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CLIMATE CHANGE PERFORMANCE AND ECONOMIC DEVELOPMENT: A COMPARATIVE ANALYSIS[i]

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Abstract:
This study comprehensively examines the complex and contradictory relationship between economic development and environmental sustainability through the Human Development Index (HDI) and the Climate Change Performance Index (CCPI). The analysis reveals that countries with high levels of human development generally pursue a development model that is not environmentally sustainable, due to high carbon emissions and intensive natural resource consumption. In contrast, some economically less developed countries show more positive results in terms of environmental indicators; however, they also face fundamental structural challenges in terms of social and economic welfare. This situation emphasizes that the relationship between economic and social development and environmental sustainability is not linear and one-directional; on the contrary, it varies depending on structural and regional factors. In this differentiation, the nature of economic growth plays a critical role: while growth supported by renewable energy sources and sustainable production models positively affects environmental performance, growth models based on unsustainable resources such as fossil fuels seriously threaten environmental sustainability. In this context, attention is drawn to the inconsistency between current global climate targets and the policies being implemented, and the ongoing significant shortcomings in countries emission reduction and renewable energy transition policies are highlighted. It is especially emphasized that developed countries, with their high carbon footprints and excessive resource consumption, are pushing the planet's ecological boundaries. Therefore, it is stated that for sustainable development to be achieved, countries must not remain limited to policy discourse but must transform these into effective and concrete practices.

JEL: Q01, Q48, Q58, O15, O44

[i] İKLİM DEĞİŞKLİĞİ PERFORMANSI VE EKONOMİK KALKINMA: KARŞILAŞTIRMALI BİR ANALİZ
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Keywords: climate change performance index, human development index, economic development, sustainability

Özet:
Bu çalışma, ekonomik kalkınma ile çevresel sürdürülebilirlik arasındaki karmaşık ve çelişkili ilişkiyi, İnsani Gelişme Endeksi (İGE) ve İklim Değişikliği Performans Endeksi (İDPE) üzerinden kapsamlı bir şekilde incelemektedir. Analiz sonuçları, yüksek insani gelişmişlik düzeyine sahip ülkelerin genellikle yüksek karbon salımı ve yoğun doğal kaynak tüketimi nedeniyle çevresel açıdan sürdürülebilir olmayan bir kalkınma modeli izlediklerini ortaya koymaktadır. Buna karşın, ekonomik açıdan daha az gelişmiş bazı ülkeler çevresel göstergeler bakımından daha olumlu sonuçlar sergilemekle birlikte, sosyal ve ekonomik refah açısından yapısal sorunlarla karşı karşıyadır. Bu durum, ekonomik ve sosyal kalkınma ile çevresel sürdürülebilirlik arasındaki ilişkinin doğrusal ve tek yönlü olmadığını, aksine yapısal ve bölgesel faktörlere bağlı olarak değiştiğini göstermektedir. Bu farklılaşmada ekonomik büyümenin niteliği belirleyici bir rol oynamaktadır: yenilenebilir enerji kaynakları ve sürdürülebilir üretim modelleriyle desteklenen büyüme çevresel performansı olumlu yönde etkilerken, fosil yakıtlar gibi sürdürülemez kaynaklara dayalı büyüme modelleri çevresel sürdürülebilirliği ciddi şekilde tehdit etmektedir. Bu bağlamda, mevcut küresel iklim hedefleri ile uygulanan politikalar arasındaki tutarsızlığa dikkat çekilmekte ve ülkelerin emisyon azaltımı ve yenilenebilir enerjiye geçiş politikalarındaki önemli eksiklikleri vurgulanmaktadır. Özellikle gelişmiş ülkelerin yüksek karbon ayak izi ve aşırı kaynak tüketimiyle gezegenin ekolojik sınırlarını zorladığı ifade edilmektedir. Dolayısıyla, sürdürülebilir kalkınmanın sağlanabilmesi için ülkelerin politika söylemleriyle sınırlı kalmayıp bu söylemleri etkili ve somut uygulamalara dönüştürmeleri gerektiği belirtilmektedir.

Anahtar kelimeler: iklim değişikliği performans endeksi, insani gelişme endeksi, ekonomik kalkınma, sürdürülebilirlik

1. Introduction

Climate change is not only an environmental issue but also a significant problem in terms of economic development and sustainability. The impact of human activities on the natural environment has increased, particularly due to the exploitative structure of capitalist production systems targeting nature and labour. This system has accelerated climate change by promoting the excessive use of natural resources and the destruction of ecosystems. Historical examples demonstrate that the roots of this human-induced transformation lie in early production relations (Patel & Moore, 2017: 16-30).

Global warming is directly related to economic growth, increasing production, and resource consumption. The rise in greenhouse gas emissions during this process accelerates climate change. The negative environmental impacts of production and consumption have brought the concept of sustainable development to the agenda. Defined in the 1987 Brundtland Report, this concept aims to "*meet the needs of the present*

without compromising the ability of future generations to meet their own needs." In this direction, countries have made both individual and collective efforts toward sustainable development (D'Amato *et al.*, 2017: 716; World Commission on Environment and Development, 1987: 41). Sustainable development aims to balance economic growth, social progress, and environmental sustainability. This approach seeks to protect natural resources, reduce poverty, and meet basic human needs to create an inclusive society (De Kruijf & Van Vuuren, 1998: 9; United Nations Development Programme, 2021). The 17 Sustainable Development Goals (SDGs) set by the United Nations concretize the vision of sustainable development on a global scale. These comprehensive goals, ranging from ending poverty to combating climate change, aim to guide countries toward more balanced and equitable development across environmental, social, and economic dimensions (United Nations Development Programme, 2021).

The Climate Change Performance Index (CCPI) is a comprehensive indicator that measures and comparatively evaluates countries' capacities to combat climate change. The index is calculated under four main categories: greenhouse gas emissions, use of renewable energy, energy efficiency, and climate policy; thus, it considers not only environmental performance but also the institutional and governance structures that shape this performance.

