**Discussion Paper**

# The Circular Carbon Economy Index 2023

Results

Mari Luomi, Fatih Yilmaz, and Thamir Alshehri

## About KAPSARC

KAPSARC is an advisory think tank within global energy economics and sustainability providing advisory services to entities and authorities in the Saudi energy sector to advance Saudi Arabia's energy sector and inform global policies through evidence-based advice and applied research.

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# Executive Summary and Key Messages

As concluded by the Global Stocktake under the Paris Agreement, while action to reduce emissions is proceeding, much more effort is required across all fronts to limit global temperature rise to 1.5 or 2 degrees Celsius. Several enabling conditions must also be lined up so that countries can achieve net-zero emissions around the mid-century. Every country must contribute to the best of its capabilities and available resources. All available technologies will be needed, and these should be deployed and combined in the most cost-effective and feasible ways by each nation.

The Circular Carbon Economy (CCE) Index provides a comparative overview of where countries stand on the road to net-zero emissions and their preparedness for this transition. The CCE Index compiles quantitative data from 38 reliable sources into a composite indicator covering countries representing approximately 90% of the global economy and carbon dioxide emissions. Each country is scored on a scale of 0-100 for each of the 38 indicators, which are then aggregated to form various composite scores: the total CCE Index, CCE Performance, CCE Enablers, and various enabling areas. Additionally, five further indicators are applied to major oil- and gas-producing countries to provide an add-on score referred to as the Oil Producers Lens.

**Total CCE Index:** In 2023, the top 3 countries in the CCE Index are Norway, the United Kingdom and the Netherlands. At the bottom of the index ranking are Ethiopia, Uganda and Tanzania. With the exception of three, all of the top 20 ranking countries are high-income countries, spanning all geographic regions except Sub-Saharan Africa and South Asia. Norway, the top-scoring country, boasts a score 4.2 times that of the lowest-scoring country, Ethiopia. The total CCE Index score rewards countries that achieve high scores in both CCE Performance and CCE Enablers.

**CCE Performance:** In 2023, Norway, the U.K. and Canada earned the highest scores in CCE Performance. The top 20 list is diverse, encompassing both high- and middle-income countries from all geographic regions except South Asia. The bottom 10 includes a diverse group of countries from all income levels from Sub-Saharan Africa, the Middle East and North Africa and Europe and Central Asia. The CCE Performance score rewards countries that engage with various CCE technologies and approaches, and achieve high scores in these. Countries, however, do not need to excel across the board, but can play to their own strengths. The top performer Norway, for example, achieves a score of 100 in four indicators (renewable energy, electrification, carbon capture, utilization and storage and clean hydrogen) but receives a score of 0 in one (nuclear energy).

**CCE Enablers:** In 2023, Switzerland, Germany and the Netherlands ranked the highest in CCE Enablers. Eight of the countries in the top 10 in Enablers also made it to the top 10 on the total CCE Index and CCE Performance. CCE Enablers represent an aggregate measure of the five enabling areas assessed by the index: policy, technology, finance, business environment and overall system resilience. The differences between the top and bottom performers in these areas are extremely wide.

**Policies and Regulation:** Overall, countries in the 2023 index received the lowest scores in carbon capture and storage policy, reflecting the highly concentrated and still low levels of global deployment of these technologies. Many countries achieved high scores in climate change policy, where a net-zero target set in law renders a country a full score (100) and one included in a policy document a score of 80. Although mid-century emission targets serve as a rough indicator of the robustness of a country's climate policy, comparing countries fairly in this area remains a daunting task due to considerations related to historical emissions and equity.

**Technology, Knowledge and Innovation:** Indicators under this dimension measure the creation and spillovers of technology, knowledge and innovation. Two of the three knowledge creation indicators exhibit a highly skewed distribution: countries ranked 15th-64th on clean energy technology patents all score less than 10, and on the 'intensity' of academic research, countries ranked 17th-64th score less than 10. The gaps between the top and bottom performers in the other indicators are also substantial.

**Finance and Investment:** There is a considerable difference among countries in the proportion of their gross domestic product spent on CCE investments. Only the top 19 countries on this indicator spent more than 0.5%, while the bottom 22 countries spent less than 0.1%. Sustainable debt follows a similarly skewed distribution, with the top 23 countries on this indicator raising an equivalent of 0.5% of their GDP or more from sustainable debt instruments, including bonds and loans. Conversely, the bottom half (31 countries) attracted less than 0.1%. In the case of both indicators, countries spending less than 0.1% mainly include low- and middle-income developing countries, along with some Gulf oil producers and European or Central Asian economies in transition.

**Business Environment:** Overall, there are fewer scores at the extremes in this dimension. The only exception is the CCS potential indicator, which measures the development of a country's $CO_2$ storage resources. Three countries scored close to 100, and three countries scored 0. The top 10 countries on the CCS potential indicator are among the top 30 global oil and gas producers.

**System Resilience:** The top 20 countries in this dimension is formed by a regionally diverse group of largely high-income countries. These countries consistently score well on at least five of the seven system resilience indicators, which assess energy security, energy grid reliability, energy access and affordability, economic diversification, adjusted national income, environmental health (including outdoor and indoor particulate matter pollution) and climate change resilience. Conversely, countries at the bottom of this dimension face a variety of challenges but tend to struggle the most with issues related to energy inequality and particulate matter pollution.

**Oil Producers Lens (OPL):** In 2023, the top 3 countries in the OPL mirror the leaders on the total CCE Index: Norway, the U.K. and the Netherlands. Generally, countries' OPL scores are higher than their total CCE Index scores, although this tendency is more pronounced among developing country oil producers than among developed countries. The five OPL indicators measure the carbon intensity of oil production, the intensity of flaring during oil production, the intensity of fugitive emissions from fossil fuel production and the carbon intensity of manufacturing value added. As a proxy for future carbon circularity industries, the OPL includes the value added by the chemical industry. On these five indicators, the highest-scoring countries, on average, are Saudi Arabia, the Netherlands and Norway.

In addition to providing a detailed presentation of the 2023 CCE Index results , this Discussion Paper also features analytical insights from the 2023 edition in the following areas: changes from previous years in the total CCE Index scores, CCE Performance, and CCE Enablers, as well as highlights of regional frontrunners in 2023.

# 1. Introduction

Reaching net-zero emissions will require all hands on deck. The urgency of bending the curve on carbon dioxide ($CO_2$) and other greenhouse gas (GHG) emissions is growing by the day, as the gap between what science tells us we should be doing and what is happening on the ground keeps widening. The first Global Stocktake under the Paris Agreement, which concluded at the 2023 U.N. Climate Change Conference in Dubai (COP 28), delivered a stark message, noting "with significant concern that, despite progress, global [GHG] emissions trajectories are not yet in line with the temperature goal of the Paris Agreement and that there is a rapidly narrowing window for raising ambition and implementing existing commitments in order to achieve it" (UNFCCC 2023a).

Collectively, the task is clear: both more ambitious policy targets and significantly higher levels of action and support are needed to accelerate emission reductions across all sectors and systems (UNFCCC 2023b). Several enabling conditions, primarily the responsibility of governments, must also be addressed. In addition to political commitment, the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) highlights as key enabling conditions: inclusive governance, innovation, monitoring and evaluation, international cooperation and higher levels of financial resources. To succeed, any climate change mitigation strategy must also tackle other challenges, such as poverty, inequality, economic and capacity barriers, access to finance and technology and trade-offs with other sustainable development priorities (UNFCCC 2023b).

Given the magnitude and urgency of the task, every country must contribute to the best of its capabilities and available resources. Each country will need all available technologies deployed and combined cost-effectively and feasibly. As of mid-2023, 104 countries had adopted national-level net-zero or carbon neutrality targets, and 60 were considering doing so (ECIU et al. 2023). This signals a clear collective commitment to meeting the long-term mitigation goals of the Paris Agreement. However, countries have diverse national contexts and development trajectories that will shape their paths to net zero and carbon circularity.[1] Comparing countries' progress on the road to a circular carbon economy (CCE), which involves reducing, recycling, reusing and removing $CO_2$ and other GHG emissions to achieve a net-zero atmospheric impact, is a complex task. Comparing their potential for the CCE transition is equally challenging for the same reasons.

Nonetheless, comparisons are necessary and valuable for informed policymaking. Getting a snapshot of where a country stands relative to others in terms of specific technologies or enabling factors, globally or within a peer group (e.g., a region or income group), can help guide decisions on where further efforts are needed, offer lessons learned from similar contexts or identify areas where support, be it financial, technological or technical, could be beneficial.

The CCE Index, developed at KAPSARC and updated annually, serves as a tool for climate and energy policy stakeholders, providing a comparative overview of where countries stand on the road to net zero and how well-equipped they are to get there. The CCE Index compiles quantitative data from 38 trusted sources into a composite indicator covering 64 major economies across all world regions, accounting for approximately 90% of the global economy and $CO_2$ emissions (see Figure 1). Each country receives a score of 0-100 on each of the 38 indicators. These scores are then aggregated to form various

composite scores: the total CCE Index, CCE Performance, CCE Enablers, and various enabling areas. Additionally, five more indicators are applied to major oil- and gas-producing countries to create an add-on score called the Oil Producers Lens (OPL). The CCE Index methodology paper explains the logic behind establishing minimum and maximum scores (0 and 100) (Luomi, Yilmaz, and Alshehri 2021).[2]

**Figure 1.** 2023 CCE Index Country Coverage.



Source: CCE Index web portal 2023 (Alaa Alarfaj).

As the name implies, the CCE Index is grounded in the concept of the CCE, as illustrated in Figure 2. It is based on two related principles. First, to achieve CCEs or net-zero emissions, no technology option should be excluded. Emissions should be reduced, recycled, reused and removed in the most efficient way in each individual country. While each country will have its own mix of approaches, no single technology will suffice. (For further conceptual discussions, refer to Alshehri et al. 2022; Luomi et al. 2021; Luomi, Yilmaz, and Alshehri 2021).

**Figure 2.** The Circular Carbon Economy.
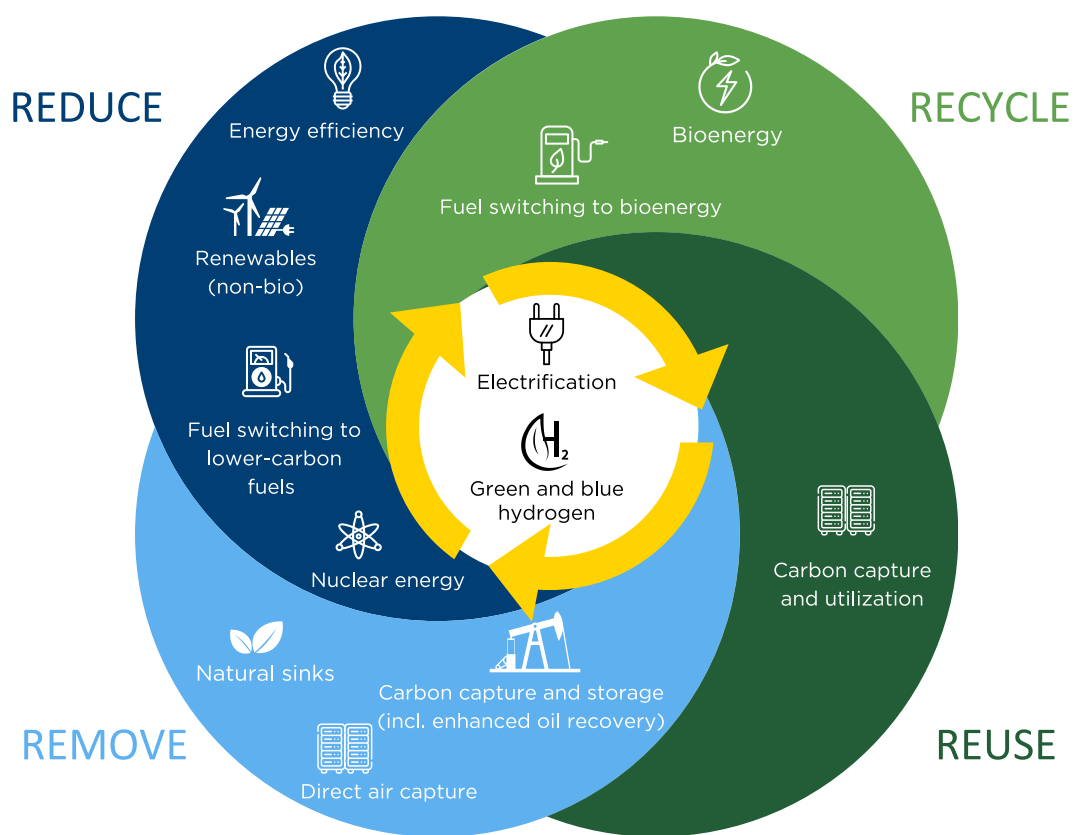


Source: CCE Index web portal 2023 (Alaa Alarfaj).

In line with this principle, the CCE Index generates the CCE Performance score to compare how countries are adopting available mitigation technologies and measures. This score incorporates measures for eight primary climate change mitigation technologies/measures currently in

implementation worldwide (for which harmonized datasets exist for at least 80% of the 64 countries covered by the index) (see Figure 3). Each of these measures is given equal weight, and each country's Performance score equals its average score on the eight CCE Performance indicators.

**Figure 3.** 2023 CCE Index Indicator Framework — Total CCE Index and Oil Producers Lens.
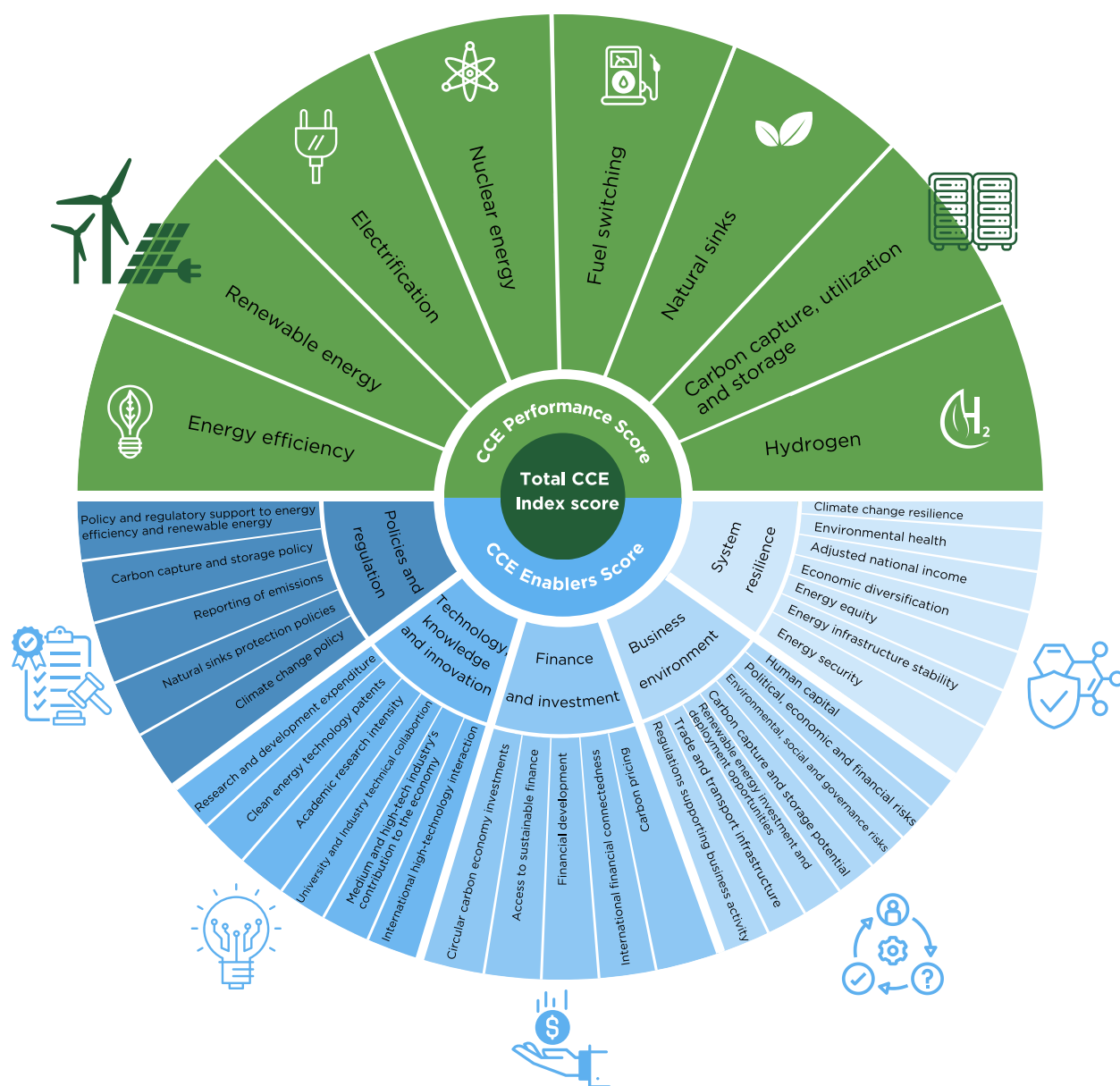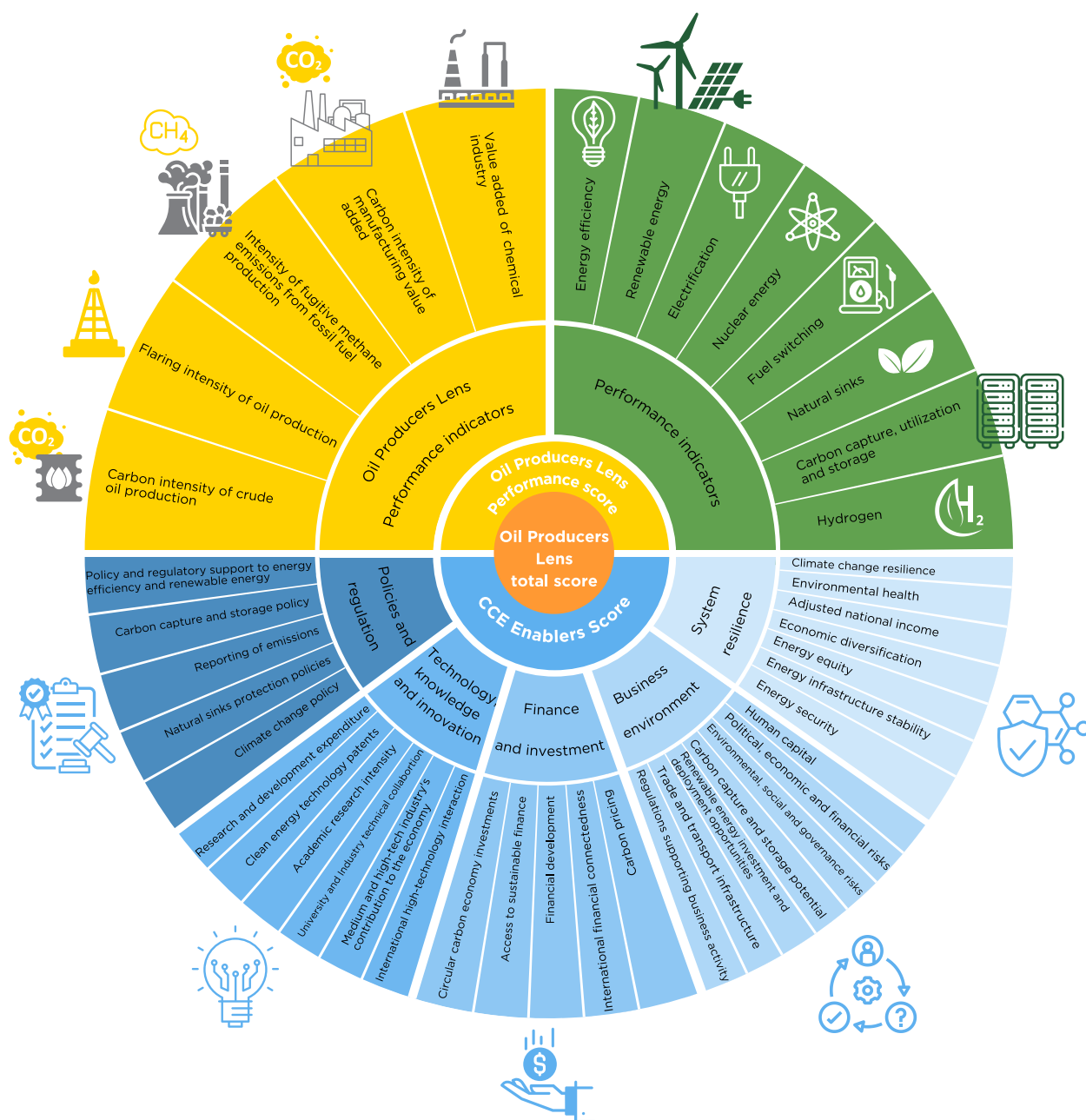
Source: CCE Index web portal 2023 (Alaa Alarfaj).

The second principle is that, as only a few countries have achieved net-zero emissions thus far (e.g., Bhutan, as discussed in Tzung 2022), a holistic approach is needed. This approach encompasses not only emission reductions but also the creation of enabling environments for transitions. Successful net-zero transitions require enabling policies, technology development and diffusion, financing and business environments that support all available and feasible technologies and approaches for emission reductions. Simultaneously, for these transitions to succeed, they must be underpinned by energy and socioeconomic systems that are resilient and leave no

one behind. In this area, the CCE Index generates the CCE Enablers score, which utilizes 30 quantitative datasets to assess countries' enabling conditions in five key areas: policies and regulation, technology, knowledge and innovation, finance and investment, business environment and system resilience (as shown in Figure 3).

Additionally, the CCE Index offers a way to separately examine a specific group of countries, namely major oil and gas producers (as indicated in Figure 3). Countries with substantial hydrocarbon production sectors, often accompanied by energy-intensive industries such as petrochemicals, steel or aluminum, face a more challenging transition to net-zero emissions compared to most other countries. These nations' hydrocarbon sectors will need to either scale down or transition to carbon circularity, which involves adopting still costly abatement technologies. Moreover, many major hydrocarbon producers depend heavily on export revenues related to their energy sector, making the energy transition also an economic transformation for them. The CCE index generates the Oil Producers Lens (OPL) score to facilitate comparisons within this group, which incorporates five metrics that gauge industrial carbon circularity performance. This add-on score is applied to the world's top-30 oil and gas-producing countries included in the index (with the exception of Libya and Turkmenistan which are excluded due to low data availability).

In summary, the CCE Index provides quantitative and comparative measures to address the following questions:

- **CCE Index (total score):** How well is a country doing overall on the CCE?

- **CCE Performance:** How effectively and comprehensively are countries engaging with key climate change mitigation technologies and measures?

- **CCE Enablers:** How well-prepared are countries to accelerate progress toward net-zero emissions and CCEs?

- **OPL:** How does industrial performance in major oil- and gas-producing countries align with CCEs?

This paper presents and analyzes the results of the 2023 CCE Index. Section 2 provides an overview of the results in all the main areas of the index. Section 3 offers analytical highlights from the 2023 edition, covering changes over time in total CCE Index scores, CCE Performance, and CCE Enablers, including its constituents, and provides highlights of regional frontrunners in 2023. Section 4 contains methodological notes and updates implemented in this edition.

# 2. 2023 Circular Carbon Economy Index Results

In 2023, the top 3 countries in the CCE Index are Norway (score 72), the U.K. (70) and the Netherlands (66) (see Figure 4). On the opposite end of the index ranking are Ethiopia (17), Uganda (18) and Tanzania (18), all situated in Sub-Saharan Africa. Notably, all but three of the top 20 ranking countries are high-income nations, representing all geographical regions except Sub-Saharan Africa and South Asia. This shows that while income and even region can influence a country's score on the CCE Index, these factors alone do not provide the full narrative: for instance, the lowest-scoring high-income country, Kuwait, ranks 49th and the highest-ranking Sub-Saharan African country, South Africa, stands at 27th.

