and ability to adapt to the negative impacts of climate change of key sectors. ⁶

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Previously called "climate change resilience," this indicator was based on the Global Climate Risk Index, which focuses on economic loss and fatalities from, and people affected by, extreme weather events.

2025 CCE Index Results and Ranking

03



In 2025, Northern and Central European countries again lead the top-10 CCE Index ranking, with Sweden, Denmark, and Norway scoring the highest. Table 2 and Figure 2 present the high-level ranking and results of the CCE Index in 2025. Further illustrations of the results are included in Appendix B.

At the bottom of the ranking, all but one of the 10 lowest-scoring countries are from Sub-Saharan Africa. As in previous editions, the top-20 countries are all high-income countries, but the bottom 20 group comprises countries from all income groups, implying that income is not the sole predictor of success in net-zero transitions.

The gap between the top- and bottom-ranked countries remains wide in 2025: the top-three countries' average score is 3.7 times that of the bottom three countries (Democratic Republic of the Congo, Madagascar, and Burkina Faso) (see Figure A1 in Appendix B.) This gap has consistently widened since 2021, when the difference was 3.1-fold. As will be discussed in Section 5, countries at the top have improved their scores, but those at the bottom of the ranking keep stalling and, in some cases, even sliding backward.

In CCE Performance, European countries similarly lead the ranking (with Denmark, Norway, and Sweden at the top), but the

bottom end of the distribution shows a more mixed group of countries both in terms of region and income, with Mongolia, Trinidad and Tobago, and Zimbabwe with the lowest scores. Both the gap and the trend in the gap between the top and bottom performers are similar to those in the total CCE Index scores (a 3.6-fold difference in 2025, increasing from a 3.1-fold difference in 2021) (see Figure A2 in Appendix B).

In CCE Enablers, Northern and Central European countries lead the ranking (with Sweden, Denmark, and Switzerland at the top), while lower-income countries dominate the bottom end. The gap between the top and bottom three is 5-fold, and it has been increasing (4.2-fold in 2021), with a small improvement year-on-year from 2024 to 2025 (from 5.2-fold from 2023 to 2024). In terms of the Enablers dimensions, the largest absolute gap persists in arguably the most crucial area for the net-zero transition, Finance and Investment, which shows an 82.2-point difference in the top and bottom three countries' average scores (see Figure A3 in Appendix B).

Table 2. 2025 CCE Index results and ranking.

2025 CCE Index Results (Top 60)						2025 CCE Index Results (Remaining 60)					
Country	CCE Performance	CCE Enablers	Total CCE Index	Rank	Rank change 2024-2025	Country	CCE Performance	CCE Enablers	Total CCE Index	Rank	Rank change 2024-2025
Sweden	67.58	80.72	74.15	1	↔	Kyrgyz Republic	45.18	32.96	39.07	64	↑
Denmark	69.54	78.45	73.99	2	↔	Jordan	37.53	40.22	38.88	65	↓
Norway	67.62	69.39	68.50	3	↑	Kazakhstan	30.45	46.35	38.40	66	↑
United Kingdom	61.24	74.73	67.99	4	↑	Jamaica	45.43	31.24	38.34	67	↑
Switzerland	58.07	76.84	67.45	5	↓	Lebanon	36.73	39.69	38.21	68	↓
Netherlands	57.93	76.31	67.12	6	↑	Morocco	34.49	41.85	38.17	69	↑
Finland	58.69	73.85	66.27	7	↓	Tunisia	36.87	39.26	38.06	70	↔
Canada	62.23	68.91	65.57	8	↑	Indonesia	32.36	43.74	38.05	71	↑
France	59.30	69.28	64.29	9	↓	Russian Federation	33.69	42.30	37.99	72	↓
Germany	51.31	75.34	63.33	10	↑	Philippines	37.52	37.97	37.75	73	↓
United States	55.58	69.69	62.63	11	↓	Dominican Republic	40.61	34.37	37.49	74	↑
Korea, Rep.	53.72	69.93	61.83	12	↔	Paraguay	43.25	31.19	37.22	75	↑
Austria	53.35	70.29	61.82	13	↑	Lao PDR	39.91	33.05	36.48	76	↓
Australia	52.22	68.74	60.48	14	↑	El Salvador	46.16	26.54	36.35	77	↓
Portugal	59.56	60.54	60.05	15	↓	Belarus	38.87	33.81	36.34	78	↑
Japan	51.58	68.46	60.02	16	↓	Ecuador	39.80	31.96	35.88	79	↓
Spain	54.90	64.20	59.55	17	↓	Moldova	36.14	35.11	35.62	80	↑
Belgium	46.59	68.69	57.64	18	↑	Ghana	42.21	28.49	35.35	81	↓
New Zealand	53.87	60.20	57.03	19	↓	Sri Lanka	37.31	33.28	35.30	82	↓
Ireland	47.81	63.98	55.90	20	↑	Armenia	36.11	33.19	34.65	83	↑
Singapore	38.48	72.67	55.58	21	↔	Algeria	35.72	33.57	34.65	84	↑
Slovenia	52.32	58.42	55.37	22	↓	Kenya	36.76	32.21	34.49	85	↑
Italy	49.44	60.88	55.16	23	↔	Bosnia and Herzegovina	35.63	33.23	34.43	86	↓
Hungary	50.07	58.50	54.28	24	↔	Egypt, Arab Rep.	32.97	35.33	34.15	87	↑
Czechia	48.32	58.92	53.62	25	↑	Tajikistan	39.44	28.68	34.06	88	↑
Greece	52.74	52.97	52.86	26	↓	Uzbekistan	31.13	36.86	34.00	89	↑
Estonia	49.12	56.32	52.72	27	↑	Azerbaijan	33.24	34.73	33.98	90	↑
Bulgaria	56.39	48.71	52.55	28	↑	Gabon	35.78	32.05	33.92	91	↓
China	44.07	59.38	51.73	29	↓	Kuwait	28.91	38.48	33.69	92	↓
Slovak Republic	51.44	50.23	50.83	30	↓	Botswana	35.36	30.02	32.69	93	↔
Poland	45.26	54.26	49.76	31	↑	Cambodia	33.35	30.54	31.94	94	↓
Chile	45.84	53.40	49.62	32	↓	Senegal	33.90	29.17	31.53	95	↑
Croatia	48.10	49.79	48.94	33	↓	Guatemala	32.27	29.43	30.85	96	↑
Romania	47.66	49.46	48.56	34	↓	Angola	38.62	22.72	30.67	97	↓
Brazil	45.72	50.35	48.03	35	↔	Iran, Islamic Rep.	27.37	32.94	30.16	98	↔
Lithuania	43.97	51.17	47.57	36	↑	Nigeria	32.32	27.98	30.15	99	↑
Malaysia	40.64	54.33	47.48	37	↑	Bolivia	34.22	25.98	30.10	100	↔
Latvia	43.30	50.20	46.75	38	↔	Honduras	35.03	23.90	29.47	101	↓
Cyprus	39.76	53.64	46.70	39	↓	Togo	35.01	23.88	29.45	102	↓
Thailand	39.22	53.64	46.43	40	↑	Pakistan	31.49	27.19	29.34	103	↑
Qatar	48.26	44.05	46.16	41	↑	Bangladesh	33.74	24.93	29.34	104	↔
Mexico	43.42	48.77	46.10	42	↔	Zambia	32.94	25.59	29.27	105	↓
Turkiye	42.87	47.62	45.24	43	↑	Nepal	29.66	26.85	28.26	106	↑
Costa Rica	50.60	39.67	45.13	44	↓	Cote d'Ivoire	29.31	26.17	27.74	107	↑
Viet Nam	44.77	45.01	44.89	45	↓	Rwanda	27.10	27.62	27.36	108	↑
United Arab Emirates	32.97	56.80	44.89	46	↓	Trinidad and Tobago	19.04	34.31	26.68	109	↔
Colombia	42.16	45.17	43.66	47	↔	Nicaragua	31.74	20.89	26.31	110	↓
Saudi Arabia	37.88	48.45	43.17	48	↓	Tanzania	28.26	24.06	26.16	111	↑
South Africa	35.11	50.34	42.72	49	↑	Myanmar	29.67	21.71	25.69	112	↓
Ukraine	42.35	41.68	42.02	50	↓	Cameroon	31.16	19.97	25.56	113	↓
India	39.03	44.87	41.95	51	↑	Niger	29.93	21.10	25.51	114	↓
Uruguay	39.99	43.90	41.94	52	↓	Mozambique	28.29	21.98	25.13	115	↓
Namibia	47.03	36.76	41.89	53	↑	Ethiopia	25.64	23.95	24.80	116	↔
Bahrain	35.66	47.34	41.50	54	↓	Malawi	29.65	19.82	24.74	117	↑
Panama	46.16	36.80	41.48	55	↓	Mauritania	25.86	21.26	23.56	118	↔
Oman	39.94	42.97	41.46	56	↓	Mongolia	17.56	29.22	23.39	119	↓
Argentina	39.72	43.17	41.44	57	↓	Uganda	23.43	22.29	22.86	120	↑
Georgia	43.64	39.08	41.36	58	↓	Mali	29.33	15.79	22.56	121	↓
Albania	49.01	33.56	41.29	59	↓	Zimbabwe	19.73	24.49	22.11	122	↓
Peru	41.78	39.15	40.47	60	↑	Burkina Faso	24.32	17.21	20.76	123	↔
Mauritius	39.43	41.30	40.36	61	↑	Madagascar	24.39	14.51	19.45	124	↑
Serbia	39.58	39.26	39.42	62	↑	Congo, Dem. Rep.	20.00	17.33	18.67	125	↓
North Macedonia	42.00	36.22	39.11	63	↓						



This section presents a disaggregation of two areas of the CCE Index where the 2025 edition introduces major changes – namely, non-energy sectors' CCE Performance (Section 4.1) and energy security (Section 4.2).

