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CROSS-COUNTRY COMPARATIVE ANALYSIS OF CLIMATE CHANGE PERFORMANCE: CLIMATE CHANGE PERFORMANCE INDEX

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ABSTRACT

Climate change represents an urgent, multi-dimensional challenge with profound ecological, social, and economic implications. Despite widespread recognition of its risks, global progress in climate action has been uneven, reflecting differences in economic capacity, governance, energy dependency, and policy ambition. This study employs a comparative cross-country analysis using the Climate Change Performance Index (CCPI) from 2021 to 2025 to examine national climate performance across greenhouse gas (GHG) emissions, renewable energy adoption, energy use, and climate policy. Focusing on 12 representative countries, including high performers, major emitters, and regional representatives, the analysis identifies leaders (e.g., Denmark, Sweden, and India), transitional economies (e.g., Brazil, Spain, and South Africa), and persistent laggards (e.g., Saudi Arabia, Russia, and China). Findings highlight that while renewable energy deployment shows consistent progress, GHG reductions and policy implementation remain insufficient, particularly among major G20 emitters. The study highlights the crucial role of standardised benchmarking tools, such as the CCPI, in fostering transparency, accountability, and international cooperation, providing actionable insights to accelerate global decarbonization and align national efforts with the Paris Agreement's 1.5°C goal.

Keywords: Climate Change Performance Index (CCPI); Cross-Country Comparison; Greenhouse Gas Emissions; Renewable Energy Transition; Climate Governance.

1. INTRODUCTION

Background

Climate change has emerged as one of the defining challenges of the 21st century, with profound implications for natural ecosystems, human societies, and global economic stability. The Intergovernmental Panel on Climate Change (IPCC) warns that global temperatures are on track to rise well beyond 1.5 °C above pre-industrial levels unless drastic reductions in greenhouse gas (GHG) emissions are achieved within the next decade (IPCC, 2023). Rising atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have accelerated the frequency and intensity of extreme weather events, disrupted food production systems, and amplified risks to biodiversity, public health, and energy security (UNEP, 2022). According to the United Nations Environment Programme (UNEP), the current trajectory of emissions reduction commitments falls significantly short of the Paris Agreement targets, necessitating stronger international cooperation and national implementation strategies (UNEP, 2022).

While the urgency of climate action is widely acknowledged, progress has been uneven across countries and regions. Many industrialised economies continue to grapple with decarbonising their fossil fuel–dependent infrastructure, while emerging economies face the dual challenge of sustaining growth and addressing environmental sustainability (Ben Ali et al., 2025). At the same time, low-income countries, despite contributing minimally to global emissions, are disproportionately affected by climate-related losses, ranging from agricultural disruptions to heightened vulnerability to floods, droughts, and heatwaves (Mawejje, 2024). This asymmetry in both responsibility and vulnerability highlights the importance of systematic cross-country comparisons that can identify leaders, laggards, and transitional cases in global climate governance.

Cross-country disparities

The global distribution of climate action efforts is deeply uneven, reflecting differences in economic capacity, governance structures, and political will. High-income countries are often at the forefront of technological innovation, renewable energy deployment, and commitments to reduce emissions. For example, Denmark has consistently ranked among the top performers in global climate indices, with policies that prioritise renewable energy integration and ambitious carbon neutrality targets (CCPI, 2022; CCPI, 2024). Similarly, the European Union has sought to lead by example, implementing comprehensive policy frameworks such as the European Green Deal to accelerate its transition to net-zero emissions by 2050 (European Commission, 2020).

By contrast, several major emitters have lagged. Ample fossil fuel–dependent economies, including Russia, Saudi Arabia, and South Korea, remain at the bottom of international rankings due to limited policy ambition and continued reliance on non-renewable energy sources (CCPI, 2025). These disparities are particularly concerning given that G20

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countries alone account for approximately three-quarters of global GHG emissions, meaning their collective progress—or lack thereof—will largely determine the world's ability to meet Paris targets (CCPI, 2023).

Emerging economies illustrate a complex middle ground. India, for instance, has consistently been highlighted in the Climate Change Performance Index (CCPI) as a relatively high performer among developing nations. With low per capita emissions, ambitious renewable energy capacity expansion, and steadily improving climate policies, India demonstrates how developmental imperatives can be balanced with climate ambition (CCPI, 2021; CCPI, 2025). However, challenges remain, including coal dependency and rapid urbanisation, which risk undermining long-term progress. China, the world's largest emitter, presents another nuanced case. While it has made substantial investments in renewable energy and electric mobility, its continued dependence on coal power constrains its overall performance. It raises questions about the pace of its transition (CCPI, 2023).

These cross-country disparities emphasise that global climate governance is not solely a question of scientific consensus but also of political economy, equity, and differentiated responsibilities (Ben Ali et al., 2025). Comparative frameworks are therefore essential to highlight not only which countries are making progress but also where gaps persist, and how lessons from leaders can inform global strategies.

CCPI as a framework

The Climate Change Performance Index (CCPI), published annually since 2005 by Germanwatch, the NewClimate Institute, and the Climate Action Network, provides a standardised methodology for evaluating and comparing national climate action. Covering more than 60 countries and the European Union—together responsible for over 90% of global GHG emissions—the CCPI assesses climate performance across four categories:

- **GHG emissions (40%)** – evaluating current levels, historical trends, and compatibility with well-below 2 °C scenarios.
- **Renewable energy (20%)** – assessing current shares, growth trajectories, and 2030 targets.
- **Energy use (20%)** – measuring total primary energy supply per capita, efficiency trends, and Paris alignment.
- **Climate policy (20%)** – based on expert assessments of both national and international policy commitments.