The scope of the CCPI makes it a functional tool not only as an environmentally focused measure but also for evaluating the complex interactions between economic development processes and environmental sustainability. However, at this point, the literature reveals that the relationship between the CCPI and development indicators does not follow a simple or linear pattern. Instead, it varies depending on countries' socioeconomic structures, governance capacities, and investment models. In this framework, various studies have addressed the multidimensional nature of the CCPI from different perspectives. Bernauer and Böhmelt (2013) identified a positive correlation between the CCPI and the C3-I index, emphasizing the influence of international environmental cooperation on climate performance. Ylä-Anttila *et al.* (2018) extended this relationship through domestic political coalitions and policy networks. Çağlar (2020) detected long-term cointegration relationships between foreign direct investment, renewable energy consumption, and carbon emissions, showing that high CCPI scores align with sustainable investment decisions. Nathwani *et al.* (2021) suggested structural integration between the Human Development Index (HDI) and the CCPI, while Puertas and Martí (2021) highlighted the role of financial capacity in emission reduction performance. Martí *et al.* (2022) and Bako *et al.* (2022) demonstrated how the CCPI is shaped by different development dynamics at the regional level. In this context, the CCPI should be considered not merely as an environmental output indicator but as a multidimensional sustainability indicator that must be evaluated in conjunction with variables such as the quality of governance, development strategies, and financial capacity.

The structural and administrative dimensions emphasized in the literature have become even more pronounced with the critical stage the climate crisis has reached today. According to data from the World Meteorological Organization, the year 2023 has been

recorded as the hottest year ever, approaching the 1.5°C threshold set in the Paris Agreement more closely than any previous period. The global temperature rise reached 1.45°C, and climatic impacts—especially extreme heat events—have begun to threaten livelihoods in many societies. Although limited emission reductions were observed in developed countries, emission concentrations reached record levels in 2022 and 2023. Compared to the pre-industrial era, CO_2 emissions increased by 150%. This situation reveals the inadequacy of current global policies in terms of both scale and impact, and it makes the relationship between unequal development and environmental vulnerability more visible (United Nations, 2024: 14-18).

Anthropogenic greenhouse gas emissions have pushed atmospheric carbon dioxide levels above 400 ppm, accelerating global warming. While the 2°C target of the Paris Agreement remains a key benchmark, current policies risk exceeding a temperature rise of 4°C by the year 2100. This would lead to significant sea level rise, loss of ecosystems, and deterioration in quality of life. Effective action against the climate crisis has become an indispensable component of sustainable development (Germanwatch, 2017: 2; World Bank, 2012).

2. International Agreements and Reports

International climate cooperation began with the strengthening of scientific foundations through six assessment reports of the Intergovernmental Panel on Climate Change (IPCC), established in 1988. These reports revealed that the accumulation of greenhouse gases originates from human activities, that temperature increases are inevitable, and that mitigation and adaptation strategies are necessary (IPCC, 1992; 1995; 2001; 2007; 2014; 2023). The United Nations Framework Convention on Climate Change (UNFCCC), adopted in 1992, imposed differentiated responsibilities on developed and developing countries, envisaging technology transfer, financial support, and environmentally oriented improvements in national development programs. Within this framework, the Conference of the Parties (COP), held annually under the UNFCCC, serves as a significant platform where climate change mitigation policies are shaped.

The focal point of COP29, held in Baku in 2024, was increasing the financial resources required for developing countries to adapt to climate change. In this context, an annual financing target of 300 billion dollars by 2035 was discussed; however, this amount was considered insufficient by some countries. The conference addressed the transition from fossil fuels to renewable energy, but no clear decision was made regarding the timing of the transition. Under Article 6 of the Paris Agreement, principles of transparency and environmental integrity regarding carbon credits were discussed, and a global consensus was reached on carbon markets. Turkiye actively participated in the conference and promoted its climate change efforts through the events it organized (Climate Change Directorate, 2024; Vasquez, 2024; Volcovici, 2024).

The 1985 Vienna Convention and the 1987 Montreal Protocol on the Protection of the Ozone Layer established a broad protection framework through trade restrictions, reporting, and monitoring mechanisms. With the 2016 Kigali Amendment, the reduction

of HFCs became a binding obligation. These protocols constitute a significant example of how environmental cooperation can be built in international law through flexible yet binding instruments (United Nations Environment Programme, 2016, Art. 1; 2j; Art. 5).

The Kyoto Protocol (1997) imposed a commitment on developed countries to reduce emissions by 5% below 1990 levels during the 2008–2012 period. It brought carbon pricing to the international level through market-based instruments such as emissions trading, the Clean Development Mechanism, and Joint Implementation. Despite shortcomings, such as the withdrawal of the United States and non-compliance by some countries, the protocol laid the legal and institutional groundwork for the Paris Agreement (United Nations, 1998).

The Paris Agreement (2015) combined the 1.5°C–2°C target with the Nationally Determined Contributions (NDC) system, establishing a mechanism of progressively ambitious commitments every five years. It aims to achieve a 45% reduction by 2030 and global net-zero emissions by 2050. This agreement addressed climate justice and sustainable development simultaneously by complementing non-binding mitigation targets with support in finance, technology, and capacity building. In doing so, the international climate regime gained a multilayered structure encompassing scientific data, policy instruments, legal texts, and financial mechanisms (United Nations, 2015, pp. 19–23).