4.1 CCE Performance Beyond Energy

The 2025 CCE Index introduces new and improved metrics under the CCE Performance sub-index that enable a more holistic, economy-wide tracking of CO₂ and other GHG emissions' circularity. These three indicators focus on the largest emitting non-energy sectors of the economy – namely, land use, land use change and forestry (LULUCF), agriculture, and waste. A total of 22% of global GHG emissions in 2019 are estimated to have come from the LULUCF and the agriculture sectors, with approximately half coming from LULUCF, predominantly from deforestation (IPCC 2022).⁷ Waste, in turn, is estimated to

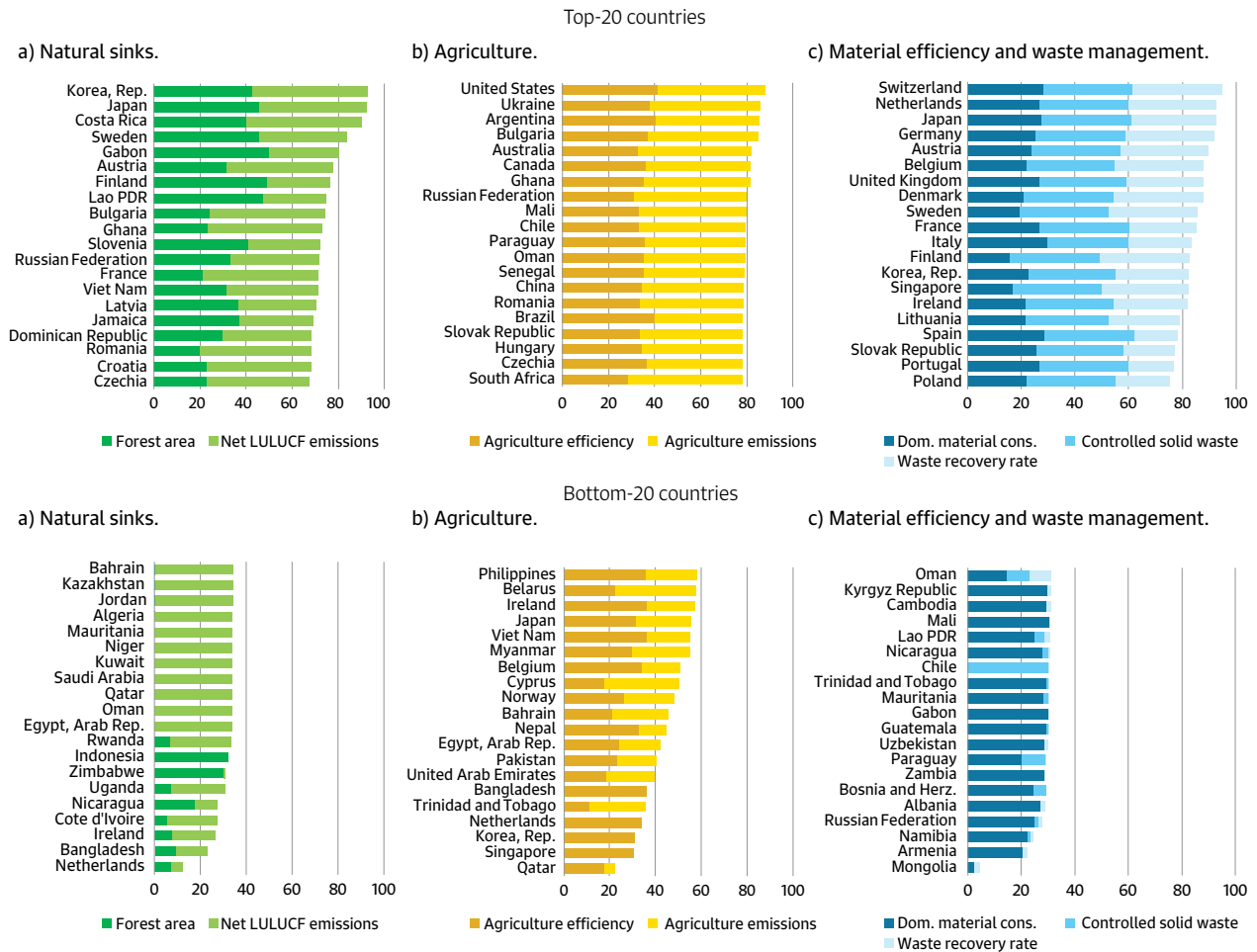
contribute approximately 4% of global GHG emissions (Climate Watch 2025). Materials production, which is a cross-cutting dimension of the CCE, was estimated to account for 23% of global GHG emissions in 2015. Both waste and materials are now incorporated into the "material efficiency and waste management" indicator.⁸

Figure 3 (containing three panels, a-c) displays a disaggregation of country scores for the top-20 and bottom-20 performers in each of the three indicators: natural sinks (covering both land and forests), agriculture and material efficiency, and waste management. (Figure A4 (a-c) in Appendix B displays the full score distribution.)

⁷ LULUCF carbon dioxide emissions data are characterized by high uncertainties (IPCC 2022).

⁸ While energy efficiency is commonly referred to as the hidden fuel in the global net-zero transition, materials efficiency has similar potential and has been overlooked perhaps even more frequently in global climate change policy discussions. Based on the International Resource Panel's (UNEP-IRP 2020) estimate, material production globally contributed 23% of global GHG emissions in 2015, and a recent European study estimated that circular economy measures in the continent's heavy industry could deliver more than half of the CO₂ emission reductions required for full circularity, relative to baseline, by midcentury (Material Economics 2024).

Figure 3. Non-energy sectors' CCE Performance: Top-20 and bottom-20 countries in 2025.



Source: Authors.

Figure 3a shows the 2025 top and bottom countries in the **natural sinks** indicator in shades of green. This indicator scores countries both for the proportional size of their forests compared to total land area and how much forests and land either sequester or emit, scaled to total land area. This gives recognition both to the relative size of countries' natural sinks (with forest area as a proxy) and how well countries are managing them (i.e., net GHG emissions from LULUCF).⁹

As shown in Figure 3a, top-scoring countries are diverse in terms of regions, income groups, and climatic conditions, but generally achieve relatively high scores on both components of

this indicator. At the bottom end of the distribution, a variety of factors contribute to low country scores, reflecting the complexity and context-specific nature of managing emissions from forests and lands. These factors include high population density (the Netherlands and Bangladesh), high historical deforestation (Ireland), and high present-day deforestation driven by cocoa plantations (Côte d'Ivoire), smallholder agricultural expansion and fuelwood harvesting (Zimbabwe), and the palm oil and paper industries (Indonesia). The bottom end of the distribution also includes arid land countries where forests constitute a negligible share of the total land area, and where land and forests are generally neither a sink nor a source

⁹ The indicator consists of two elements: total forest area and a three-year average of national net LULUCF emissions. Both are scaled to the country's total land area and weighted equally to achieve the indicator score. The data are sourced from FAO (2025), and the years of data used for the 2025 CCE Index scores are 2022 and 2020-2022, respectively.

of emissions (Egypt, Oman, Qatar, Saudi Arabia, and Kuwait, among others).¹⁰

Figure 3b shows the top and bottom performers in the **agriculture** indicator in 2025 in shades of yellow. This indicator scores countries both for the efficiency and overall environmental sustainability of their agricultural sector and how much agriculture emits, scaled to total agriculture area.¹¹ Similar to the natural sinks indicator, top-performing countries are structurally highly diverse, but characteristically achieve high scores from managing both the environmental and emissions impacts of their agricultural sectors. Among the bottom performers are generally high-income countries, which in many cases manage the broader environmental sustainability of this sector relatively well, but which achieve low scores from agricultural GHG emissions intensity due to their small land areas (Qatar and Singapore) or because of a combination of high livestock-related emissions and a limited agricultural land area (Republic of Korea and the Netherlands).

Figure 3c shows the top and bottom performers in the **material efficiency and waste management** indicator in 2025 in shades of blue. The scores for this indicator are based on per capita domestic material consumption (DMC) rates and scores from two waste-related indicators from the Environmental Performance Index (controlled and recovered solid waste).¹² DMC is an input-based measure of the level of material use (biomass, fossil fuels, metal ores, and non-metallic minerals) within a national economy.

The top-performing countries in this indicator are high-income countries. DMC and the two waste-related indicators show a moderate inverse correlation, meaning that countries achieving

a high score on one generally do less well on the other. This is most evident toward the bottom of the score distribution where bottom 20 countries score on par with the top-20 countries in DMC; however, their waste control and recovery scores are extremely low. The only exception to this is Chile, where the country's copper and other mining industries underpin an extremely high DMC per capita rate.

4.2 Energy Security

The 2025 CCE Index edition also expands the conceptual coverage of energy security under the System Resilience dimension of CCE Enablers. In an era of increasing multipolarity, energy security has gained increasing prominence on the global agenda. While international cooperation remains key to enabling cost-effective net-zero energy transitions, self-sufficiency and resilience have moved to the core of how countries perceive energy security as a policy issue (WEC 2025). At the same time, diversifying the national energy mix remains an essential component and enabler for electrification and decarbonization in the great majority of countries. Also, commodity price volatility remains a leading source of uncertainty for energy policy, elevating the importance of economic dependence on energy trade as a key dimension of energy security.

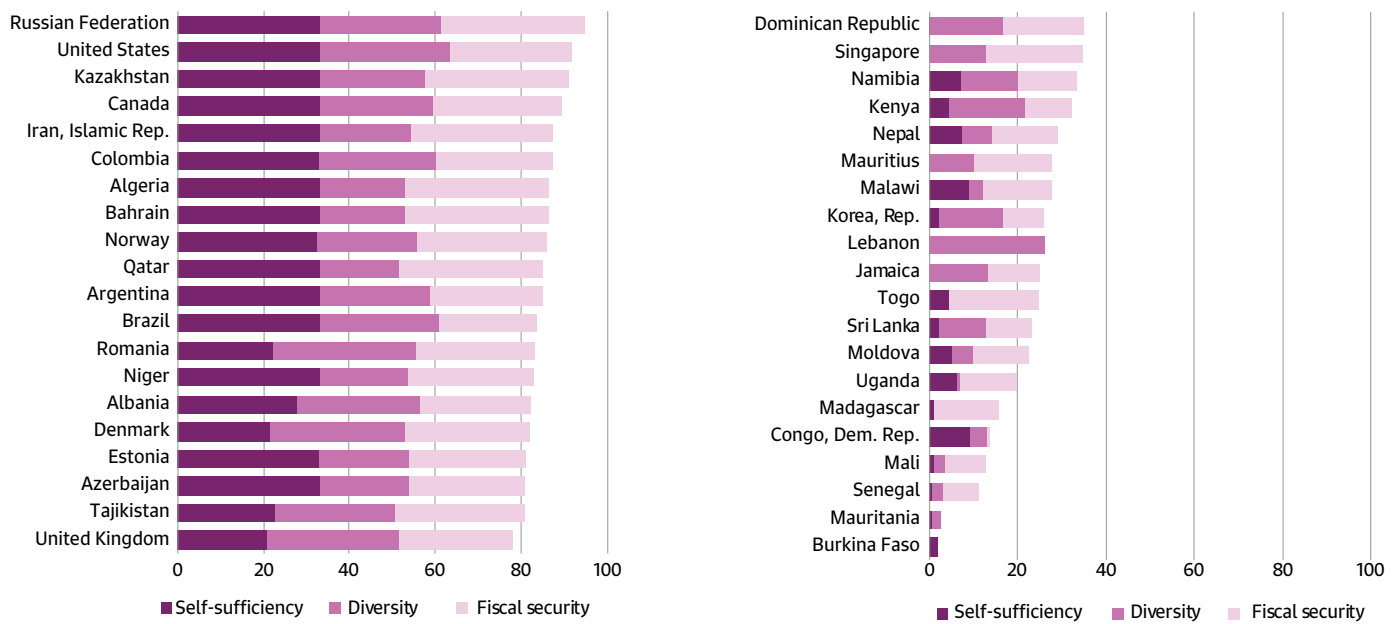
Consequently, the revised **energy security** indicator incorporates three components: rate of energy self-sufficiency, energy supply diversity, and economic vulnerability to energy trade. Figure 4 displays a disaggregation of country scores for the top-20 and bottom-20 performers in the energy security indicator in shades of purple. (Figure A5 in Appendix B displays the full score distribution.)

¹⁰ The minimum and maximum values for the scoring scale for the net LULUCF emissions component of the natural sinks indicator are set based on the averages of the highest and lowest five values in the data used for 2025 scores (i.e., emissions average for 2020-2022). Two extreme values were excluded from the top. As a result, the scoring range runs from -1.1065 ktCO₂/ha (max. threshold) to 2.3076 ktCO₂/ha (min. threshold), and countries with net LULUCF emissions of zero or close to zero receive a score of ca. 67-68.

¹¹ The indicator consists of two equally weighted elements: the Agriculture issue category from the Environmental Performance Index (covering relative crop yield, sustainable nitrogen management index, phosphorus surplus, and pesticide pollution risk), and agricultural GHG emissions as a proportion of total agriculture area. The data are sourced from Block et al. (2024) and FAO (2025), and the years of data used for the 2025 CCE Index scores are 2024 and 2022, respectively.