Unlike national reports, which often emphasise domestic achievements without cross-reference to international benchmarks, the CCPI provides an independent, transparent, and comparative lens. The index not only identifies top performers but also explicitly highlights the absence of any country in the first three ranking positions, reflecting the reality that no nation is yet fully aligned with the Paris Agreement's goals (CCPI, 2024). This approach highlights both progress and shortcomings, rendering the CCPI a distinctive tool for accountability, policy learning, and global climate diplomacy.

Between 2021 and 2025, the CCPI has provided significant insights into the evolving dynamics of climate governance. Denmark consistently occupied one of the highest positions, reinforcing its reputation as a climate leader, while India demonstrated notable progress among emerging economies. The European Union, as a bloc, has improved its standing, although internal heterogeneity persists (CCPI, 2025). In contrast, several fossil fuel–exporting nations, including Saudi Arabia and Russia, remained entrenched at the bottom of the index. These findings illustrate the duality of global climate action: while leadership examples exist, the absence of any country in the top three ranks signifies that ambition and implementation remain insufficient to close the emissions gap.

Study contribution

This study leverages CCPI results from 2021 to 2025 to conduct a cross-country comparative analysis of climate change performance. By systematically examining patterns across five consecutive editions, it contributes to three interrelated areas of scholarship and policy.

First, it enriches the literature on comparative climate governance by providing longitudinal insights into national trajectories of climate performance. While much of the existing research has focused on single-country case studies or aggregate global assessments, this study emphasises the value of comparative approaches that capture heterogeneity across political, economic, and geographic contexts (Mawejje, 2024). Second, it highlights best practices and lessons learned from high-performing countries, providing policy-relevant insights for nations that are lagging in climate action. For example, the role of coherent national policy frameworks in Denmark or India's strategy of balancing development with renewable expansion can serve as models for replication or adaptation elsewhere (CCPI, 2022; CCPI, 2025). Third, it highlights the persistent shortfalls that hinder collective progress, particularly among major G20 emitters. By identifying structural weaknesses such as fossil fuel dependency, insufficient policy ambition, or lack of implementation capacity, this study contributes to debates on equity, responsibility, and the urgent need for transformative climate governance (Ben Ali et al., 2025).

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Ultimately, this cross-country comparison reinforces the importance of standardised benchmarks, such as the CCPI, in enhancing transparency, mobilising accountability, and accelerating the global transition toward sustainable, low-carbon pathways. By situating national performances within a global comparative framework, the study not only assesses progress but also informs future strategies to close the emissions gap and achieve the objectives of the Paris Agreement.

2. LITERATURE REVIEW

2.1 Global climate change impacts

The literature consistently highlights climate change as a multi-dimensional challenge with ecological, social, and economic consequences. Rising global temperatures are associated with an increase in the frequency of extreme weather events, including floods, droughts, and heatwaves (IPCC, 2023). These events disrupt agricultural production, accelerate biodiversity loss, and increase vulnerability in regions with weaker adaptive capacity (Diffenbaugh & Burke, 2019). The UNEP (2022) Emissions Gap Report emphasises that current global mitigation pledges are insufficient, with the world on track for a temperature rise of 2.4–2.8 °C by 2100. Empirical evidence demonstrates that low-income and tropical regions bear the brunt of climate shocks, exacerbating inequality (Dell et al., 2012; Mawejje, 2024).

2.2 Cross-country climate performance disparities

Cross-national studies show significant variations in climate action, reflecting differences in economic capacity, energy dependence, and policy ambition. For instance, European countries such as Denmark, Sweden, and Germany have advanced renewable energy transitions through robust policy frameworks (CCPI, 2022; Steckel et al., 2020). In contrast, fossil fuel–dependent economies, including Russia, Saudi Arabia, and South Korea, continue to lag, occupying the lowest positions in the CCPI rankings due to weak policies and inadequate energy transitions (CCPI, 2025). Emerging economies present a more nuanced picture: India has demonstrated significant improvements in renewable capacity and per capita emissions reductions (CCPI, 2024), while China, despite being the global leader in renewable deployment, faces challenges due to its continued reliance on coal (Gallagher et al., 2019).

2.3 The role of governance and policy

Institutional quality and governance structures are critical in shaping national climate outcomes. Comparative analyses reveal that strong democratic institutions and the rule of law correlate positively with ambitious climate policies (Povitkina, 2018). The European Union's Green Deal exemplifies coordinated supranational governance in driving decarbonization (European Commission, 2020). Conversely, countries with high fossil fuel rents often face policy inertia due to vested interests and rent-seeking behaviours (Ross, 2019). Policy coherence, long-term planning, and the integration of climate objectives into national development agendas are consistently identified as key success factors (Ben Ali et al., 2025).

2.4 Climate change and economic implications

At the macroeconomic level, studies show that climate shocks reduce GDP growth, increase poverty, and intensify economic policy uncertainty, particularly in developing regions (Lanzafame, 2014; Ben Ali et al., 2025). Firm-level studies confirm similar patterns: adverse climate shocks lower productivity, profits, and labour demand in low-income contexts (Mawejje, 2024; Traore & Foltz, 2018). Nonetheless, climate pressures can also spur innovation, with firms in developing countries adopting adaptive technologies and green practices when institutional and financial conditions allow (Alam et al., 2020).

2.5 Comparative frameworks: the role of CCPI

The CCPI has emerged as a critical tool for transparent, cross-country benchmarking of climate performance. By integrating emissions data, energy use, renewable trends, and expert-based policy assessments, the CCPI offers a comprehensive lens for evaluating climate ambition and implementation (Burck et al., 2021). Its annual results (2021–2025) reveal that while no country has yet achieved a fully Paris-compatible trajectory, Denmark and India remain high performers, whereas several G20 economies consistently underperform (CCPI, 2023; CCPI, 2025). Scholars have increasingly used such indices to assess global progress and accountability (Schreurs, 2016; Dubash et al., 2021).