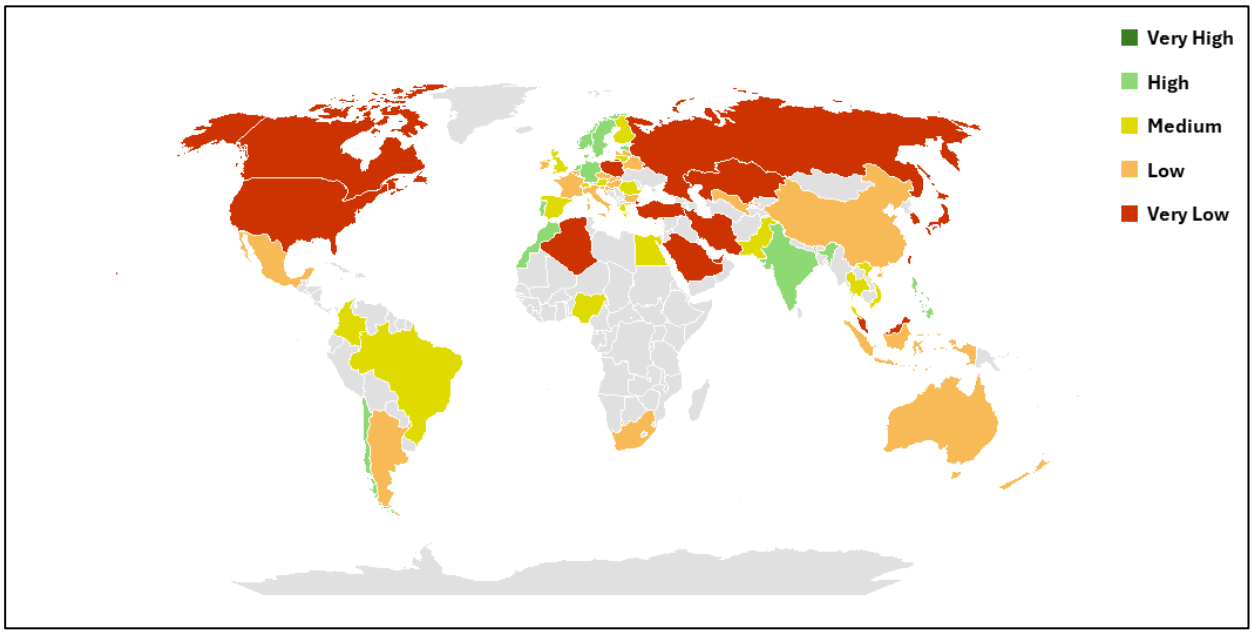
3. Climate Change Performance Index (CCPI)

Achieving sustainable development goals on a global scale is possible not only through policy declarations but also through monitoring the extent to which these policies succeed at the implementation level. In this context, the Climate Change Performance Index (CCPI) is an important tool developed to measure and compare countries' efforts in the field of climate. In this regard, it identifies the strengths and weaknesses of countries in terms of environmental sustainability and reveals the areas that need improvement in combating climate change. The CCPI serves as a guide for policymakers by ensuring the traceability of environmentally friendly transformation (Germanwatch, 2023a: 4).

The index conducts its analysis by considering the 2030 targets and alignment with the 2°C threshold. As of 2024, the index covers 63 countries responsible for 90% of global emissions and evaluates them across four main categories: greenhouse gas emissions (40%), renewable energy (20%), energy use (20%), and climate policy (20%) (Germanwatch, 2023b: 3).

Figure 1 presents a world map created according to the CCPI scores.

Figure 1: CCPI Scores (2024)



Note: Created by the authors based on Germanwatch data.
Source: Germanwatch, 2023b: 6–7.

The data presented in Figure 1 shows that countries such as Denmark (75.59), Estonia (72.07), the Philippines (70.70), and India (70.25) are among the most successful countries in implementing effective measures to combat climate change. These countries have been evaluated in the "high performance" category of the Climate Change Performance Index (CCPI) due to their determined efforts to reduce greenhouse gas emissions, increase investments in renewable energy, and implement climate policies effectively. India has made remarkable progress not only in integrating renewable energy but also in expanding access to energy and enhancing social inclusion. Between 2016 and 2018, the share of solar and wind energy in electricity production in the country increased from 4% to 8%. During the same period, energy efficiency measures prevented 15% of additional energy demand and approximately 300 million tons of carbon dioxide emissions. Furthermore, since 2000, nearly 700 million people have gained access to electricity, and 80 million households have been provided with safer cooking technologies in terms of health. All these indicators reveal that India is undergoing a comprehensive transformation toward sustainable development goals (International Energy Agency, 2022).

On the other hand, the deliberate vacancy of the top three positions in the index clearly reflects that no country to date has demonstrated "very high" environmental performance, and that no nation has yet achieved an ideal level of climate policy success on a global scale.

Countries in the middle ranks, such as Germany (65.77), France (57.12), Mexico (55.81), and Belgium (55.00), have shown strong performance in certain indicators. However, due to inconsistencies in policies and shortcomings in implementation, they have remained at this level. While Germany is categorized in the "high" performance group, France, Mexico, and Belgium are classified as having "low" performance. Although France has a strong institutional framework in terms of climate policies and

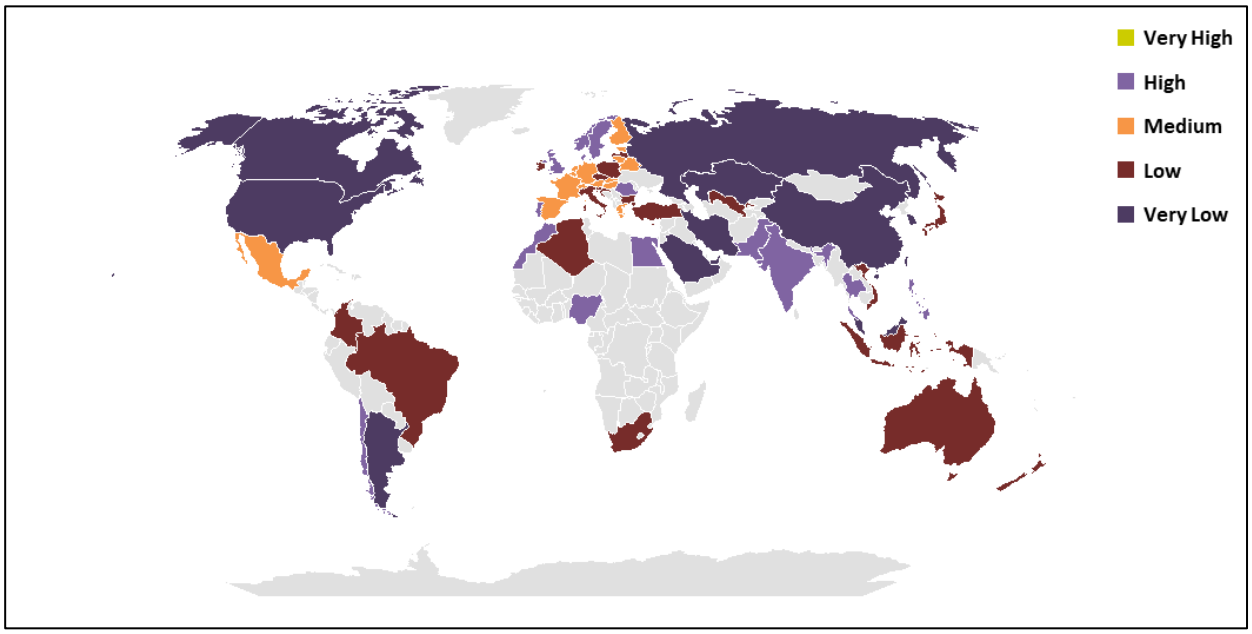
has achieved significant success in low-carbon energy production, it is criticized for its high dependence on nuclear power in its energy policy. While this strategy is effective in reducing greenhouse gas emissions, it slows down the transition to renewable energy, which is considered one of the main reasons for its low score in the index (World Nuclear Association, 2024). In the case of these countries, further progress is needed in areas such as energy efficiency, the transport sector, and carbon pricing.