The total CCE Index score rewards countries that consistently perform well, on average, in both CCE Performance and CCE Enablers, as it is an average of these two sub-indices. It not only identifies leaders in CCE transitions but also signals countries that are in danger of getting left behind. The score of the top-ranked country, Norway (72), is an impressive 4.2 times higher than that of the lowest-scoring country, Ethiopia (17). Further insights into the drivers of performance in the CCE Index across different countries are detailed in subsequent sections, which unpack the index into its constituent elements.

**Figure 4.** 2023 Total CCE Index Scores.
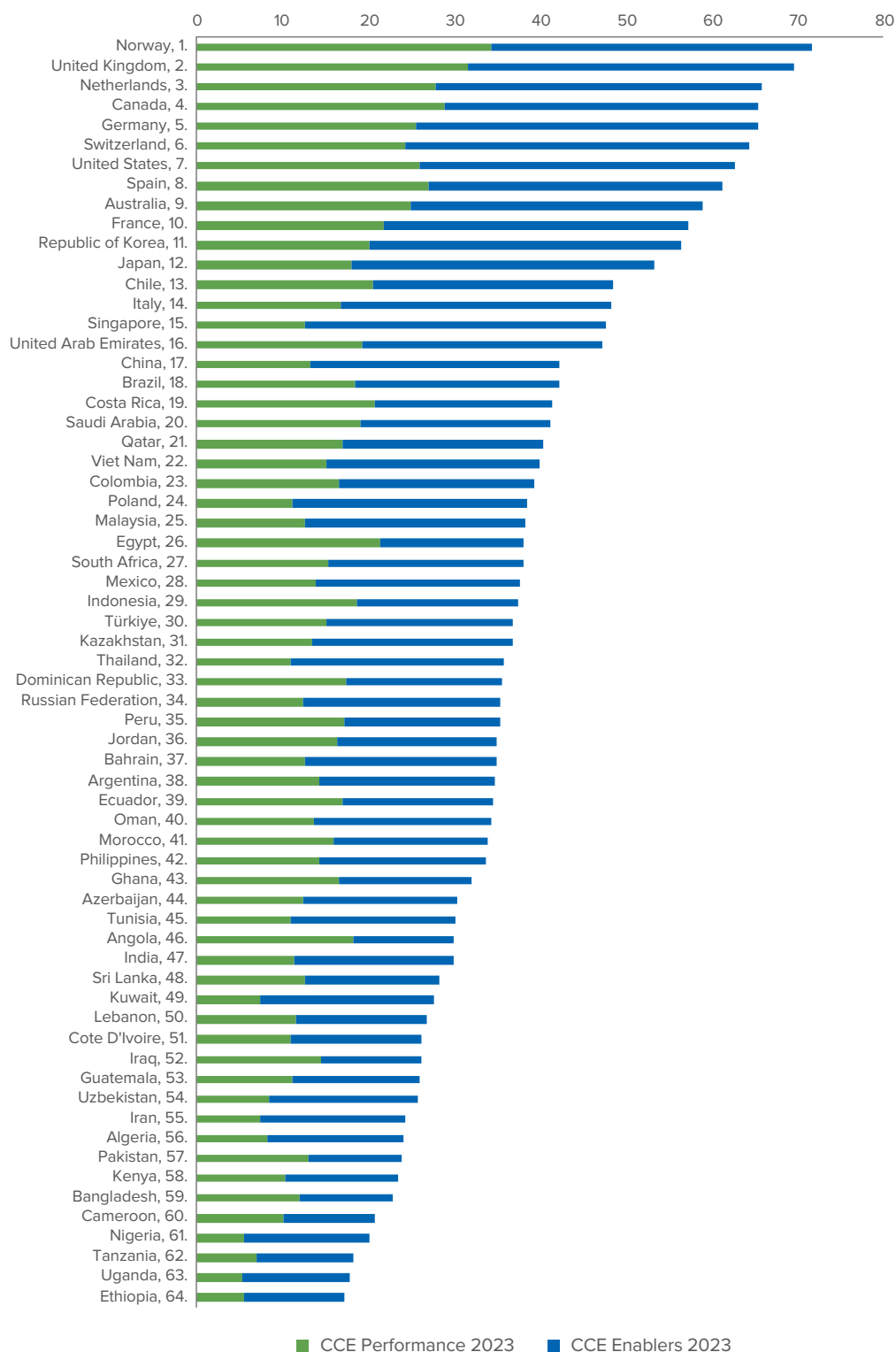


Source: Authors' construction

Note: The length of each bar represents the total CCE Index score, while different colors indicate the contribution of each sub-index to the total.

## 2.2 Circular Carbon Economy Performance

In 2023, the top countries in CCE Performance were Norway (69), the U.K. (63) and Canada (58) (see Figure 5). The top 10 list for CCE Performance includes the same countries as the total CCE Index, though with some variations in rank. While the top 10 on CCE Performance consists solely of high-income countries from Europe, Central Asia and North America, the top 20 is notably more diverse, featuring both high- and middle-income countries from all geographical regions except South Asia. On the lower end of the ranking are Uganda (11), Nigeria (11) and Ethiopia (11). The bottom 10 comprises a diverse group of countries from all income levels from Sub-Saharan Africa, Middle East and North Africa (MENA), and Europe and Central Asia. These low performers have no common denominator: some are African Least Developed Countries, while others are wealthier MENA oil and gas producers.

The CCE Performance score rewards countries that engage with a range of CCE technologies and approaches and achieve high scores in these. Countries, however, do not need to do well across the board but can leverage their unique strengths. This aligns with the CCE principle, which emphasizes the need for diverse mitigation approaches to achieve net zero, with choices based on each country's priorities, strengths and capabilities. For instance, the top performer, Norway achieved a score of 100 on four indicators (renewable energy, electrification, carbon capture, utilization and storage [CCUS] and clean hydrogen), but a score of 0 on one (nuclear energy) and scores ranging from 33 to 76 on the remaining three (fuel switching in the power sector, natural sinks conservation and energy efficiency). In 2023, all the top 10 countries in CCE Performance received a score of 50 or higher on at least three indicators.

Among the bottom 10 countries, only four receive a score exceeding 50 on any indicator. Generally, the lowest-scoring countries in CCE Performance have zeros or very low scores on more expensive technologies, namely nuclear energy, CCUS and clean hydrogen), as well as on renewable energy. The gap between the top performer, Norway (69) and the bottom performer, Uganda (11), is even wider than in the total CCE Index score, with Norway's score being 6.5 times that of Uganda's. Technologies with the highest number of zero scores across countries include nuclear energy (44 countries), CCUS (35 countries) and clean hydrogen (28 countries). Section 3.2 delves further into the two latter CCE Performance technologies, including their uptake across countries and over recent years.

**Figure 5.** 2023 CCE Performance Scores.
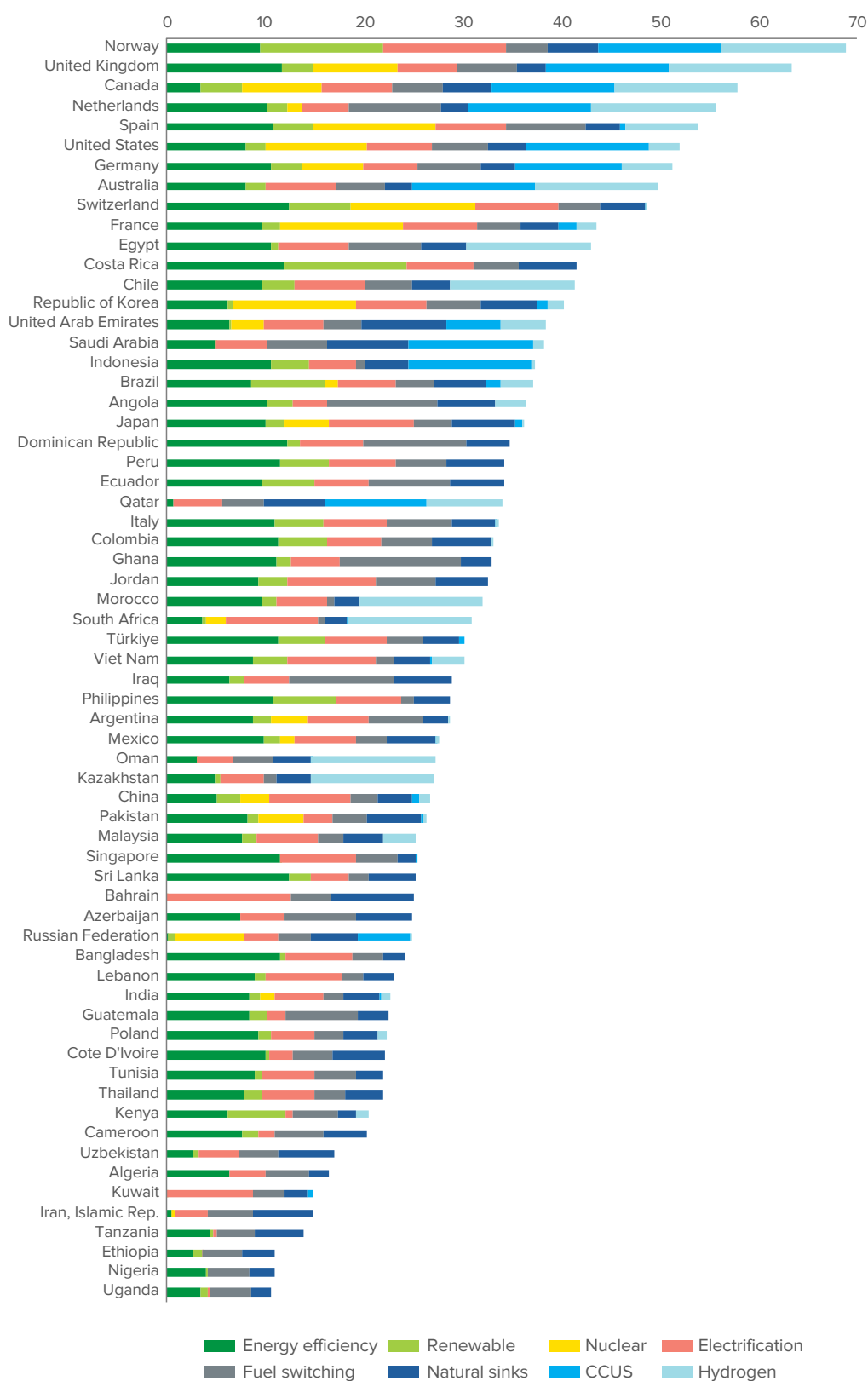


Source: Authors' construction
Note: The length of each bar represents the CCE Performance score, while different colors indicate the contribution of each indicator to the total. The order of countries reflects their ranking in the Performance sub-index.

# 2.3 Circular Carbon Economy Enablers

In 2023, Switzerland (score 80), Germany (80) and the Netherlands (76) secured the top positions in CCE Enablers (see Figure 6). Notably, eight of the countries within the top 10 in Enablers also feature in the top 10 on both the total CCE Index and CCE Performance. Switzerland stands out, ranking 9th in CCE Performance, which might suggest that the country is currently performing below its full potential. Finance and investment (score 89) are a particular strength for Switzerland, but also for the other top 3 countries: Germany (83) and the Netherlands (88).

Within the CCE Enablers sub-index, wealth tends to correlate with stronger outcomes. Among the top 20 countries, only three are middle-income nations: China (58), Malaysia (51) and Viet Nam (50). China's high rank (15th) can be attributed to its favorable business environment (score 70), with scores above 50 in all other areas as well. Malaysia and Viet Nam also exhibit strengths in their business environments (both scoring 62) but lag behind in finance and technology. Surprisingly,

the bottom of CCE Enablers are three middle-income countries: Cameroon (21), Pakistan (21) and Bangladesh (22). These countries achieve low scores on average across the five enabling dimensions, particularly in finance and technology, with their CCE Enablers scores averaging 3.6 times lower than those of the top 3 countries.

CCE Enablers are an aggregate measure of the five enabling areas, or dimensions, gauged by the index: policy, technology, finance, business environment and overall system resilience. A country's performance on average in these five dimensions determines its CCE Enablers score. The first four dimensions gauge factors essential for supporting a country's journey toward achieving net-zero emissions. The fifth enabling dimension, system resilience, holds a two-way relationship with the CCE transition. On the one hand, factors such as energy grid stability, economic diversification and resilience to physical climate risks facilitate countries' transitions. On the other hand, net-zero transitions should not adversely affect a country's energy security (measured as the share of fuel imports in total imports), energy equity or economy, among other aspects. Subsequent sections further unpack the 2023 results across these five enabling dimensions.

**Figure 6.** 2023 CCE Enablers Scores.
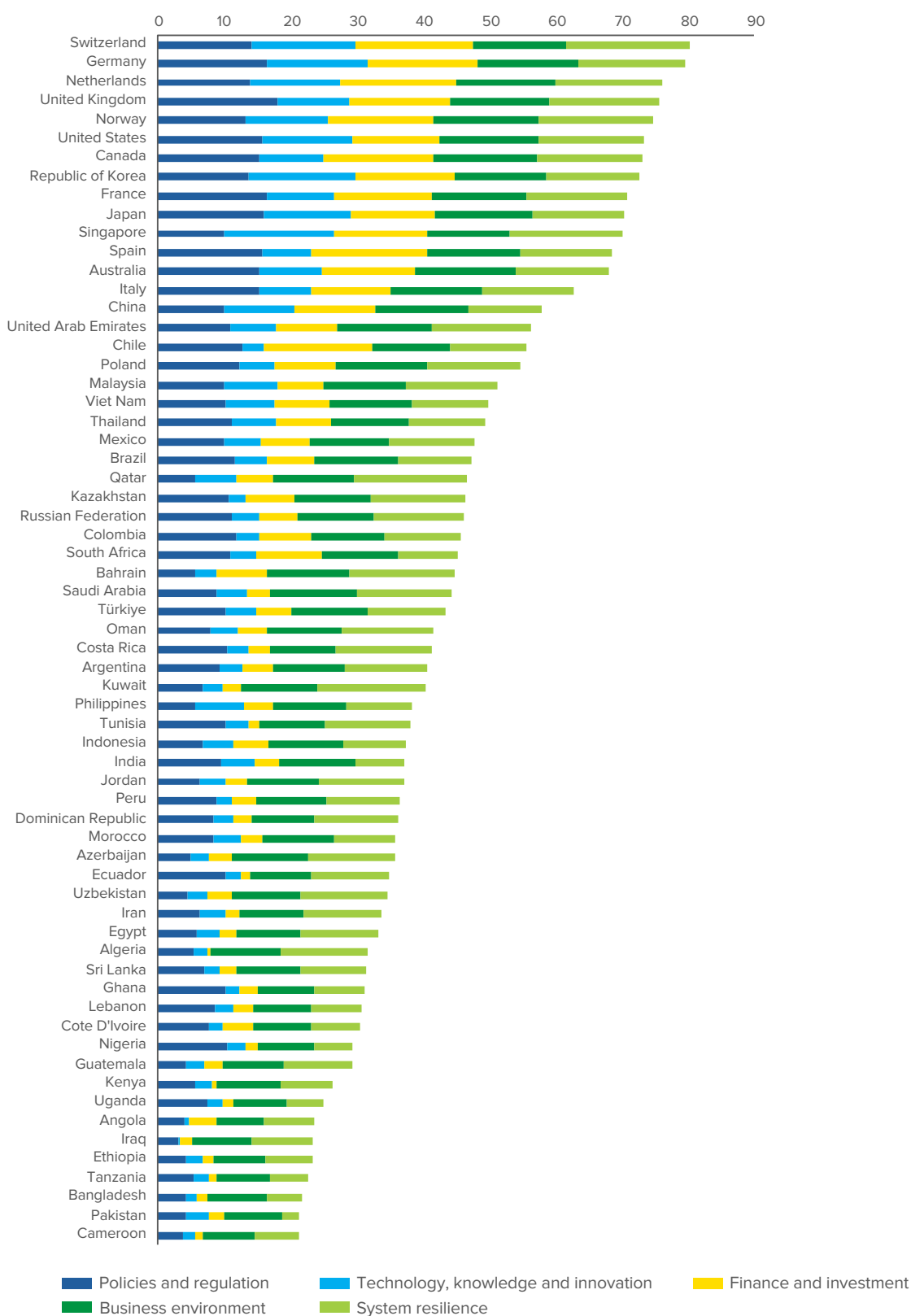


Source: Authors' construction

Note: The length of each bar represents the CCE Enablers score, while different colors indicate the contribution of each dimension to the total. The countries are ordered based on their ranking in the Enablers sub-index.

# 2.3.1 Policies and Regulation

In 2023, the U.K. (score 91), followed by Germany (83) and France (82), received the highest scores in policies and regulations for CCE transitions (see Figure 7). The U.K. consistently performed at a high level across all five indicators in this dimension: policy and regulatory support for renewable energy and energy efficiency (87), CCS policy (71), natural sinks protection policies (95), reporting of emissions (100) and climate change policy, or the existence and bindingness of a net-zero target (100).[3] Germany and France achieved similarly high scores in all other indicators except CCS policy (34 and 39, respectively). At the bottom of the ranking are three middle-income countries: Iraq (16), Cameroon (19) and Angola (21), which scored particularly low on CCS policy, emissions reporting and climate change policy.

Overall, countries in the 2023 index received the lowest scores in CCS policy, reflecting and partially explaining the highly concentrated and still low levels of deployment of these technologies globally. Regarding emissions reporting, measured by compliance with the U.N. Framework Convention on Climate Change reporting requirements, most Annex I (developed) countries received high scores. A notable change will take place

in this area from 2024 onwards when all countries are expected to start reporting on their emissions biannually. This will place a further burden on developing countries that have been required to report less frequently to date but have still struggled to keep up with their reporting obligations. Simultaneously, this is expected to greatly enhance data transparency and enable better-informed policymaking, as emissions reports can have a maximum two-year lag, representing another substantial change for developing countries that have generally reported on their emissions with a lag of several years.

Another indicator where many countries received high scores is net-zero emissions, where a target set in law awards a country a full score (100), and one included in a policy document garners a score of 80. While mid-century emission targets are a very rough indicator of the robustness of a country's climate policy, there are few other methods to compare countries in this area, primarily due to the lack of standardization in how countries set their medium-term emission targets, such as those found in their nationally determined contributions to the Paris Agreement. Perhaps more than in other policy areas, comparing countries' climate policy targets with each other is a sensitive exercise, given the expectation under the U.N. climate convention that developed countries should do more, while there is no objective means to assess how rapidly each country, whether developed or developing, should reduce its emissions..

**Figure 7.** Policies and Regulation Dimension Scores.
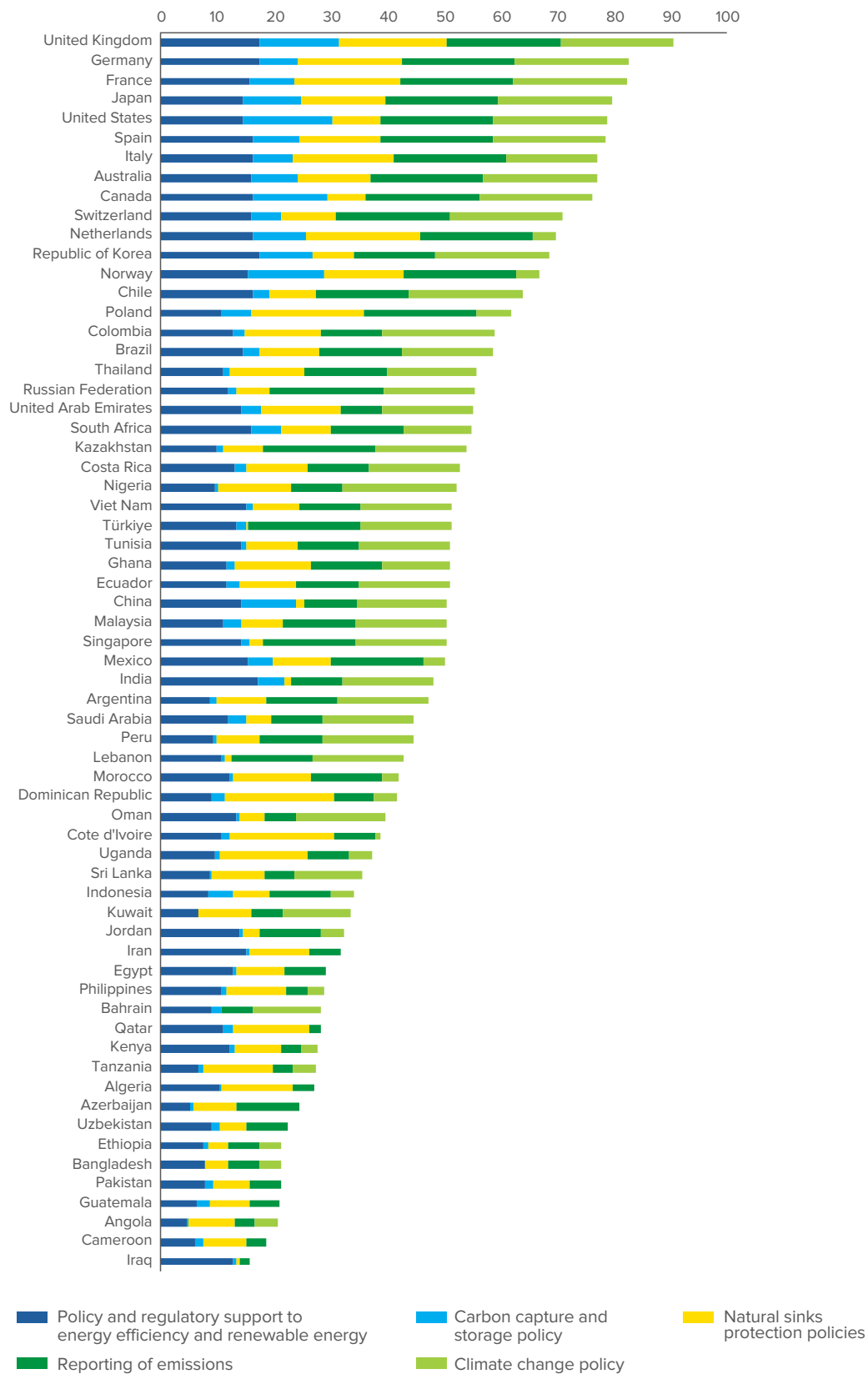


Source: Authors' construction

Note: The length of each bar represents the policies and regulation dimension score, while different colors indicate the contribution of each indicator to the total. The order of countries reflects their ranking in this dimension.

# 2.3.2 Technology, Knowledge and Innovation

In the 2023 CCE Index, two Asian countries lead in technology, knowledge and innovation: Singapore (score 82) and the Republic of Korea (80), followed closely by Switzerland (78) (see Figure 8). Notably, nine of the top 20 countries in this dimension are located in the Asia and Pacific region, including five middle-income countries: China (53), Malaysia (40), Viet Nam (37), the Philippines (36) and Thailand (34). The index scores in this dimension decrease substantially, with a decline of 48 points from the top-ranking country to the 20th (Thailand). At the lower end of the technology ranking, some countries received exceptionally low scores, with the three lowest-ranking countries scoring less than 10: Iraq (1), Angola (3) and Bangladesh (8). This highlights the considerable differences in technology availability and readiness worldwide and underscores the urgent need for action to address related inequalities among countries.

Indicators within this dimension measure the creation and spillovers (both diffusion and absorption) of technology, knowledge and innovation. On the knowledge creation side, two of the three indicators exhibit a highly skewed distribution: concerning clean energy technology patents (relative to the country's total population), the top 3 countries (the Republic of Korea, Germany and Norway) score 100, while countries ranked 15th and beyond all score less than 10. In terms of the "intensity" of academic research, measured by the Nature Index and normalized to population size, four countries (Switzerland, Singapore, Netherlands and the United States) received a score of 100, while countries ranked 17th and beyond scored less than 10.

The gaps between the top and bottom performers on the other indicators are also substantial. For the third knowledge creation indicator, research and development expenditure (as a share of GDP), the top 5 countries (the Republic of Korea, the U.S., Japan, Switzerland and Germany) spend more than 3%, while approximately half of the 64 countries in the index are estimated to spend 0.5% or less. On international high-technology interaction, measured by the share of the sum of high-tech exports and imports of total trade, three countries (Malaysia, the Philippines and Viet Nam) receive the top score of 100, while the bottom third of countries score less than 10. Considering other high-performing countries in Asia, such as China (score 96), Singapore (87) and the Republic of Korea (75), the region stands out as having significant potential to emerge as a hub for clean technology production and trade.