3. RESEARCH GAPS

Despite extensive research, several gaps remain. First, most studies emphasise national trajectories without sufficient comparative analysis across diverse contexts. Second, while the macroeconomic impacts of climate change are well-documented, cross-national evaluations linking emissions trends, energy use, and policy commitments are less developed. Third, limited attention has been given to how benchmarking tools such as the CCPI can inform governance reforms, international negotiations, and equitable burden-sharing. Addressing these gaps, the present study systematically analyses CCPI results from 2021 to 2025 to highlight global disparities, identify leaders and laggards, and derive policy lessons for strengthening collective climate action

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4. RESEARCH QUESTIONS

1. How do selected countries differ in their climate performance across GHG emissions, renewable energy, energy use, and climate policy between 2021 and 2025?
2. What common factors distinguish leaders, transitional economies, and laggards in the CCPI rankings?
3. To what extent do major G20 emitters align with the Paris Agreement's 1.5 °C goal compared to high-performing and transitional economies?
4. How has the performance of emerging economies (e.g., India, Brazil, South Africa) evolved relative to developed economies (e.g., Denmark, Sweden, EU)?
5. What lessons can lagging countries learn from climate leaders to strengthen policy ambition, renewable adoption, and decarbonization strategies?

5. RESEARCH OBJECTIVES

1. To compare the climate performance of 12 selected countries using CCPI rankings (2021–2025).
2. To analyze category-level performance across GHG emissions, renewable energy, energy use, and climate policy.
3. To classify countries into leaders, transitional economies, and laggards, identifying their strengths and weaknesses.
4. To examine the role of governance, fossil fuel dependence, and policy ambition in shaping national climate outcomes.
5. To derive policy lessons and recommendations for strengthening global cooperation, accountability, and alignment with the Paris Agreemen.

6. METHODOLOGY

6.1 Research design

This study employs a comparative cross-country research design to evaluate national climate change performance, utilising secondary data from the Climate Change Performance Index (CCPI). The analysis spans the period **from 2021 to 2025**, enabling a longitudinal perspective that captures both temporal shifts and cross-sectional disparities in climate action. The CCPI was chosen because it is widely recognised as one of the most comprehensive and independent benchmarks of climate performance, covering more than 60 countries and the European Union, which together account for over 90% of global greenhouse gas (GHG) emissions (CCPI, 2025).

6.2 Data source

The CCPI evaluates climate performance across four categories: (i) **GHG emissions** (40%), (ii) **renewable energy** (20%), (iii) **energy use** (20%), and (iv) **climate policy** (20%). Quantitative data are drawn from international statistical databases (including IEA and UNFCCC submissions), while climate policy assessments are based on expert surveys conducted by the Climate Action Network. The combination of quantitative and qualitative dimensions provides a holistic evaluation of climate ambition and implementation (Burck et al., 2021).

6.3 Country selection

Given the broad scope of the CCPI, it is neither feasible nor analytically efficient to include all countries in this study. Therefore, a set of **selection criteria** was applied to ensure meaningful and representative cross-country comparison:

1. **Top performers** – Countries consistently ranked in the top 10 of the CCPI (e.g., Denmark, Sweden, Morocco, India). These cases illustrate ambitious climate policies and provide lessons on best practices.
2. **Major emitters** – G20 countries, which collectively account for ~75% of global emissions (e.g., China, USA, India, EU, Russia, Saudi Arabia). Their inclusion is essential since their policies largely determine the success of global climate goals.
3. **Regional representation** – At least one representative country from each central region (Europe, Asia, Africa, Latin America, and the Middle East) to capture geographic diversity and differential vulnerabilities.
4. **Policy variation** – Inclusion of countries with contrasting performance levels (high, medium, and low CCPI ranks) to ensure that the analysis reflects both leaders and laggards.

Based on these criteria, the study focuses on 12 selected countries:

- **High performers**: Denmark, Sweden, India, Morocco.
- **Major G20 emitters**: United States, China, European Union, Russia, Saudi Arabia.
- **Regional representatives**: Brazil (Latin America), South Africa (Africa), South Korea (Asia-Pacific).

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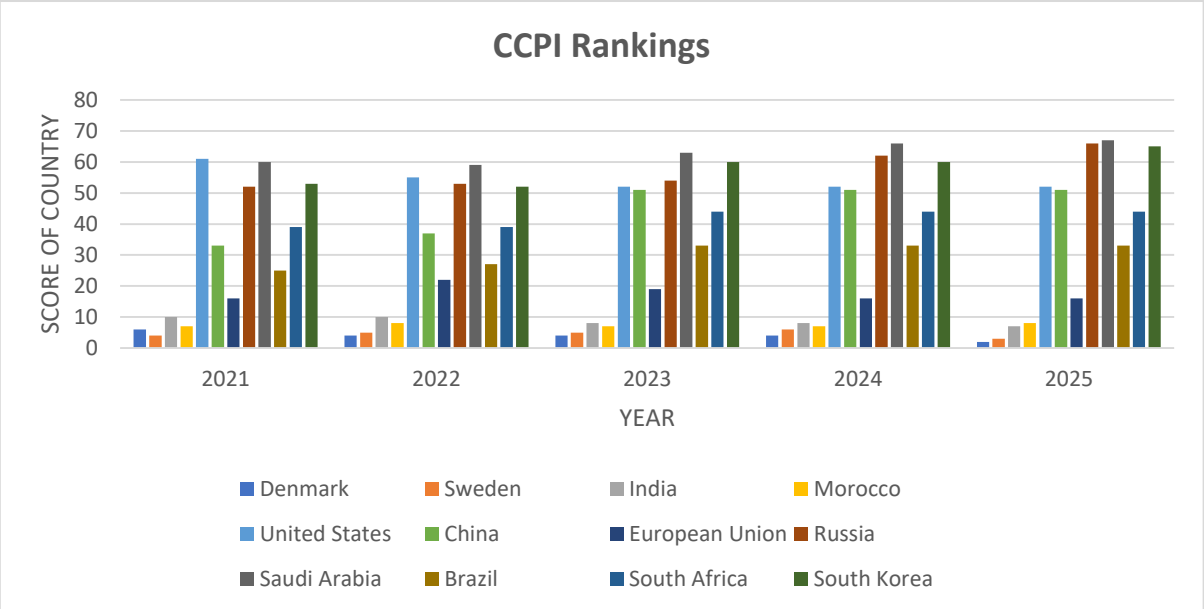
Table 1: CCPI Rankings of Selected Countries (2021–2025)