Toward the lower end of the list, serious gaps in climate policy and implementation are observed. Turkiye (43.82) is among the countries with "very low" performance. The slow transition to renewable energy, the upward trend in emissions, and the limited implementation capacity of climate policies are the main factors influencing this score. While Turkiye's ratification of the Paris Agreement is a significant development, more concrete and comprehensive steps are needed to translate its commitments into practical results (Republic of Türkiye Ministry of Foreign Affairs, 2025).

Countries at the very bottom of the list—such as Saudi Arabia (19.33), Iran (23.53), the United Arab Emirates (24.55), South Korea (29.98), Russia (31.00), and Canada (31.55)—are categorized in the "very low" group. Due to high dependence on fossil fuels, weak levels of transparency, and low climate policy effectiveness, they exhibit the weakest performance in the fight against the climate crisis. This situation constitutes a significant obstacle to achieving global climate targets. The overall picture indicates that most countries are not following a roadmap aligned with the 1.5°C goal, and that the vision of sustainable development has not been sufficiently realized in practice. Transforming policy discourse into effective implementation is a shared and urgent responsibility not only for high-scoring countries but for the entire world (Germanwatch, 2023b: 4–7).

Figure 2 presents the CCPI greenhouse gas emissions data. Based on Figure 2, countries at the top of the list such as the Philippines (33.75), Sweden (32.93), Chile (32.31), Luxembourg (32.23), Nigeria (31.51), India (31.22), and Morocco (31.18) demonstrate strong environmental performance due to their low per capita greenhouse gas emission levels, positive trends, and proximity to 2030 targets. Particularly, developing countries such as Nigeria, India, and Morocco have achieved this success by keeping their emission levels limited despite economic growth. Industrialized countries like Sweden have reached this level through energy efficiency, low-carbon technologies, and consistent policy implementation.

Figure 2: Greenhouse Gases (2024)



Note: Created by the authors based on Germanwatch data.
Source: Germanwatch, 2023b: 8–9.

Countries in the middle ranks, such as Germany (28.47), France (27.02), Mexico (27.83), Belgium (25.29), Spain (27.78), and Switzerland (27.77), although they have taken significant steps in terms of climate policy, have made only limited progress in terms of emission reduction rates and per capita emission levels. Countries like Germany appear strong in general environmental policy, but due to still-high emission levels, they remain in the medium-performance group. France, despite having a strong institutional framework in terms of environmental policy, is criticized for its slow transition to renewable energy due to its reliance on nuclear power, and this is reflected in its performance. A common feature among countries in this group is that, despite political commitment, there are limitations in implementation and a lack of momentum regarding emission reduction targets.

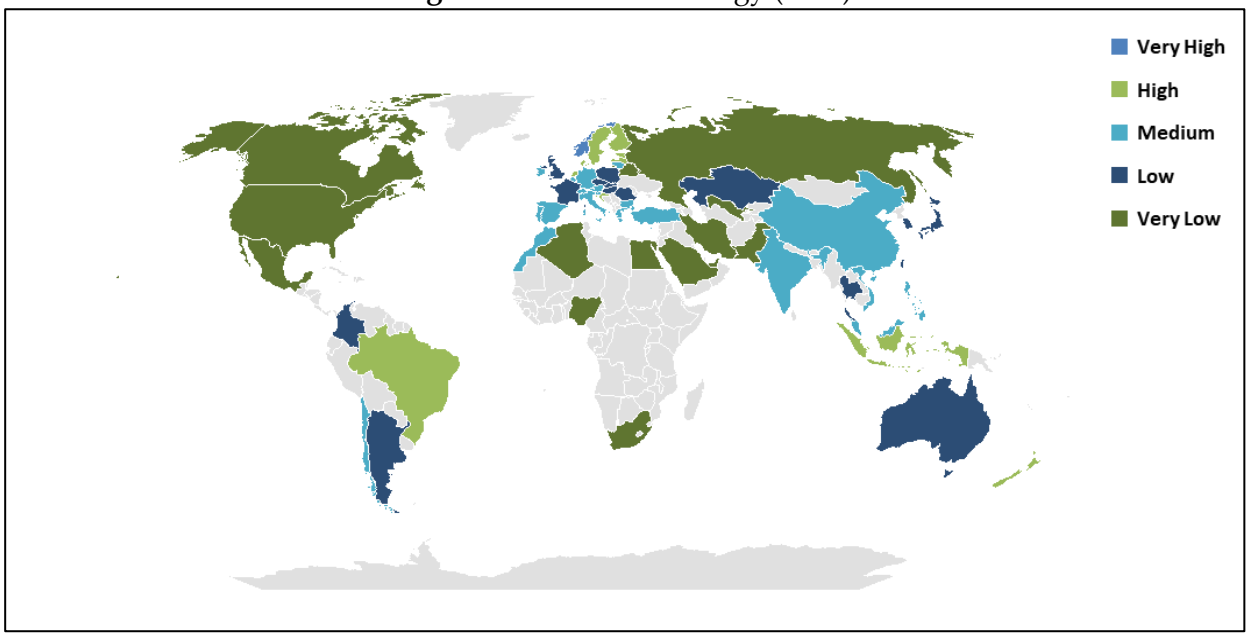
Countries ranked lower—such as Turkiye (22.34), Italy (23.20), Australia (23.20), Vietnam (22.80), Algeria (22.54), and New Zealand (21.99)—are evaluated in the low-performance category. In these countries, there are significant gaps between current per capita emissions and climate targets. In the case of Turkiye, although the country has ratified the Paris Agreement, the insufficiency of national targets, the upward trend in carbon emissions, and the slow pace of the transition to renewable energy have limited its performance.

