THE DEVELOPMENT OF CO_2 EMISSIONS IN BRICS AND THE EXPANDED BRICS+ FORMAT AFTER THE ADOPTION OF THE PARIS AGREEMENT: A COMPARATIVE ANALYSIS (2015–2024)

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Abstract

The article examines the development of CO_2 emissions in the countries of BRICS and the extended BRICS+ format in the period following the adoption of the Paris Agreement. Using a comparative and analytical approach, the study analyses both absolute emissions and per capita emissions between 2015 and 2024, with an emphasis on identifying long-term trends and structural differences among individual states. The research applies time-series analysis to assess the dynamics of emissions before, during, and after the COVID-19 pandemic, as well as in the context of recent geopolitical developments. The findings reveal significant heterogeneity in emission trajectories, reflecting differences in economic structure, energy dependence, and political priorities. The results also highlight the limits of the Paris Agreement as a tool of global climate governance, particularly due to its voluntary nature and the absence of enforcement mechanisms. The article concludes that the effectiveness of global decarbonisation efforts will largely depend on deeper institutional coordination and stronger engagement of BRICS and BRICS+ countries.

Keywords: *BRICS, CO_2 emissions, Paris Agreement, Climate policy*

Introduction

Climate change ranks among the most significant global challenges of the 21st century, with consequences that extend far beyond environmental concerns to affect economic stability, social cohesion, and geopolitical relations. Since the adoption of the Paris Agreement in 2015, the international community has sought to coordinate measures aimed at limiting global warming, with one of its central objectives being to keep the increase in global average temperature well below 2 °C compared to pre-industrial levels. The importance of this issue is indisputable, as achieving climate targets constitutes a fundamental prerequisite for preventing severe economic and social consequences, including extreme weather events, the deterioration of living conditions, and the rise of climate-induced migration.

The practical relevance of analysing the development of CO_2 emissions lies in its ability to assess the extent to which individual countries succeed in fulfilling their climate commitments, to identify weaknesses in policy implementation, and to explore more effective policy instruments. Attention is warranted for the countries of BRICS and the expanded BRICS+ format, as they are among the world's largest emitters of greenhouse gases while simultaneously playing a crucial role in the global economy.

The BRICS grouping, consisting of Brazil, Russia, India, China and South Africa, represents a coalition of major emerging economies that have gained increasing relevance in global governance structures. In recent years, the format has been further expanded (BRICS+), incorporating additional countries such as Saudi Arabia, the United Arab Emirates, Egypt, Iran and Ethiopia. These states collectively account for a substantial share of global greenhouse gas emissions and play a crucial role in international climate negotiations, particularly within the framework of the United Nations Framework Convention on Climate Change (UNFCCC). Their importance stems not only from their economic weight, but also from their position as key actors representing the interests of the Global South and advocating the principle of common but differentiated responsibilities.

This growing importance is closely linked to the increasing share of BRICS countries in global greenhouse gas emissions and their rising influence in international political and economic structures. Over the past two decades, these states have become more active participants in global climate negotiations, often coordinating their positions and emphasising the principle of common but differentiated responsibilities. As a result, BRICS countries have evolved from passive recipients of climate policy frameworks into key actors shaping the direction and ambition of global climate governance.

It is important to note that the analysed countries also differ significantly in terms of their structural and economic characteristics. The group includes transition economies (e.g. Russia), emerging economies (e.g. China and India), oil-exporting countries (e.g. Saudi Arabia and the United Arab Emirates), as well as least developed countries (e.g. Ethiopia). These differences reflect their diverse positions within the global economic and energy system. Rather than representing a limitation, this diversity is analytically relevant, as it allows for a more nuanced understanding of how structurally different states approach climate commitments within a shared political framework. Their climate policies are therefore decisive for the success or failure of global decarbonisation efforts.

Climate Crisis and Human Civilization

The issue of climate change currently affects virtually all spheres of social life. Its consequences result in extensive material damage and have serious implications for human health and security. For these reasons, climate change has become a subject of intensive interest not only within the natural sciences but also across the social sciences, as the environmental crisis constitutes an integral component of a broader crisis of human civilization.

Unsustainable patterns of economic activity and the excessive exploitation of natural resources have irreversible consequences for global ecosystems and living conditions across all continents. Among the most significant risks is the negative impact of climate change on public health, manifested by an increase in premature mortality associated with extreme weather events. According to the latest report by the World Weather Attribution initiative, climate change has tripled the number of heat-related deaths during heatwaves that affected the European continent in the first half of the summer of 2025. An illustrative example is Spain, where extreme temperatures in May and June 2025 resulted in more than 1,100 deaths. The most severely affected regions included Galicia, Asturias, Cantabria, and La Rioja—areas that, from a historical perspective, have not been exposed to such extreme temperatures and lack sufficient adaptive capacity (World Weather Attribution, 2025; Reuters, 2025).