Country	2021	2022	2023	2024	2025
Denmark	6	4	4	4	2
Sweden	4	5	5	6	3
India	10	10	8	8	7
Morocco	7	8	7	7	8
United States	61	55	52	52	52
China	33	37	51	51	51
European Union	16	22	19	16	16
Russia	52	53	54	62	66
Saudi Arabia	60	59	63	66	67
Brazil	25	27	33	33	33
South Africa	39	39	44	44	44
South Korea	53	52	60	60	65



This selection strikes a balance between climate ambition, emissions responsibility, and regional diversity, thereby strengthening the validity of comparative analysis.

6.4 Analytical framework

The analysis proceeds in three steps:

a) Descriptive comparison – Examining CCPI scores and ranks of the selected countries across 2021–2025, focusing on changes in performance.

b) Category-level analysis – Breaking down results by the four CCPI dimensions (emissions, renewable energy, energy use, climate policy) to identify strengths and weaknesses.

c) Thematic synthesis – Grouping countries into leaders, transitional economies, and laggards to derive lessons, policy implications, and areas requiring stronger international cooperation.

This mixed descriptive and thematic approach allows for a balanced understanding of both quantitative performance trends and the qualitative policy drivers underpinning them

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7. RESULT AND ANALYSIS

a) Descriptive comparison

Table 2: Descriptive Comparison of CCPI Rankings with Real-World Reasons

Country	Rank Trend (2021→2025)	Performance Pattern	Real-World Reasons
Denmark	6 → 2	Improving leader	Ambitious renewable policies, a 70% GHG reduction target by 2030, and the end of oil/gas exploration.
Sweden	4 → 3	Stable leader	Strong carbon tax, high renewable share, net-zero 2045 plan.
India	10 → 7	Rising performer	Low per capita emissions and a 500 GW renewable target by 2030 remain a challenge for coal.
Morocco	7 → 8	Stable high rank	Noor solar complex, 52% renewable electricity target, slow fossil phase-out.
EU	16 → 16	Mixed/stagnant	European Green Deal, Fit-for-55, but internal variation (Germany vs. Poland).
Brazil	25 → 33	Declining	Amazon deforestation (Bolsonaro), recovery under Lula, and policy inconsistency.
South Africa	39 → 44	Stagnant low	Coal-heavy grid (>80%), Just Energy Transition Partnership, slow renewables.
USA	61 → 52	Low but improving	Rejoined the Paris Agreement, the Inflation Reduction Act of 2022, but fossil subsidies remain.
China	33 → 51	Sharp decline	Largest renewables investor, but with plans for coal expansion (200 GW+ plants), and a net-zero 2060 pledge.
Russia	52 → 66	Worsening laggard	The Ukraine war has worsened fossil fuel reliance and weakened climate ambition.
Saudi Arabia	60 → 67	Persistent laggard	Oil dependence, as well as the Saudi Green Initiative (2021), lacks implementation.
South Korea	53 → 65	Declining laggard	Coal ~40% of electricity, low renewables in OECD, weak net-zero enforcement.

1. Consistent Leaders

b) Denmark (Rank 6 → 2)

Denmark has improved steadily due to its ambitious renewable energy policies, including the expansion of wind power, a legally binding target to reduce emissions by 70% by 2030, and the phasing out of oil and gas exploration in the North Sea (CCPI, 2024).

c) Sweden (Rank 4 → 3)

Sweden maintained its top-tier performance due to its carbon tax (since 1991), high share of renewables, and its plan to achieve net-zero emissions by 2045. Slight fluctuations in rank reflect slower progress in decarbonising heavy industry (CCPI, 2025).

d) India (Rank 10 → 7)

India rose within the top 10 due to its large-scale renewable deployment (a 500 GW target by 2030) and its efforts to maintain low per capita emissions. However, coal dependency remains a drag, preventing a higher ranking (CCPI, 2025).

e) Morocco (Rank 7 → 8)

Morocco sustained high performance with its Noor Ouarzazate Solar Complex and 2030 target of 52% renewable electricity capacity. Slight decline reflects delayed fossil fuel phase-out plans (CCPI, 2024).

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2. Stagnant or Mixed Performers

a) European Union (Rank 16–22)

The EU improved overall thanks to the European Green Deal (2019), the Fit-for-55 package (2021), and intense climate diplomacy. However, intra-EU variation (e.g., Poland's coal use vs. Germany's renewable push) kept it from breaking into the top tier (CCPI, 2025).

b) Brazil (Rank 25 → 33)

Brazil's decline was attributed to Amazon deforestation under Bolsonaro's government (2019–2022), which weakened its climate credibility. Under President Lula (from 2023), new commitments improved its climate policy rating, but the impacts of deforestation linger (CCPI, 2025).

c) South Africa (Rank 39–44)

South Africa stagnated due to its reliance on coal (over 80% of electricity) and a slow rollout of renewable energy. However, international finance deals, such as the $8.5 billion Just Energy Transition Partnership (2021), provided hope, although implementation lags (CCPI, 2024).