¹² This indicator consists of three equally weighted elements: domestic material consumption per capita; controlled solid waste score from the Environmental Performance Index; and waste recovery rate from the Environmental Performance Index. The data is sourced from UNEP-IRP (2025) and Block et al. (2024), and the year of data for the 2025 CCE Index scores is 2024 for all components.

Figure 4. Energy security as a system resilience enabler: Top-20 and bottom-20 countries in 2025.



Source: Authors.

This indicator scores countries based on how much of the actual energy used domestically is sourced from within the country (self-sufficiency), the concentration of primary energy production within the country (diversity), and the share of fuel imports of a country's total imports (fiscal security).¹³ Given the lag in statistical data, the year measured for the 2025 CCE Index scores is 2023, meaning the data captures the start of the current conflict in Ukraine but not the war in Gaza, the rise of artificial intelligence (AI), or the acceleration in U.S. trade tariffs (see, e.g., WEF 2025), which will be covered in subsequent editions' results.

As shown in Figure 4, top-scoring countries are generally energy-rich, high- or upper-middle-income nations, and they achieve high scores on all three energy security components. Countries at the bottom end of the distribution are mainly lower income and located in Sub-Saharan Africa. They receive low scores in all or most areas of energy security, and particularly in self-sufficiency. Lebanon stands out as an example of a country that scores well in diversity but has both high import dependence and a high fiscal burden from fuel imports. In the remainder of the score distribution (see Figure A5 in Appendix B), countries' highly varied results for the self-sufficiency component show how energy security cannot be achieved via self-sufficiency alone.

¹³ The indicator consists of three equally weighted elements: rate of self-sufficiency, Herfindahl-Hirschman index of total primary energy production, and share of fuel imports of total imports of goods and services (current US\$). The data are sourced from Enerdata (2025) and the World Bank (2024), and the years of data for the 2025 CCE Index scores are 2023 for all components.

Changes From 2021 to 2025

05



Utilizing half a decade of CCE Index data available via the 2025 edition, this section analyzes changes in the global net-zero transition between 2021 and 2025 at both the global level and through country cases.

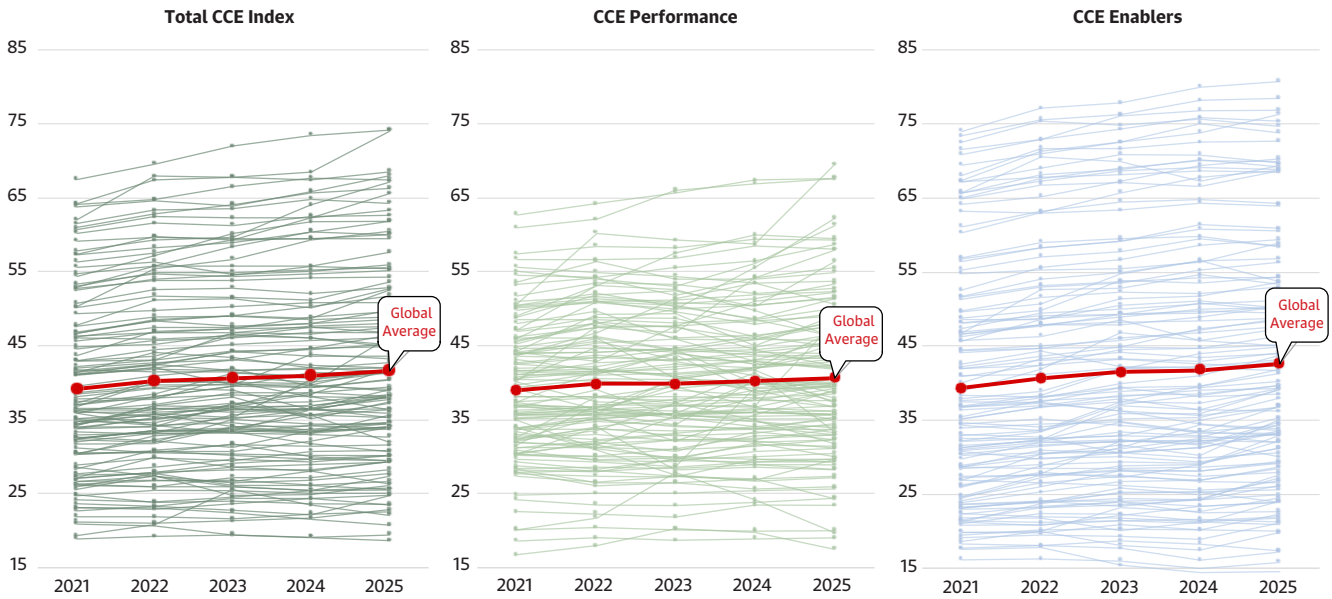
5.1 Total CCE Index Score Trends

The analysis that follows presents key findings for the CCE Index 2021-2025 trends at a global level. Given the data lag issue described in Section 4.2, which typically affects all country comparison indices, the results do not directly mirror the global outlook in their respective years. In other words, the 2021 results reflect a mix of pre-COVID-19 pandemic conditions and the first year of the pandemic. The following two years, 2022 and 2023, primarily capture the years of pandemic recovery. The 2024 scores incorporate the initial impacts of major geopolitical developments that have shifted global attention toward political risks. Finally, the 2025 score can be interpreted to reflect the

post-pandemic era, in which countries are increasingly seeking to balance between the climate agenda and broader global risks.

Over the past half decade, the world has evolved in multiple ways that affect the pace of energy transitions. While the global pandemic heightened awareness of climate change and the net-zero agenda, it had both positive and negative effects on net-zero performance and enablers across countries. The total CCE Index scores in 2021 and 2022 showed strong growth in the first two years, both in terms of CCE performance and enabling environments, as displayed in Figure 5 and Table 3, which show the average scores of the 125 countries covered in the index and their growth rates.

Figure 5. Total CCE Index trends over time.



Note: Global average refers to the average scores of all 125 countries covered in the index.
 Source: Authors.

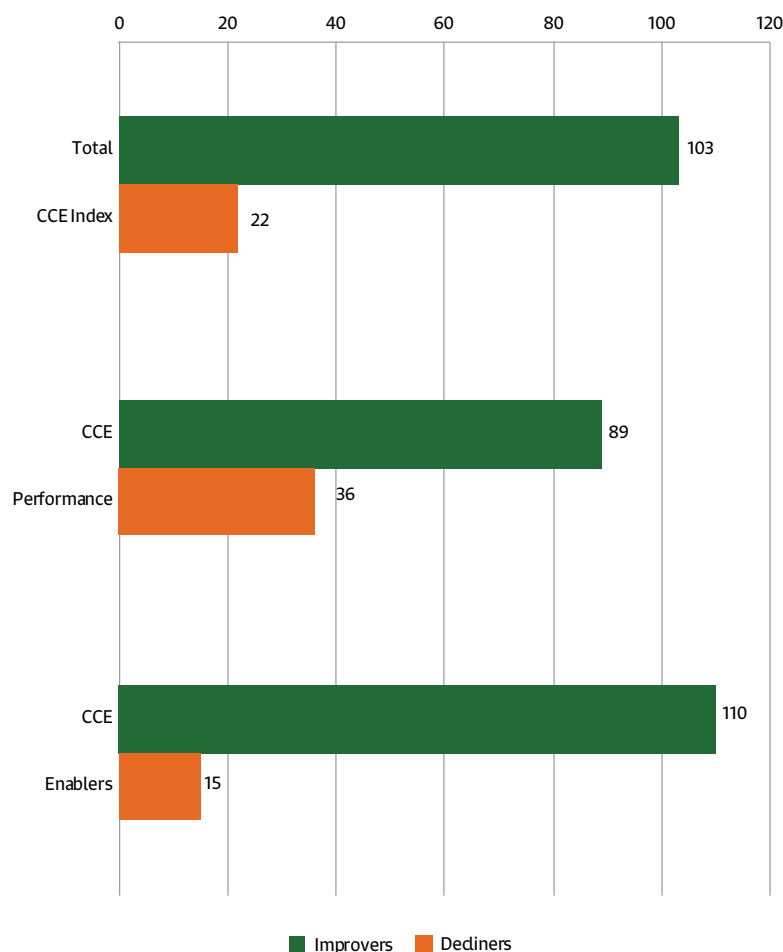
Table 3. Year-on-year growth in average scores.

	Total CCE Index	CCE Performance	CCE Enablers
From 2021 to 2022	2.6%	2.1%	3.1%
From 2022 to 2023	1.2%	0.2%	2.2%
From 2023 to 2024	0.8%	0.8%	0.7%
From 2024 to 2025	1.5%	1.1%	2.0%

However, this growth stagnated in 2023 and 2024, amid financial and economic tightening to combat rising inflation, as well as heightened geopolitical risks. Notably, in 2024, the year-on-year growth of the global average score fell to 0.8% from 1.2% the previous year. In 2025, however, the scores indicate an acceleration in global net-zero progress, with year-on-year growth reaching 1.5% for the total CCE Index scores, 1.1% for the CCE Performance sub-index, and 2.0% for the CCE Enablers sub-index.

Figure 5 also highlights two important features of the recent net-zero trajectory. First, the average score in the CCE Enablers sub-index has, in most years, grown faster than in the CCE Performance sub-index. This is also shown in Figure 6, which shows that while the majority of countries covered in the index

have recorded some improvement over the last half decade, those improving their Performance scores (i.e., 89 countries) remain considerably fewer than those improving their enabling environments (i.e., 110 countries). This suggests that enabling conditions for net-zero transitions in areas such as policies, finance, and technology have been improving more rapidly than actual mitigation actions on the ground, and thus implies a lag between the two. Second, the dispersion of country trajectories around the global average visible in Figure 5 indicates that these improvements are taking place unevenly across countries: some experience marked accelerations, while others saw plateauing or setbacks. Together, these patterns point to a global net-zero agenda that has proven resilient and persistent but that still progresses at a pace that remains exposed and vulnerable to macroeconomic and geopolitical headwinds.

Figure 6. Improvement and deterioration in CCE Index scores from 2021 to 2025 (number of countries).

Note: Boxes indicate the number of countries in the relevant categories.

Source: Authors.