**Figure 8.** Technology, Knowledge and Innovation Dimension Scores.



Legend:
- Research and development expenditure
- Clean energy technology patents
- Academic research intensity
- University and industry technical collaboration
- Medium and high tech industry's contribution to the economy
- International high-technology interaction

Source: Authors' construction

Note: The length of each bar represents the technology, knowledge and innovation dimension score, while different colors indicate the contribution of each indicator to the total. The order of countries reflects their ranking in this dimension.
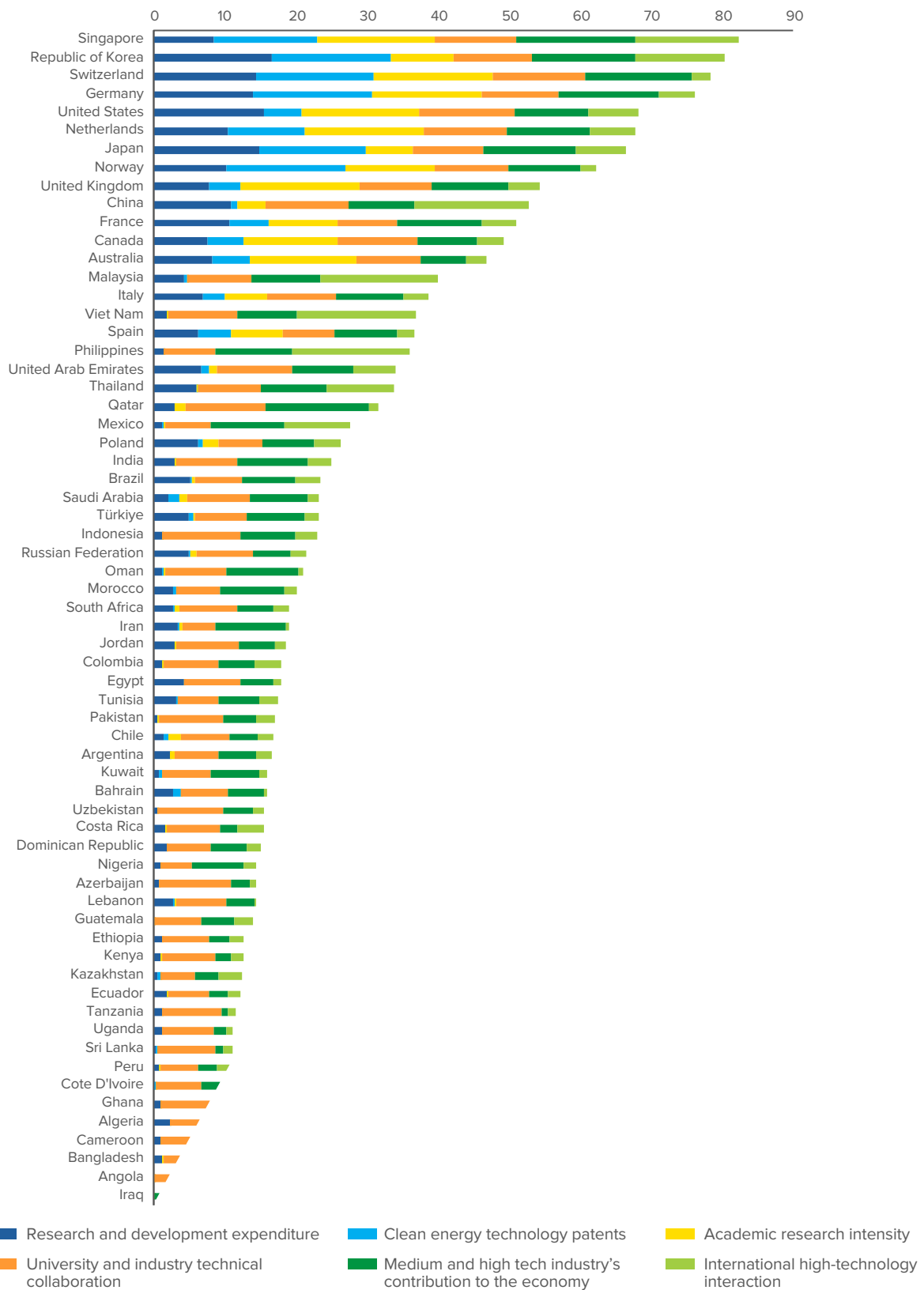
## 2.3.3 Finance and Investment

The 2023 finance and investment enablers scores display similarly wide gaps between top and bottom performers. Switzerland leads with a score of 89, while Algeria, the lowest performer, scores only 3 (see Figure 9). The top 3 countries in finance and investment all achieve scores of 100 on at least two indicators.[4] The highest-scoring country from Latin America and the Caribbean on any of the enabling dimensions is Chile (score 81), ranking sixth. Chile performs well (80 or above) in all areas of this dimension, except for financial development, where it still scores above the average (50, compared to a median of 39).

Perhaps counterintuitively, in the bottom half of the ranking there are three high-income countries, all from the Gulf Cooperation Council. However, their structural path dependencies related to oil production likely explain this, as all three received low scores on energy transition-specific metrics. These metrics encompass CCE investments (which cover renewable energy, CCS, hydrogen, energy storage, electrified transport, electrified heat, nuclear and sustainable materials), sustainable debt (involving green and sustainable bonds and loans) and carbon pricing (indicating the existence of a carbon tax, emissions trading scheme [ETS] or carbon crediting mechanism). On the two more generic financial indicators, financial development (based on the International Monetary Fund's Financial Development Index score) and international financial connectedness (measuring net foreign financial flows relative to GDP size), they perform better.

Regarding the CCE transition-focused indicators, countries have a highly uneven distribution in the proportion of their GDP spent in CCE investments. Only the top 19 countries on this indicator spent more than 0.5% of their GDP on various CCE technologies between 2019-2021, on average, according to data from BNEF (2023). Norway, the leading country, spent between 2% and 2.5% of its GDP during these years. In contrast, the bottom 22 countries spent less than 0.1% of their GDP on CCE investments. Sustainable debt follows a similar skewed distribution, with the top 23 countries on this indicator raising an equivalent of 0.5% or more of their GDP from environmental, social and governance (ESG) debt instruments, including bonds and loans. The Netherlands, the leading country in this metric, leveraged an equivalent of 6.3% of its GDP. Conversely, 31 countries at the bottom end attracted an equivalent of less than 0.1% of their GDP in sustainable debt. In the case of both indicators, countries spending less than 0.1% primarily include low- and middle-income developing countries, along with some Gulf oil producers and European or Central Asian economies in transition.

Carbon pricing gives points to countries depending on whether they have in place, or in the pipeline, a national or subnational compliance (tax or ETS) or a voluntary (crediting mechanism) scheme. schemes. Currently, 30 out of the 64 countries score zero on this metric. These countries are all developing countries, primarily located in the MENA and Sub-Saharan Africa regions. However, half of the 10 highest-scoring countries on this indicator are developing countries according to the UNFCCC classification: the Republic of Korea, China, South Africa, Kazakhstan and Chile. This suggests that while carbon pricing has historically been more associated with developed countries, related instruments are gaining popularity in developing countries. According to the World Bank (2023), in 2023, 23% of global GHG emissions were covered by either a carbon tax or an ETS.

**Figure 9.** Finance and Investment Dimension Scores.



Legend:
- Circular carbon economy investments
- Access to sustainable finance
- Financial development
- International financial connectedness
- Carbon pricing
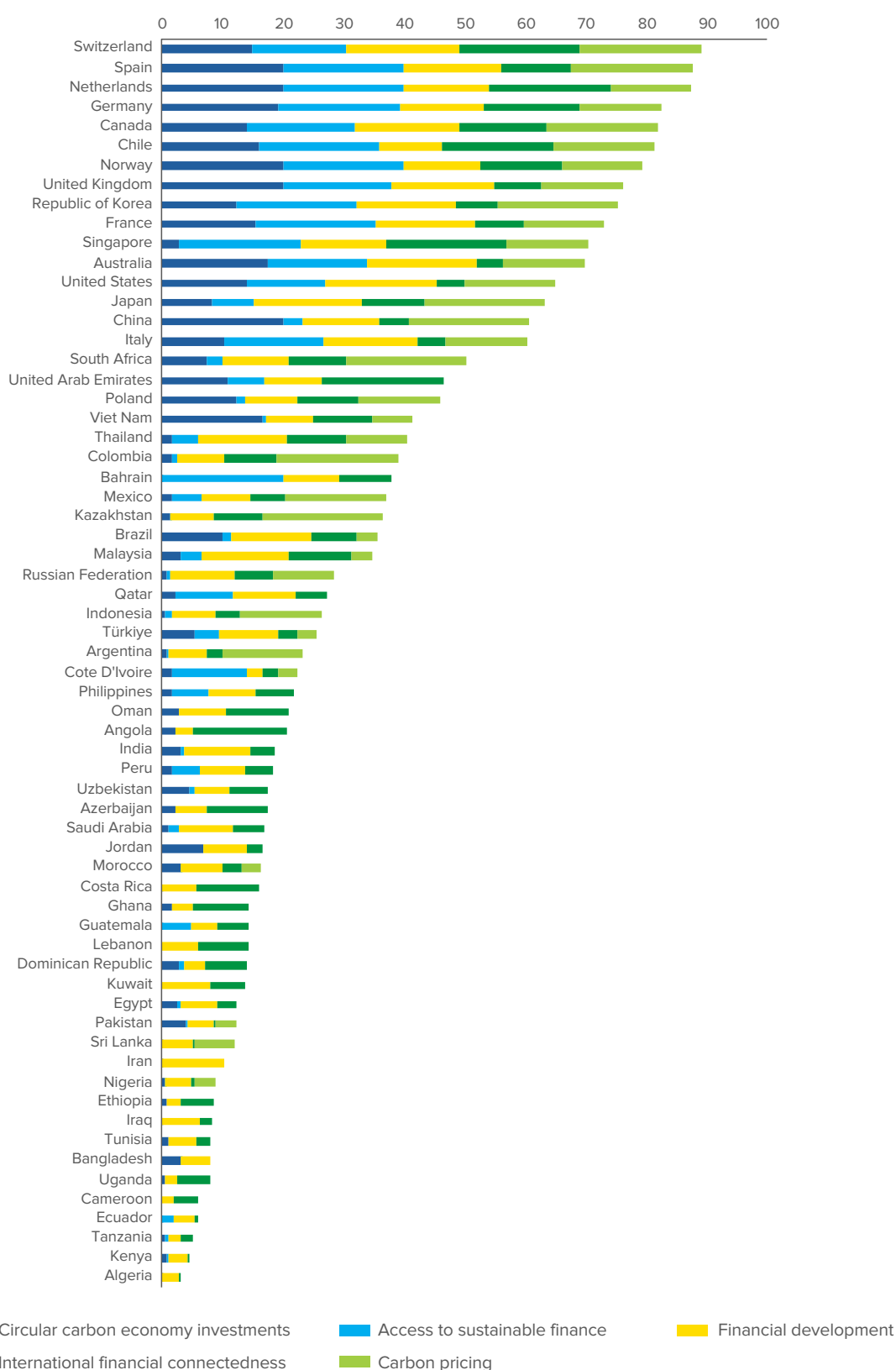
Source: Authors' construction

Note: The length of each bar represents the finance and investment dimension score, while different colors indicate the contribution of each indicator to the total. The order of countries reflects their ranking in this dimension.

# 2.3.4 Business Environment

In 2023, Canada (score 79), Norway (79) and Australia (77) emerged as leaders in fostering business environments conducive to CCE transitions (see Figure 10). In contrast, Angola (36), Ethiopia (38) and Cameroon (38) found themselves at the bottom of the ranking. It is worth noting that the spread of scores in this dimension is less pronounced compared to other dimensions. However, substantial differences persist between top-performing and bottom-performing nations. The top 10 countries, on average, exhibit almost double the score of the bottom 10, highlighting significant gaps, particularly pronounced in Sub-Saharan African countries, where eight of the bottom 10 are situated.

The business environment dimension encompasses diverse factors, including regulatory support, trade and transportation infrastructure, renewable energy investment opportunities, carbon capture and storage (CCS) potential, ESG risks, political, economic, and financial risks, and the quality of human capital. Across these factors, gradual differences prevail, with top-performing countries indicating 1.5 to 2 times higher performance than their bottom-performing counterparts. Areas deserving special attention in developing countries include the strengthening of regulatory environments, enhancements to transportation infrastructure and seizing opportunities in clean technology while effectively mitigating associated economic, political and financial risks.

The only exception to the less pronounced differences across countries is the CCS potential indicator, which is based on the Global CCS Institute's CCS Storage indicator and measures the development of a country's $CO_2$ storage resources (GCCSI 2023). In this indicator, three countries score close to 100 — Canada (score 98), the U.S. (96) and Norway (96) — and three countries score 0 — the Dominican Republic, Singapore and Costa Rica. Notably, among the top-10 countries on the CCS potential indicator, all are among the top-30 global oil and gas producers, which reflects the relevance of CCS technologies for the decarbonization of their hard-to-abate sectors.

**Figure 10.** Business Environment Dimension Scores.



Source: Authors' construction

Note: The length of each bar represents the business environment dimension score, while different colors indicate the contribution of each indicator to the total. The order of countries reflects their ranking in this dimension.
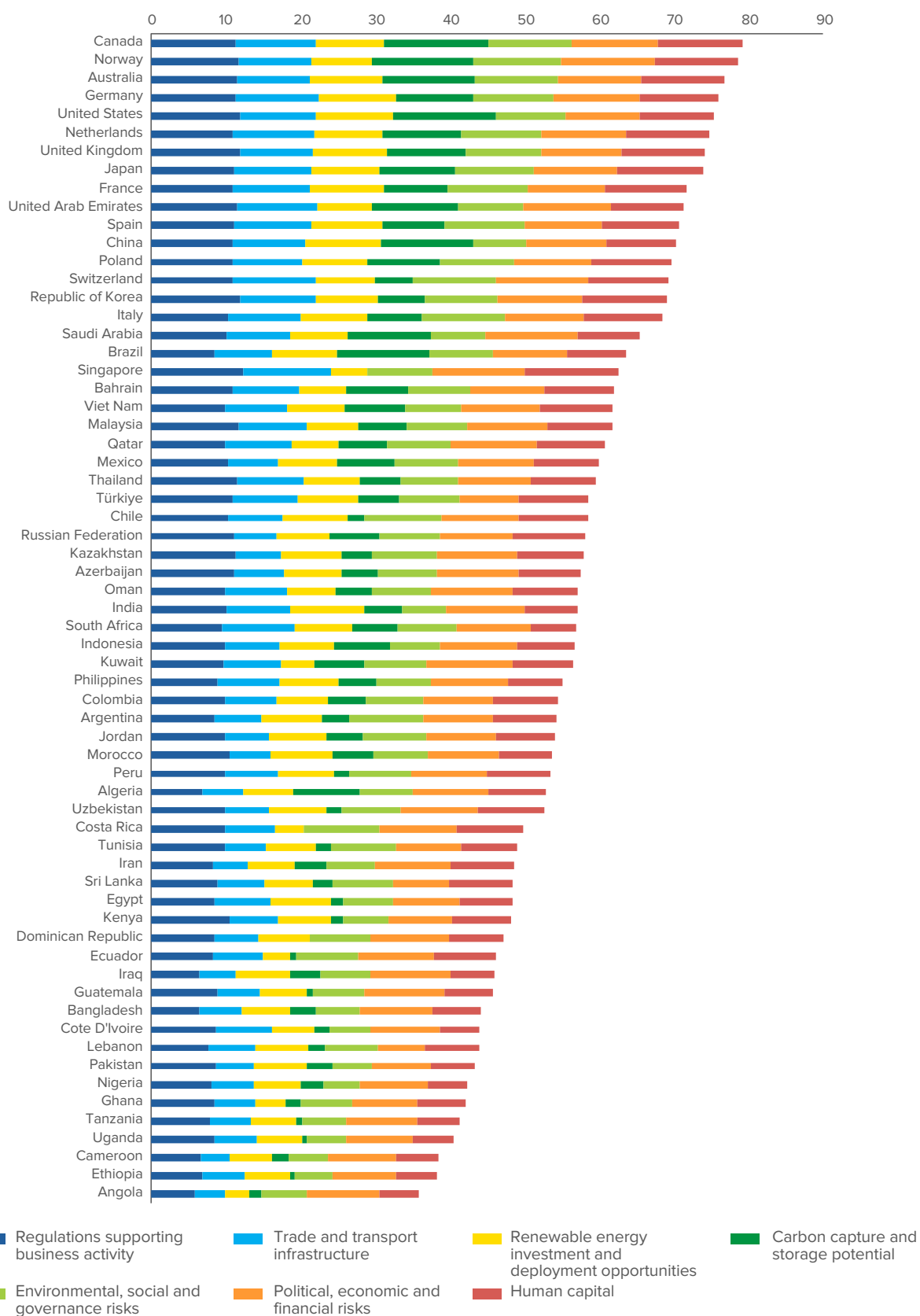
# 2.3.5 System Resilience

In the 2023 index, Switzerland (score 93) stands out with an exceptionally high score in system resilience, followed by Norway (87) and Singapore (86) (see Figure 11). The top 20 countries in this dimension are regionally diverse, predominantly comprising high-income nations. Among them, nine are situated in Europe and five are in the Gulf subregion of the MENA. Two middle-income countries, Costa Rica and Kazakhstan, also secure places in the top 20. These countries consistently score well across at least five of the seven system resilience indicators. These indicators measure aspects such as energy security, stability of energy infrastructure (i.e., grid reliability), energy equity (i.e., access and affordability), economic diversification (i.e., the complexity and uniqueness of a country's exports), adjusted national income (i.e., available income for the transition net of consumption of fixed capital and natural resources depletion), environmental health (i.e., outdoor and indoor particulate matter pollution) and climate change resilience (i.e., fatalities and economic losses from extreme weather events).

Conversely, at the bottom of the ranking on system resilience are Pakistan (13), Bangladesh (27) and Tanzania (28). Among the bottom 10, seven are again Sub-Saharan African countries and three from South Asia. Apart from their low wealth levels, there is no clear pattern regarding the specific challenges faced by these countries. On average, they encounter the most difficulties in addressing energy inequality and particulate matter pollution. To illustrate the diversity of challenges among countries ranking lower in the system resilience dimension, Ghana, positioned at 55th, earns a high score in energy security (96) but scores poorly in grid stability (23) and energy equity (26). Meanwhile, India, ranked 56th, has a high score in grid stability (95) but struggles with energy security (15), environmental health (pollution) (30) and climate resilience (13). (Notably, because electricity grids are extremely unstable in approximately a dozen countries included in the index, this skews the score distribution and makes it easy to achieve a higher score on this indicator.)

**Figure 11.** System Resilience Dimension Scores.



Legend:
- Energy security
- Energy infrastructure stability
- Energy equity
- Economic diversification
- Adjusted national income
- Environmental health
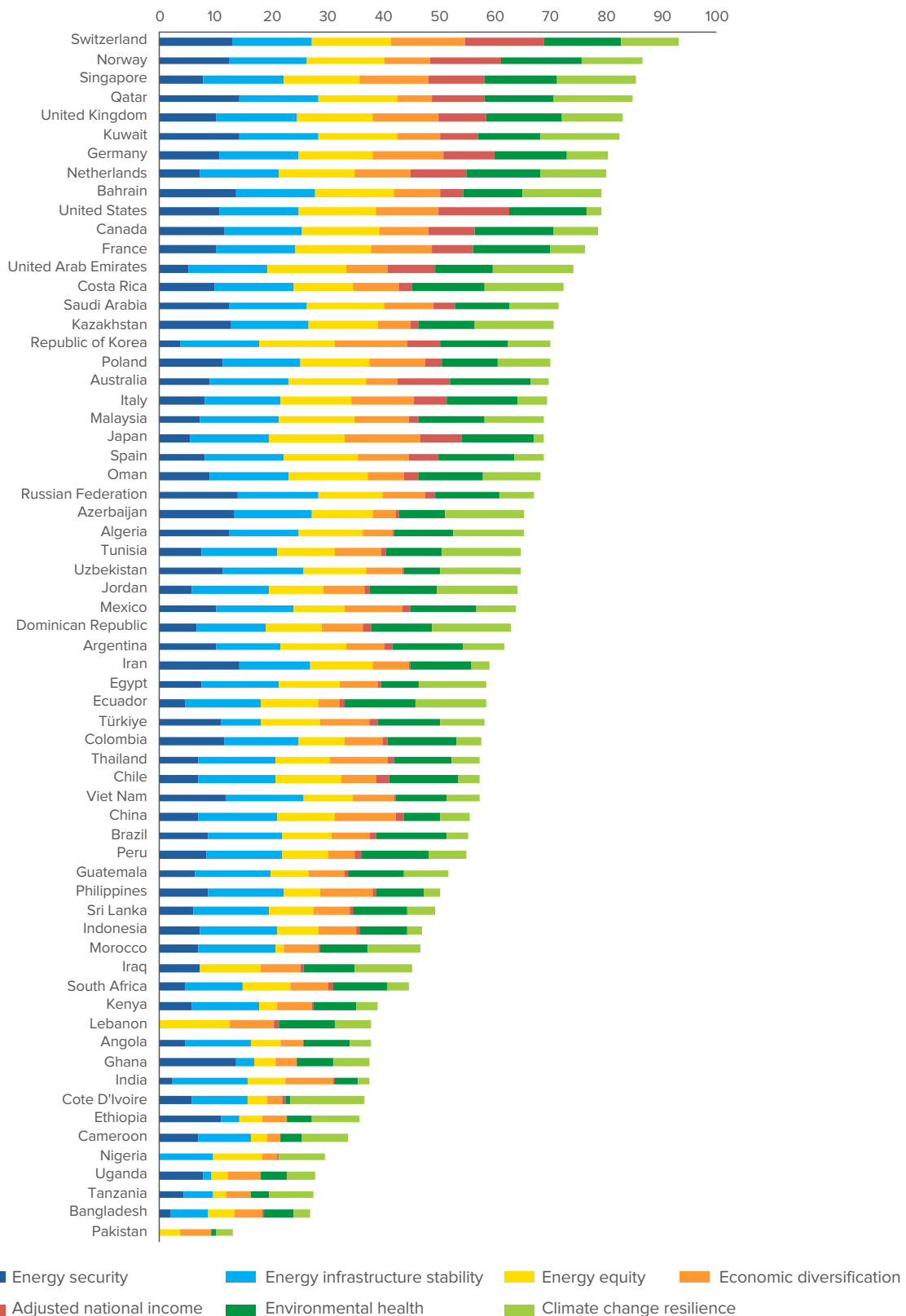- Climate change resilience

Source: Authors' construction

Note: The length of each bar represents the system resilience dimension score, while different colors indicate the contribution of each indicator to the total. The order of countries reflects their ranking in this dimension.

# 2.4 Oil Producers Lens

The OPL score offers an alternative perspective for evaluating the top 30 oil and gas producers included in the CCE Index and. Due to their resource-based industries and industrial setup, these producers face unique challenges and opportunities in the transition to net-zero emissions. The OPL score is derived by adding five additional indicators that gauge industries' carbon circularity performance and readiness into the CCE Performance subindex. Consequently, the total OPL score is composed of a 25% contribution from the five OPL indicators, a 25% contribution from the eight existing CCE Performance indicators, and a 50% contribution from the existing 30 CCE Enablers indicators.

In 2023, the top 3 countries in the OPL mirrored those in the total CCE Index: Norway (OPL score 75), the U.K. (73) and the Netherlands (73) (see Figure 12). Conversely, at the lower end of the rankings, the five lowest-scoring countries in the OPL also align with the five lowest-scoring countries in the total CCE Index, albeit in a different order. The bottom three countries in the OPL are Algeria (23), Iraq (25) and Uzbekistan (27).