At the bottom of the list are countries such as Russia (18.85), Argentina (18.77), the United States (16.88), Kazakhstan (14.66), Canada (14.59), South Korea (13.96), China (13.45), Malaysia (13.38), Iran (7.16), Saudi Arabia (4.85), and the United Arab Emirates (2.43). In these countries, per capita emission levels are quite high, and current policies do not provide a reduction pathway compatible with the 1.5°C target. This situation is driven by dependence on fossil fuels, low energy efficiency, and insufficient transparency in climate policies. Furthermore, the inadequacy or absence of 2030 targets in many of these countries further worsens their performance. Overall, it is observed that most

countries have failed to close the gap between emission levels and climate targets, indicating a lack of effective action in combating climate change. This highlights the need to align not only environmental policies but also energy and development strategies with climate objectives. Achieving climate goals will only be possible not through declarations of intent alone, but through concrete and actionable strategies.

Figure 3 presents the renewable energy scores.

Figure 3: Renewable Energy (2024)



Note: Created by the authors based on Germanwatch data.
Source: Germanwatch, 2023b: 10–11.

Within the scope of the CCPI, Norway (19.12) ranks at the top among the countries demonstrating the highest performance in the field of renewable energy. Norway stands out with an energy system largely free from fossil fuels, while other Scandinavian countries such as Sweden (15.23) and Denmark (15.01) also lead the transition to renewable energy. In these countries, resources such as hydropower, wind, and biomass have been systematically and strategically integrated into energy production. Finland (13.39), Estonia (12.67), Latvia (12.63), and New Zealand (12.52) are also among the high-performing countries, implementing strategies that align energy supply security with environmental sustainability. This high-performance group consists of countries that have successfully achieved a systematic transformation in renewable energy use.

Countries such as Lithuania, Luxembourg, China, Turkiye (8.4), Italy, Germany, Ireland, Spain, India, and Portugal have made partial progress in renewable energy investments, but current levels are not yet fully aligned with climate targets. These countries need to prioritize renewable sources more strongly in their energy policies and enhance support mechanisms. Although these medium-performing countries have developed technical capacity and infrastructure, they still require further reforms in areas such as policy continuity, market regulations, and investment incentives.

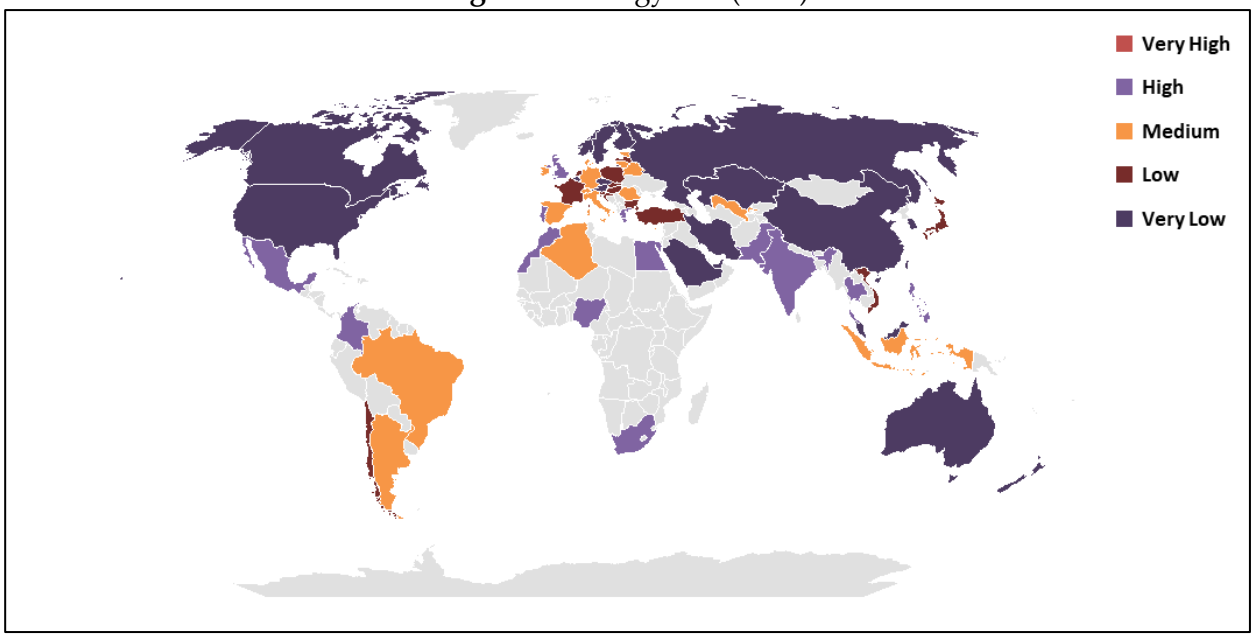
Countries like Poland (5.79), Australia (5.57), the United Kingdom (5.20), Japan (5.00), Slovakia (4.99), France (4.55), and Thailand (4.52) draw attention with their low scores. In these countries, renewable energy investments are limited, fossil fuel dependence persists, and the energy transition process progresses slowly. Especially for developed countries such as the United Kingdom and France, scoring low in this indicator highlights deficiencies in renewable energy policy.

Countries such as Canada (3.4), the United States (3.03), Saudi Arabia (3.09), the United Arab Emirates (3.15), Mexico (2.38), Iran (1.94), and Uzbekistan (0.28) are categorized among the very low performers. In these countries, renewable energy policies are either nearly non-existent or very weak in terms of implementation. Economic structures based on fossil fuel exports, low energy transition capacity, and inadequate policy frameworks significantly undermine environmental performance. This poses a serious threat not only to national energy security but also to global sustainability goals.

Overall, the renewable energy indicator reveals how determined and implementation-oriented countries are in their fight against climate change. High-performing countries treat energy transformation not only as a technical issue but also as an area of administrative and economic reform, while in low-performing countries, this area still holds secondary policy priority. Therefore, accelerating the transition to renewable energy plays a critical role in achieving global climate targets.

Figure 4 presents the energy use scores.

Figure 4: Energy Use (2024)



Note: Created by the authors based on Germanwatch data.
Source: Germanwatch, 2023b: 12–13.