3. Major Emitters with Poor Performance

a) United States (Rank 61 → 52)

The U.S. improved modestly after President Biden rejoined the Paris Agreement (2021) and passed the Inflation Reduction Act (2022), which invests $369 billion in clean energy. Still, fossil fuel subsidies and high per capita emissions keep its rank low (CCPI, 2025).

b) China (Rank 33 → 51)

China's growth has declined significantly due to its continued expansion of coal production, with over 200 GW of new coal plants under construction, despite its leading role in solar and wind installations worldwide. Its net-zero 2060 pledge has not yet translated into intense short-term action (CCPI, 2025).

4. Persistent Laggards

a) Russia (Rank 52 → 66)

Russia's climate ambition weakened further after the Ukraine war (2022), which intensified fossil fuel exports and sidelined climate commitments. No credible renewable or decarbonization strategy is in place (CCPI, 2025).

b) Saudi Arabia (Rank 60 → 67)

Saudi Arabia consistently ranks at the bottom due to its oil-dependent economy. Despite launching the Saudi Green Initiative (2021), domestic emissions reduction remains negligible, and the country resists ambitious international commitments (CCPI, 2024).

c) South Korea (Rank 53 → 65)

South Korea declined due to its continued reliance on coal for 40% of electricity and its reliance on imported fossil fuels. Although it pledged to be net-zero by 2050, implementation is weak, and its renewable energy share remains among the lowest in the OECD (CCPI, 2025).

b) Category-Level Trends in CCPI (2021–2025)

1. GHG Emissions

- **Strengths:**

Countries like India consistently score high due to their very low per capita emissions compared to the global average.

The UK and the EU have shown steady declines in emissions since 1990.

Denmark, Morocco, and Chile demonstrated ambitious emissions targets and achieved reductions close to Paris-aligned pathways.

- **Weaknesses:**

China, Saudi Arabia, Russia, and the U.S. remain major laggards. China's per capita emissions remain more than double Paris-compatible levels.

The implementation gap widened: by 2025, only 22 of 64 countries (including the EU) were on a Paris-compatible pathway.

High absolute emissions from G20 countries continue to dominate (over 75% of global emissions across all years).

2. Renewable Energy

- **Strengths:**

Momentum continued to grow each year, with 2022 and 2023 witnessing record increases in renewable capacity and declining costs.

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Countries like **Norway, Denmark, Estonia, Portugal, and Spain** ranked very high thanks to ambitious 100% renewable electricity targets and rapid implementation.

Many European nations have revised their 2030 targets upward (e.g., Portugal, Spain, and Germany, aiming for more than 80% renewable energy by 2030).

- **Weaknesses:**

Despite the growth of renewables, fossil fuel subsidies reached record highs in 2022 ($7 trillion globally), limiting the transition speed.

Countries such as Japan, Vietnam, and Pakistan have set new renewable energy targets, but they still fall short of aligning with the Paris Agreement.

Some middle performers (e.g., Austria, New Zealand) scored high on renewables but poorly on emissions/energy use, indicating that renewables alone are insufficient.

3. Energy Use

- **Strengths:**

A few countries (Denmark, the UK, and Switzerland) managed to reduce per capita energy use while maintaining economic growth, demonstrating decoupling.

The EU's **Fit for 55** package (2023–2024) integrated efficiency measures with emissions reductions.

- **Weaknesses:**

Globally, total primary energy supply (TPES) has continued to rise since 2000, offsetting gains from renewable sources.

Many countries (the U.S., Canada, Australia, and Saudi Arabia) remained among the highest per capita energy users.

Developing countries, such as India and Indonesia, continue to face increasing energy demand, which makes it challenging to achieve efficiency improvements.

4. Climate Policy

Strengths:

Denmark consistently ranked as a leader, combining ambitious policies with implementation.

The EU has shown progress through initiatives such as the Fit for 55 package and Green Deal measures.

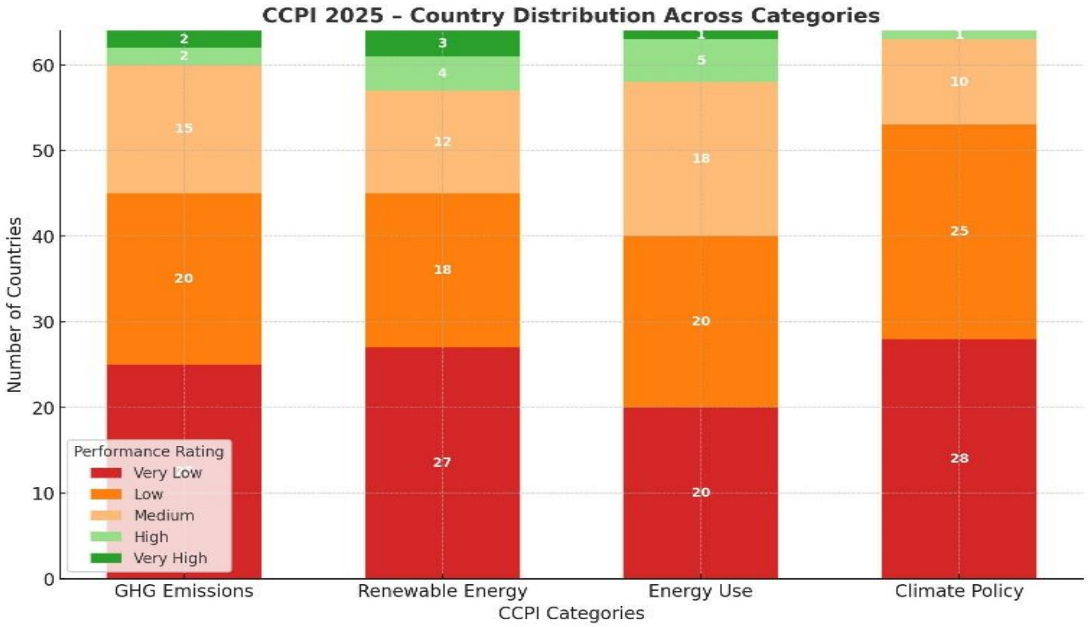
Civil society, litigation, and international agreements pushed stronger national policies (examples: Germany's Constitutional Court ruling in 2021; EU and UK net-zero frameworks).