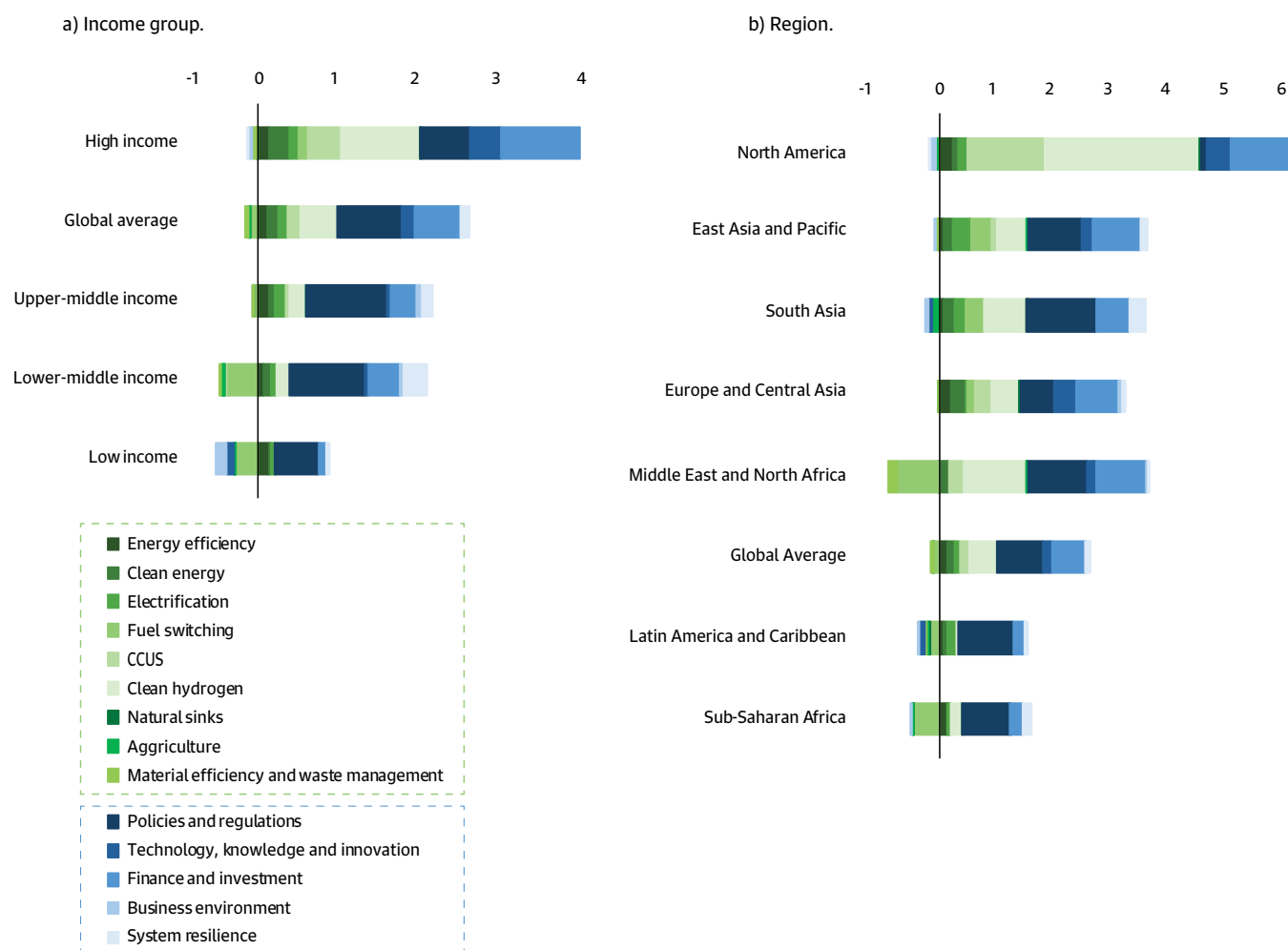
A disaggregation of these results reveals further patterns. Figure 7 provides a detailed breakdown of the drivers of score changes between 2021 and 2025. It shows a breakdown of the contributions by individual indicators under the CCE Performance sub-index, as well as the five enabling dimensions under the CCE Enablers sub-index, segmented into income and regional groups.

As shown in Figure 7a, high-income economies exhibit the most significant overall improvement, with sizeable positive contributions from almost all components of the index. Among the enabling dimensions, Policies and Regulation, Technology, Knowledge and Innovation, and Finance and Investment saw notable growth. This strong growth in enabling environments is

amplified by substantial improvements in net-zero transition performance among high-income countries with stronger penetration of critical technologies, including clean hydrogen, CCUS, and clean energy deployment.

On the contrary, improvements among all other income groups were more modest and lower than the global average. In these groups, incremental advances in the uptake of specific technologies and activities, such as energy efficiency, clean hydrogen, electrification, and the deployment of clean energy, appear more notable. However, these improvements were partly offset by a decline in momentum in fuel switching (i.e., moving away from coal and liquid fuels in the power sector), especially in low-income countries.

Figure 7. Changes in CCE Index scores from 2021 to 2025 by income group and region.



Note: Legend applies to both panels.

Source: Authors.

Among the key enabling dimensions, significant improvements in the Finance and Investment dimension are visible globally and are particularly notable in high-income countries. In middle-income countries, in turn, the Policy and Regulation dimension recorded significant improvements. While some improvements are observable in these areas among low-income countries, some backtracking in the Business Environment and System Resilience dimensions also took place.

Figure 7b shows a similar decomposition exercise across world regions. North America recorded the highest increase in CCE Index scores over the last five years, driven predominantly by the deployment of clean hydrogen and CCUS projects, as well as significant increases in sustainable finance and investment, and improvements in the Technology, Knowledge and Innovation

dimension. Four regions, namely East Asia and Pacific, South Asia, Europe and Central Asia, and the Middle East and North Africa, all recorded above-average improvements in total CCE Index scores, with relatively balanced contributions to their increases coming from CCE Performance and CCE Enablers. Clean hydrogen projects, as well as advances in Finance and Investment and in Policies and Regulation, were the strongest contributors to this performance.

In East Asia and Pacific and in South Asia, electrification and fuel switching, mostly away from coal, are common factors supporting score improvements. Europe and Central Asia and particularly Europe achieved significant improvements in the Technology, Knowledge and Innovation dimensions. The MENA region also made moderate improvements in the Technology,

Knowledge and Innovation dimension, but experienced a notable decline in fuel switching rates.

The remaining two regions, Latin America and the Caribbean and Sub-Saharan Africa, display lower score improvements relative to the global average, indicating regional transition gaps. While countries in these regions, on average, display notable improvements in the Policies and Regulation dimension, their scale-up of decarbonization technologies remained limited, and setbacks in fuel switching constituted a drag on their scores.

5.2 Country Cases

This subsection provides a more granular analysis of CCE Index score changes over the past half a decade in the form of brief country-specific case studies. The score change contribution breakdowns for the top-20 improvers and top-20 decliners are shown in Figures 8 and 9, respectively.

5.2.1 CCE Performance

A clear trend among the top improvers is that they significantly expanded and advanced in their clean hydrogen project pipelines and, to some extent, CCUS technologies to strengthen decarbonization efforts in their hard-to-abate sectors. Some notable examples include Denmark, Australia, Qatar, the Netherlands, and Canada, which saw important increases in both technologies. More examples are visible in Figure 8, which are mainly related to improvements in clean hydrogen. Conversely, the deployment of these technologies was close to non-existent among the top-20 decliners (Figure 9). Both clean hydrogen and CCUS technologies are capital-intensive, requiring significant public incentives to scale up, which complicates efforts to develop and deploy such projects in most emerging and developing economies (Yilmaz 2025).

The scaling up of clean energy remains moderate among the top-20 improvers and very limited among the top-20 decliners, despite the agreement on aiming to substantially increase the share of renewable energy in the global energy mix by 2030, which was enshrined a decade ago in the UN Sustainable Development Goal 7 (SDG 7).¹⁴ Some notable examples include Portugal, Denmark, Albania, Bulgaria, and the Netherlands from Europe, along with South Korea and Chile.

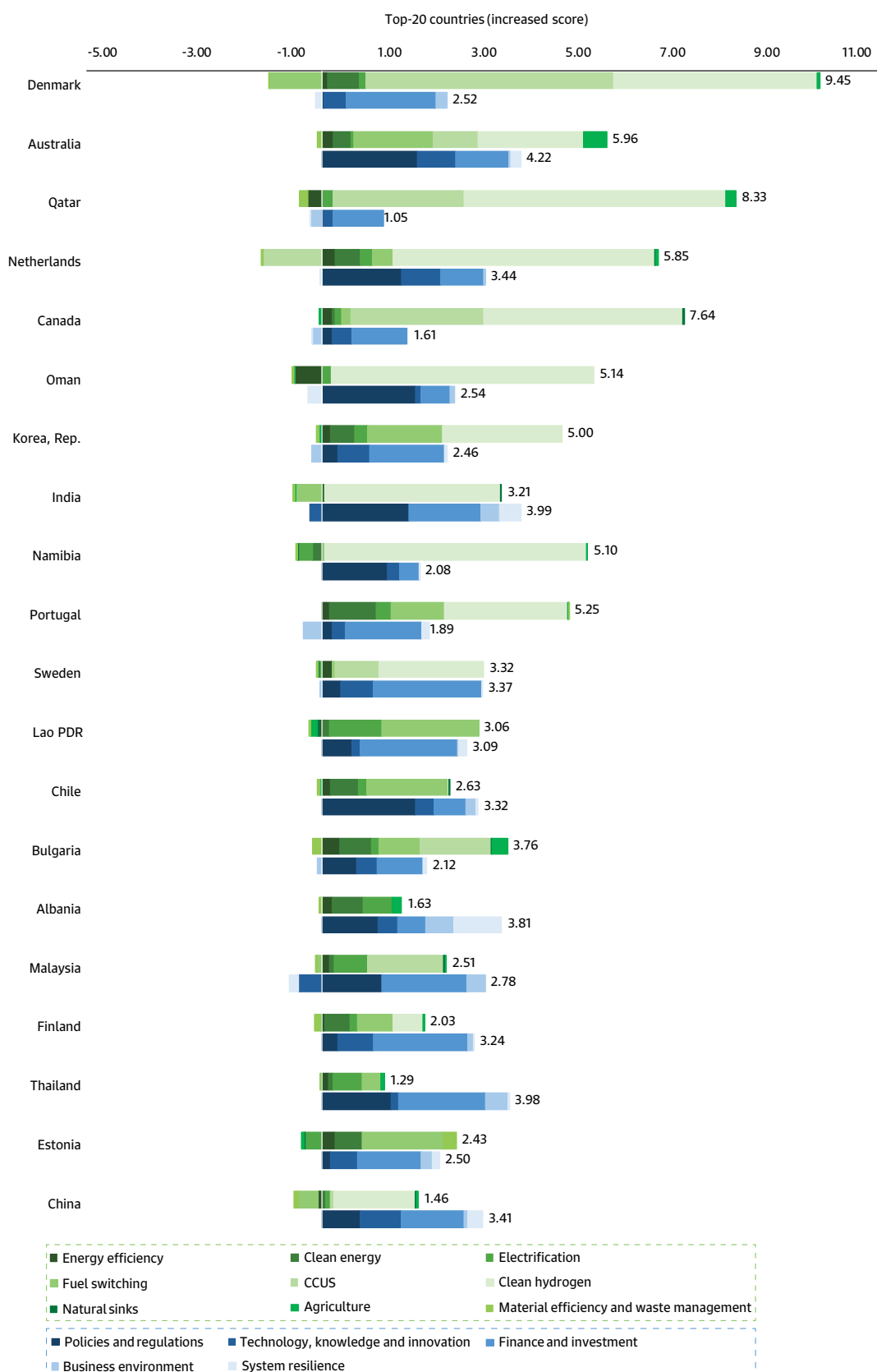
In the area of energy efficiency, the goal of doubling the global average annual rate of improvements by 2030 was similarly included under SDG 7 in 2015, and more recently reinforced in the UAE Consensus (UNFCCC 2024). Despite this, countries seem to have made little progress toward this goal in the half decade covered by the CCE Index. The energy efficiency improvements among the top-improving countries remain quite small. Notably, some countries among the top decliners, including Iran and Honduras, recorded improvements that were either on par or even greater than among the top improvers. Contributions to score improvements from electrification were the highest among the emerging and developing countries in the top-20 list, such as Laos, Albania, and Malaysia. Among the top-declining countries, Jordan was the only country to achieve a significant improvement in electrification.