Based on energy use data, the CCPI evaluates countries by considering their per capita energy consumption levels and the extent to which this consumption aligns with climate targets. The overall picture reveals that energy use has not yet been fully integrated with

sustainability principles on a global scale. Countries such as the Philippines (17.88), Colombia (17.71), Nigeria (17.70), and Egypt (17.18) stand out with relatively low per capita energy consumption, which contributes to their high scores in the CCPI. In these countries, annual per capita energy consumption ranges between 20 and 45 gigajoules, which is approximately 50% below the global average. The fact that economic structures in these countries are based on less energy-intensive sectors, coupled with limited industrialization and relatively underdeveloped infrastructure, contributes to their lower consumption levels. On the other hand, some developing or industrialized countries—such as the United Kingdom (16.63), Mexico (16.55), India (16.42), and Pakistan (16.17)—exhibit a more balanced energy use profile thanks to energy efficiency policies, technological investments, and consumption optimization strategies (Energy Institute, 2024, p. 15).

In countries scoring at a medium level—such as Argentina (15.33), Estonia (15.31), Cyprus (15.30), Switzerland (15.03), Romania (14.77), Brazil (14.77), Indonesia (14.76), and Spain (14.68)—progress has been made in energy policy, yet energy consumption still does not fully align with climate goals. Particularly in countries like Argentina and Brazil, while energy consumption is on the rise, there are also steps being taken to increase investments in renewable energy. In countries like Germany (14.54), Ireland (14.11), and Lithuania (14.08), per capita energy consumption is 50–80% above the global average, which is associated with a high level of economic development and industrial intensity. For instance, per capita energy consumption is 137 gigajoules in Germany, 128 in Switzerland, and 64.1 in Romania. These differences offer important insights into the degree of transformation in countries' energy infrastructures, their dependence on fossil fuels, and the effectiveness of energy efficiency policies (Energy Institute, 2024, p. 15).

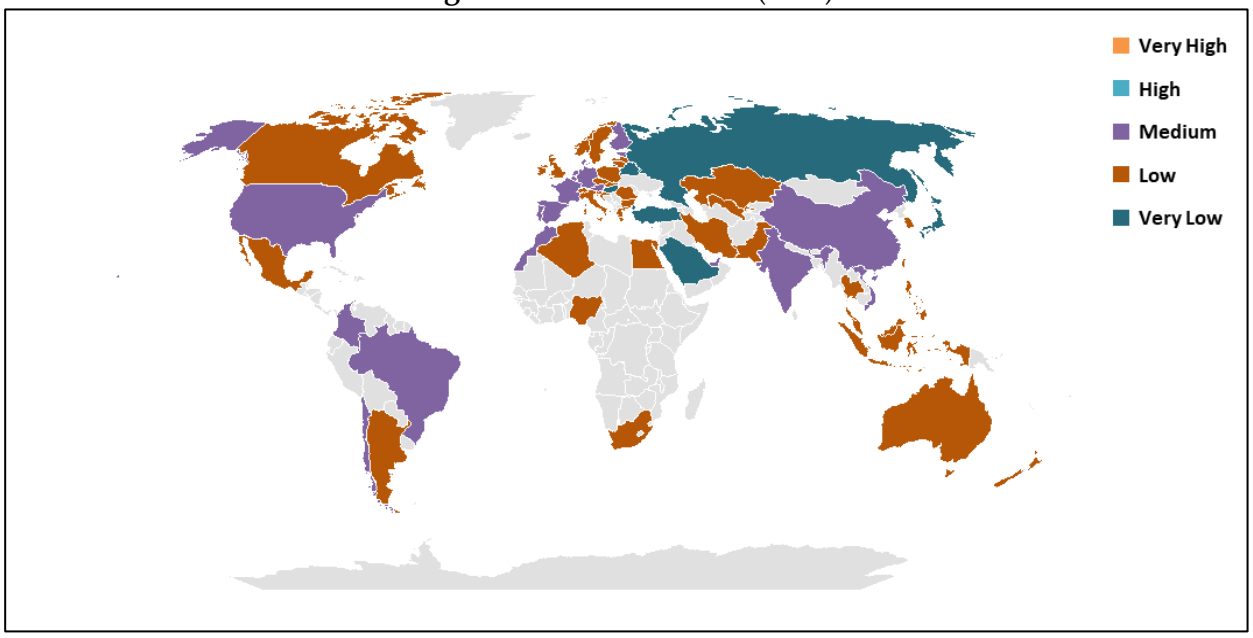
Several countries—such as the Netherlands, Chile, Japan, Latvia, France, Turkiye, and Poland—demonstrate relatively low performance in terms of energy use. In these countries, per capita energy consumption ranges from about 20% to 50% above the global average. For example, annual per capita energy consumption is approximately 195 gigajoules in the Netherlands and 81.6 gigajoules in Turkiye, whereas the global average is around 70 gigajoules (Energy Institute, 2024, p. 15). This discrepancy indicates that energy infrastructures in these countries are still based on carbon-intensive production patterns, and energy efficiency policies are not being implemented in full alignment with climate targets. Turkiye's inclusion in this category highlights the need for structural reform in energy transformation and the necessity of strategies aimed at increasing energy efficiency, particularly in the industrial, transportation, and residential sectors.

Countries categorized as very low performers include both developed and developing economies such as New Zealand, Malaysia, Sweden, China, the United States, Saudi Arabia, South Korea, and Canada. In these countries, per capita energy consumption is approximately 40% to 70% above the global average, indicating that their energy infrastructure remains heavily reliant on carbon-intensive production. For instance, in countries like Canada and the United States, per capita emissions range between 14 and 18 tons, nearly three times the global average of approximately 4.7 tons (International Energy Agency, 2023, p. 46). This high level of energy and emissions highlights the need

to transform not only supply sources but also consumption patterns. The direct link between economic growth and energy consumption in developed economies reveals the inadequacy of energy efficiency policies. It also shows that a fair and sustainable energy transition has yet to be fully achieved on a global scale. The data demonstrate that these structural imbalances in energy use deepen not only environmental issues but also social and economic inequalities.

Figure 5 presents the climate policy data.

Figure 5: Climate Policies (2024)



Note: Created by the authors based on Germanwatch data.
Source: Germanwatch, 2023b: 13–14.