The negative consequences of climate change, however, extend far beyond risks associated with heatwaves. Their complex impact includes an increased frequency and intensity of extreme meteorological events, such as hurricanes, tornadoes, and floods, leading to extensive material damage and loss of human life. In addition, climate change poses growing threats to the availability and quality of water resources, thereby exacerbating risks related to drinking water supply, sanitation, and the spread of infectious diseases. A further critical challenge concerns global food security, which is increasingly jeopardized by declining agricultural productivity resulting from drought, soil degradation, biodiversity loss, and broader ecosystem disruption. These challenges have intensified in recent years, reinforcing the systemic nature of the climate crisis (Schripke et al., 2024).

These factors have a direct impact on the quality of life of billions of people, generating social tensions within affected countries and contributing to the emergence of so-called climate-induced migration. This process may, in the future, generate heightened political and security risks even for states that are not directly affected by environmental crises, thereby becoming an increasingly important subject of research in international relations, security studies, and geopolitics (Welzer, 2022, p. 22).

It follows from the above that climate change does not constitute merely an environmental challenge, but fundamentally affects social stability, international security, and geopolitical relations. The phenomenon of climate-induced migration, driven by environmental degradation, resource scarcity, and extreme climatic events, is increasingly emerging as one of the key security challenges of the 21st century. Consequently, it is essential to address this issue systematically not only within the framework of environmental policies, but also through research into its broader social and political dimensions, which is necessary for preventing the escalation of conflicts and for identifying sustainable responses to global challenges (Waldinger, 2015; Climate Action Tracker, n.d.).

In this context, the analysis shifts toward the political, economic, and social dimensions of the examined issue. The climate crisis undeniably affects economic growth, industrial development, and energy systems across states. These impacts may be interpreted from both positive and negative perspectives. From a positive standpoint, the ongoing transformation of industry and the economy toward more sustainable, "green" alternatives does not necessarily imply economic decline, as is sometimes suggested in political discourse. On the contrary, the transition to a green economy offers a range of advantages that may be crucial for long-term societal development. Most importantly, it can contribute to greater economic stability, as investments in renewable energy sources and energy efficiency reduce dependence on fossil fuels, whose prices are highly volatile and subject to geopolitical risks. Diversification of energy sources also lowers the likelihood of economic disruptions associated with oil shocks (Jones, 2011, p. 179).

Another significant benefit of the green transition is job creation. According to estimates by the International Labour Organization, the transition toward a green economy could generate up to 24 million jobs globally by 2030, particularly in sectors such as renewable energy, sustainable mobility, the circular economy, and environmental innovation. At the same time, the shift toward a low-carbon economy stimulates technological progress and innovation—ranging from the development of clean technologies, including battery systems and hydrogen energy, to the digitalization of industry. These trends enhance countries' competitiveness in global markets. In addition, the green economy contributes to the reduction of environmental and public health costs (International Labour Organization, 2018).

Cleaner air and reduced emissions can also contribute to improvements in public health, particularly in countries with high levels of industrial activity and urbanisation. In the context of BRICS countries, where rapid economic growth is often associated with increased environmental pressure, these co-benefits of climate policies are especially relevant, as they may help address both environmental and socio-economic challenges, including high levels of air pollution and related health risks. A further significant benefit is enhanced energy security, as the use of locally available renewable energy sources decreases dependence on energy imports from geopolitically unstable regions and increases national self-sufficiency. Equally important are emerging trade opportunities, as growing demand for green technologies and products enables firms to expand into new markets and strengthens export potential (Finn – Brockway, 2023; World Health Organization, 2025).

For states, the green transition also represents an opportunity to meet international climate commitments arising from the Paris Agreement, thereby enhancing their reputation and credibility in the eyes of investors and international partners. For these reasons, it is evident that the green economy should not be viewed as an obstacle to development, but rather as a strategic opportunity to achieve sustainable and inclusive economic growth, with positive environmental, economic, and social outcomes.

Conversely, continued reliance on the current emissions trajectory is likely to result in severe long-term economic damage. Estimates suggest that within one to two decades, the economic losses associated with climate change could reach levels comparable to the global impact of a pandemic-scale crisis recurring every ten years. If global emissions continue to follow their current path, the scale of these impacts is expected to intensify significantly by the end of the 21st century (Gates, 2021, p. 35).

In light of the above, it is therefore essential to examine climate change through the lens of the social sciences, as its consequences extend beyond natural processes and fundamentally shape societal development. Climate change represents a complex phenomenon that influences political decision-making, international relations, economic stability, and social cohesion.