Changes in fuel switching performance had a significant impact on numerous countries' index scores. Among the top-20 improvers, countries such as Laos, Chile, Estonia, Australia, and South Korea all achieved sizeable gains in this area by cutting the role of high-emitting fuels in their power sector energy mix while scaling up clean energy. By contrast, among the top-20 decliners, 14 countries registered a deterioration in their total CCE Index scores because progress on fuel switching stalled or reversed. In several cases, including Jordan, Rwanda, and Ecuador, higher-emitting fuels either stayed or regained ground in the power sector energy mix following earlier improvements.

5.2.2 CCE Enablers

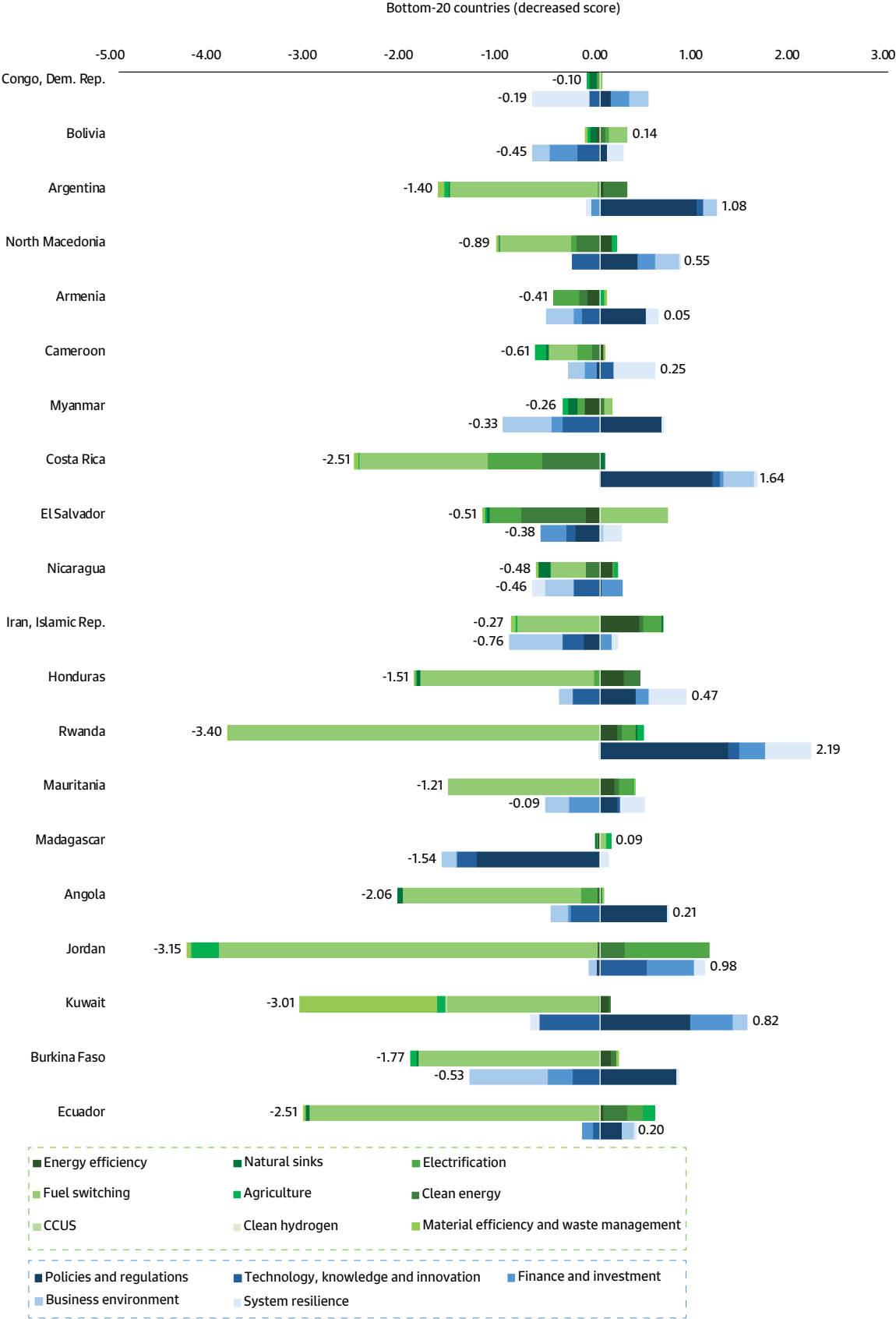
Among the critical enablers, the Policies and Regulation dimension emerges as the common positive driver for both the top-20 improvers and top-20 decliners, pointing to a broad acceleration of the climate policy agenda worldwide (Figures 8 and 9). Among the top-improving developing countries, Chile, India, and Oman stand out alongside industrialized economies, such as Australia and the Netherlands, as countries where climate policy reforms and upgrades made visible contributions to CCE Index scores in the period 2021-2025. Even among countries whose overall scores declined, such as Argentina, Costa Rica, Rwanda, and Kuwait, stronger climate policy frameworks still contributed positively to their CCE performance. However, in the top-20 decliners group, this alone was insufficient to compensate for setbacks in other areas, and the translation of this policy ambition into broader CCE Performance gains also remained limited.

Figure 8. Half-decade changes (2021 to 2025) for top-20 improvers.



Source: Authors.

Figure 9. Half-decade changes (2021 to 2025) for top-20 decliners.



Source: Authors.

This shortfall in the impact of climate policy in some countries becomes clearer when looking at the Finance and Investment and the Technology, Knowledge and Innovation dimensions. Despite the global expansion of sustainable finance, only a small fraction of these flows has reached developing countries (Yilmaz 2026), and this is reflected in the index score change patterns. As shown in Figure 8, Finance and Investment made sizable positive contributions to total CCE Index score improvements in many of the top-20 improving countries, including high-income economies such as Sweden, Finland, and Denmark, as well as middle-income countries like Malaysia, Thailand, and Laos. By contrast, most of the top-20 decliners recorded negligible or even negative contributions in this area,

with only a few countries (Kuwait, Jordan, and Rwanda) showing some progress in mobilizing climate-relevant finance (Figure 9).

A similar divergence is observable in the Technology, Knowledge and Innovation dimension, which measures countries' capacity for technology creation and absorption: contributions to score improvements are strong among the top-20 improvers, such as China, South Korea, the Netherlands, and Australia. While this dimension also captures international technology spillovers, these appear to be largely missing for most of the top-20 decliners, suggesting that many of these countries are not yet fully benefiting from global advances in climate-relevant technologies.

Additional Metrics for Major Oil Producer and Forest Industry Nations

06

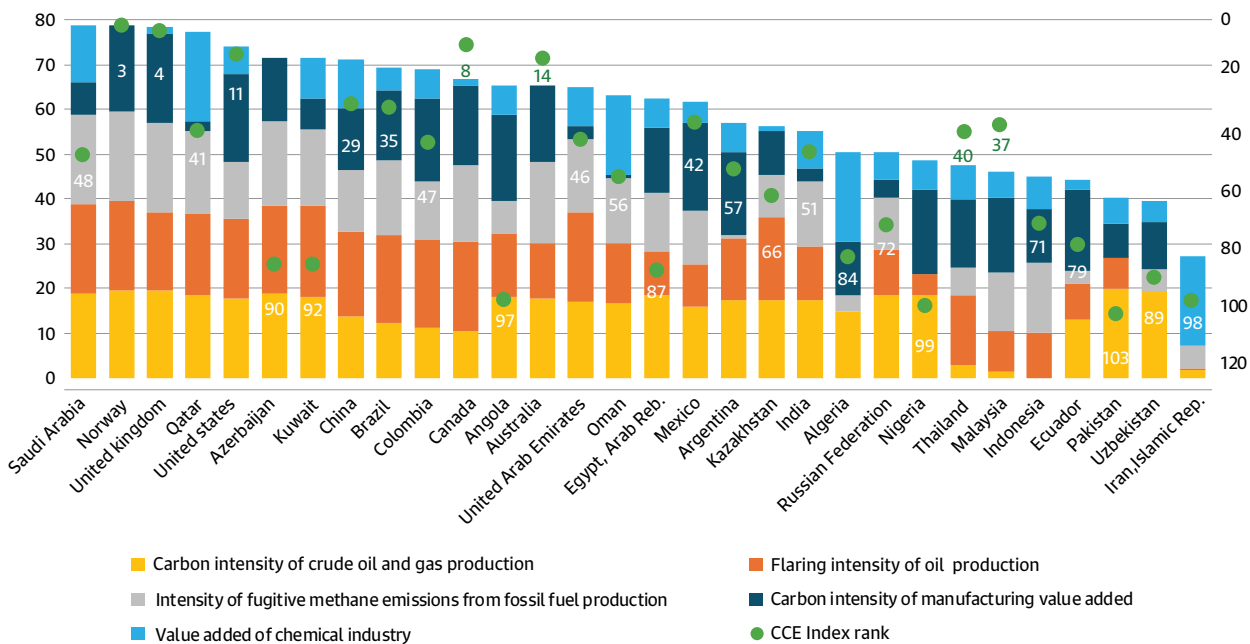
Since its first edition, the CCE Index has been calculating an add-on score for evaluating industrial carbon circularity in the world's major oil- and gas-producing countries called the Oil Producers Lens (OPL). The 2025 CCE Index edition introduces a new lens, called the Forest Industry Lens (FIL), which is applied to the world's leading forest industry countries. The following subsections provide highlights from the 2025 OPL and FIL results.

6.1 2025 OPL Indicators

The OPL introduces five additional metrics that can be used to generate an industry-focused carbon circularity score or aggregated to provide an economy-wide benchmarking of the

30 leading industrial players in the sector.¹⁵ Figure 10 shows the 2025 OPL indicators' scores and ranking, with the bars showing the breakdown of countries' scores on the five OPL indicators, while the green dots display countries' rank in the 2025 total CCE Index. (The total 2025 OPL scores are displayed in Figure A6 in Appendix B.)

Figure 10. 2025 OPL Indicators' aggregate scores and ranking.



Source: Authors.

Figure 10 shows a significant difference in the carbon circularity performance of the major oil and gas producers' industrial performance: the three countries leading on the five OPL indicators (Saudi Arabia, Norway, and the United Kingdom) display an average score of 79, while the average of the bottom three countries (Iran, Uzbekistan, and Pakistan) is less than half of this at 36. The three highest performers score half a point from each other, and all three achieve high scores in the three core industry metrics (carbon intensity of crude oil and gas production, flaring intensity of oil production, and fugitive methane intensity).¹⁶ Figure 10 also displays how there is only a moderate correlation between countries' overall CCE Index ranking and their ranking in the five OPL metrics, showing how sector-specific metrics can enable a more granular understanding of CCE performance.