The Climate Policy component of the CCPI measures countries' national and international political commitments, implementation efforts, and administrative capacities in combating climate change. The absence of any countries scoring in the "very high" or "high" categories under this indicator clearly reveals that climate policies remain insufficient at the global level.

Countries that received medium-level scores include the Netherlands (18.67), Finland (17.86), Vietnam (17.4), Denmark (17.24), EU-27 (17.22), India (16.38), Brazil (16.3), and the United States (16.2). Although climate policies in these countries have reached a certain level of development, there are inconsistencies or inadequacies in their implementation. Especially in European countries and large economies, despite the announcement of emission reduction commitments, structural and political barriers encountered during implementation limit the effectiveness of these policies.

Countries classified under the low-performance group include both developing and developed economies such as China (15.91), Indonesia (11.9), the Philippines (11.95), Sweden (10.8), Mexico (9.04), Canada (9.52), the United Kingdom (9.58), Norway (9.95), and Australia (8.9). Although these countries generally have strong economic capacities, either a lack of political will or the prioritization of short-term economic interests has

hindered the realization of climate policies. Fossil fuel–based energy strategies pose a significant obstacle to climate commitments.

Countries in the very low category include Saudi Arabia (5.09), Belarus (4.86), Japan (2.5), Hungary (2.56), Russia (1.45), and Turkiye (1.07). In these countries, climate change policies are either significantly inadequate or not effectively implemented. Especially Turkiye's placement at the very bottom of the list with a score of 1.07 indicates that both national regulations and international obligations in the field of climate policy need to be seriously reconsidered. Turkiye's delayed ratification of the Paris Agreement and its lack of an effective carbon pricing mechanism contribute to this low score.

When evaluating the overall picture, it becomes clear that establishing and implementing strong climate policies remains a major global challenge. The complete absence of countries in the "very high" and "high" categories highlights that merely setting targets is not sufficient; these targets must be supported by robust policies and effective implementation. In this context, strengthening international cooperation, supporting green transformation, and ensuring fair access to climate finance are of critical importance.

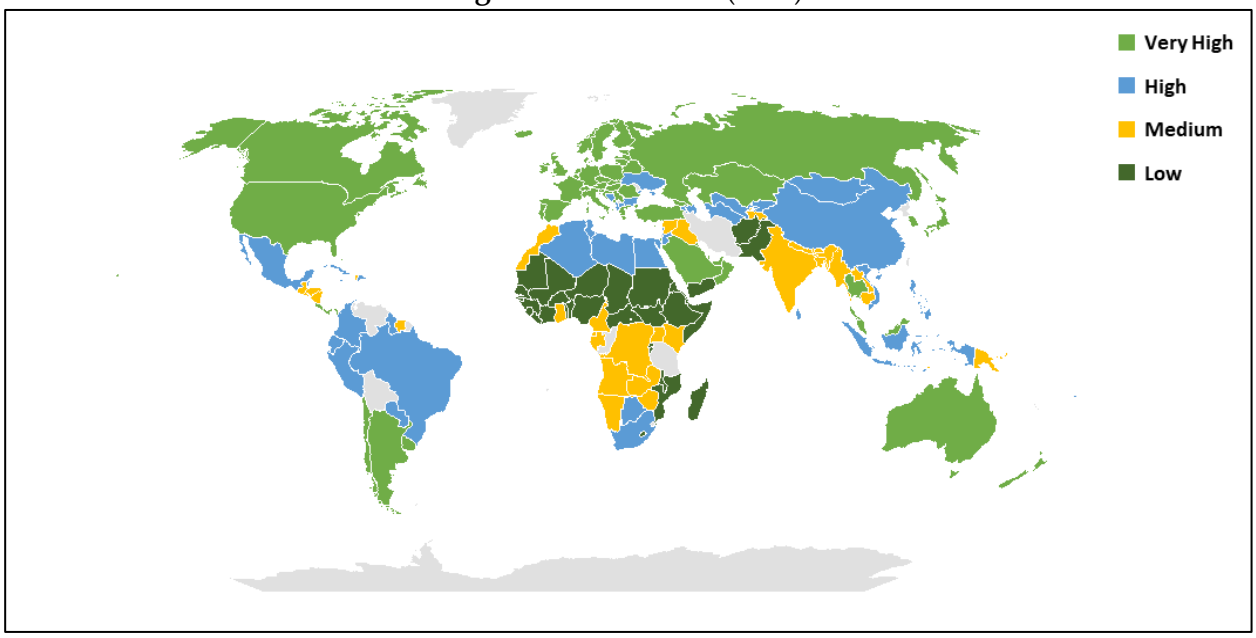
4. Human Development Index (HDI)

The Human Development Index (HDI) is an indicator designed to measure human well-being in a multidimensional way, going beyond economic growth. Developed by the United Nations Development Programme (UNDP), the index is calculated based on individuals' opportunities to live healthy, educated, and dignified lives. As of the 2023/2024 period, the HDI is constructed using data on life expectancy at birth, years of schooling (both expected and mean), and gross national income (GNI) per capita, adjusted by purchasing power parity (PPP) (United Nations Development Programme, 2024: 14–24).

The HDI is calculated on a scale ranging from 0 to 1, and countries are classified into four categories based on their scores: very high (≥0.800), high (0.700–0.799), medium (0.550–0.699), and low (<0.550) human development. In 2020 and 2021, the global HDI experienced a historic decline for the first time because of the COVID-19 pandemic and subsequent multiple crises. In 2022, the global average HDI value was measured at 0.74, rising to 0.75 in 2023, indicating a partial recovery. However, this recovery has been uneven. While OECD countries largely surpassed their 2019 levels, 51% of the poorest countries, encompassing approximately 328 million people, have still not reached their pre-pandemic values. In 2023, 92% of countries in the very high human development group regained their 2019 HDI scores, whereas only 48% of countries in the low human development group did so. This reveals the fragile nature of human development globally and the unequal pace of recovery (United Nations Development Programme, 2024: 29–30).

Figure 6 presents the Human Development Index (HDI) scores.

Figure 6: HDI Scores (2022)



Note: Created by the authors using the UNDP database.
Source: United Nations Development Programme Database.