Weaknesses:

Policy ambition still lags behind Paris goals: by 2025, only 19 countries had sufficient 2030 targets.

Fossil fuel–dependent states (Saudi Arabia, Russia, South Korea) consistently ranked at the bottom for weak or obstructive climate policy.

Frequent policy reversals in countries such as the U.S. and Brazil (prior to 2023) weakened credibility.



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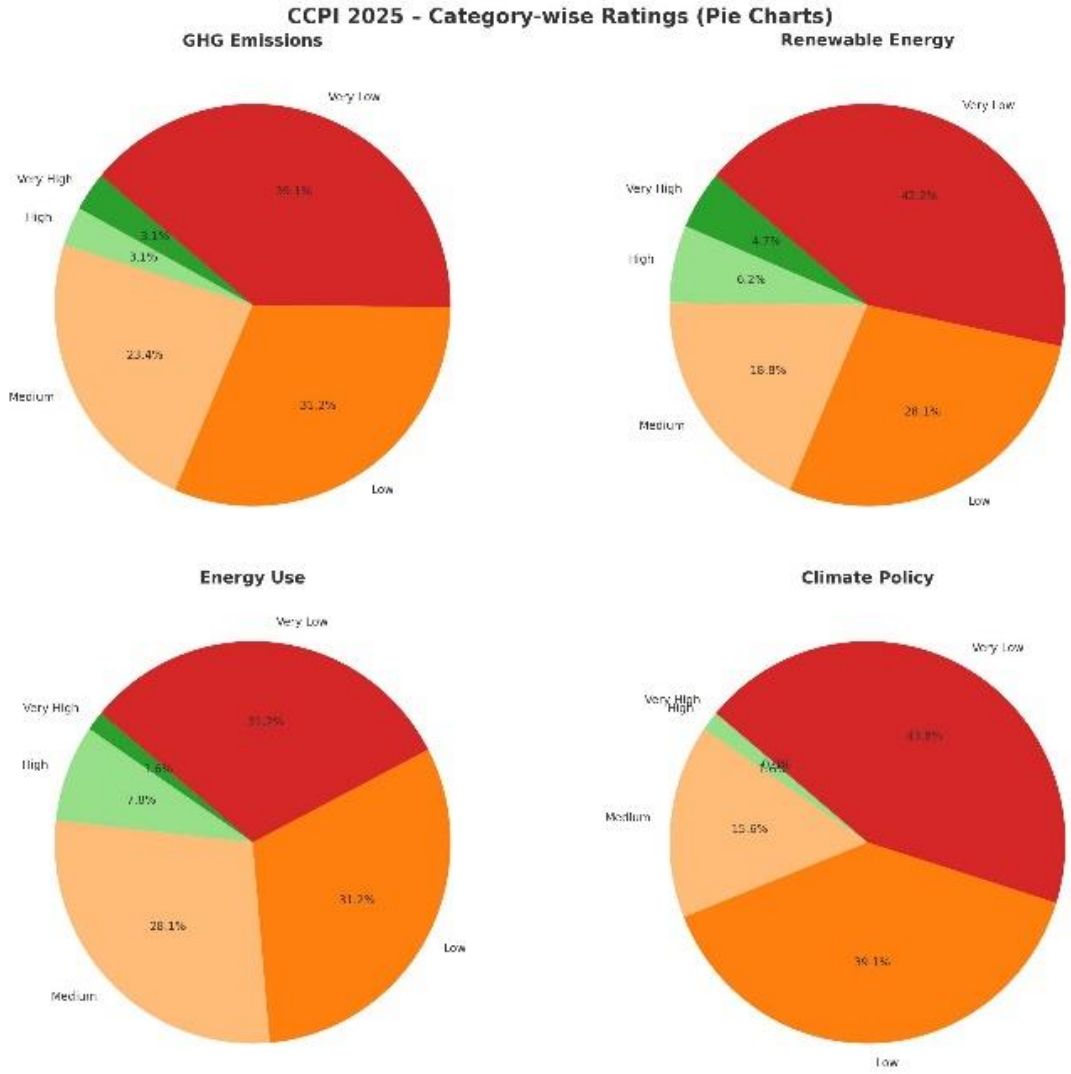

Figure 2: Country and Category-wise contribution

The CCPI 2025 category distribution highlights persistent global weaknesses in climate action. Most countries perform poorly in GHG emissions and climate policy, with the majority clustered in the low or very low categories. This highlights a widening gap between implementation and ambition, as emissions reductions remain insufficient and policy commitments lack effective enforcement. Renewable energy shows the most substantial progress, with a small but growing group of leaders achieving high and very high scores, while many others still lag. Energy use remains moderate**,** reflecting limited gains in efficiency. Overall, the chart confirms that no country excels across all four dimensions, revealing the fragmented nature of global climate action.

c) Thematic Synthesis

The Climate Change Performance Index (CCPI) evaluates national climate efforts across four key areas: greenhouse gas emissions, renewable energy, energy use, and climate policy. Based on results from 2021 to 2025, countries can be grouped into leaders, transitional economies, and laggards**.** Leaders demonstrate ambitious renewable transitions and strong policies; transitional economies show progress but struggle with implementation and consistency; laggards remain fossil-fuel dependent with weak commitments. This classification provides valuable insights for shaping policies, drawing lessons, and fostering international cooperation toward the Paris Agreement's 1.5°C goal.