6.2 2025 FIL Indicators

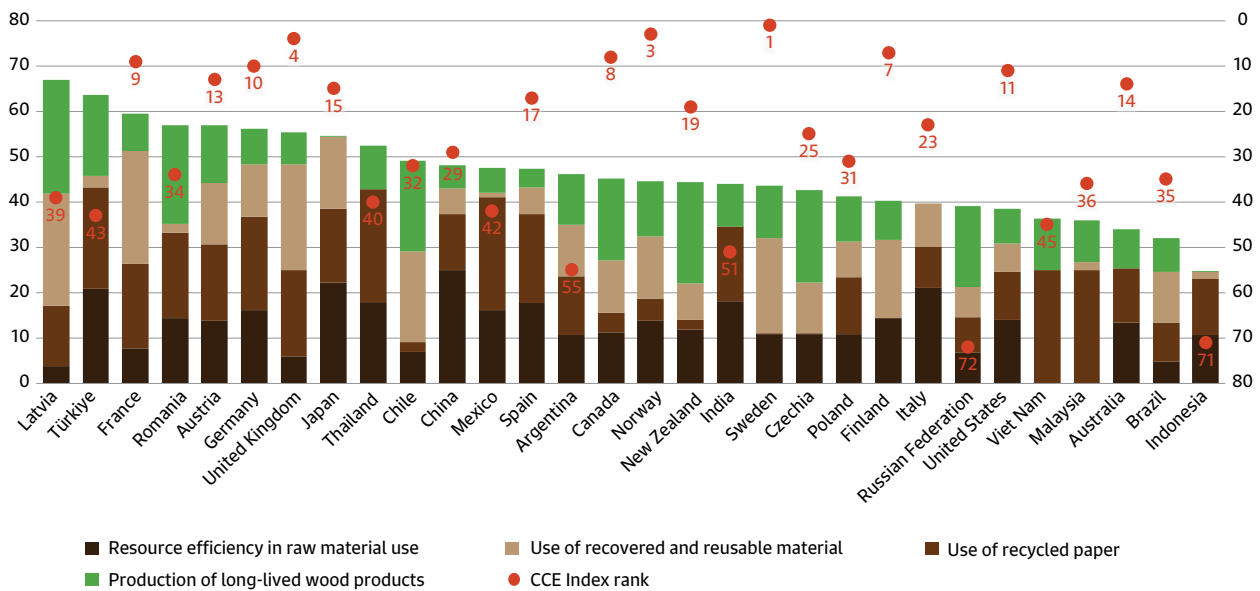
The FIL makes a novel contribution to measuring industrial carbon circularity in the world's largest forest industry nations, covering 30 countries similar to the OPL.¹⁷ Figure 11 shows the

2025 FIL indicators' scores and ranking. The bars show the breakdown of countries' scores on the four FIL indicators, while the green dots display countries' rank in the 2025 total CCE Index. (The total 2025 FIL scores are displayed in Figure A6 in Appendix B.)

Figure 11 displays an equally wide divergence between the top three (Latvia, Türkiye, and France, with an average score of 63) and the bottom three (Indonesia, Brazil, and Australia, with an average score of 30) countries as the OPL. Notably, the results indicate a strong specialization among countries, reflected in the fact that countries generally score well on one or two indicators only, and point to countries' forest industry sustainability strategies not yet being holistic in nature. The FIL 2025 results are presented and analyzed in detail in Forsell and Luomi (2025).

Similar to the OPL, countries' FIL indicator ranking and their total CCE Index ranking show an extremely weak correlation (0.22), pointing again to the need for industry-specific circularity metrics to help support targeted and context-specific CCE and net-zero transitions worldwide.

Figure 11. 2025 OPL Indicators' aggregate scores and ranking.



Source: Authors.

¹⁶ These three countries' scores, however, are underpinned by structural differences: Saudi Arabia's additional strength is its chemicals industry, which in the OPL serves as a proxy for industrial CCE applications potential, while Norway and the United Kingdom excel in low emissions intensity performance in their manufacturing sectors.

¹⁷ FIL countries were selected based on the national production of roundwood, industrial roundwood, and the share of total land being forested. Low-income countries were removed for equity reasons, and countries with questionable data quality were removed based on expert judgment. Ukraine was not included due to the ongoing conflict, which was deemed to significantly impact data reliability.

The 2025 CCE Index results show that while global net-zero progress has accelerated compared to the immediate post-pandemic years, improvements remain uneven across countries. They also reflect the findings of global synthesis studies on the insufficiency of the pace of countries' efforts relative to Paris Agreement temperature goals.

Four policy-relevant messages emerge from the updated indicator framework and 2021-2025 trends:

- 1. Countries need holistic net-zero strategies for effective progress in emissions circularity:** Expanding the scope of CCE Performance to cover all major sources of emissions reveals major, persistent gaps in the carbon circularity of natural sinks, agriculture, and materials. Countries scoring high in CCE Performance generally score higher on these three indicators, but strong performance in one area does not predict success in another. This implies that, in the great majority of countries, a more holistic approach is needed for managing CCE transitions.
- 2. A multi-dimensional approach to energy security is required to allow for net-zero transitions:** The broadened scope of the energy security indicator reflects how resilience, self-sufficiency, and supply diversity have become core components of energy policy that countries need to successfully manage while promoting net-zero transitions. Countries scoring high in this area are generally energy-rich, high- or upper-middle-income nations, while countries at the bottom are lower-income nations that struggle, particularly with self-sufficiency. The 2025 results can also be read as a cautionary tale of the importance of international energy cooperation in a time of rising geopolitical risks and price volatility to ensure energy equity and access in poorer countries. At the same time, the indicator results reflect the fact that energy security in a decarbonizing world cannot be achieved via self-sufficiency alone, requiring attention to domestic source diversification toward higher rates of carbon-neutral energy and electrification.
- 3. Closing performance gaps will require strengthening enabling environments:** Half-decade trends of CCE Index scores (2021-2025) show that enabling conditions are improving faster than actual carbon and emissions circularity outcomes. High-income countries have leveraged these enablers to scale up clean hydrogen, CCUS, and clean energy, while many developing economies struggle with stagnation or reversals in fuel switching and limited access to climate finance and technology. The findings in this area underscore that closing the CCE readiness gap is not only a matter of deploying more decarbonization technologies but also of strengthening the enabling foundations that allow these technologies to scale. Countries and regions that combine ambitious and predictable policy frameworks, innovative ecosystems, and access to finance with the active deployment of clean technologies and activities have seen

the largest step-up in their CCE Index scores over the last half-decade. Conversely, where enabling environments remain weak or deteriorate, even progress in specific technologies yields only modest overall gains.

4. **CCE transitions in developing countries can be accelerated with scaled-up support:** An analysis of the half-decade trends at country level highlights the drivers of net-zero transitions at a more granular level. In the area of CCE Performers, trends among the top improvers and top decliners in the index in 2021-2025 imply that achieving global clean energy ambitions requires strengthened support in developing countries, where opportunities to scale up renewable energy, energy efficiency, and electrification are the highest. Simultaneously, the highly

divergent trajectories in fuel switching highlight an essential point: switching to lower-carbon fuels in the power sector is achievable and can be deployed rapidly. However, many emerging and developing economies remain constrained in this effort by energy-security concerns, infrastructure gaps, and volatile global energy prices, as well as supply due to increased geopolitical risks.

Launched at a time of high global uncertainty and fragmentation, the 2025 CCE Index results offer a glimmer of hope for a fledgling global net-zero transition. Future editions will confirm whether high ambition and international cooperation prevail and whether the fragile momentum can be sustained.

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Appendices

Appendix A. Methodological Notes and Updates

The CCE Index 2025 edition continues to apply strict data availability and quality criteria to maintain the robustness and reliability of the index. As in previous editions, countries and indicators must demonstrate at least 80% data availability prior to the application of any imputation procedures in order to be included in the index. This threshold is intended to ensure that results are driven primarily by observed data rather than imputed values, and to limit the influence of data gaps on country scores.

Data availability is assessed at both the country and indicator levels. While the 80% threshold is applied strictly, limited exceptions were made in a small number of cases where indicators are conceptually central to the CCE framework and where data constraints could not be fully avoided. In the 2025 edition, exceptions were granted for the following indicators, which were deemed as essential for conceptual completeness in the indicator framework: carbon capture and storage policy (71% data coverage), research and development expenditure (73%), low-carbon technology trade (74%), renewable energy investment and deployment opportunities (67%), digital infrastructure (77%), and value added of the chemical industry (73%).

In addition, nine countries marginally below the data availability threshold were retained following a case-by-case assessment. These were Cameroon (79%), Democratic Republic of Congo (74%), Malawi (76%), Mali (79%), Mauritania (74%), Nepal (76%), Niger (79%), Togo (79%), and Ukraine (79%). In each case, data gaps were limited in scope and were not considered sufficient to warrant exclusion from the index.

As per the CCE Index methodology, once the set of countries and indicators is finalized, missing observations are imputed following a standardized procedure, consistent with previous editions.

First, zero imputation is applied where appropriate, based on confirmation from data providers. This approach is used for indicators where missing values indicate the absence of the underlying activity or infrastructure rather than missing reporting. Examples include CCS capacity, clean hydrogen capacity, sustainable debt issuance, and energy transition investments drawn from the Bloomberg New Energy Finance (BNEF) database, which provides comprehensive global coverage of these activities.

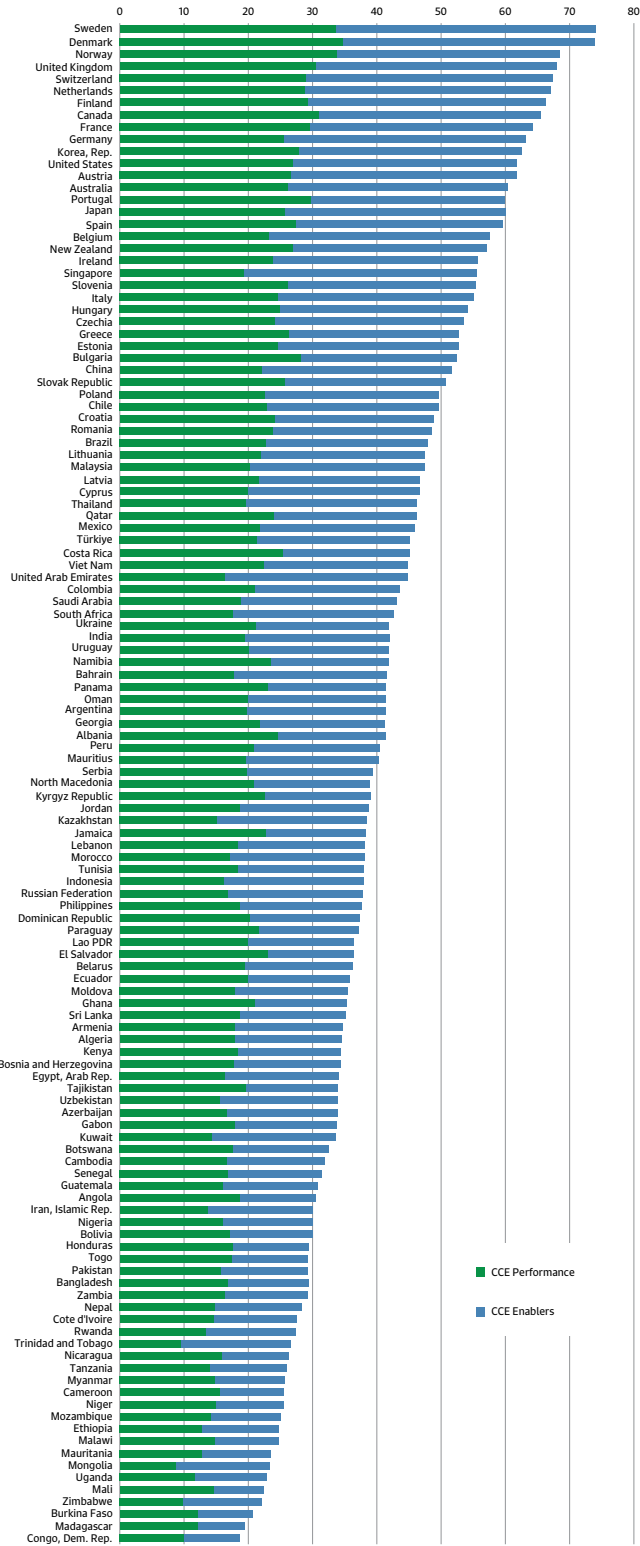
Second, remaining missing observations are imputed using the most recent available data point for the country, whether historical or forward-looking. This step is intended to prevent the creation of artificial trends over time that could arise from alternative imputation approaches.