The 2022 Human Development Index (HDI) data classify countries into four levels of development based on key indicators such as education, health, and standard of living. At the top of the list are countries such as Switzerland, Norway, Iceland, Denmark, and Sweden, all of which have HDI scores above 0.95, indicating very high human development. These countries report average life expectancies between 70 and 85 years and per capita incomes generally ranging from $15,000 to $60,000. This group accounts for approximately 15% of the global population. With an HDI score of 0.86, Turkiye is also in the very high human development group, which reflects recent improvements such as an increase in average life expectancy to 78 years and an average of 8.4 years of schooling (United Nations Development Programme, 2024, pp. 274–277).

Countries in the high human development category—such as Bulgaria, China, Iran, Mexico, and Albania—generally have HDI scores between 0.70 and 0.80. Although social indicators in these countries have improved, there is still a need for reforms in areas such as per capita income growth and quality of education to advance to a higher level of development. This group represents around 35% of the global population (United Nations Development Programme, 2024, pp. 274–277).

Countries with medium levels of human development include India, Bangladesh, Iraq, Bolivia, and Morocco, with HDI scores ranging between 0.55 and 0.70. In these countries, average life expectancy is between 65 and 72 years, and per capita income generally ranges from $2,000 to $9,000. Although access to education and healthcare services remains limited, gradual improvements are being observed. This group accounts for more than 40% of the world's population. These figures highlight the persistence of global inequalities in human development and demonstrate that both regional and structural disparities continue to shape development levels (United Nations Development Programme, 2024, pp. 274–277).

Countries with low levels of human development include many from Africa and South Asia. Examples include Nigeria, Rwanda, Pakistan, Sudan, Mali, and Somalia. These countries typically have HDI scores below 0.55 and are characterized by high poverty rates, limited health and education infrastructure, and widespread social inequalities. As a result, these regions have become priority areas for global development interventions. This distribution illustrates that significant inequalities in human development persist globally and that geographic and socioeconomic conditions continue to exert a strong influence on development outcomes. Inequality is evident not only in human development indicators but also in environmental indicators. Key reasons behind poor performance include insufficient transition to renewable energy, rising carbon emissions, and ineffective climate policies. In contrast, countries such as Sweden and Denmark provide relatively successful examples by achieving a balanced approach to environmental sustainability and human development (United Nations Development Programme, 2024, pp. 274–277).

Per capita carbon emissions and material footprint data further illustrate the environmental contradiction between these two indices. For instance, countries with the highest per capita carbon emissions—Canada (14.7 tons CO_2), Australia (14.9 tons), the United States (14.9 tons), and Saudi Arabia (17.6 tons)—also score very high in HDI rankings. Conversely, countries such as India (1.9 tons) and Nigeria (0.6 tons) have low carbon emissions but rank lower in terms of HDI. Similarly, in terms of per capita material footprint, developed countries consume significantly more natural resources. For example, annual per capita material use is recorded at 26.9 tons in Australia and 37.2 tons in Canada, whereas it is only 4.6 tons in Bangladesh and 3.7 tons in Ethiopia. These differences indicate that the environmental burden is largely generated by developed countries, but its consequences are often felt mostly in vulnerable regions. This data reveals that having a high HDI score alone is not sufficient for environmental sustainability. On the contrary, developed countries increase pressure on the planet through higher carbon emissions and resource consumption. Therefore, effective climate change mitigation is not only a matter of technological capacity or economic power, but also of low-carbon strategies, environmentally responsible policies, and the transformation of consumption patterns (United Nations Development Programme, 2024: 57–61; 301–304).

5. Conclusion

This study reveals the contradictory relationship between the level of human development and environmental sustainability in the process of combating climate change. Countries with high HDI scores demonstrate strong performance in key indicators such as life expectancy, education, and income; however, these achievements are often accompanied by high carbon emissions and excessive resource consumption. A significant portion of the countries with the most intense environmental pressure also fall under the "very high" human development category. This situation indicates that

development must reflect not only quantitative growth but also a qualitative nature integrated with environmental responsibility.

Various recent studies have also drawn attention to this contradictory structure. Nathwani *et al.* (2021) argued that indices such as HDI and CCPI should not be evaluated independently, and that assessing development and environmental performance within a common governance framework would be more meaningful for sustainability. Similarly, Puertas and Martí (2021) showed that environmental performance across countries is directly related to financial and administrative capacity, and they emphasized that access to financing is a key factor for low-income countries to achieve better results in environmental indicators. Bako *et al.* (2022), in a study focused on European countries, identified a structural relationship between human development and the success of climate policies, noting that this relationship is influenced by regional dynamics. These findings in the literature are consistent with the results of this study, indicating that there is no direct harmony between human development and environmental sustainability and that development needs to be redefined in a holistic manner.

When evaluated together with CCPI data, it becomes evident that HDI alone does not represent sustainable development. The high emission and material footprint levels in developed countries reveal how far they have drifted from environmental sustainability. On the other hand, many low- or medium-income countries can present a more favorable environmental profile, but they face significant structural challenges in terms of human well-being.

Indicators such as carbon emissions and natural resource consumption make visible not only the differences in development between countries but also the environmental impacts of development on the planet. Therefore, the development process must be conducted within a framework that respects planetary boundaries, balances resource use, and prioritizes social justice. As in the case of Turkiye, achieving a certain level of human development does not guarantee environmental performance; rather, the pace of energy transition, the capacity to implement policies, and emission trends are the determining factors in this regard.

In conclusion, the sustainable development approach should not only aim to enhance human well-being but also be based on how such well-being can be maintained in harmony with nature. In this context, indicators such as HDI and CCPI should be considered complementary to each other, and development policies should be designed around this integrative perspective. In the long run, countries that can perform strongly in both environmental and human development indicators will not only achieve sustainable development but also serve as exemplary models in terms of governance, implementation capacity, and societal participation supporting this process.

Research Background

This article is derived from the Ph.D. dissertation of the first author, titled *"The Relationship Between Sustainable Development and Climate Change Performance: A Panel Data Analysis."* The dissertation was conducted under the supervision of Prof. Dr. Türker

Şimşek at Tokat Gaziosmanpaşa University. The study was developed collaboratively by both authors and presents the findings in an original and publication-specific format.

Conflict of Interest Statement

The authors declare that there is no conflict of interest regarding the publication of this article. The research was conducted independently, without any financial, personal, or professional affiliations that could influence the findings or interpretations. No external funding was received for this study.

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