Table 3: Thematic Synthesis-Grouping Countries Based on Climate Performance

Category	Countries	Key Lessons	Policy Implications	Need for International Cooperation
Leaders (High CCPI)	Denmark, Sweden, Estonia, Morocco, India, Philippines, Netherlands, Chile,	Ambitious renewable targets, firm climate policy, and integration of GHG reductions with	Act as role models, share best practices, and support the adoption of innovative and clean	North–South collaboration for technology transfer, climate finance, and

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Category	Countries	Key Lessons	Policy Implications	Need for International Cooperation
	Portugal, Germany, Norway	renewable expansion	technologies.	global carbon markets
Transitional Economies	Spain, Lithuania, New Zealand, Austria, Brazil, Vietnam, Egypt, Thailand, Romania, South Africa	Need more vigorous enforcement, diversify the energy mix, and bridge the ambition–implementation gaps.	Enhance policy frameworks, invest in capacity-building, and support the development of a green economy.	Regional alliances, capacity building, and renewable integration
Laggards (Low CCPI)	Saudi Arabia, Russia, South Korea, United States, Australia, Canada, Iran, Kazakhstan	Weak policies, fossil-fuel dependence, insufficient NDCs	Require binding commitments, subsidy reforms, and fossil fuel phase-out	Global governance reforms, international climate finance, accountability mechanisms, just transition

1. **Leaders (Denmark, Sweden, Estonia, India, etc.)**

These countries demonstrate that ambitious renewable energy targets, combined with strong governance and innovation, drive sustainable progress. Their role is not only to sustain momentum domestically but also to share expertise and provide financial/technological support globally. Leaders set examples for aligning economic growth with decarbonization.

2. **Transitional Economies (Spain, Brazil, Vietnam, etc.)**

These states show promising signs, but inconsistency in implementation and reliance on mixed energy portfolios slow down progress. With targeted support, finance, capacity building, and stronger institutions, they could accelerate transitions. They represent the **"**swing group"**:** if supported well, they can shift global momentum toward sustainability.

3. **Laggards (Saudi Arabia, Russia, USA, etc.)**

Fossil-fuel dependence and weak climate policy remain the most significant barriers to progress.

Without urgent reforms such as subsidy removal, stronger NDCs, and enforced accountability, they risk undermining global progress.

International cooperation and pressure (via trade, finance, or diplomacy) will be critical to drive change here.

8. DISCUSSION

The analysis of CCPI data from 2021 to 2025 reveals clear patterns in global climate performance. **Leaders** such as Denmark, Sweden, and India illustrate that ambitious renewable energy targets, robust climate policies, and effective governance structures are pivotal for achieving sustained emissions reductions. Their experience underscores the importance of integrating decarbonization strategies with economic growth objectives, highlighting replicable policy instruments such as carbon pricing, renewable incentives, and legally binding emission reduction targets.

Transitional economies, including Brazil, South Africa, and Spain, demonstrate progress but face challenges in bridging the gap between policy ambition and implementation. Structural constraints, including reliance on fossil fuels, political inconsistency, and limited institutional capacity, hinder their potential. These countries represent a critical group where targeted international support, capacity building, and access to clean technologies could accelerate climate transitions.

Persistent laggards, including Saudi Arabia, Russia, the United States, and South Korea, illustrate that fossil fuel dependence and weak policy ambition remain significant barriers. Even with global agreements like the Paris Accord, these nations have made limited progress, underscoring the need for binding commitments, subsidy reforms, and international accountability mechanisms.

Across all categories, **renewable energy deployment exhibits the most positive trends, whereas reductions in GHG emissions** and policy effectiveness remain uneven. This reinforces the notion that technological progress alone is insufficient without supportive governance, enforcement, and social and political buy-in. Moreover, cross-country disparities emphasise the unequal responsibility and vulnerability in climate change, necessitating differentiated strategies in global climate governance.

9. CONCLUSION

The longitudinal CCPI analysis highlights three key conclusions. First, leadership matters**,** as high-performing countries demonstrate that strong policy frameworks, ambitious targets, and practical implementation can significantly advance climate action, providing actionable lessons for other nations. Second, support for transitional economies is critical because countries with mixed performance can accelerate progress through international cooperation, climate finance, technology transfer, and capacity-building initiatives. Third, urgent reforms are needed for laggards, as fossil fuel–dependent countries must implement decisive policy changes, enhance accountability, and phase out unsustainable energy practices to prevent undermining global climate goals.

Policy implications include prioritising cross-national learning, strengthening global accountability mechanisms, and ensuring equitable distribution of climate finance. For international cooperation, the study underscores the importance of North–South collaboration, particularly in facilitating technology transfer, capacity building, and financial support for renewable energy projects in developing and emerging economies.

Ultimately, achieving the Paris Agreement's 1.5 °C target requires not only technological and policy innovation but also coordinated global action that addresses both performance gaps and equity concerns. Standardised benchmarking tools, such as the CCPI, play a vital role in informing policy, enhancing transparency, and fostering collective accountability, making them indispensable for guiding the transition toward a sustainable, low-carbon future.

10. LIMITATION

This study has several limitations. First, it relies solely on the Climate Change Performance Index (CCPI) from 2021 to 2025, which, while comprehensive, may not capture subnational initiatives, informal actions, or rapidly evolving policies. Second, the analysis focuses on 12 selected countries to ensure representativeness, which may potentially limit the generalizability of the findings to all nations. Third, the five-year window may not reflect the long-term impacts of climate policies or renewable energy investments. Fourth, the policy dimension of the CCPI depends on expert assessments, which could involve subjective judgments. Additionally, the study emphasises mitigation metrics such as emissions, renewable energy, and energy use. However, it pays limited attention to socioeconomic factors, cultural influences, and climate adaptation measures, which are critical for holistic climate governance. These limitations suggest the need for complementary research using broader datasets, longer temporal horizons, and integrated socio-economic and adaptation indicators.