The five OPL indicators assess the carbon intensity of oil production, the flaring intensity of oil production, the intensity of fugitive emissions from fossil fuel production and the carbon intensity of manufacturing value added. As a proxy for future carbon circularity industries, the OPL incorporates the value added by the chemical industry. On average, the highest-scoring countries across these five indicators are Saudi Arabia (average score 83), the Netherlands (83) and Norway (80). These three countries either achieve a score of 100 or come very close on the three indicators related to emission intensity in the fossil fuel industry. This implies that they have some of the lowest $CO_2$ and fugitive methane emissions per unit of hydrocarbon energy produced on a global scale.

As depicted in Figure 12, most countries' OPL scores tend to be higher than their total CCE Index scores. This trend is more pronounced among developing country oil producers than developed countries. In 2023, out of the 28 countries in the OPL, 17 received scores that were 5 points or more higher than their total CCE Index scores. Notably, only one of these countries, the Netherlands, is a developed country.

**Figure 12.** 2023 CCE Oil Producers Lens Scores.
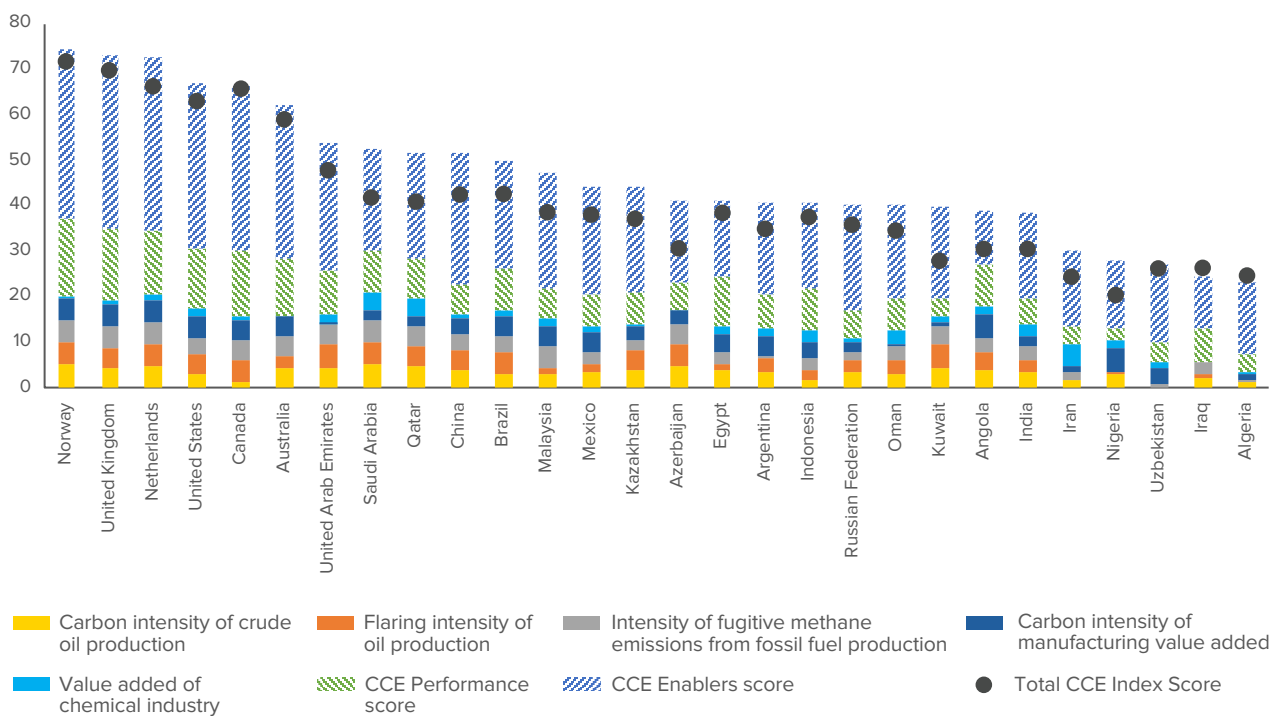


Source: Authors' construction
Note: The length of the bar indicates the total OPL score. Different colors display each component's (indicators' and sub-indices') contribution to the total. The order of countries reflects their ranking in the OPL.

# 3. Analysis of the 2023 Results

This section provides analytical highlights from the 2023 CCE Index edition in the following areas: changes between 2021, 2022 and 2023 in the total CCE Index scores, CCE Performance, and CCE Enablers, and highlights of regional frontrunners in 2023.

## 3.1 Circular Carbon Economy Index — Most Countries Have Made Incremental Improvements

The CCE Index, now in its third edition, incorporates two years of historical data. Each edition includes one additional year of historical data, and past index scores are recalculated using the latest available data, taking into account retrospective updates from data providers. This approach ensures comparability of index scores across different years and ensures that the most accurate data available is used to track countries' performance (refer to Luomi, Yilmaz, and Alshehri 2022).

Figure 13 illustrates changes in countries' total CCE Index scores from 2021 to 2023, based on the current CCE Index

edition. The overall height of the bar represents a country's CCE Index score in 2023. A dark green area indicates an improvement in the country's score from 2022, while a red area indicates a decrease in the country's score from 2022. The blue dash represents the country's CCE Index score in 2021.

The major improvers between 2022 and 2023 include Indonesia (with a gain of 5.7 points), Saudi Arabia (5.7), Germany (4.7), Qatar (4.3), Ghana (3.9) and Malaysia (3.1). These changes were primarily driven by improvements in CCE Performance (as discussed in the next subsection), while changes in the Enablers sub-index also contributed to the results. In contrast, only six countries experienced a decrease of more than 1 point in their scores between 2022 and 2023, with the most notable drops occurring in Jordan (2.5), the U.K. (2.4) and Cameroon (2.1). These decreases were also influenced by changes in their CCE Performance. It is important to note that the CCE Enablers sub-index comprises five dimensions and 30 indicators, reflecting the complex nature of enabling environments that require longer time frames for improvement.

**Figure 13.** Total CCE Index Scores and Changes, 2021-2023.
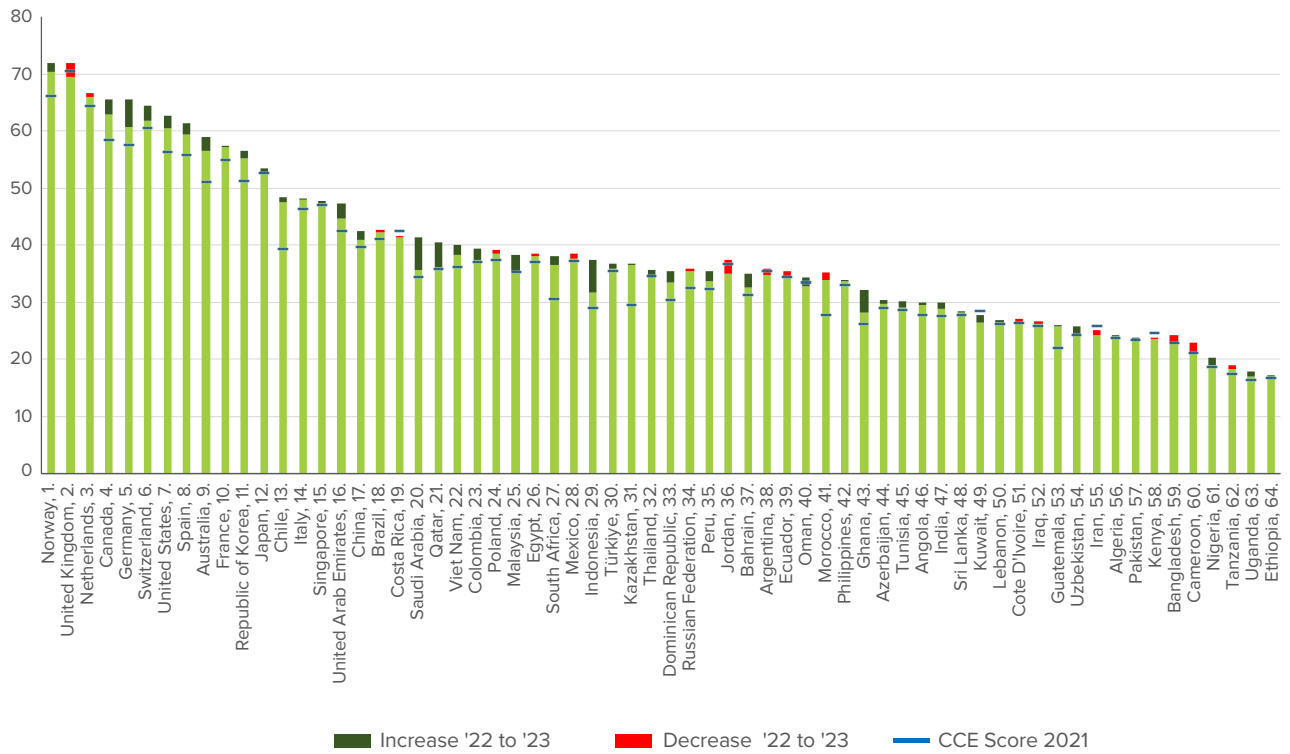


Source: Authors' construction.

Note: The order of countries reflects their ranking in the total CCE Index in 2023.

## 3.2 Circular Carbon Economy Performance — CCUS and Clean Hydrogen Pipelines Experience Rapid Growth, but Unequal Distribution and Low Operational Capacities Persist

Figure 14 shows the contribution of each of the eight CCE Performance indicators to changes in countries' scores in this sub-index between 2022 and 2023. For the top improvers — Indonesia, Saudi Arabia and Germany — announced capacities of major CCUS projects considerably contributed to their overall CCE Index score improvements

from 2022 to 2023.[5] For Qatar and Malaysia, the primary source of the increase was major announcements regarding clean hydrogen capacity additions. Ghana, in turn, accelerated its transition away from oil in the power sector.

For the countries that experienced the most significant drops from 2022 to 2023 — Jordan, the U.K. and Cameroon — changes were primarily motivated by lower scores in fuel switching. This indicator measures both the share of oil and coal in power generation and changes in this share over a five-year period. In the case of the U.K., there was a substantial drop in the share of coal in the country's electricity mix from 2015 to 2016. The index score for 2022 covers the period 2015-2020, during which the share of coal decreased by 20.6 percentage points. For the 2023 score, the period covered is 2016-2021. Since the substantial drop from 2015 to 2016 is no longer registered, the decline only totaled 6.9 percentage points, resulting in a lower indicator score. Jordan similarly experienced a notable drop in the share of oil in its power sector mix from 2015 to 2016. Cameroon, in turn, had a temporary spike in oil use in its power sector in 2015.[6][7]

**Figure 14.** CCE Performance Scores — Key Drivers of Changes from 2022 to 2023.
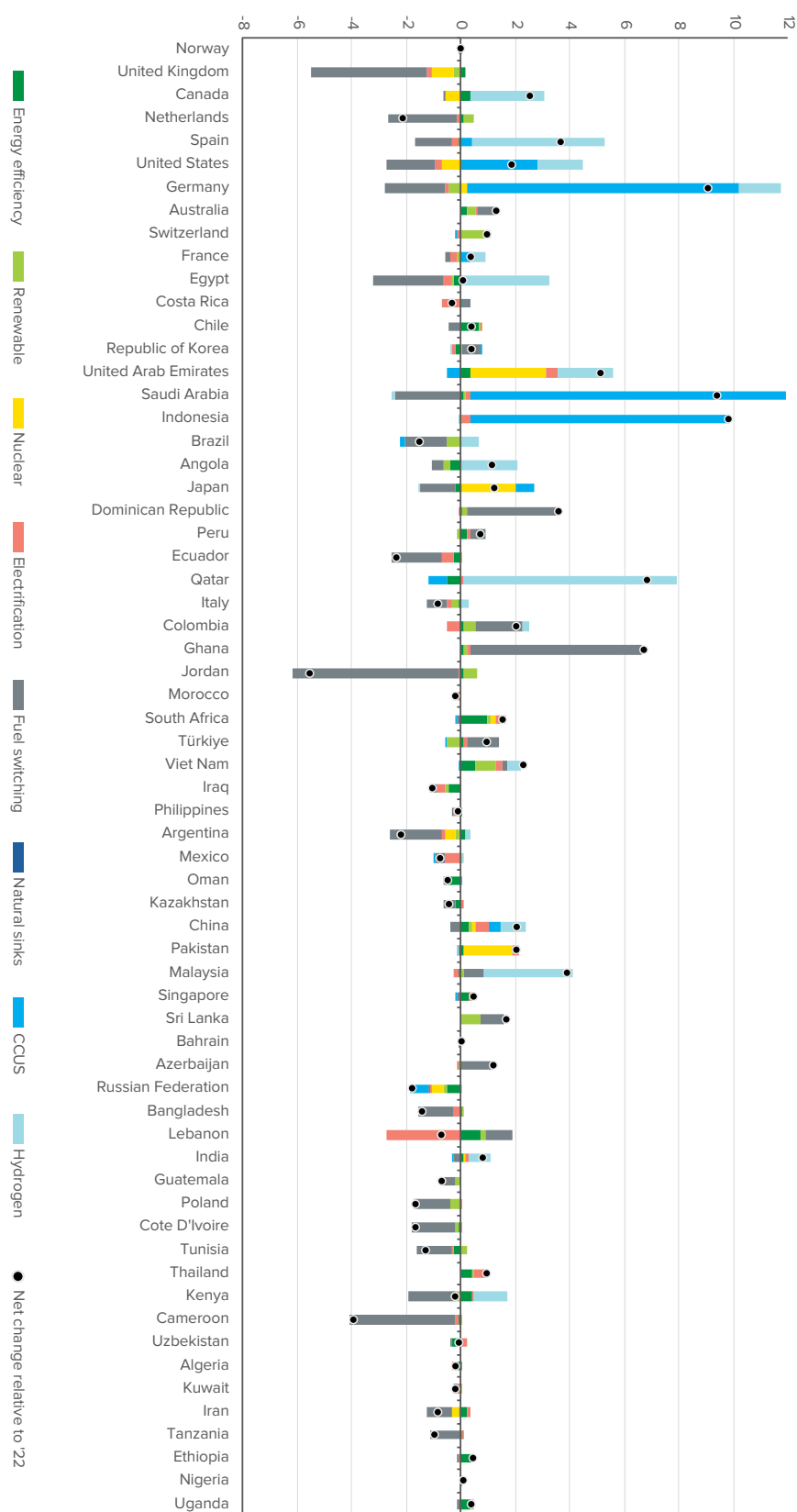
Legend:
- Energy efficiency
- Renewable
- Nuclear
- Electrification
- Fuel switching
- Natural sinks
- CCUS
- Hydrogen
- ● Net change relative to '22

Source: Authors' construction.

Note: The order of countries reflects their ranking in the Performance sub-index in 2023.

As highlighted above, CCUS and clean hydrogen drove some of the bigger changes in CCE Index scores from 2022 to 2023. These indicators therefore merit closer examination. The CCUS indicator (see Figure 15) measures the total announced capture capacity of countries' projects in various stages, including operational, under construction, advanced development, early development or evaluation.[8] The indicator adjusts for country size by normalizing the total capacity with the country's GDP. The 2023 score for this indicator encompasses projects through 2022 (based on their announcement year), while the 2022 score covers projects through 2021 and so on.

The first clear observation is that the distribution of CCUS projects is highly unequal: in 2023, eight countries scored 100, while 35 countries received a score of 0. Additionally, only 14 countries scored higher than 10 on this indicator. Notably, these 14 countries cover all regions except Sub-Saharan Africa and South Asia and include five emerging economies (Indonesia, Saudi Arabia, Qatar, the United Arab Emirates [UAE] and Brazil), as well as three middle-income countries. Furthermore, among the total of 29 countries with any CCUS capacity, whether operational or in the pipeline, a third are not major hydrocarbon producers.

The second observation is that interest in CCUS technologies is increasing over time, albeit at a very slow rate. In 2021, only four countries achieved a score of 100, with more countries having 0 or minor capacity shares. Since 2021, major capacity additions (relative to GDP size) have been announced and explored in countries such as Australia, the U.S., Indonesia, Saudi Arabia, Germany and the Russian Federation. Nevertheless, the global CCUS project pipeline, let alone operational capacity, lags considerably behind what is suggested by IPCC net-zero scenarios aligned with the Paris Agreement (IPCC 2023, 52).

**Figure 15.** Carbon Capture, Utilization and Storage — Scores and Changes from 2021 to 2023.

CCUS '21

CCUS '22
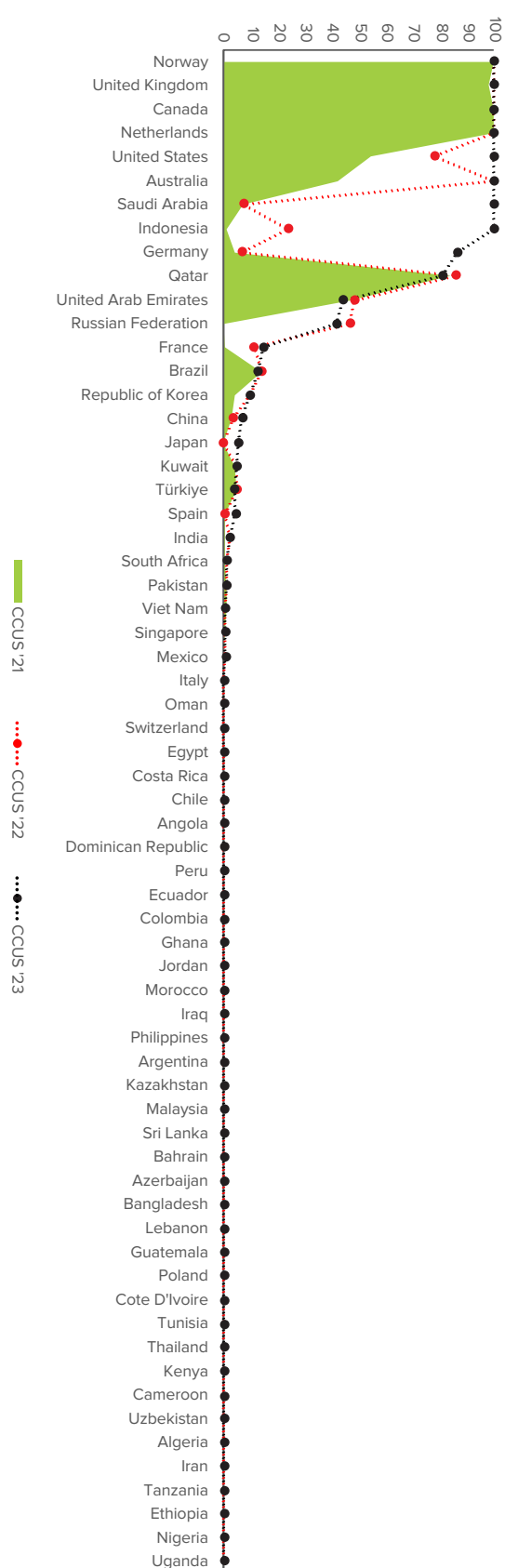
CCUS '23

Similar trends are observable in the clean hydrogen indicator (see Figure 16), which measures the total capacity of countries' clean hydrogen projects encompassing those that have been commissioned, financed, are under construction, in the feasibility study stage, announced and in the pipeline, or announced and have initiated planning. The clean hydrogen indicator covers all types of clean hydrogen, with green and blue variants being the primary types. Green hydrogen is produced using renewable energy through electrolysis, whereas blue hydrogen is typically derived from natural gas, with associated $CO_2$ emissions captured and stored via CCS. The values are normalized to economy size.

In 2021, 11 countries achieved a score of 100, while 28 countries received a score of 0. Notably, all countries with a score of 0 fall under the category of developing countries according to the UNFCCC classification.[9] Eight of the 22 countries that scored more than 10 are middle-income countries. In a departure from the CCUS pattern, two Sub-Saharan African countries, South Africa and Angola, also joined this group. Out of the 36 countries with at least some announced capacity in the pipeline, approximately two-thirds (21) are major oil and gas producers and 21 are developing countries.

Similarly, in this indicator, projects with substantial capacities (relative to the size of the economy) have been officially announced since 2021. However, operational capacity remains at very low levels. This signals a heightened interest in clean hydrogen as a crucial means of decarbonizing the hard-to-abate sectors. In 2021, only three countries had sizable project announcements when scaled to their respective economy sizes. By 2023, this number had increased to 11, with many other countries also recording substantial increases in their scores.

**Figure 16.** Clean Hydrogen — Scores and Changes from 2021 to 2023.
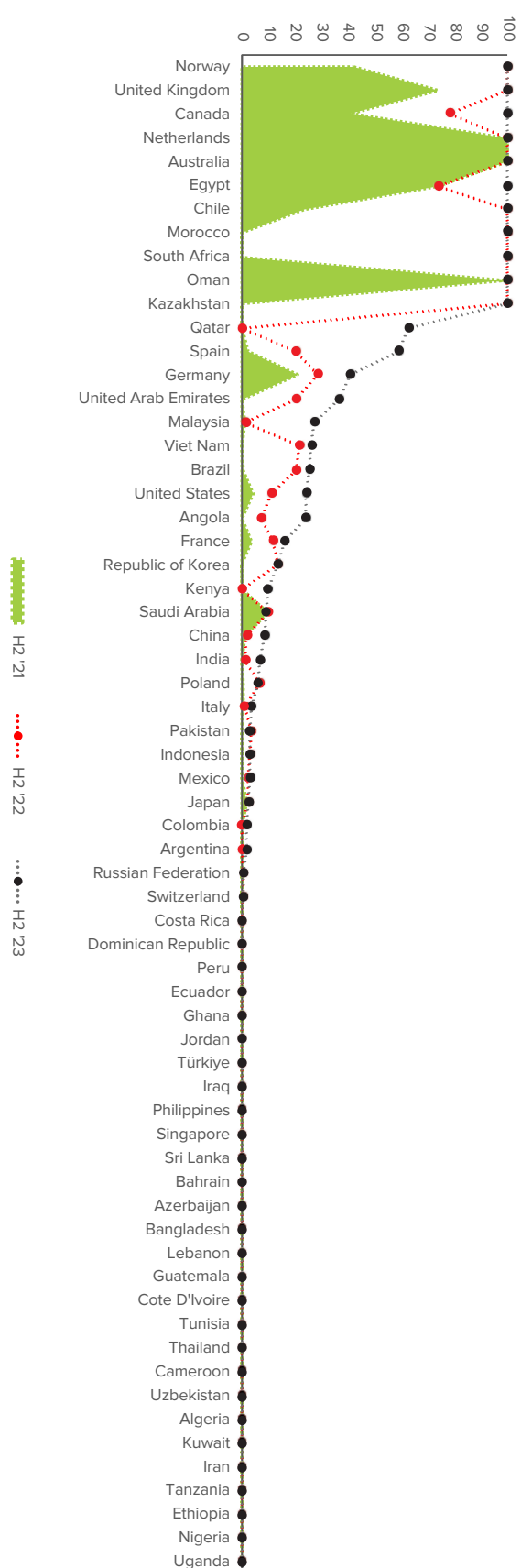
Source: Authors' construction, based on data from BloombergNEF 2023.

Legend:
- H2 '21
- H2 '22
- H2 '23

Countries (top to bottom): Norway, United Kingdom, Canada, Netherlands, Australia, Egypt, Chile, Morocco, South Africa, Oman, Kazakhstan, Qatar, Spain, Germany, United Arab Emirates, Malaysia, Viet Nam, Brazil, United States, Angola, France, Republic of Korea, Kenya, Saudi Arabia, China, India, Poland, Italy, Pakistan, Indonesia, Mexico, Japan, Colombia, Argentina, Russian Federation, Switzerland, Costa Rica, Dominican Republic, Peru, Ecuador, Ghana, Jordan, Türkiye, Iraq, Philippines, Singapore, Sri Lanka, Bahrain, Azerbaijan, Bangladesh, Lebanon, Guatemala, Cote D'Ivoire, Tunisia, Thailand, Cameroon, Uzbekistan, Algeria, Kuwait, Iran, Tanzania, Ethiopia, Nigeria, Uganda

## 3.3 Circular Carbon Economy Enablers — Technology, Finance and Policy Action Remain the Most Critical Enabling Factors in Achieving Net-Zero Goals Where Major Gaps Exist

The contribution of each enabling dimension to the net change in the Enablers sub-index scores from 2022 to 2023 is illustrated in Figure 17. Among the five dimensions, the most notable contributions to the net change over time come from improvements in the policies and regulation, finance and investment, as well as technology, knowledge and innovation dimensions. In comparison to CCE Performance, changes in CCE Enablers over time

are relatively smaller. One clear reason for this difference lies in the multi-factor complexity of enabling dimensions, monitored with a higher number of indicators within the index. Consequently, countries must effectively manage multi-level improvements across various indicators to achieve a notable increase in their CCE Enablers scores.