Third, in cases where a country reports no data for a given year, missing values are imputed using region-income averages for that specific year. With the expanded country coverage in the 2025 edition, this approach draws on all World Bank regions (East Asia and Pacific, Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa, North America, South Asia, and Sub-Saharan Africa) and all four income groups (low-income, lower-middle-income, upper-middle-income, and high-income economies).

A methodological update in the 2025 edition was applied to the method for normalizing (i.e., conversion of indicator values into a score scale of 0-100). In previous editions, minimum and maximum value thresholds were calculated using 2021 score data and were held constant across all index years. This approach was adopted to ensure strict mathematical comparability over time. In the 2025 edition, the minimum and maximum threshold values were instead calculated using the most recent data year, and were applied retrospectively to all index years. This change was introduced to better reflect current conditions and to capture incremental changes in performance that may be compressed or obscured under the previous approach. This adjustment improves the ability of the index to reflect recent developments and shifts in relative performance, and it will be applied in all subsequent editions.

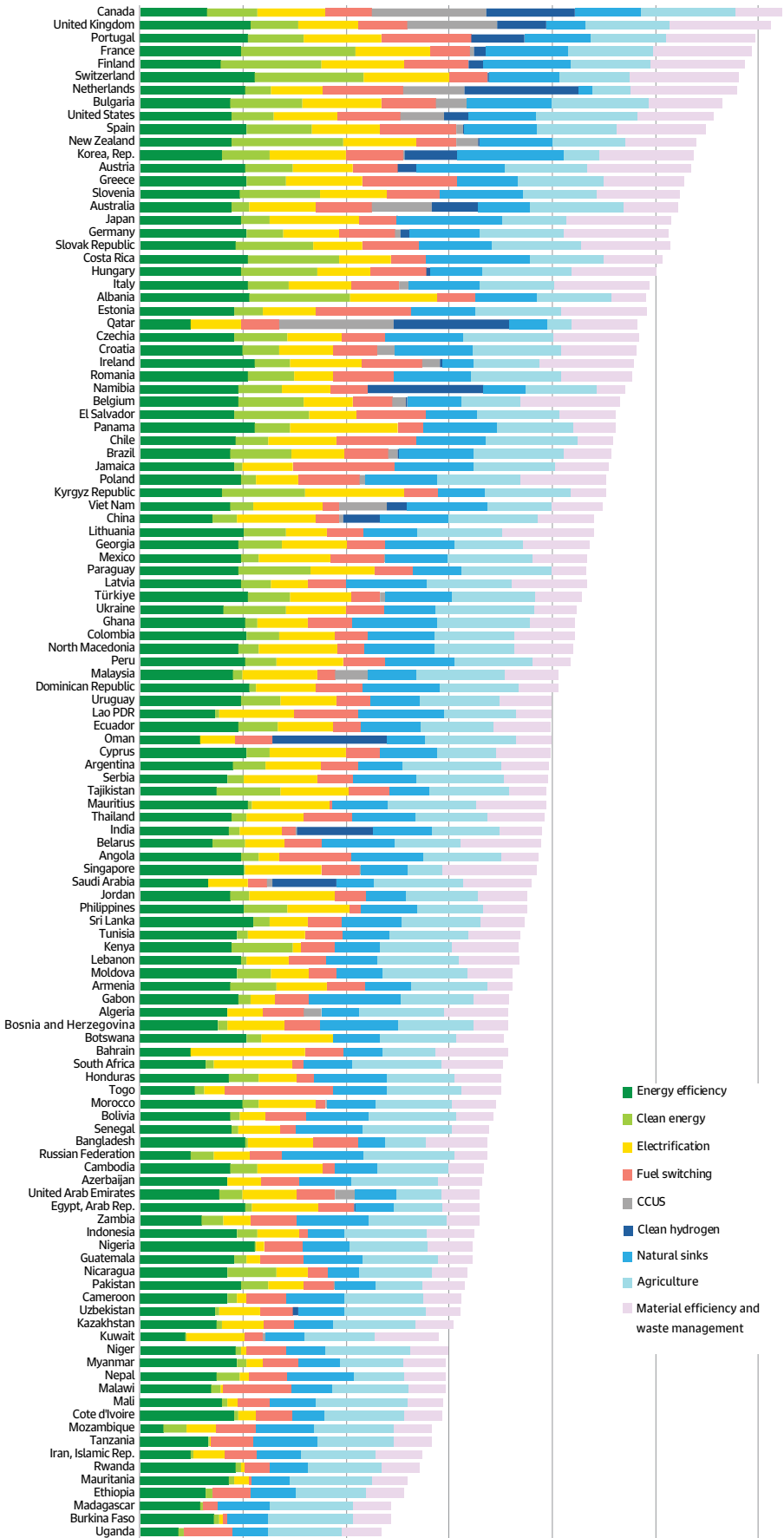
Appendix B. Additional Visualizations

Figure A1. 2025 CCE Index total scores.



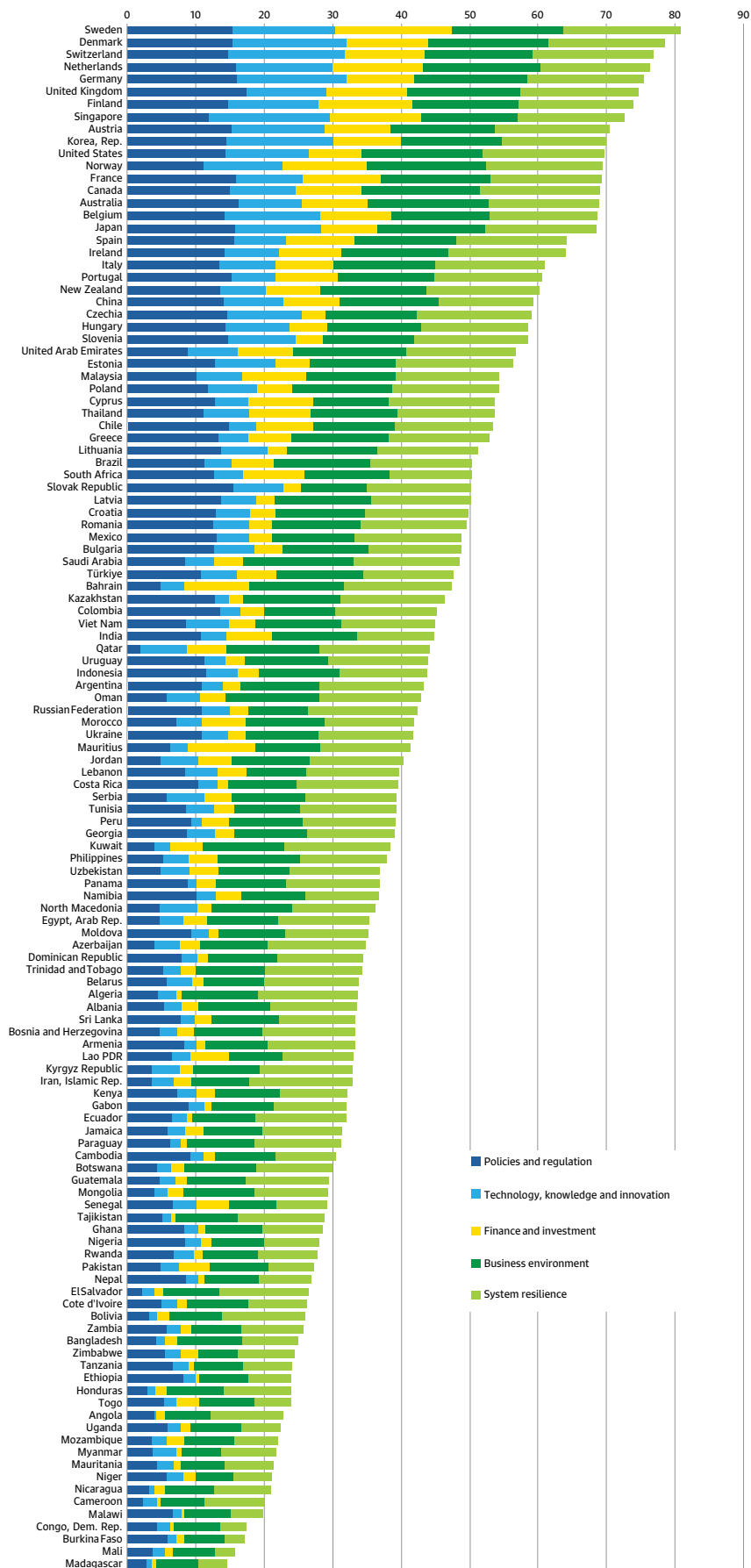
Source: Authors.

Figure A2. 2025 CCE Performance scores.



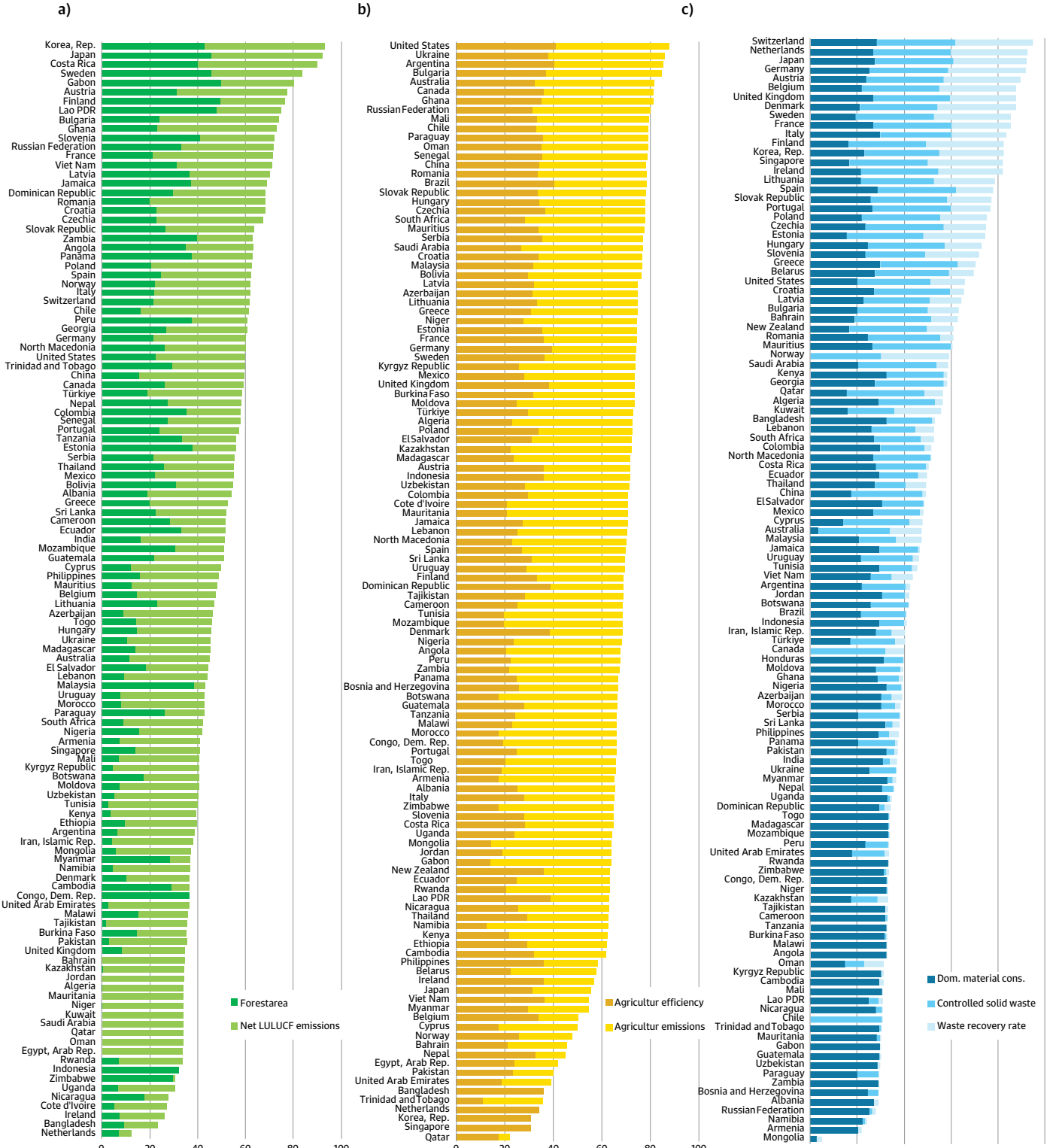
Source: Authors.