11. REFERENCES

[1] Alam, G. M., Alam, K., & Mushtaq, S. (2020). Climate change perceptions and adaptation strategies of smallholder farmers in South Asia. Climatic Change, 157(3), 515–532. https://doi.org/10.1007/s10584-019-02697-1

[2] Ben Ali, M. S., Al-Maadid, A., & Bergougui, B. (2025). How does climate change asymmetrically affect economic policy uncertainty in the GCC countries? Sustainable Futures, 10, 101063. https://doi.org/10.1016/j.sftr.2025.101063

[3] Ben Ali, M. S., Al-Maadid, A., & Bergougui, B. (2025). How does climate change asymmetrically affect economic policy uncertainty in the GCC countries? Sustainable Futures, 10, 101063. https://doi.org/10.1016/j.sftr.2025.101063

[4] Burck, J., Hagen, U., Höhne, N., Nascimento, L., & Bals, C. (2021). Climate Change Performance Index 2021 Results. Germanwatch, NewClimate Institute, & Climate Action Network.

[5] Climate Change Performance Index (CCPI). (2021). CCPI 2021 Results. Germanwatch, NewClimate Institute, & Climate Action Network.

[6] Climate Change Performance Index (CCPI). (2022). CCPI 2022 Results. Germanwatch, NewClimate Institute, & Climate Action Network.

[7] Climate Change Performance Index (CCPI). (2022). CCPI 2022 Results. Germanwatch, NewClimate Institute, & Climate Action Network.

[8] Climate Change Performance Index (CCPI). (2023). CCPI 2023 Results. Germanwatch, NewClimate Institute, & Climate Action Network.

[9] Climate Change Performance Index (CCPI). (2023). CCPI 2023 Results. Germanwatch, NewClimate Institute, & Climate Action Network.

[10] Climate Change Performance Index (CCPI). (2024). CCPI 2024 Results. Germanwatch, NewClimate Institute, & Climate Action Network.

[11] Climate Change Performance Index (CCPI). (2024). CCPI 2024 Results. Germanwatch, NewClimate Institute, & Climate Action Network.

[12] Climate Change Performance Index (CCPI). (2025). CCPI 2025 Results. Germanwatch, NewClimate Institute, & Climate Action Network.

[13] Climate Change Performance Index (CCPI). (2025). CCPI 2025 Results. Germanwatch, NewClimate Institute, & Climate Action Network.

[14] Dell, M., Jones, B. F., & Olken, B. A. (2012). Temperature shocks and economic growth: Evidence from the last half century. American Economic Journal: Macroeconomics, 4(3), 66–95. https://doi.org/10.1257/mac.4.3.66

[15] Diffenbaugh, N. S., & Burke, M. (2019). Global warming has increased global economic inequality. Proceedings of the National Academy of Sciences, 116(20), 9808–9813. https://doi.org/10.1073/pnas.1816020116

[16] Dubash, N. K., Hagemann, M., Höhne, N., & Upadhyaya, P. (2021). Assessing the climate policies of the G20. Nature Climate Change, 11(12), 1004–1011. https://doi.org/10.1038/s41558-021-01249-0

[17] European Commission. (2020). The European Green Deal. Publications Office of the EU. https://doi.org/10.2775/855540

[18] European Commission. (2020). The European Green Deal. Publications Office of the EU. https://doi.org/10.2775/855540

[19] Gallagher, K. S., Bhandary, R., & Zhang, F. (2019). Climate change and China: Transitioning from an energy-intensive economy. Energy Policy, 129, 1130–1140. https://doi.org/10.1016/j.enpol.2019.02.043

[20] IPCC. (2023). Climate Change 2023: Synthesis Report. Intergovernmental Panel on Climate Change.

[21] IPCC. (2023). Climate Change 2023: Synthesis Report. Intergovernmental Panel on Climate Change.

[22] Lanzafame, M. (2014). Temperature, rainfall and economic growth in Africa. Empirical Economics, 46(1), 1–18. https://doi.org/10.1007/s00181-013-0736-6

[23] Mawejje, J. (2024). How does the weather and climate change affect firm performance in low-income countries? Evidence from Uganda. Sustainable Futures, 7, 100167. https://doi.org/10.1016/j.sftr.2024.100167

[24] Mawejje, J. (2024). How does the weather and climate change affect firm performance in low-income countries? Evidence from Uganda. Sustainable Futures, 7, 100167. https://doi.org/10.1016/j.sftr.2024.100167

[25] Povitkina, M. (2018). The limits of democracy in tackling climate change. Environmental Politics, 27(3), 411–432. https://doi.org/10.1080/09644016.2018.1444723

[26] Ross, M. L. (2019). What do we know about fossil fuel dependence and democratization? Annual Review of Political Science, 22(1), 239–256. https://doi.org/10.1146/annurev-polisci-050317-064032

[27] Schreurs, M. A. (2016). The Paris Climate Agreement and the three largest emitters: China, the United States, and the European Union. Politics and Governance, 4(3), 219–223. https://doi.org/10.17645/pag.v4i3.666

[28] Steckel, J. C., Jakob, M., & Edenhofer, O. (2020). From climate finance toward sustainable development finance. Wiley Interdisciplinary Reviews: Climate Change, 11(3), e632. https://doi.org/10.1002/wcc.632

[29] Traore, F., & Foltz, J. D. (2018). The impact of climate change on agricultural productivity: Evidence from Sub-Saharan Africa. World Development, 105, 73–84. https://doi.org/10.1016/j.worlddev.2017.12.014

[30] UNEP. (2022). Emissions Gap Report 2022. United Nations Environment Programme.

[31] United Nations Environment Programme (UNEP). (2022). Emissions Gap Report 2022. UNEP.