As shown in Figure 17, the top 5 improvers in CCE Enablers are Bahrain, Switzerland, Australia, Oman and Tunisia. For Bahrain, a significant portion of the increase comes from improvements in the finance and investment dimension. Australia, in addition to a major improvement in finance and investment, also recorded a substantial improvement in policy and regulation, along with some advancements in technology, innovation and knowledge. The vast majority of improvements in the enabling environments in Switzerland, Oman and Tunisia came from policy and regulation. On the other hand, major drops relative to 2022 were observed in Morocco, Pakistan and Sri Lanka, with declines in system resilience, policies and regulation, and business environments. Overall, the net improvements seem to considerably outweigh the declines, indicating a positive trajectory in the global enabling environments for the net-zero transition.

Legend:
- Policies and regulation
- Business environment
- Technology, knowledge and innovation
- System resilience
- Finance and investment
- Net change relative '22
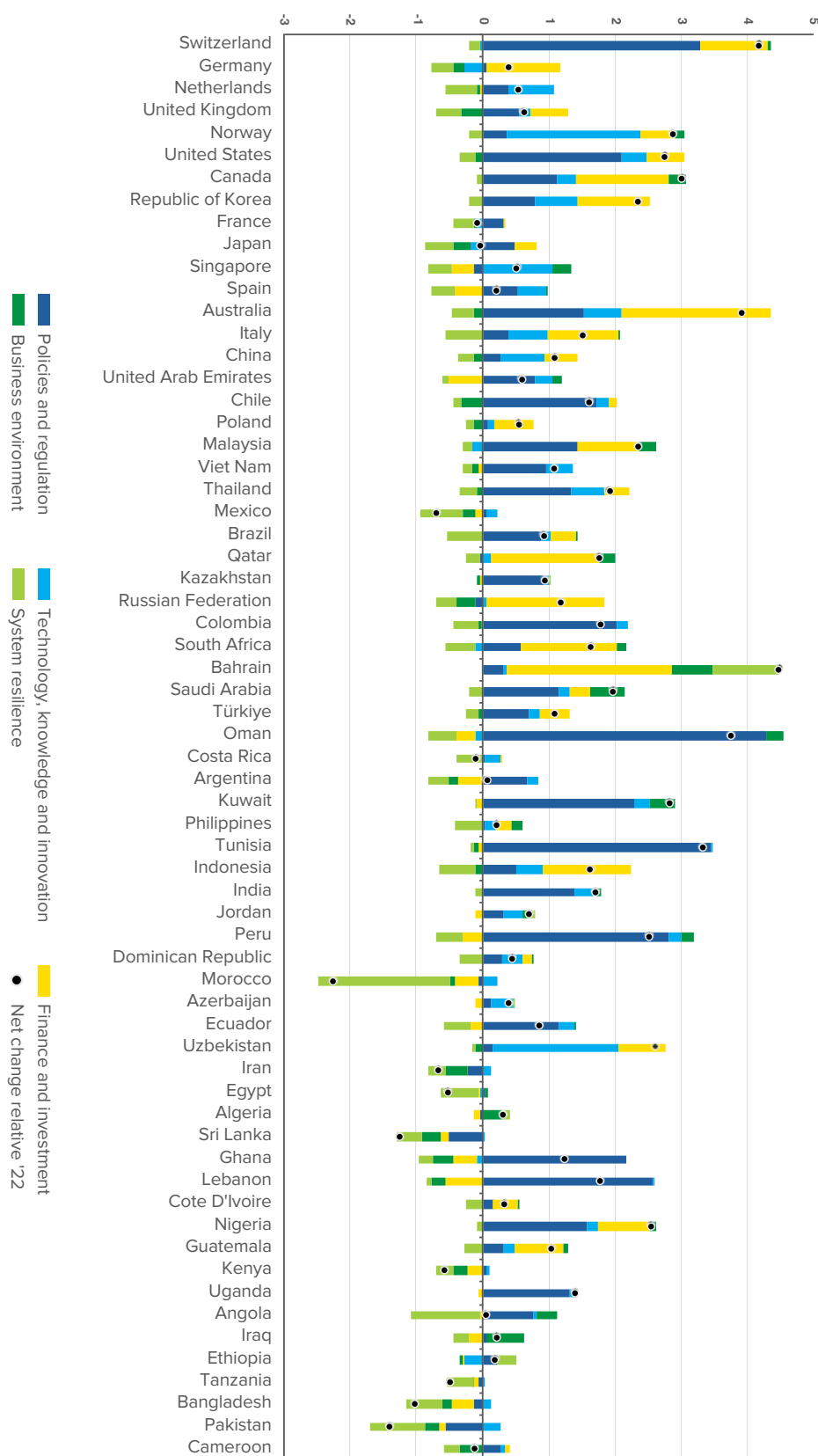
To delve deeper into key areas of change within these dimensions, the analysis below unpacks the net changes and contributing metrics in policies and regulations, technology, knowledge and innovation and the finance and investment dimensions, as shown in Figures 18-20.

As depicted in Figure 18, there have been major improvements in climate change policy – measured by net-zero targets and how binding these are – particularly outside the top 10 or so countries performing well in this dimension. Among countries outside this group, Oman, Tunisia, Peru, Lebanon and Kuwait have notably improved their climate change policy scores compared to 2022. Several other developing countries have also made moderate improvements in this indicator. These score increases result from countries either announcing net-zero targets or strengthening the binding nature of their existing targets, such as formalizing them in policy documents or laws.

Beyond climate policy target setting, specific policies and policy instruments are needed to drive the scaling up of

CCE technologies and activities, which are measured by other indicators within this dimension. Among the areas covered, there have been moderate improvements relative to 2022 in CCS policies, as well as in policy and regulatory support for energy efficiency and renewable energy. While most policy improvements in the former are observed in the top 15 countries performing well in the policies and regulation dimension, some moderate improvements are seen in developing countries outside this top 15 group, including South Africa, India and Indonesia. Notably, the U.S. exhibited the most notable improvement in this area (potentially due to the implementation of the Inflation Reduction Act), followed by Canada and the Republic of Korea. Since many top-performing countries in this dimension already had strong policy frameworks in place for energy efficiency and renewable energy, moderate improvements were generally observed in this area, primarily in countries outside the top quarter of the distribution, with Oman, Saudi Arabia and the Russian Federation being notable examples

**Figure 18.** Policies and Regulation — Key Factors Driving Changes from 2022 to 2023.
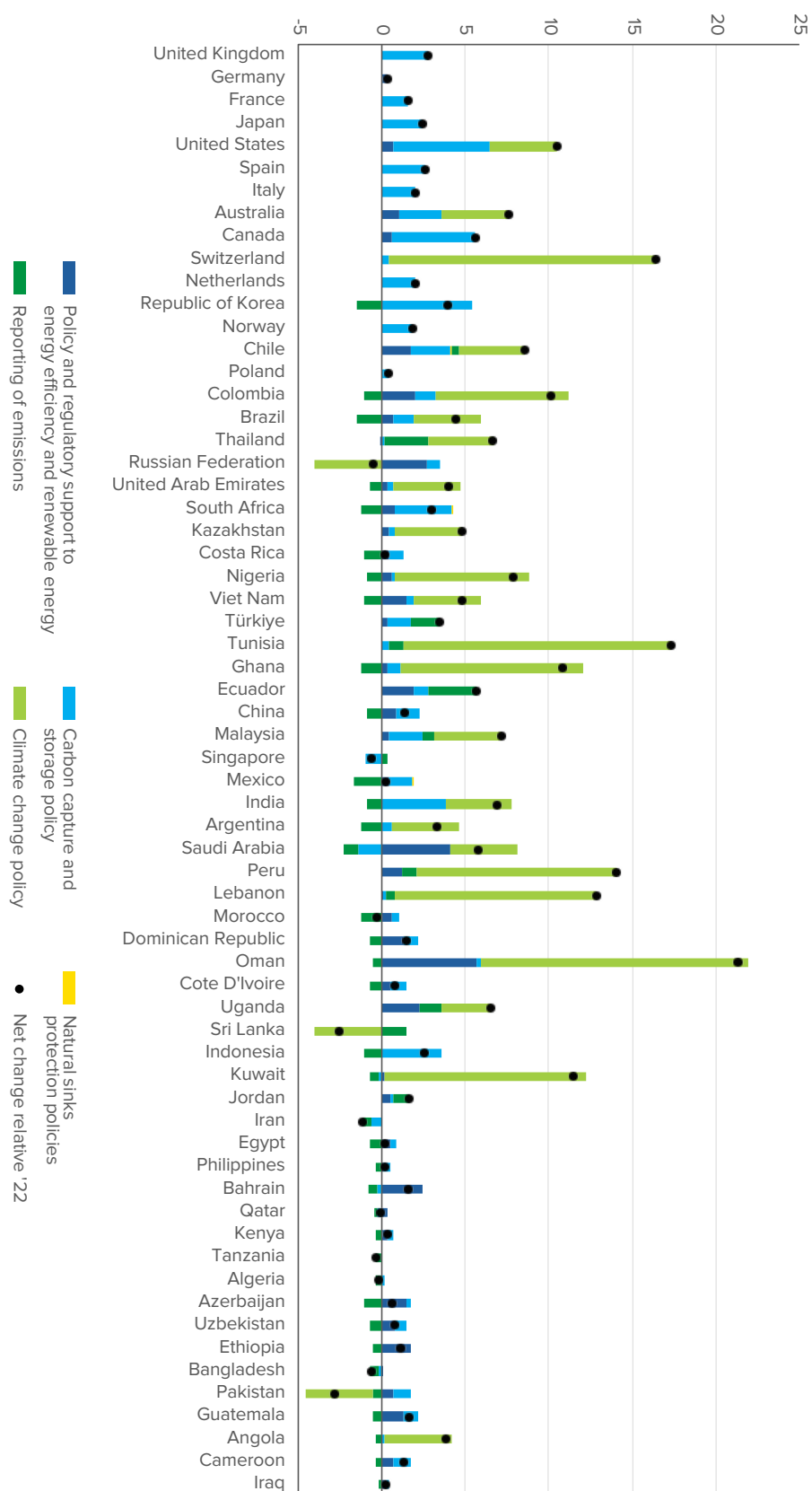
Source: Authors' construction.

Note: The order of countries reflects their ranking in the policies and regulation dimension in 2023.

Legend:
- Policy and regulatory support to energy efficiency and renewable energy
- Reporting of emissions
- Carbon capture and storage policy
- Climate change policy
- Natural sinks protection policies
- Net change relative '22

Figure 19 summarizes the net changes in the technology, knowledge and innovation dimension compared to 2022, along with the contribution of each indicator to these changes. As shown in the figure, the net improvements in this dimension appear to be rather moderate, with only one-third of the index countries recording an improvement of one or more scores in 2023. The top 5 notable improvers are Norway, Uzbekistan, Singapore, the Netherlands and China.

Considering the concentration of knowledge creation activities (i.e., number of clean energy technology patents relative to the population, R&D expenditure as a share of GDP and academic research intensity relative to the population) in top-15 scoring countries in this dimension, improvements in this area are mainly observed in a select few countries. For instance, Norway, Singapore and the

Netherlands have made notable advancements in clean energy patents. Additionally, Canada, the U.K. and Australia have also recorded advancements in academic research intensity alongside these countries.

The index assesses cross-country diffusion through two indicators: international high-tech interactions and the contributions of medium- and high-tech industries to the economy. It also measures within-country diffusion using university and industry technical collaboration. In terms of cross-country diffusion, moderate improvements are observed across many countries, with notable improvements in some emerging Asian economies, including Thailand, China, Kazakhstan, the Republic of Korea and Singapore. As for within-country diffusion, Uzbekistan, Indonesia and India registered strong improvements in their 2023 indicator scores

**Figure 19.** Technology, Knowledge and Innovation — Factors Driving Changes from 2022 to 2023.

Legend:
- Research and development expenditure
- Medium and high tech industry's contribution to the economy
- Clean energy technology patents
- International high-technology interaction
- Academic research intensity
- Net change relative '22
- University and industry technical collaboration

Changes over time in the finance and investment dimensions are illustrated in Figure 20, which also displays specific indicator contributions to this dimension relative to 2022. As seen in the figure, there have been substantial improvements in this dimension, primarily concentrated in the first half of the country distribution. On average, these improvements are notably larger than those observed in the second half, indicating a widening gap in transition finance and investment between the top- and bottom-ranked countries over time. Notable improvers include Bahrain, Australia, the Russian Federation, Qatar and South Africa. While these countries have also made progress in various other metrics, increased access to sustainable finance is a common trend among them.

The investment requirements for successful CCE transitions by the mid-century are immense (Yilmaz et al. 2023). These transitions will need to be funded through a combination of public and private resources. Consequently, the index tracks both government-led CCE investments and private finance (i.e., ESG debt) flows (as a precentage of the

GDP). As expected, there is a strong correlation between investment and sustainable finance flows. Countries that have improved their ability to access sustainable finance tend to record substantial increases in their CCE investments. The top 5 improvers in these two metrics are Bahrain, Qatar, Germany, Australia and Italy. Additionally, carbon pricing, including carbon markets, represents another potentially crucial source of transition finance. In comparison to the previous year, Australia, Indonesia, the Russian Federation, Nigeria and Viet Nam have all shown improvements in this metric, which tracks carbon taxes, emission trading schemes and baseline-and-credit mechanisms worldwide.

This dimension also monitors cross-country financial net inflows and outflows as a percentage of GDP to assess their international financial connectedness, a critical aspect of transition finance. While notable improvements have occurred in many countries across the distribution, South Africa, Chile, Malaysia, Norway and the U.K. have made noticeable strides in this area relative to 2022.

**Legend:**
- Circular carbon economy investments
- International financial connectedness
- Access to sustainable finance
- Carbon pricing
- Financial development
- Net change relative '22

Source: Authors' construction.

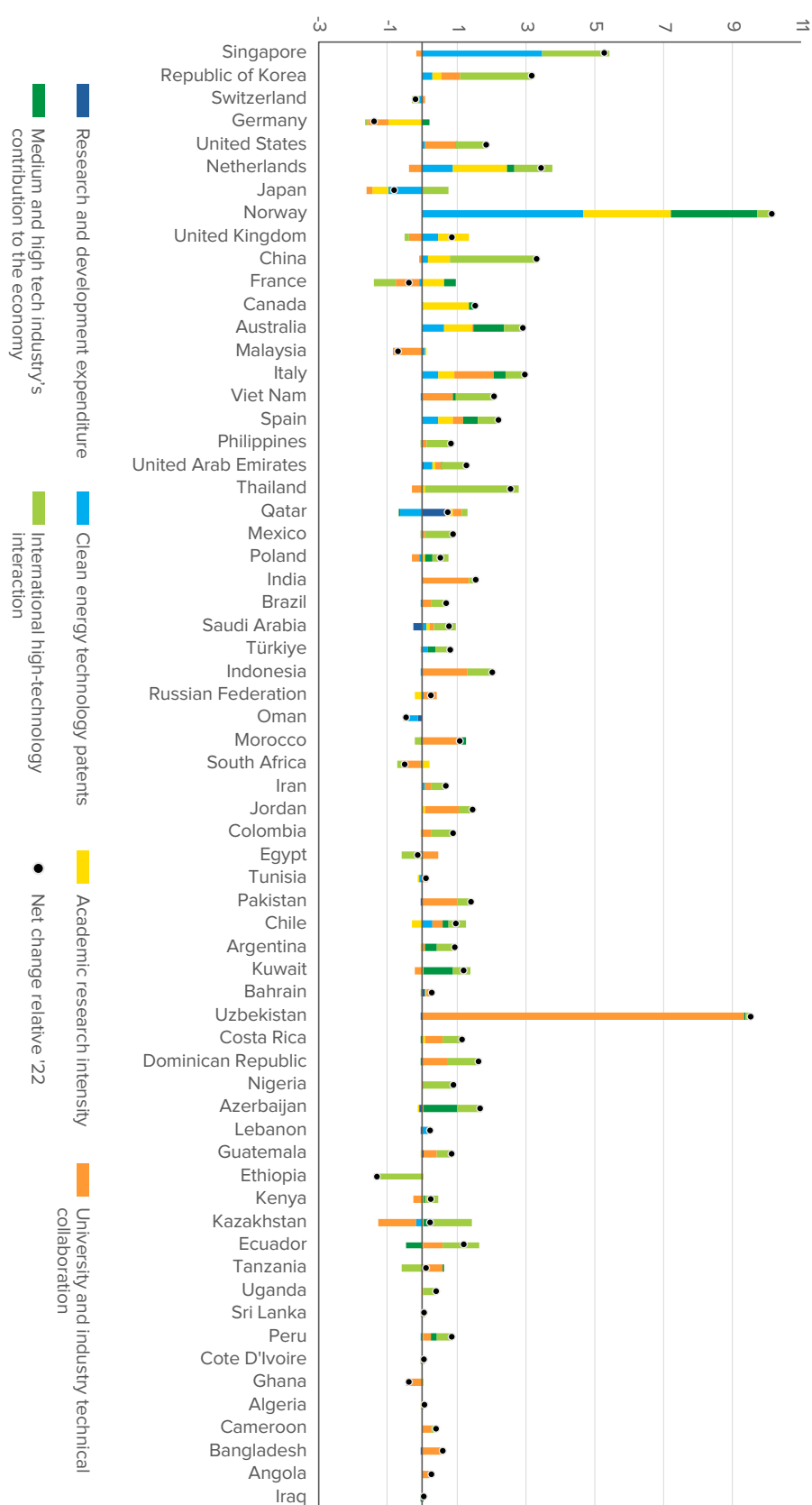Note: The order of countries reflects their ranking in the finance and investment dimension in 2023.

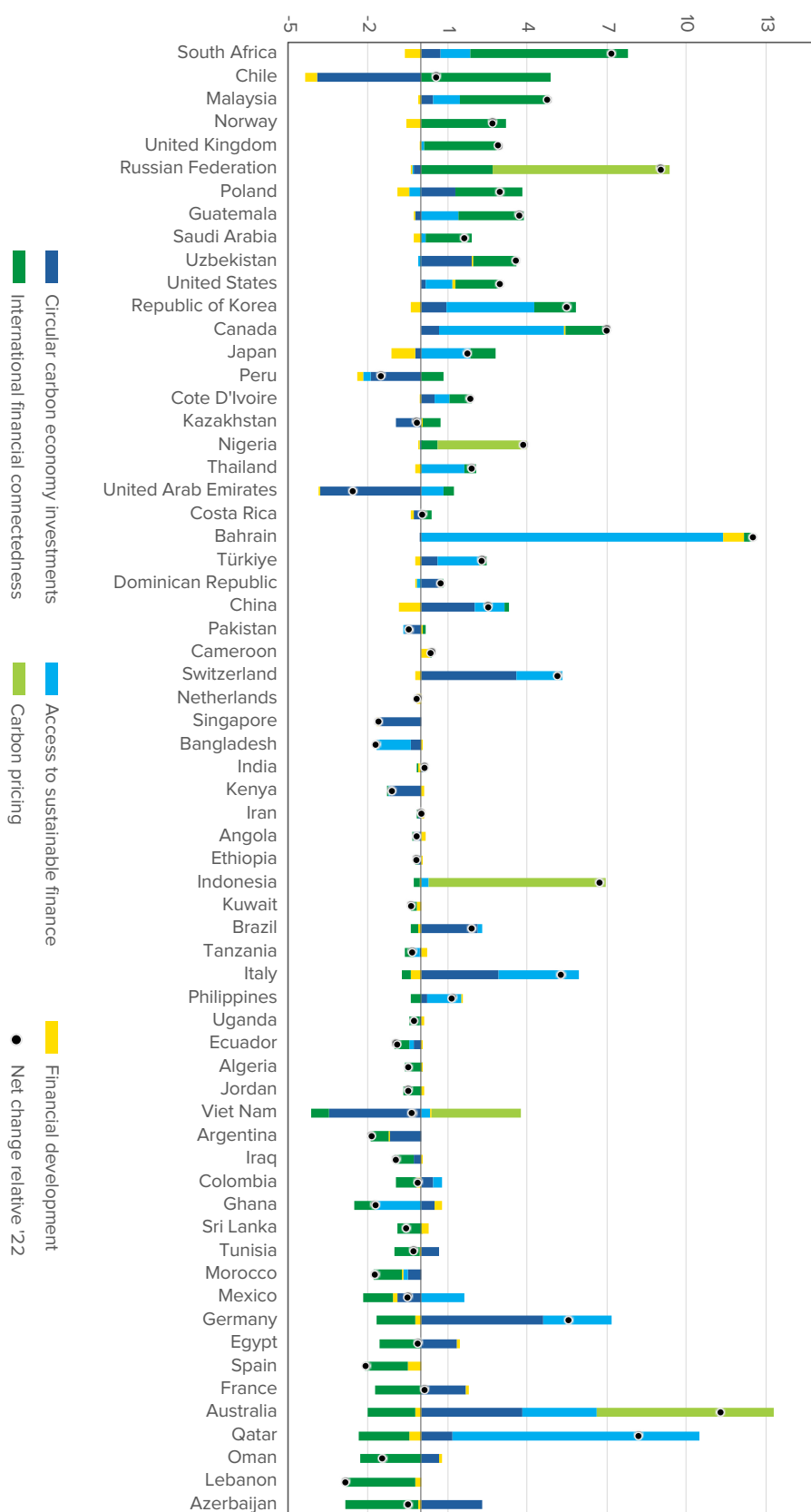# 3.4 Regional Frontrunners — Different Regions Display Different Strengths, While South Asia and Sub-Saharan African Countries Require Urgent Support

The fact that industrialized countries from Europe and North America typically dominate the top of the CCE Index ranking conceals important narratives about emerging and developing economies in other regions. Examining the leading countries in each respective region is generally more beneficial and meaningful for countries within those regions. Regions are often more closely connected geographically, economically, socially and culturally, which makes cooperation more likely in many cases. Identifying what leading countries in each region are doing "right" or more effectively than other nations can provide insights into areas where other countries with similar characteristics might be able to improve. It also points to opportunities for regional leaders to support other countries, including through finance, technology or knowledge sharing.

Figure 21 groups countries into regions and ranks them based on their 2023 scores in CCE Performance. Highlights of regional frontrunners in this sub-index include:

- **East Asia and the Pacific:** Australia, the Republic of Korea and Indonesia lead in this region. Far ahead of other countries, Australia's score benefits from top scores (100) in both CCUS and clean hydrogen. The Republic of Korea has a top score in nuclear energy, while Indonesia also achieves a top score in CCUS.

- **Europe and Central Asia:** Top performers Norway, the U.K. and the Netherlands rank among the highest on the index (ranks 1, 2 and 4, respectively) and receive high scores on various indicators, including energy efficiency, renewable energy, electrification, fuel switching, CCUS and clean hydrogen, albeit with variations among the countries. This region shows the largest differences, with Norway scoring 69 and Uzbekistan 17.

- **Latin America and the Caribbean:** Costa Rica, Chile and Brazil each exhibit distinct strengths. Costa Rica, with its almost entirely renewable-powered electricity supply, scores 100 in renewable energy (with a 42.3% share of commercial renewables in its total primary energy consumption in 2021) and also high in energy efficiency, measured by the energy intensity of the GDP. Chile receives a top score in clean hydrogen and similarly scores high in energy efficiency. Brazil, meanwhile, performs well in several indicators, particularly in renewable energy and energy efficiency.