Figure A3. 2025 CCE Enablers scores.



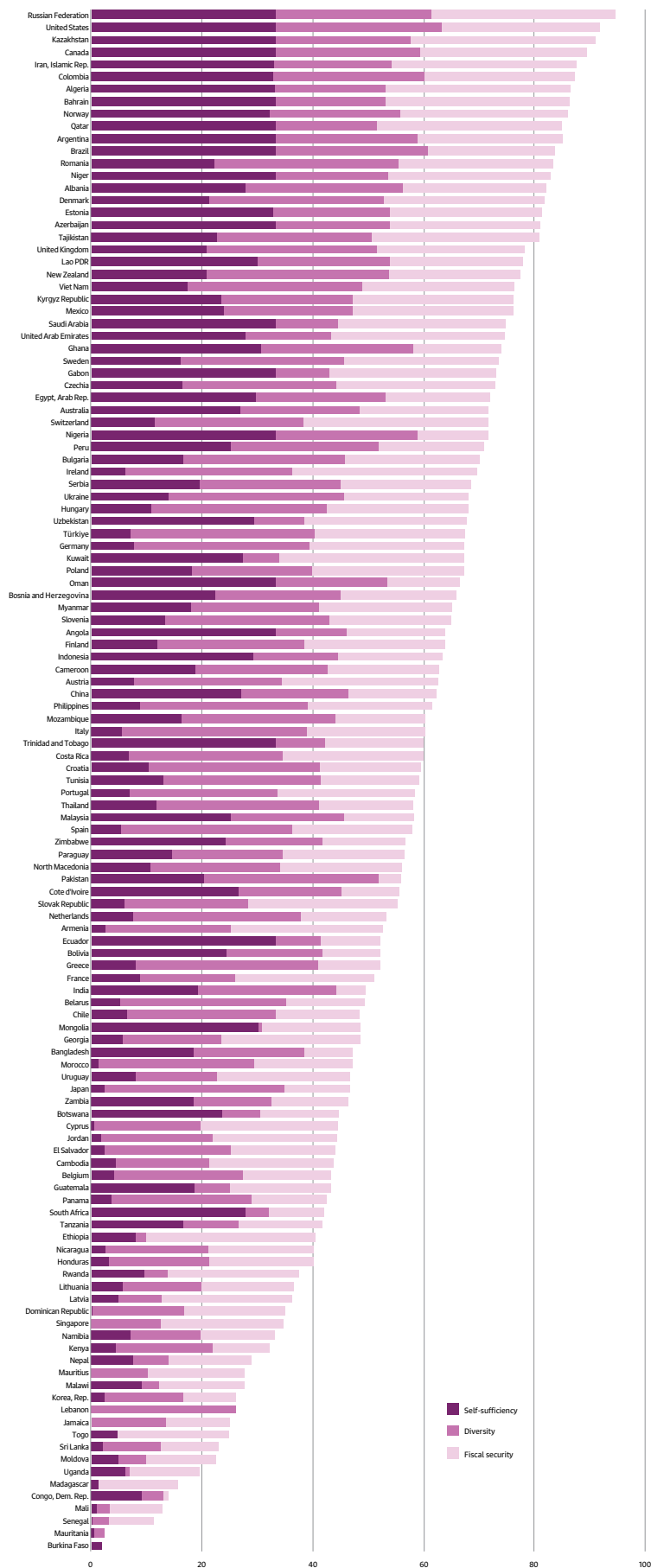
Source: Authors.

Figure A4. Non-energy sectors' CCE Performance in 2025: (a) natural sinks, (b) agriculture, and (c) material efficiency and waste management.



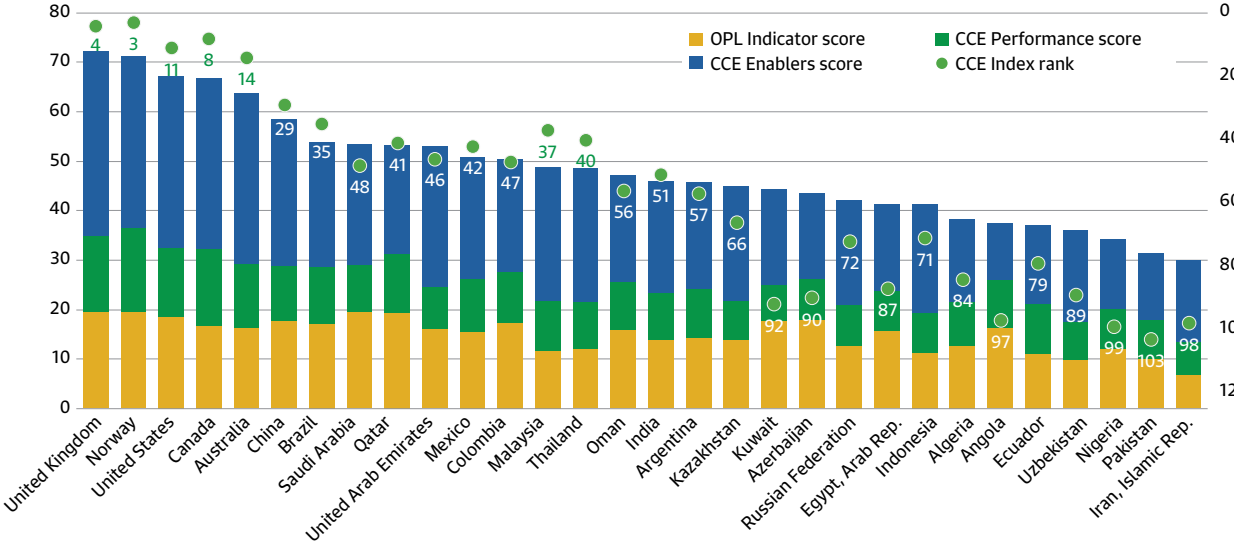
Source: Authors.

Figure A5. Energy security as a system resilience enabler in 2025.



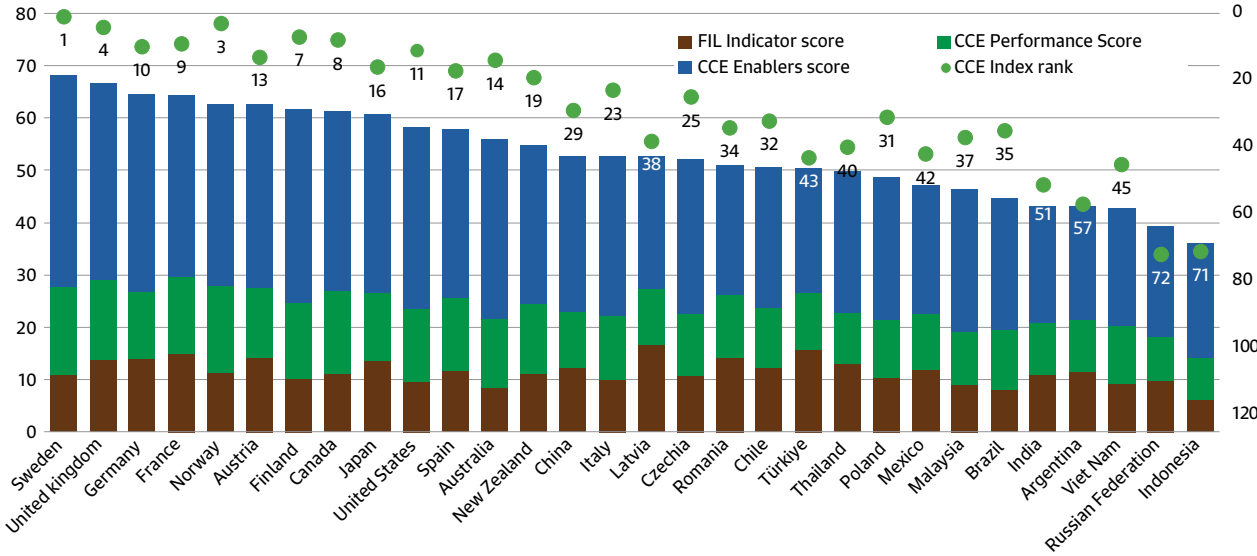
Source: Authors.

Figure A6. 2025 total OPL scores and ranking.



Source: Authors.

Figure A7. 2025 total FIL scores and ranking.



Source: Authors.

About the Author



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Mari is a Principal Fellow in the Climate and Sustainability Department. She is a policy-oriented social scientist who has been studying climate change, energy transitions, and sustainable development policy in the Gulf and globally for 17 years. She has worked for other leading energy, sustainable development, and foreign policy research institutions, including the Oxford Institute for Energy Studies, the International Institute for Sustainable Development (Earth Negotiations Bulletin), Georgetown University, the Finnish Institute of International Affairs, and the Emirates Diplomatic Academy. Mari holds a master's degree in Political Science and International Politics from the University of Helsinki and a Ph.D. in Middle Eastern Studies from Durham University. In addition to a broad research publications portfolio, she has substantial experience in executive training, presentations, policy advisory, and reporting services for multilateral environmental negotiations.



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About the Project

KAPSARC's Circular Carbon Economy (CCE) Index project expands and adds rigor to the conceptual basis of the CCE concept, as well as its practical operationalization, by providing a robust quantitative framework to measure countries' performance and progress toward CCEs, or net-zero emissions. The resulting CCE Index is a composite indicator that measures various dimensions of the CCE and net-zero transitions in a national context across countries. Its main foci are current performance and enabling factors for future progress. The first edition of the CCE Index, published in November 2021, covered 30 countries. The 2022 and 2023 editions covered 64 major economies and oil- and gas-producing countries. From the 2024 edition onward, the index has included 125 countries, providing broad representation from all world regions and covering 96% of global greenhouse gas (GHG) emissions. The index is disseminated through various research outputs, including KAPSARC discussion papers and commentaries that present and analyze the results in depth, as well as KAPSARC methodology papers, conferences, workshops, other events, and an online platform located at <https://cceindex.kapsarc.org>. The index is updated annually, with the 2025 edition launched in November 2025.