- **MENA:** The leading countries — Egypt, UAE and Saudi Arabia — each score well for different reasons. Egypt boasts a top score in clean hydrogen, Saudi Arabia in CCUS, and, while the UAE does not score high on any specific indicator, it only scores low in one indicator, namely renewable energy – similar to other MENA region countries. In the region's top performer in renewable energy, Jordan (score 24), commercial renewables accounted for 8.4% of total primary consumption in 2021.

- **North America:** This region only has two countries, Canada and the U.S., both of which achieve high scores on the overall CCE Performance index. Both nations earn top scores in CCUS. Canada also receives a top score for clean hydrogen, while the U.S. boasts a high score in nuclear energy.

- **South Asia:** This region, comprising four countries in the index, is led by Pakistan and Sri Lanka, which rank as 40th and 43rd, respectively, in CCE Performance. This implies that they generally do not perform well on any indicator, with the exception of energy efficiency, on which Sri Lanka excels. This indicator estimates how much energy a country needs to generate a unit of GDP. However, particularly in developing countries, especially those with lower-middle or low-income status like Sri Lanka, relatively lower energy usage may also reflect the country's limited access to energy or higher economic dependence on low-energy-intensive sectors, such as agriculture and services.

- **Sub-Saharan Africa:** Angola, Ghana and South Africa rank highest in this region. Both Angola and Ghana earn high scores in both fuel switching in the power sector and energy efficiency. South Africa receives a top score for clean hydrogen and electrification. Notably, the renewable energy indicator excludes traditional wood-based biofuels due to their generally negative environmental and human health impacts.

It only encompasses commercial renewables (that is, grid-based renewables and commercial biofuels and biomass. As a result, this leads to low renewable energy scores for this region, with only Kenya (score 47, 16.5% share) and Angola (21, 7.3%) scoring above average.

Figure 22 groups countries into regions and ranks them based on their 2023 CCE Enablers scores. Determining the specific strengths of each country requires a deeper dive into the respective enabling dimensions, which will be the focus of separate KAPSARC regional case studies in 2024, particularly for MENA and Southeast Asian countries. Highlights of regional leaders at a higher level in this sub-index include:

- **East Asia and the Pacific:** In this region, the Republic of Korea, Japan and Singapore excel in technology and finance, far surpassing the average scores for these dimensions. Singapore and the Republic of Korea have the highest scores in technology among all countries.

- **Europe and Central Asia:** The regional leaders, Switzerland, Germany and the Netherlands, demonstrate strong performance across all five dimensions, with a particular strength in finance. Switzerland and the Netherlands rank among the top 3 countries in this dimension. Germany ranks second among all countries in policy. Alongside the MENA region, Europe and Central Asia exhibit the widest differences among countries in terms of overall enablers performance.

- **Latin America and the Caribbean:** Among the three leading countries — Chile, Mexico and Brazil, Chile excels in finance, ranking sixth among all countries, but falls below the average in technology. The other two countries rank slightly above the global average in most dimensions.

- **MENA:** The UAE, Qatar and Bahrain lead the ranking in this region. All of them score above global averages in business environments and system resilience. The UAE ranks 10th in business environments among all countries, and both Qatar and Bahrain rank in the top 10 in system resilience. The UAE also scores above the global average on policy and regulation, making it along with Tunisia the only country in the MENA region to do so.

- **North America:** The two countries in this region, the U.S. and Canada, achieve high scores in CCE Enablers overall, with policies being a particular strength, along with business environments (Canada being the frontrunner among all countries) and system resilience. Canada also scores highly in finance, and the U.S. excels in technology.

- **South Asia:** Of the four South Asian countries covered by the index, India has the highest rank (39th). It scores around global averages on policies, technology and business environments.

- **Sub-Saharan Africa:** Alongside South Asia, this region includes some of the lowest-scoring countries, highlighting the need for targeted support in various areas. Only South Africa ranks above 50th (rank 28). Its scores on policies and finance exceed the global averages.

Starting in 2024, KAPSARC will produce "deep-dive" studies on selected regions and countries that unpack the CCE Index results further, providing them further interpretation and context. The CCE Index team is also working on futher expanding the number of countries included in the index.

**Figure 21.** CCE Performance — Regional Frontrunners.
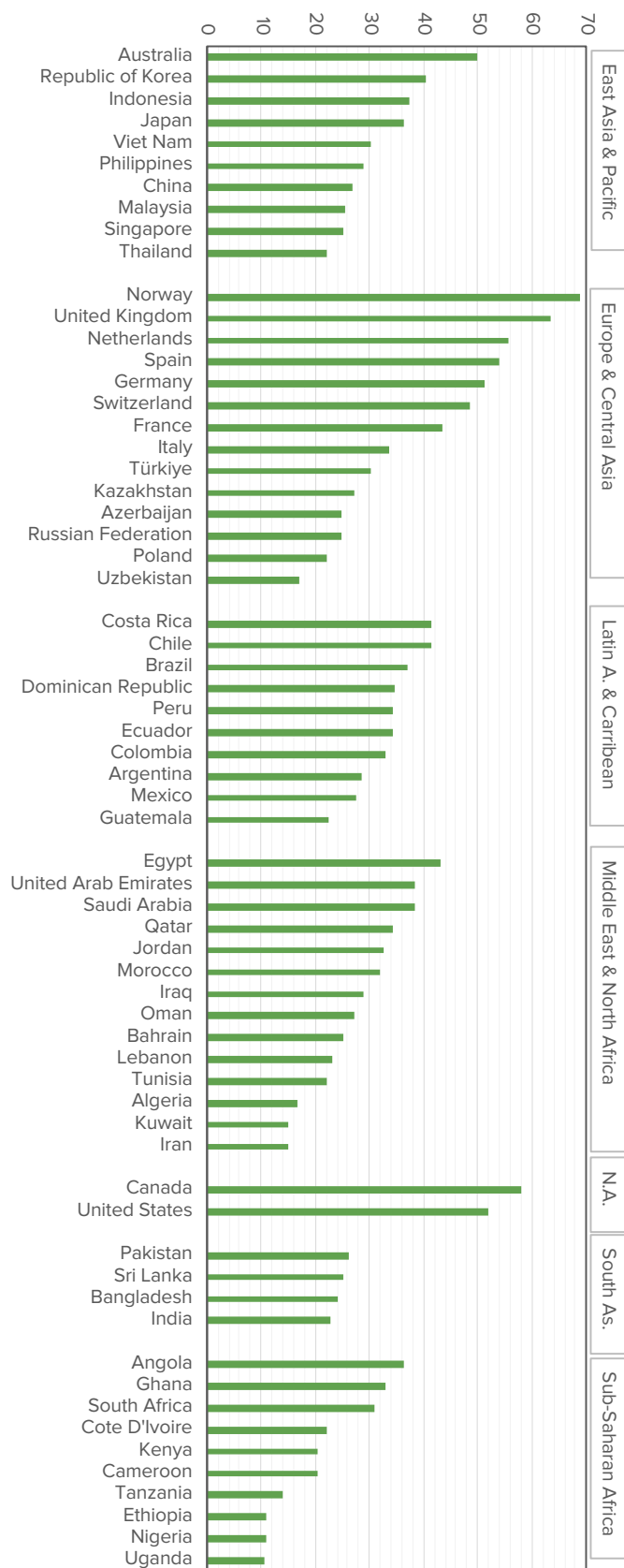
**Figure 22.** CCE Enablers — Regional Frontrunners.
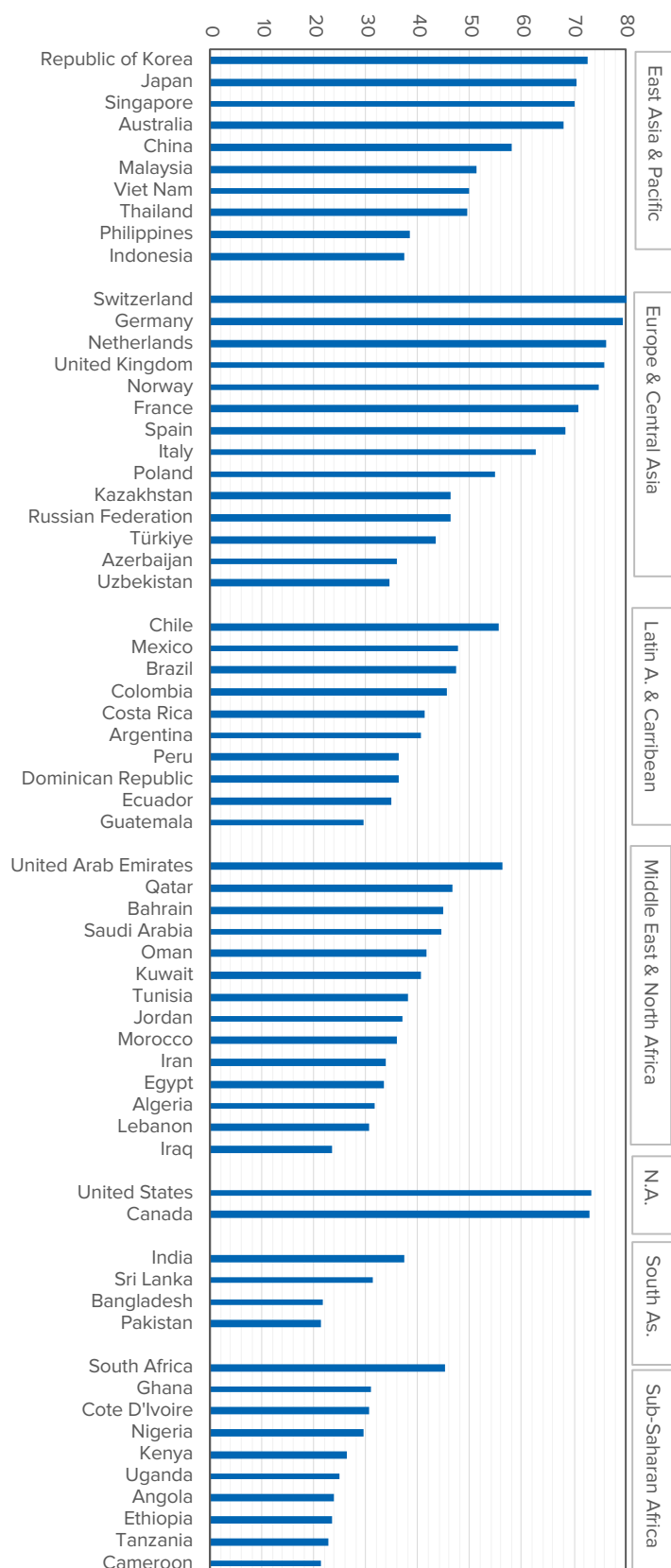
Source: Authors' construction.

# 4. Methodological Notes and Updates

This section discusses the main methodological updates to the original CCE Index methodology presented in Luomi, Yilmaz, and Alshehri (2021) and the subsequent updates detailed in Luomi, Yilmaz, and Alshehri (2022). In particular, the focus is on three primary updates: revisions in the imputation methodology, updates to the indicator framework and the impact of retrospective updates on historical results.

## 4.1. Revisions to the Imputation Methodology

Cross-country data covering several indicators or concepts is needed to create aggregate indices. However, this data may not always be fully available for all countries, a common issue for indices. The CCE has adopted an 80% data availability rule in its methodology to minimize this. An indicator or country must have at least 80% data availability to be included in the index.

To impute the remaining missing observations, the index follows a hierarchy. First, after confirming with the data provider, if missing data implies non-existence or simply zero, for example, no access to sustainable finance or no announced hydrogen projects, zero is imputed for these missing observations in such indicators (listed in the imputation matrix, available on the CCE Index web portal, as ZI — zero-imputed). Some indicators may still contain missing observations. For these, the index team first consults with the data provider for a better understanding of the dataset and/or assistance with the imputations (listed in the imputation matrix as SI — imputed based on advice from the original data source). For instance, in the CCS storage indicator, the index team worked with the Global CCS Institute to impute missing observations.

In previous editions of the index, the remaining missing observations were imputed based on region and income

group averages. While common in many indices, this approach caused large fluctuations in country-level trends, particularly where the region-income group countries are heterogeneous. To minimize such fluctuations, this approach was revised. A two-step methodology was adopted for the imputation of these remaining missing observations. According to the revised methodology, missing observations are imputed with the most recent data if an observation exists before or after an indicator (i.e., RI — imputed based on the most recent available value for the country). In cases where all observations (in all three years) are missing, the missing observation is imputed based on income and region averages (i.e., GI — imputed based on regional and income group averages). It is important to reiterate that the CCE Index continues to strictly impose the 80% data availability rule. However, this rule is applied after excluding ZI and SI imputations.

The imputation matrix (available via the 'Downloads' page of the CCE Index portal: https://cceindex.kapsarc.org/cceindex/downloads) details all imputations made in 2021-2023 for each indicator and country. All indicators and countries satisfy the data availability rule, with two exceptions: Lebanon has 79% indicator availability in this year's index, and the indicator on research and development expenditure (as a percentage of GDP) has 77% country coverage in the 2023 CCE Index. These exceptions were made considering that these missing observations only exist in the most recent year (not in the 2021 or 2022 CCE Index scores) and the lags in the data reporting of countries to international institutions.

## 4.2. Revisions to the Indicator Framework

In the 2023 edition, the following indicators were revised to enhance their ability to measure what they are intended to measure:

Fuel Switching: This indicator aims to account for countries' shift toward lower-emitting fuels in the electricity sector, specifically transitioning from coal and oil-based fuels to cleaner sources, including renewables or natural gas. Initially, countries received two separate scores: one based on their coal and oil usage levels (with lower usage credited) and the other for reducing coal and oil usage in favor of cleaner fuels within a five-year window. In previous editions, levels were determined using the initial year of the period (e.g., for 2022 index scores, the initial year was 2015, and the period covered was 2015-2020). Starting from the 2023 edition, the level is measured based on the final year of the five-year period to capture more recent trends (i.e., for 2022 scores, the data is now based on 2020).

CCUS: This indicator accounts for a country's total CCUS capacity, including currently commissioned, announced and under-development projects. In earlier editions, the index considered projects up to the latest data update (typically in September of the index edition year). Due to improvements in BNEF's database, including offering broader and more precise coverage of announcement years, the index now includes all projects up to the end of the preceding year for the index edition. This change eliminates timing-related confusion and aligns the indicator's timing with others. For example, the 2023 CCUS indicator (in the current edition) accounts for all projects until December 2022.

Clean Hydrogen: This indicator quantifies a country's total hydrogen capacity, considering currently commissioned, announced and under-development projects. Previously, the index focused solely on green hydrogen projects and covered the time period until the latest data update (usually in September of the index edition year). Following a significant data update by BNEF in this area, the dataset now includes all types of clean hydrogen (including blue hydrogen) and provides improved coverage of announcement years. Similar to the CCUS indicator, starting from the 2023 edition, the index incorporates all clean hydrogen announcements up to the end of December of the previous year for the index edition.

Access to Sustainable Finance: This indicator measures the size of sustainable finance flows (i.e., ESG debt including bonds and loans) as a share of a country's GDP. In previous editions, it was calculated as the sum of the last three years of sustainable finance flows divided by the country's GDP, which has now been revised to the average of the flows in the last three years scaled by GDP size. This change allows the indicator to better reflect countries' performance over time relative to their GDP size.

Circular carbon economy Investment: This indicator accounts for the size of investment flows into clean energy technologies (renewable energy, electric vehicle infrastructure, CCUS, clean hydrogen, etc.) as a share of a country's GDP. In previous editions, it was calculated as the sum of the last three years of investment flows divided by a country's GDP. Starting from the 2023 edition, it has been revised to the average of the flows in the last three years scaled to GDP. This modification enables the indicator to better reflect countries' performance over time relative to their GDP size.

## 4.3. Retrospective Data Updates and Their Impact on Historical Index Scores

Underlying data for some of the indicators are retroactively updated by the data sources. The CCE Index is annually updated using the most recent available data. Consequently, when such updates occur, the revised historical data is used to recalculate scores for previous index years. In this year's edition, this applies specifically to the years 2021 and 2022. Additionally, the minimum and maximum values relevant to score calculations, especially those relying on the performance of the top- and bottom-performing countries, are also updated using the revised data for the 2021 index values.

While some of these updates were moderate in the 2023 edition of the index, in certain cases, they led to substantial changes in the underlying data, resulting in altered scores and country ranks. These substantial changes were particularly evident in indicators related to energy efficiency (i.e., energy usage relative to GDP), renewable energy (i.e., the share of renewable energy in primary energy consumption) and fuel switching (i.e., the level of and changes in the share of oil, coal, lignite and derived gas in electricity production). This data is sourced from Enerdata, which, in some instances, revised

its methodology, changed its data sources, or saw major revisions made to historical data by countries themselves or by other data sources used by Enerdata. Consequently, the updated historical scores show notable differences for some countries compared to previous index editions. Similar retrospective changes are observed in other indicators, such as the CCUS and hydrogen capacity indicators, sourced from BNEF.

The decision to update historical scores based on retroactive data updates by data sources is a common methodological choice in the development of composite indicators. This practice is maintained to ensure the index's high quality, using the most current data available. Therefore, it is important to mention that the 2023 edition of the index also includes revised 2021 and 2022 raw data, scores and rankings. All this information can be accessed through the downloads section of the CCE Index web portal: https://cceindex.kapsarc.org/cceindex/downloads.

# Endnotes

1 Another factor influencing the relative speed of countries' roads to net-zero emissions is the principle of common but differentiated responsibilities and respective capabilities, enshrined in the United Nations Framework Convention on Climate Change.

2 In brief, the scores are calculated against predetermined minimum and maximum values for each indicator, based on a hierarchy: technical optimum (scientifically established or absolute top and bottom performance levels) or pre-established values (e.g., scores from another index); if these are not available, the average of the top- and bottom-three performing countries is used. Thus, a score of 100 indicates that a country is performing at or above the current maximum for a given indicator, relative to its peers.

3 It is important to note that, due to the nature of statistical datasets, there is typically a 1-3 year lag in data for most indicators in the index. For instance, in the policies and regulation dimension, the data for indicators is as follows: policy and regulatory support for renewable energy and energy efficiency (2021), CCS policy (2023), natural sinks protection policies (2022), reporting of emissions (mid-2023), and climate change policy (mid-2023). Complete indicator descriptions and methodological details are available in the 2023 CCE Index Codebook and Database file, accessible in Excel format via the CCE Index web portal: https://cceindex.kapsarc.org/

4 The logic for establishing minimum and maximum scores (0 and 100) is described in the CCE Index methodology paper (Luomi, Yilmaz, and Alshehri 2021).

5 According to Bloomberg New Energy Finance, the data provider, a significant portion of the projects are in the early stages. Consequently, the capture and storage capacity is based on official announcements rather than actual operational capacity.

6 The examples of the United Kingdom and Jordan illustrate the challenge of achieving further improvements as the share of coal and oil approaches zero in the context of fuel switching.

7 On a broader note, when deconstructing the index scores and comparing changes over time, it is crucial to consider the time lag in the underlying data: under CCE Performance, data for five of the eight indicators for 2023 is from 2021 (and for 2022 from 2020, and for 2021 from 2019). In other parts of the index too there is often a lag of a year or two in data. Therefore, major events occurring during this period, including the COVID-19 pandemic, are reflected in the scores but cannot be fully isolated, as the data years are not synchronized. This approach ensures the use of the latest available data for each indicator.

8 The status information is current as of the last update date by the data source BNEF, which is June 27, 2023, for the BNEF CCUS and Hydrogen databases.

9 Poland is the sole exception, with a score of 0 under CCUS.

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# Appendix I

## 2023, 2022 and 2021 Circular Carbon Economy Index Results

| 2021 CCE Index Results | Total CCE Index | | Performance sub-index | | Enablers sub-index | | Enablers dimensions | | | | | | | | | | Oil Producers Lens (OPL) | | | | | |
| | | | | | | | Policies and regulation | | Technology, knowledge and innovation | | Finance and investment | | Business environment | | System resilliance | | Total OPL | | Performance sub-index (with OPL) | | OPL indicators | |
| | score | rank | score | rank | score | rank | score | rank | score | rank | score | rank | score | rank | score | rank | score | rank | score | rank | score | rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| United Kingdom | 70.58 | 1 | 66.95 | 1 | 74.20 | 3 | 87.71 | 1 | 53.78 | 8 | 69.85 | 7 | 75.89 | 7 | 83.79 | 5 | 72.67 | 1 | 71.14 | 2 | 75.33 | 5 |
| Norway | 66.23 | 2 | 61.49 | 2 | 70.97 | 5 | 65.29 | 10 | 47.89 | 10 | 75.02 | 3 | 78.22 | 1 | 88.41 | 2 | 71.18 | 3 | 71.40 | 1 | 81.30 | 4 |
| Netherlands | 64.35 | 3 | 53.55 | 3 | 75.14 | 2 | 67.80 | 9 | 64.06 | 7 | 87.90 | 1 | 75.25 | 8 | 80.68 | 8 | 71.71 | 2 | 68.29 | 3 | 83.02 | 2 |
| Switzerland | 60.49 | 4 | 47.02 | 5 | 73.96 | 4 | 54.40 | 15 | 78.83 | 1 | 73.57 | 5 | 69.51 | 15 | 93.48 | 1 | | | | | | |
| Canada | 58.53 | 5 | 49.06 | 4 | 68.00 | 9 | 70.65 | 7 | 46.91 | 11 | 65.94 | 8 | 77.39 | 2 | 79.10 | 10 | 61.88 | 5 | 55.77 | 5 | 62.48 | 13 |
| Germany | 57.70 | 6 | 39.45 | 11 | 75.94 | 1 | 82.25 | 2 | 76.91 | 2 | 61.95 | 9 | 77.03 | 4 | 81.57 | 7 | | | | | | |
| United States | 56.32 | 7 | 44.76 | 7 | 67.87 | 10 | 62.73 | 11 | 64.73 | 6 | 55.82 | 13 | 75.93 | 5 | 80.13 | 9 | 62.09 | 4 | 56.30 | 4 | 67.85 | 10 |
| Spain | 55.81 | 8 | 44.93 | 6 | 66.69 | 12 | 76.11 | 5 | 33.67 | 18 | 83.39 | 2 | 70.43 | 10 | 69.85 | 20 | | | | | | |
| France | 54.89 | 9 | 39.78 | 10 | 70.00 | 6 | 78.04 | 3 | 51.69 | 9 | 71.12 | 6 | 71.91 | 9 | 77.24 | 11 | | | | | | |
| Japan | 52.63 | 10 | 35.46 | 15 | 69.80 | 7 | 77.22 | 4 | 68.18 | 5 | 58.32 | 11 | 75.92 | 6 | 69.35 | 22 | | | | | | |
| Republic of Korea | 51.18 | 11 | 34.93 | 17 | 67.43 | 11 | 62.08 | 12 | 76.85 | 3 | 59.59 | 10 | 70.03 | 11 | 68.59 | 24 | | | | | | |
| Australia | 51.12 | 12 | 39.09 | 12 | 63.16 | 13 | 69.10 | 8 | 43.25 | 13 | 55.73 | 14 | 77.05 | 3 | 70.67 | 18 | 56.40 | 6 | 49.64 | 10 | 60.19 | 14 |
| Singapore | 47.06 | 13 | 24.51 | 37 | 69.61 | 8 | 51.02 | 19 | 75.44 | 4 | 73.61 | 4 | 61.49 | 19 | 86.50 | 4 | | | | | | |
| Italy | 46.43 | 14 | 33.71 | 18 | 59.16 | 14 | 75.38 | 6 | 34.32 | 16 | 46.45 | 16 | 68.29 | 16 | 71.35 | 17 | | | | | | |
| United Arab Emirates | 42.56 | 15 | 31.33 | 21 | 53.78 | 16 | 51.51 | 18 | 28.23 | 21 | 44.00 | 18 | 69.86 | 12 | 75.31 | 12 | 51.54 | 7 | 49.29 | 11 | 67.26 | 11 |
| Costa Rica | 42.35 | 16 | 43.96 | 8 | 40.75 | 31 | 50.82 | 20 | 14.57 | 44 | 16.88 | 41 | 48.62 | 45 | 72.86 | 14 | | | | | | |
| Brazil | 41.09 | 17 | 36.46 | 13 | 45.72 | 23 | 54.12 | 16 | 23.15 | 25 | 32.32 | 25 | 61.64 | 18 | 57.38 | 40 | 48.97 | 10 | 52.22 | 8 | 67.99 | 9 |
| China | 39.66 | 18 | 24.81 | 35 | 54.51 | 15 | 48.82 | 24 | 46.13 | 12 | 52.50 | 15 | 69.68 | 14 | 55.41 | 43 | 49.24 | 9 | 43.97 | 14 | 63.13 | 12 |
| Chile | 39.36 | 19 | 30.16 | 24 | 48.57 | 19 | 53.42 | 17 | 16.13 | 39 | 58.31 | 12 | 58.19 | 27 | 56.79 | 42 | | | | | | |
| Poland | 37.37 | 20 | 22.00 | 47 | 52.74 | 17 | 61.10 | 13 | 25.79 | 23 | 37.29 | 21 | 69.81 | 13 | 69.69 | 21 | | | | | | |
| Mexico | 37.23 | 21 | 28.05 | 29 | 46.40 | 22 | 46.75 | 27 | 27.08 | 22 | 32.82 | 24 | 59.36 | 22 | 66.00 | 26 | 43.79 | 12 | 41.18 | 17 | 54.31 | 15 |
| Egypt | 36.98 | 22 | 40.92 | 9 | 33.04 | 46 | 27.80 | 47 | 16.35 | 35 | 13.90 | 47 | 47.39 | 48 | 59.76 | 36 | 39.06 | 17 | 45.08 | 13 | 49.25 | 21 |
| Colombia | 36.92 | 23 | 30.96 | 22 | 42.89 | 28 | 46.77 | 26 | 16.27 | 36 | 39.71 | 20 | 53.88 | 36 | 57.81 | 39 | | | | | | |
| Jordan | 36.67 | 24 | 36.43 | 14 | 36.92 | 37 | 29.82 | 44 | 16.18 | 38 | 21.19 | 33 | 53.53 | 37 | 63.87 | 29 | | | | | | |
| Viet Nam | 36.03 | 25 | 24.52 | 36 | 47.53 | 20 | 46.21 | 28 | 33.76 | 17 | 40.85 | 19 | 59.72 | 21 | 57.11 | 41 | | | | | | |
| Qatar | 35.91 | 26 | 27.62 | 31 | 44.21 | 26 | 27.73 | 48 | 31.17 | 19 | 16.33 | 42 | 58.49 | 26 | 87.32 | 3 | 49.78 | 8 | 55.35 | 6 | 83.08 | 1 |
| Türkiye | 35.50 | 27 | 29.11 | 25 | 41.89 | 29 | 47.49 | 25 | 21.22 | 27 | 21.56 | 32 | 56.69 | 28 | 62.47 | 33 | | | | | | |
| Argentina | 35.37 | 28 | 30.60 | 23 | 40.14 | 32 | 41.65 | 32 | 16.25 | 37 | 26.08 | 27 | 53.50 | 38 | 63.22 | 31 | 41.21 | 16 | 42.28 | 16 | 53.97 | 17 |
| Malaysia | 35.10 | 29 | 21.58 | 49 | 48.63 | 18 | 43.12 | 30 | 42.92 | 14 | 28.23 | 26 | 60.12 | 20 | 68.77 | 23 | 43.26 | 13 | 37.90 | 19 | 54.22 | 16 |
| Thailand | 34.50 | 30 | 22.38 | 46 | 46.62 | 21 | 49.38 | 22 | 31.11 | 20 | 35.73 | 22 | 58.91 | 24 | 57.99 | 38 | | | | | | |
| Saudi Arabia | 34.44 | 31 | 27.96 | 30 | 40.92 | 30 | 35.05 | 38 | 22.26 | 26 | 12.12 | 51 | 61.66 | 17 | 73.51 | 13 | 48.13 | 11 | 55.34 | 7 | 82.73 | 3 |
| Ecuador | 34.26 | 32 | 35.37 | 16 | 33.15 | 45 | 44.28 | 29 | 12.25 | 51 | 6.41 | 61 | 44.53 | 52 | 58.28 | 37 | | | | | | |
| Oman | 33.40 | 33 | 28.80 | 27 | 38.00 | 34 | 18.18 | 60 | 20.91 | 30 | 24.09 | 31 | 54.34 | 35 | 72.50 | 15 | 38.10 | 20 | 38.19 | 18 | 47.58 | 22 |
| Philippines | 32.91 | 34 | 28.48 | 28 | 37.35 | 36 | 28.83 | 46 | 35.21 | 15 | 18.74 | 37 | 52.40 | 39 | 51.56 | 46 | | | | | | |
| Russian Federation | 32.49 | 35 | 20.08 | 52 | 44.91 | 24 | 55.69 | 14 | 21.15 | 28 | 20.65 | 34 | 58.96 | 23 | 68.08 | 25 | 38.21 | 19 | 31.51 | 23 | 42.95 | 23 |
| Peru | 32.36 | 36 | 32.01 | 20 | 32.71 | 47 | 29.94 | 43 | 9.86 | 57 | 17.90 | 40 | 51.39 | 42 | 54.47 | 44 | | | | | | |
| Bahrain | 31.25 | 37 | 25.10 | 34 | 37.41 | 35 | 26.00 | 53 | 15.21 | 41 | 15.72 | 45 | 58.51 | 25 | 71.59 | 16 | | | | | | |
| South Africa | 30.54 | 38 | 18.10 | 54 | 42.98 | 27 | 50.04 | 21 | 19.85 | 31 | 45.04 | 17 | 54.50 | 32 | 45.46 | 51 | | | | | | |
| Dominican Republic | 30.28 | 39 | 25.34 | 32 | 35.21 | 40 | 40.35 | 34 | 14.09 | 45 | 13.90 | 46 | 46.05 | 50 | 61.65 | 34 | | | | | | |
| Kazakhstan | 29.53 | 40 | 14.37 | 60 | 44.70 | 25 | 49.33 | 23 | 12.14 | 52 | 35.55 | 23 | 56.37 | 29 | 70.10 | 19 | 38.49 | 18 | 32.27 | 22 | 50.18 | 19 |
| Indonesia | 29.06 | 41 | 23.53 | 42 | 34.60 | 41 | 29.18 | 45 | 20.01 | 30 | 19.55 | 36 | 55.30 | 31 | 48.97 | 49 | 35.54 | 23 | 36.49 | 21 | 49.45 | 20 |
| Azerbaijan | 29.06 | 42 | 21.94 | 48 | 36.18 | 38 | 23.70 | 54 | 12.35 | 50 | 25.48 | 28 | 55.62 | 30 | 63.77 | 30 | 42.06 | 14 | 47.95 | 12 | 73.95 | 6 |
| Tunisia | 28.65 | 43 | 22.92 | 45 | 34.39 | 42 | 33.77 | 39 | 17.98 | 33 | 8.78 | 60 | 48.45 | 47 | 63.00 | 32 | | | | | | |
| Kuwait | 28.31 | 44 | 18.06 | 55 | 38.56 | 33 | 22.08 | 56 | 17.47 | 34 | 16.21 | 43 | 54.49 | 33 | 82.53 | 6 | 41.25 | 15 | 43.95 | 15 | 69.83 | 8 |
| Angola | 27.85 | 45 | 32.73 | 19 | 22.97 | 59 | 15.01 | 63 | 2.91 | 63 | 24.47 | 30 | 31.54 | 64 | 40.93 | 52 | 37.16 | 21 | 51.36 | 9 | 69.98 | 7 |
| Morocco | 27.74 | 46 | 19.56 | 53 | 35.92 | 39 | 38.45 | 35 | 14.82 | 43 | 20.10 | 35 | 52.20 | 40 | 54.01 | 45 | | | | | | |
| Sri Lanka | 27.66 | 47 | 23.35 | 43 | 31.96 | 48 | 38.01 | 36 | 9.44 | 58 | 13.59 | 48 | 48.61 | 46 | 50.16 | 48 | | | | | | |
| India | 27.53 | 48 | 21.05 | 50 | 34.00 | 44 | 40.55 | 33 | 23.86 | 24 | 15.81 | 44 | 54.40 | 34 | 35.39 | 56 | 35.62 | 22 | 37.24 | 20 | 53.42 | 18 |
| Cote D'Ivoire | 26.53 | 49 | 24.24 | 38 | 28.82 | 51 | 31.44 | 41 | 8.91 | 60 | 24.64 | 29 | 42.25 | 56 | 36.87 | 54 | | | | | | |
| Ghana | 26.29 | 50 | 23.98 | 39 | 28.60 | 53 | 37.74 | 37 | 10.74 | 55 | 18.17 | 39 | 40.93 | 58 | 35.40 | 55 | | | | | | |
| Lebanon | 26.26 | 51 | 23.86 | 41 | 28.67 | 52 | 26.07 | 52 | 14.08 | 46 | 18.31 | 38 | 45.62 | 51 | 39.28 | 53 | | | | | | |
| Iran | 25.78 | 52 | 17.41 | 56 | 34.15 | 43 | 32.14 | 40 | 19.48 | 32 | 9.60 | 57 | 48.86 | 44 | 60.66 | 35 | 30.69 | 24 | 27.23 | 24 | 37.05 | 25 |
| Iraq | 25.68 | 53 | 28.89 | 26 | 22.47 | 60 | 14.67 | 64 | 0.84 | 64 | 9.88 | 55 | 41.13 | 57 | 45.81 | 50 | 23.96 | 27 | 25.45 | 26 | 22.01 | 27 |
| Kenya | 24.65 | 54 | 23.22 | 44 | 26.07 | 56 | 26.88 | 50 | 13.34 | 47 | 9.72 | 56 | 47.29 | 49 | 33.11 | 57 | | | | | | |
| Uzbekistan | 24.19 | 55 | 16.89 | 58 | 31.48 | 49 | 21.58 | 58 | 6.29 | 62 | 12.18 | 50 | 52.16 | 41 | 65.19 | 27 | 25.80 | 26 | 20.12 | 27 | 23.35 | 26 |
| Algeria | 23.70 | 56 | 16.50 | 59 | 30.91 | 50 | 26.83 | 51 | 10.00 | 56 | 3.58 | 64 | 49.99 | 43 | 64.16 | 28 | 22.61 | 28 | 14.31 | 28 | 12.11 | 28 |
| Pakistan | 23.39 | 57 | 25.29 | 33 | 21.48 | 64 | 21.82 | 57 | 15.17 | 42 | 12.43 | 49 | 42.61 | 55 | 15.38 | 64 | | | | | | |
| Bangladesh | 22.83 | 58 | 23.86 | 40 | 21.81 | 63 | 22.11 | 55 | 7.34 | 61 | 9.17 | 59 | 43.08 | 54 | 27.34 | 62 | | | | | | |
| Guatemala | 22.08 | 59 | 17.05 | 57 | 27.12 | 54 | 16.89 | 62 | 13.03 | 48 | 10.61 | 54 | 43.97 | 53 | 51.13 | 47 | | | | | | |
| Cameroon | 21.18 | 60 | 20.52 | 51 | 21.85 | 62 | 17.32 | 61 | 9.24 | 59 | 11.23 | 52 | 38.54 | 62 | 32.92 | 59 | | | | | | |
| Nigeria | 18.77 | 61 | 11.21 | 62 | 26.32 | 55 | 41.84 | 31 | 12.68 | 49 | 4.94 | 63 | 40.44 | 59 | 31.70 | 60 | 26.14 | 25 | 25.95 | 25 | 40.69 | 24 |
| Tanzania | 17.45 | 62 | 12.72 | 61 | 22.18 | 61 | 27.19 | 49 | 11.46 | 53 | 5.37 | 62 | 39.35 | 61 | 27.52 | 61 | | | | | | |
| Ethiopia | 16.78 | 63 | 10.10 | 63 | 23.46 | 57 | 20.14 | 59 | 16.05 | 40 | 11.02 | 53 | 37.14 | 63 | 32.97 | 58 | | | | | | |
| Uganda | 16.26 | 64 | 9.30 | 64 | 23.22 | 58 | 30.38 | 42 | 10.82 | 54 | 9.25 | 58 | 39.58 | 60 | 26.07 | 63 | | | | | | |

| | | | | | Enablers dimensions | | | | | | | | | Oil Producers Lens (OPL) | | | | | |
| 2022 CCE Index Results | Total CCE Index | | Performance sub-index | | Enablers sub-index | | Policies and regulation | | Technology, knowledge and innovation | | Finance and investment | | Business environment | | System resilliance | | Total OPL | | Performance sub-index (with OPL) | | OPL indicators | |
| | score | rank | score | rank | score | rank | score | rank | score | rank | score | rank | score | rank | score | rank | score | rank | score | rank | score | rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| United Kingdom | 71.91 | 1 | 68.71 | 2 | 75.11 | 4 | 87.81 | 1 | 53.54 | 8 | 73.25 | 8 | 75.85 | 6 | 85.08 | 5 | 73.81 | 1 | 72.52 | 2 | 76.33 | 5 |
| Norway | 70.39 | 2 | 68.84 | 1 | 71.94 | 5 | 64.99 | 11 | 52.17 | 9 | 76.79 | 6 | 77.93 | 1 | 87.83 | 2 | 73.29 | 2 | 74.64 | 1 | 80.43 | 3 |
| Netherlands | 66.68 | 3 | 57.85 | 3 | 75.52 | 3 | 67.80 | 10 | 64.46 | 7 | 87.66 | 2 | 75.11 | 8 | 82.58 | 7 | 72.91 | 3 | 70.29 | 3 | 82.73 | 2 |
| Canada | 62.78 | 4 | 55.46 | 4 | 70.11 | 10 | 70.65 | 7 | 47.83 | 12 | 75.00 | 7 | 77.90 | 2 | 79.15 | 10 | 64.56 | 5 | 59.02 | 5 | 62.57 | 13 |
| Switzerland | 61.88 | 5 | 47.68 | 8 | 76.08 | 2 | 54.60 | 16 | 78.54 | 1 | 84.01 | 3 | 69.13 | 15 | 94.12 | 1 | | | | | | |
| Germany | 60.77 | 6 | 42.34 | 11 | 79.20 | 1 | 82.25 | 2 | 77.71 | 2 | 76.99 | 5 | 76.87 | 4 | 82.16 | 8 | | | | | | |
| United States | 60.43 | 7 | 50.19 | 6 | 70.67 | 7 | 68.28 | 9 | 66.43 | 6 | 62.17 | 12 | 75.98 | 5 | 80.51 | 9 | 65.27 | 4 | 59.87 | 4 | 69.55 | 8 |
| Spain | 59.34 | 8 | 50.33 | 5 | 68.34 | 12 | 76.11 | 5 | 34.45 | 18 | 89.79 | 1 | 70.67 | 11 | 70.69 | 22 | | | | | | |
| France | 57.10 | 9 | 43.21 | 9 | 71.00 | 6 | 80.64 | 3 | 51.49 | 10 | 73.02 | 9 | 71.95 | 9 | 77.90 | 11 | | | | | | |
| Australia | 56.42 | 10 | 48.64 | 7 | 64.20 | 13 | 69.50 | 8 | 43.96 | 13 | 58.53 | 14 | 77.46 | 3 | 71.53 | 17 | 59.72 | 6 | 55.23 | 7 | 61.83 | 14 |
| Republic of Korea | 55.22 | 11 | 39.98 | 14 | 70.46 | 9 | 64.68 | 12 | 77.23 | 3 | 69.94 | 11 | 69.24 | 14 | 71.21 | 18 | | | | | | |
| Japan | 52.82 | 12 | 35.11 | 19 | 70.53 | 8 | 77.27 | 4 | 67.22 | 5 | 61.68 | 13 | 75.28 | 7 | 71.19 | 19 | | | | | | |
| Italy | 47.96 | 13 | 34.61 | 20 | 61.30 | 14 | 75.18 | 6 | 35.61 | 15 | 55.11 | 16 | 68.39 | 16 | 72.24 | 16 | | | | | | |
| Chile | 47.49 | 14 | 40.96 | 13 | 54.03 | 18 | 55.32 | 15 | 15.80 | 38 | 80.79 | 4 | 60.13 | 23 | 58.09 | 42 | | | | | | |
| Singapore | 47.36 | 15 | 24.95 | 42 | 69.77 | 11 | 51.02 | 21 | 77.07 | 4 | 72.04 | 10 | 61.28 | 20 | 87.43 | 3 | | | | | | |
| United Arab Emirates | 44.56 | 16 | 33.42 | 22 | 55.71 | 16 | 51.21 | 20 | 32.85 | 19 | 49.18 | 17 | 70.54 | 12 | 74.78 | 12 | 52.36 | 7 | 49.02 | 11 | 64.62 | 11 |
| Brazil | 42.60 | 17 | 38.72 | 15 | 46.49 | 23 | 54.12 | 17 | 22.77 | 25 | 33.78 | 25 | 63.53 | 17 | 58.25 | 40 | 49.95 | 9 | 53.41 | 8 | 68.11 | 10 |
| Costa Rica | 41.68 | 18 | 41.87 | 12 | 41.49 | 31 | 52.62 | 18 | 14.43 | 43 | 15.94 | 44 | 49.92 | 45 | 74.54 | 13 | | | | | | |
| China | 40.85 | 19 | 24.73 | 43 | 56.96 | 15 | 49.22 | 25 | 49.43 | 11 | 58.27 | 15 | 71.10 | 10 | 56.80 | 45 | 50.53 | 8 | 44.10 | 14 | 63.46 | 12 |
| Poland | 39.13 | 20 | 23.96 | 46 | 54.30 | 17 | 61.50 | 13 | 25.76 | 23 | 42.99 | 19 | 70.46 | 13 | 70.82 | 20 | | | | | | |
| Mexico | 38.51 | 21 | 28.48 | 32 | 48.54 | 21 | 50.07 | 22 | 26.85 | 22 | 37.58 | 23 | 61.01 | 21 | 67.18 | 26 | 44.41 | 12 | 40.27 | 18 | 52.07 | 20 |
| Egypt | 38.41 | 22 | 42.92 | 10 | 33.89 | 47 | 29.00 | 47 | 18.06 | 34 | 12.60 | 51 | 48.15 | 49 | 61.65 | 34 | 40.90 | 17 | 47.91 | 12 | 52.91 | 18 |
| Viet Nam | 38.31 | 23 | 27.90 | 33 | 48.73 | 20 | 46.61 | 28 | 34.78 | 17 | 41.69 | 20 | 62.32 | 19 | 58.22 | 41 | | | | | | |
| Colombia | 37.49 | 24 | 31.06 | 25 | 43.92 | 27 | 48.98 | 26 | 17.12 | 37 | 39.20 | 21 | 54.62 | 37 | 59.66 | 37 | | | | | | |
| Jordan | 37.38 | 25 | 38.26 | 16 | 36.50 | 38 | 30.72 | 44 | 17.19 | 36 | 17.16 | 41 | 53.62 | 40 | 63.82 | 32 | | | | | | |
| Kazakhstan | 36.53 | 26 | 27.61 | 35 | 45.45 | 24 | 49.23 | 24 | 12.21 | 51 | 36.85 | 24 | 58.23 | 29 | 70.74 | 21 | 43.10 | 14 | 40.75 | 17 | 53.89 | 17 |
| South Africa | 36.50 | 27 | 29.37 | 28 | 43.62 | 28 | 51.86 | 19 | 19.66 | 31 | 43.17 | 18 | 56.27 | 33 | 47.17 | 50 | | | | | | |
| Qatar | 36.13 | 28 | 27.36 | 37 | 44.89 | 26 | 28.33 | 49 | 30.99 | 21 | 19.31 | 37 | 59.72 | 25 | 86.11 | 4 | 48.76 | 11 | 52.63 | 10 | 77.89 | 4 |
| Türkiye | 35.85 | 29 | 29.33 | 29 | 42.38 | 30 | 47.89 | 27 | 22.47 | 27 | 23.43 | 29 | 58.82 | 28 | 59.27 | 38 | | | | | | |
| Argentina | 35.79 | 30 | 30.92 | 26 | 40.67 | 32 | 43.95 | 31 | 15.76 | 41 | 25.18 | 28 | 55.04 | 35 | 63.41 | 33 | 41.26 | 16 | 41.85 | 16 | 52.77 | 19 |
| Russian Federation | 35.79 | 31 | 26.59 | 38 | 44.98 | 25 | 55.89 | 14 | 21.28 | 29 | 19.47 | 36 | 59.71 | 26 | 68.56 | 25 | 39.88 | 18 | 34.78 | 23 | 42.97 | 23 |
| Saudi Arabia | 35.65 | 32 | 28.82 | 31 | 42.49 | 29 | 38.95 | 37 | 22.57 | 26 | 15.43 | 45 | 62.84 | 18 | 72.65 | 15 | 49.21 | 10 | 55.94 | 6 | 83.07 | 1 |
| Ecuador | 35.34 | 33 | 36.68 | 17 | 34.00 | 45 | 45.29 | 29 | 11.12 | 53 | 6.98 | 59 | 46.15 | 51 | 60.47 | 35 | | | | | | |
| Morocco | 35.24 | 34 | 32.28 | 23 | 38.19 | 35 | 42.45 | 33 | 19.17 | 32 | 18.24 | 39 | 54.18 | 39 | 56.92 | 44 | | | | | | |
| Malaysia | 35.20 | 35 | 21.47 | 54 | 48.92 | 19 | 43.32 | 32 | 40.82 | 14 | 30.10 | 26 | 60.60 | 22 | 69.76 | 24 | 43.89 | 13 | 38.86 | 20 | 56.24 | 15 |
| Thailand | 34.36 | 36 | 21.08 | 55 | 47.64 | 22 | 49.28 | 23 | 31.40 | 20 | 38.59 | 22 | 60.00 | 24 | 58.90 | 39 | | | | | | |
| Peru | 33.78 | 37 | 33.57 | 21 | 33.99 | 46 | 30.43 | 45 | 9.99 | 59 | 19.95 | 34 | 52.56 | 42 | 57.01 | 43 | | | | | | |
| Philippines | 33.62 | 38 | 28.96 | 30 | 38.29 | 34 | 28.73 | 48 | 35.29 | 16 | 20.54 | 33 | 54.35 | 38 | 52.52 | 47 | | | | | | |
| Dominican Republic | 33.54 | 39 | 31.20 | 24 | 35.88 | 40 | 40.35 | 35 | 13.57 | 46 | 13.39 | 48 | 47.06 | 50 | 65.01 | 30 | | | | | | |
| Oman | 32.77 | 40 | 27.75 | 34 | 37.80 | 36 | 18.48 | 61 | 21.61 | 28 | 22.56 | 30 | 55.83 | 34 | 70.49 | 23 | 37.86 | 21 | 37.93 | 22 | 48.12 | 22 |
| Bahrain | 32.68 | 41 | 25.10 | 41 | 40.26 | 33 | 26.60 | 53 | 15.78 | 39 | 25.47 | 27 | 58.98 | 27 | 74.48 | 14 | | | | | | |
| Indonesia | 31.73 | 42 | 27.55 | 36 | 35.91 | 39 | 31.68 | 42 | 20.90 | 30 | 19.68 | 35 | 57.33 | 31 | 49.96 | 49 | 37.39 | 22 | 38.87 | 19 | 50.20 | 21 |
| Azerbaijan | 29.63 | 43 | 23.79 | 49 | 35.46 | 42 | 23.80 | 55 | 12.71 | 49 | 18.01 | 40 | 57.48 | 30 | 65.33 | 27 | 41.49 | 15 | 47.52 | 13 | 71.26 | 6 |
| Angola | 29.50 | 44 | 35.34 | 18 | 23.65 | 57 | 16.91 | 63 | 2.91 | 63 | 20.98 | 31 | 34.26 | 64 | 43.22 | 52 | 38.36 | 20 | 53.07 | 9 | 70.80 | 7 |
| Tunisia | 29.10 | 45 | 23.35 | 51 | 34.86 | 43 | 33.87 | 40 | 17.52 | 35 | 8.43 | 57 | 49.35 | 47 | 65.12 | 28 | | | | | | |
| India | 28.78 | 46 | 21.96 | 53 | 35.60 | 41 | 41.25 | 34 | 23.42 | 24 | 18.60 | 38 | 56.60 | 32 | 38.14 | 57 | 37.13 | 23 | 38.65 | 21 | 55.35 | 16 |
| Ghana | 28.16 | 47 | 26.39 | 39 | 29.92 | 52 | 40.34 | 36 | 10.64 | 56 | 16.26 | 43 | 43.66 | 57 | 38.69 | 54 | | | | | | |
| Sri Lanka | 28.13 | 48 | 23.60 | 50 | 32.66 | 48 | 38.31 | 38 | 11.09 | 54 | 12.78 | 49 | 49.89 | 46 | 51.25 | 48 | | | | | | |
| Cote D'Ivoire | 27.01 | 49 | 23.80 | 48 | 30.23 | 51 | 38.14 | 39 | 10.22 | 57 | 20.70 | 32 | 43.92 | 56 | 38.17 | 56 | | | | | | |
| Iraq | 26.65 | 50 | 30.15 | 27 | 23.16 | 60 | 15.45 | 64 | 1.41 | 64 | 9.34 | 54 | 43.05 | 58 | 46.55 | 51 | 24.43 | 27 | 25.70 | 25 | 21.25 | 27 |
| Kuwait | 26.42 | 51 | 15.10 | 60 | 37.73 | 37 | 22.08 | 56 | 14.84 | 42 | 14.21 | 46 | 54.67 | 36 | 82.84 | 6 | 39.84 | 19 | 41.96 | 15 | 68.82 | 9 |
| Lebanon | 26.40 | 52 | 23.83 | 47 | 28.98 | 53 | 30.17 | 46 | 14.08 | 45 | 17.15 | 42 | 45.01 | 53 | 38.48 | 55 | | | | | | |
| Guatemala | 25.80 | 53 | 23.24 | 52 | 28.37 | 54 | 19.49 | 60 | 13.11 | 48 | 10.63 | 52 | 45.46 | 52 | 53.17 | 46 | | | | | | |
| Iran | 25.14 | 54 | 15.76 | 59 | 34.51 | 44 | 32.94 | 41 | 18.45 | 33 | 10.50 | 53 | 50.22 | 44 | 60.44 | 36 | 30.40 | 24 | 26.29 | 24 | 36.83 | 25 |
| Uzbekistan | 24.54 | 55 | 17.07 | 57 | 32.00 | 49 | 21.58 | 58 | 6.07 | 62 | 14.04 | 47 | 53.24 | 41 | 65.08 | 29 | 25.76 | 26 | 19.51 | 27 | 21.95 | 26 |
| Bangladesh | 24.19 | 56 | 25.52 | 40 | 22.86 | 62 | 22.01 | 57 | 7.89 | 61 | 9.71 | 54 | 44.95 | 54 | 29.75 | 61 | | | | | | |
| Algeria | 24.11 | 57 | 16.77 | 58 | 31.45 | 50 | 27.23 | 52 | 10.00 | 58 | 3.72 | 64 | 51.49 | 43 | 64.82 | 31 | 23.35 | 28 | 15.25 | 28 | 13.72 | 28 |
| Kenya | 23.87 | 58 | 20.72 | 56 | 27.03 | 55 | 27.48 | 51 | 12.44 | 50 | 5.46 | 62 | 49.29 | 48 | 40.49 | 53 | | | | | | |
| Pakistan | 23.58 | 59 | 24.31 | 45 | 22.85 | 63 | 24.02 | 54 | 15.77 | 40 | 12.75 | 50 | 44.45 | 55 | 17.27 | 64 | | | | | | |
| Cameroon | 22.93 | 60 | 24.36 | 44 | 21.49 | 64 | 17.42 | 62 | 9.15 | 60 | 5.77 | 60 | 40.15 | 62 | 34.96 | 58 | | | | | | |
| Tanzania | 19.00 | 61 | 14.87 | 61 | 23.13 | 61 | 27.80 | 50 | 11.41 | 52 | 5.47 | 61 | 41.29 | 60 | 29.71 | 62 | | | | | | |
| Nigeria | 18.96 | 62 | 10.93 | 62 | 26.98 | 56 | 44.24 | 30 | 13.52 | 47 | 5.02 | 63 | 41.87 | 59 | 30.24 | 60 | 26.33 | 25 | 25.69 | 26 | 40.44 | 24 |
| Uganda | 16.92 | 63 | 10.24 | 64 | 23.59 | 58 | 30.78 | 43 | 10.84 | 55 | 8.28 | 58 | 40.38 | 61 | 27.68 | 63 | | | | | | |
| Ethiopia | 16.90 | 64 | 10.64 | 63 | 23.16 | 59 | 20.24 | 59 | 14.09 | 44 | 8.72 | 56 | 38.34 | 63 | 34.43 | 59 | | | | | | |

| 2023 CCE Index Results | Total CCE Index score | rank | Performance sub-index score | rank | Enablers sub-index score | rank | Policies and regulation score | rank | Technology, knowledge and innovation score | rank | Finance and investment score | rank | Business environment score | rank | System resilliance score | rank | Total OPL score | rank | Performance sub-index (with OPL) score | rank | OPL indicators score | rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Norway | 71.81 | 1 | 68.82 | 1 | 74.79 | 5 | 66.79 | 13 | 62.29 | 8 | 79.44 | 7 | 78.58 | 2 | 86.83 | 2 | 74.69 | 1 | 74.59 | 1 | 80.36 | 3 |
| United Kingdom | 69.55 | 2 | 63.40 | 2 | 75.71 | 4 | 90.61 | 1 | 54.37 | 9 | 76.13 | 8 | 74.21 | 7 | 83.22 | 5 | 73.07 | 2 | 70.43 | 2 | 77.46 | 5 |
| Netherlands | 65.84 | 3 | 55.64 | 4 | 76.05 | 3 | 69.80 | 11 | 67.87 | 6 | 87.51 | 3 | 74.87 | 6 | 80.19 | 8 | 72.60 | 3 | 69.16 | 3 | 82.68 | 2 |
| Canada | 65.51 | 4 | 57.93 | 3 | 73.09 | 7 | 76.25 | 9 | 49.33 | 12 | 81.97 | 5 | 79.19 | 1 | 78.69 | 11 | 66.65 | 5 | 60.20 | 6 | 62.48 | 14 |
| Germany | 65.46 | 5 | 51.35 | 7 | 79.58 | 2 | 82.55 | 2 | 76.28 | 4 | 82.51 | 4 | 76.09 | 4 | 80.47 | 7 | | | | | | |
| Switzerland | 64.42 | 6 | 48.61 | 9 | 80.24 | 1 | 71.00 | 10 | 78.31 | 3 | 89.16 | 1 | 69.40 | 14 | 93.34 | 1 | | | | | | |
| United States | 62.69 | 7 | 51.98 | 6 | 73.39 | 6 | 78.78 | 5 | 68.26 | 5 | 65.10 | 13 | 75.40 | 5 | 79.41 | 10 | 67.21 | 4 | 61.03 | 4 | 70.07 | 7 |
| Spain | 61.23 | 8 | 53.93 | 5 | 68.54 | 12 | 78.71 | 6 | 36.63 | 17 | 87.69 | 2 | 70.75 | 11 | 68.91 | 23 | | | | | | |
| Australia | 59.00 | 9 | 49.91 | 8 | 68.08 | 13 | 77.10 | 8 | 46.88 | 13 | 69.80 | 12 | 76.74 | 3 | 69.90 | 19 | 62.32 | 6 | 56.56 | 8 | 63.21 | 12 |
| France | 57.22 | 10 | 43.55 | 10 | 70.90 | 9 | 82.24 | 3 | 51.10 | 11 | 73.09 | 10 | 71.68 | 9 | 76.39 | 12 | | | | | | |
| Republic of Korea | 56.57 | 11 | 40.35 | 14 | 72.78 | 8 | 68.62 | 12 | 80.41 | 2 | 75.40 | 9 | 69.18 | 15 | 70.30 | 17 | | | | | | |
| Japan | 53.40 | 12 | 36.32 | 20 | 70.49 | 10 | 79.67 | 4 | 66.37 | 7 | 63.41 | 14 | 73.98 | 8 | 68.99 | 22 | | | | | | |
| Chile | 48.46 | 13 | 41.31 | 13 | 55.61 | 17 | 63.90 | 14 | 16.77 | 39 | 81.33 | 6 | 58.50 | 27 | 57.56 | 40 | | | | | | |
| Italy | 48.25 | 14 | 33.70 | 25 | 62.81 | 14 | 77.18 | 7 | 38.57 | 15 | | | 68.43 | 16 | 69.49 | 20 | | | | | | |
| Singapore | 47.80 | 15 | 25.31 | 42 | 70.28 | 11 | 50.38 | 32 | 82.34 | 1 | 70.38 | 11 | 62.70 | 19 | 85.58 | 3 | | | | | | |
| United Arab Emirates | 47.38 | 16 | 38.48 | 15 | 56.28 | 16 | 55.18 | 20 | 34.12 | 19 | 46.59 | 18 | 71.25 | 10 | 74.27 | 13 | 53.71 | 7 | 51.15 | 11 | 63.81 | 10 |
| China | 42.38 | 17 | 26.73 | 39 | 58.04 | 15 | 50.61 | 30 | 52.72 | 10 | 60.79 | 15 | 70.42 | 12 | 55.65 | 42 | 51.63 | 10 | 45.23 | 14 | 63.73 | 11 |
| Brazil | 42.27 | 18 | 37.15 | 18 | 47.39 | 23 | 58.57 | 17 | 23.44 | 25 | 35.70 | 26 | 63.70 | 18 | 55.57 | 43 | 49.99 | 11 | 52.58 | 10 | 68.01 | 9 |
| Costa Rica | 41.45 | 19 | 41.54 | 12 | 41.37 | 33 | 52.81 | 23 | 15.54 | 44 | 15.97 | 44 | 49.85 | 44 | 72.68 | 14 | | | | | | |
| Saudi Arabia | 41.33 | 20 | 38.23 | 16 | 44.43 | 30 | 44.74 | 36 | 23.31 | 26 | 17.06 | 41 | 65.38 | 17 | 71.64 | 15 | 52.58 | 8 | 60.73 | 5 | 83.23 | 1 |
| Qatar | 40.39 | 21 | 34.15 | 24 | 46.63 | 24 | 28.20 | 52 | 32.67 | 21 | 27.47 | 29 | 60.87 | 23 | 84.95 | 4 | 51.63 | 9 | 56.63 | 7 | 79.12 | 4 |
| Viet Nam | 39.96 | 22 | 30.12 | 32 | 49.80 | 20 | 51.42 | 25 | 36.84 | 16 | 41.33 | 20 | 61.87 | 21 | 57.53 | 41 | | | | | | |
| Colombia | 39.37 | 23 | 33.08 | 26 | 45.67 | 27 | 59.09 | 16 | 18.01 | 35 | 39.08 | 22 | 54.43 | 37 | 57.74 | 38 | | | | | | |
| Poland | 38.54 | 24 | 22.27 | 51 | 54.82 | 18 | 61.90 | 15 | 26.24 | 23 | 45.93 | 19 | 69.77 | 13 | 70.27 | 18 | | | | | | |
| Malaysia | 38.28 | 25 | 25.33 | 41 | 51.24 | 19 | 50.45 | 31 | 40.08 | 14 | 34.83 | 27 | 61.81 | 22 | 69.02 | 21 | 47.24 | 12 | 43.24 | 16 | 61.15 | 15 |
| Egypt | 38.16 | 26 | 42.97 | 11 | 33.34 | 48 | 29.17 | 49 | 17.91 | 36 | 12.48 | 50 | 48.37 | 48 | 58.79 | 35 | 41.00 | 16 | 48.66 | 12 | 54.35 | 18 |
| South Africa | 38.06 | 27 | 30.90 | 30 | 45.23 | 28 | 54.79 | 21 | 19.13 | 32 | 50.35 | 17 | 57.00 | 33 | 44.87 | 51 | | | | | | |
| Mexico | 37.72 | 28 | 27.63 | 36 | 47.81 | 22 | 50.31 | 33 | 27.70 | 22 | 37.06 | 24 | 60.00 | 24 | 63.99 | 31 | 44.40 | 13 | 40.99 | 18 | 54.35 | 19 |
| Indonesia | 37.44 | 29 | 37.37 | 17 | 46.63 | 24 | 34.19 | 45 | 22.93 | 28 | 26.37 | 30 | 56.77 | 34 | 47.30 | 48 | 40.52 | 18 | 43.54 | 15 | 49.71 | 22 |
| Türkiye | 36.83 | 30 | 30.23 | 31 | 43.43 | 31 | 51.41 | 26 | 23.27 | 27 | 25.71 | 31 | 58.53 | 26 | 58.25 | 37 | | | | | | |
| Kazakhstan | 36.76 | 31 | 27.15 | 38 | 46.37 | 25 | 54.03 | 22 | 12.41 | 52 | 36.64 | 25 | 57.98 | 29 | 70.81 | 16 | 44.03 | 14 | 41.69 | 17 | 56.24 | 17 |
| Thailand | 35.73 | 32 | 21.96 | 54 | 49.50 | 21 | 55.93 | 18 | 33.91 | 20 | 40.47 | 21 | 59.56 | 25 | 57.64 | 39 | | | | | | |
| Dominican Republic | 35.52 | 33 | 34.75 | 21 | 36.30 | 42 | 41.80 | 40 | 15.18 | 45 | 14.11 | 48 | 47.17 | 50 | 63.24 | 32 | | | | | | |
| Russian Federation | 35.45 | 34 | 24.76 | 46 | 46.14 | 26 | 55.39 | 19 | 21.52 | 29 | 28.46 | 28 | 58.21 | 28 | 67.10 | 25 | 40.26 | 19 | 34.38 | 23 | 44.01 | 23 |
| Peru | 35.41 | 35 | 34.34 | 22 | 36.49 | 41 | 44.54 | 37 | 10.84 | 57 | 18.45 | 38 | 53.58 | 41 | 55.03 | 44 | | | | | | |
| Jordan | 34.92 | 36 | 32.66 | 28 | 37.18 | 40 | 32.33 | 47 | 18.61 | 34 | 16.64 | 42 | 54.19 | 39 | 64.14 | 30 | | | | | | |
| Bahrain | 34.91 | 37 | 25.09 | 44 | 44.73 | 29 | 28.20 | 51 | 16.00 | 42 | 37.93 | 23 | 62.07 | 20 | 79.46 | 6 | | | | | | |
| Argentina | 34.69 | 38 | 28.69 | 35 | 40.70 | 34 | 47.28 | 35 | 16.67 | 40 | 23.27 | 32 | 54.39 | 38 | 61.89 | 33 | 40.76 | 17 | 40.82 | 19 | 52.96 | 20 |
| Ecuador | 34.52 | 39 | 34.21 | 23 | 34.83 | 45 | 50.98 | 29 | 12.31 | 53 | 6.02 | 61 | 46.29 | 51 | 58.55 | 36 | | | | | | |
| Oman | 34.36 | 40 | 27.20 | 37 | 41.51 | 32 | 39.83 | 41 | 21.08 | 30 | 21.09 | 35 | 57.18 | 31 | 68.39 | 24 | 40.24 | 20 | 38.96 | 21 | 50.73 | 21 |
| Morocco | 34.00 | 41 | 32.09 | 29 | 35.92 | 43 | 42.18 | 39 | 20.24 | 31 | 16.47 | 43 | 53.74 | 40 | 46.97 | 49 | | | | | | |
| Philippines | 33.63 | 42 | 28.80 | 34 | 38.46 | 36 | 28.87 | 50 | 36.11 | 18 | 21.73 | 34 | 55.16 | 36 | 50.45 | 46 | | | | | | |
| Ghana | 32.09 | 43 | 33.04 | 27 | 31.13 | 51 | 51.17 | 28 | 10.22 | 59 | 14.52 | 45 | 42.08 | 59 | 37.67 | 55 | | | | | | |
| Azerbaijan | 30.38 | 44 | 24.90 | 45 | 35.85 | 44 | 24.41 | 56 | 14.36 | 47 | 17.48 | 40 | 57.52 | 30 | 65.49 | 26 | 41.28 | 15 | 46.71 | 13 | 68.52 | 8 |
| Tunisia | 30.08 | 45 | 22.00 | 53 | 38.15 | 37 | 51.18 | 27 | 17.59 | 37 | 8.12 | 57 | 49.00 | 45 | 64.88 | 28 | | | | | | |
| Angola | 30.04 | 46 | 36.38 | 19 | 23.69 | 58 | 20.74 | 62 | 3.13 | 63 | 20.82 | 36 | 35.83 | 64 | 37.91 | 54 | 38.88 | 22 | 54.08 | 9 | 71.77 | 6 |
| India | 30.01 | 47 | 22.73 | 49 | 37.28 | 39 | 48.14 | 34 | 24.91 | 24 | 18.68 | 37 | 57.09 | 32 | 37.59 | 56 | 38.45 | 23 | 39.62 | 20 | 56.51 | 16 |
| Sri Lanka | 28.29 | 48 | 25.20 | 43 | 31.39 | 50 | 35.77 | 44 | 11.12 | 56 | 12.19 | 52 | 48.46 | 47 | 49.39 | 47 | | | | | | |
| Kuwait | 27.71 | 49 | 14.91 | 59 | 40.52 | 35 | 33.53 | 46 | 16.03 | 41 | 13.81 | 49 | 56.54 | 35 | 82.69 | 6 | 39.71 | 21 | 38.89 | 22 | 62.87 | 13 |
| Lebanon | 26.89 | 50 | 23.04 | 48 | 30.74 | 52 | 42.98 | 38 | 14.29 | 48 | 14.29 | 47 | 44.00 | 56 | 38.11 | 53 | | | | | | |
| Cote D'Ivoire | 26.31 | 51 | 22.09 | 52 | 30.53 | 53 | 38.91 | 42 | 10.26 | 58 | 12.55 | 53 | 44.02 | 55 | 36.91 | 57 | | | | | | |
| Iraq | 26.18 | 52 | 29.01 | 33 | 23.36 | 59 | 15.68 | 64 | 1.40 | 64 | 8.38 | 56 | 45.98 | 52 | 45.35 | 50 | 24.59 | 27 | 25.82 | 26 | 22.64 | 27 |
| Guatemala | 25.94 | 53 | 22.48 | 50 | 29.39 | 55 | 21.12 | 61 | 13.93 | 49 | 14.30 | 46 | 45.84 | 53 | 51.76 | 45 | | | | | | |
| Uzbekistan | 25.79 | 54 | 16.97 | 57 | 34.60 | 46 | 22.35 | 57 | 15.55 | 43 | 17.59 | 39 | 52.67 | 43 | 64.84 | 29 | 27.23 | 26 | 19.86 | 27 | 22.74 | 26 |
| Iran | 24.34 | 55 | 14.85 | 60 | 33.83 | 47 | 31.79 | 48 | 19.11 | 33 | 10.48 | 53 | 48.55 | 46 | 59.20 | 34 | 30.24 | 24 | 26.66 | 24 | 38.47 | 25 |
| Algeria | 24.13 | 56 | 16.54 | 58 | 31.72 | 49 | 27.07 | 55 | 10.01 | 60 | 3.19 | 64 | 52.90 | 42 | 65.44 | 27 | 23.19 | 28 | 14.65 | 28 | 12.77 | 28 |
| Pakistan | 23.88 | 57 | 26.33 | 40 | 21.43 | 63 | 21.18 | 60 | 17.13 | 38 | 12.29 | 51 | 43.35 | 57 | 13.18 | 64 | | | | | | |
| Kenya | 23.48 | 58 | 20.52 | 55 | 26.44 | 56 | 27.82 | 53 | 12.64 | 51 | 4.34 | 63 | 48.20 | 49 | 39.21 | 52 | | | | | | |
| Bangladesh | 22.95 | 59 | 24.10 | 47 | 21.81 | 62 | 21.36 | 59 | 8.47 | 62 | 8.04 | 58 | 44.23 | 54 | 26.95 | 63 | | | | | | |
| Cameroon | 20.84 | 60 | 20.35 | 56 | 21.33 | 64 | 18.76 | 63 | 9.50 | 61 | 6.17 | 60 | 38.40 | 62 | 33.83 | 59 | | | | | | |
| Nigeria | 20.24 | 61 | 10.99 | 63 | 29.50 | 54 | 52.13 | 24 | 14.40 | 46 | 8.89 | 54 | 42.31 | 58 | 29.76 | 60 | 27.89 | 25 | 26.28 | 25 | 41.57 | 24 |
| Tanzania | 18.24 | 62 | 13.88 | 61 | 22.61 | 61 | 27.44 | 54 | 11.46 | 54 | 5.13 | 62 | 41.29 | 60 | 27.72 | 62 | | | | | | |
| Uganda | 17.76 | 63 | 10.56 | 64 | 24.97 | 57 | 37.35 | 43 | 11.21 | 55 | 7.98 | 59 | 40.47 | 61 | 27.82 | 61 | | | | | | |
| Ethiopia | 17.18 | 64 | 11.03 | 62 | 23.33 | 60 | 21.39 | 58 | 12.71 | 50 | 8.55 | 55 | 38.19 | 63 | 35.80 | 58 | | | | | | |

*Enablers dimensions* spans: Policies and regulation · Technology, knowledge and innovation · Finance and investment · Business environment · System resilliance.
*Oil Producers Lens (OPL)* spans: Total OPL · Performance sub-index (with OPL) · OPL indicators.

# Notes

# Notes

# Notes

# Acknowledgments

# About the Authors

**Mari Luomi**

Dr. Luomi is a Fellow II in KAPSARC's Climate and Sustainability program. As a policy-oriented social scientist, she has spent 17 years studying climate change, energy transitions and sustainable development policy in the Gulf and globally. At KAPSARC, she leads projects on Carbon Markets and Paris Agreement Article 6, and the Circular Carbon Economy Index. Her previous roles span 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.

Dr. Luomi 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 extensive experience in executive training, presentations, policy advisory and reporting services for multilateral environmental negotiations.

**Fatih Yilmaz**

Dr. Yilmaz currently works as a Fellow I in the Climate and Sustainability program. His current research agenda aims to enhance our understanding of the financial and economic consequences of the sustainable energy transition and to design effective policies to balance risk and growth prospects.

Before joining KAPSARC, Dr. Yilmaz worked as an economist at the Central Bank of the Republic of Turkey, where he was actively involved in the research and the design of policies for the private and banking sectors. He also worked as a consultant for the World Bank and spent a year as an assistant professor of economics at ADA University. He has authored various academic and policy articles and attended academic conferences and workshops. He holds a Ph.D. in economics from the University of Calgary.

**Thamir Alshehri**

As a Research Lead in KAPSARC's Climate and Sustainability program, Dr. Alshehri concentrates on developing data-driven tools for evaluating energy market scenarios and advancing the KAPSARC CCE Index.

In addition to his role at KAPSARC, Dr. Alshehri advises on clean energy transitions, sustainability and carbon emissions management in Saudi Arabia's broader energy ecosystem. He is a member of the Technology and Economic Assessment Panel at the United Nations Environment Programme. His past experiences include lecturing in Australia and engaging in entrepreneurial and industrial projects, notably the Burj Khalifah Building Management System.

# About the Project

KAPSARC's Circular Carbon Economy (CCE) Index project seeks to expand and add rigor to the conceptual basis of the CCE concept, as well as its practical operationalization, by developing a robust quantitative framework to measure countries' performance and their progress toward CCEs. The resulting CCE Index is a composite indicator that measures various dimensions of the CCE 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. From the 2022 edition onward, the index covers 64 major economies and oil and gas-producing countries. The index is disseminated through various research outputs, including KAPSARC discussion papers and commentaries, which present the index results and analyze them in depth, as well as KAPSARC methodology papers, conferences, workshops and other events, and an online platform, located at https://cceindex.kapsarc.org/. The index is updated annually, with the 2023 edition launched in December 2023.