The Paris Agreement as a Tool for Addressing the Environmental Crisis

The adoption of the Paris Agreement in 2015 represented the culmination of extensive diplomatic and political efforts. The Paris Agreement constitutes a key instrument of global climate governance under the framework of the United Nations Framework Convention on Climate Change (UNFCCC), adopted in 1992, whose ultimate objective is the stabilisation of greenhouse gas concentrations in the atmosphere at a level that prevents dangerous anthropogenic interference with the climate system. Together with earlier mechanisms, such as the Kyoto Protocol, it forms part of a broader international regime aimed at mitigating climate change and stabilising greenhouse gas concentrations. The Agreement builds upon this institutional foundation while introducing a more flexible and inclusive system of nationally determined contributions. At the same time, it marked a milestone in global climate policy, supported by nearly all countries worldwide. The Agreement emerged in response to the growing need for coordinated international action to combat climate change, with its primary objective being to limit the increase in global average temperature to well below 2 °C compared to pre-industrial levels. An even more ambitious target was set to pursue efforts to limit warming to 1.5 °C. The latter target is particularly emphasised by many developing countries, which are more vulnerable to the impacts of climate change and therefore advocate more ambitious mitigation goals. The Agreement also established a mechanism for monitoring its implementation through the creation of nationally determined contributions (NDCs). These are intended not only to regularly assess progress toward the stated goals, but also to progressively increase their level of ambition, with the aim of preventing dangerous global warming. Although the Paris Agreement represents a significant step towards a more universal and inclusive climate regime, its commitments differ from those established under the Kyoto Protocol. While the Kyoto Protocol introduced legally binding emission reduction targets for developed countries, the Paris Agreement relies on nationally determined contributions (NDCs), which are not legally binding in terms of emission outcomes. Furthermore, the principle of differentiation has not disappeared but has been reformulated within the framework of the Agreement, particularly in Articles 4.1–4.6, reflecting the continued relevance of the principle of common but differentiated responsibilities. De jure, this framework created a dynamic process oriented toward long-term decarbonisation (Huang – Zhai, 2021; Boehringer, 2003).

In the context of the issue examined in this article, the Paris Agreement is of relevance for the countries under analysis. Members of BRICS and the expanded BRICS+ format rank among the world's largest emitters of carbon dioxide, while their economic growth remains closely linked to energy systems with a high dependence on fossil fuels. For this reason, it is essential to analyse the extent to which BRICS and BRICS+ countries have succeeded in reducing their emissions following the adoption of the Agreement. The signatories of the Paris Agreement committed themselves to the following key objectives:

1. The increase in global average temperature should be limited to no more than 1.5 °C by the end of the 21st century.
2. States should ensure transparency in their climate actions by providing information on implemented measures to the public and by subjecting their efforts to mutual review.
3. States are required to submit their own national plans outlining measures for the overall reduction of greenhouse gas emissions.
4. Climate policy requires a degree of solidarity with countries that are unable – due, for example, to economic constraints – to adapt rapidly to climate change or to transform their economies toward greener alternatives. Accordingly, signatories committed to supporting vulnerable countries not only in reducing greenhouse gas emissions, but also in building resilience to the already ongoing impacts of climate change.
5. States are obliged to report their action plans every five years, with each successive cycle introducing progressively more ambitious targets (United Nations Framework Convention on Climate Change, n.d.).

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These points indicate that the Paris Agreement represents a comprehensive framework that combines environmental objectives with principles of transparency, solidarity, and the progressive increase of ambition. The Agreement does not constitute a one-off commitment, but rather a dynamic process in which states are required to regularly update their climate strategies and gradually enhance the level of emissions mitigation. Particular emphasis is placed on support for vulnerable countries, reflecting the principle of climate justice and the necessity of global cooperation.

This system of cyclical assessments and information sharing is intended to ensure not only transparency and accountability, but also the long-term sustainability of efforts aimed at preventing the most severe consequences of climate change. The Paris Agreement thus differs from its predecessor, the Kyoto Protocol, primarily in the universal nature of its commitments and its reliance on voluntary, nationally determined contributions (NDCs). While the Kyoto Protocol imposed legally binding targets only on developed countries, the Paris Agreement incorporates the principle of common but differentiated responsibilities and allows for the gradual increase of ambition across all states. In this regard, the Agreement can be viewed as a step forward in global climate policy. Nevertheless, it also exhibits significant shortcomings. One of the most notable is the absence of an effective sanctioning mechanism through which compliance could be enforced. As a result, the Paris Agreement largely depends on the voluntary commitment of its signatories, which substantially complicates its effective implementation. Another persistent challenge lies in the gap between declared commitments and actual policy measures. Despite the adoption of the Agreement, global greenhouse gas emissions continue to rise. According to reports by the Intergovernmental Panel on Climate Change (IPCC), current measures remain insufficient to keep global warming below the 1.5 °C threshold. A similar conclusion is emphasized by the International Energy Agency, which notes that CO_2 emissions are declining far too slowly to meet the global climate objectives set out in the Paris Agreement (Bendunski, 2020; International Energy Agency, 2025; European Commission, 2025).

The Paris Agreement represents a key document in the history of global climate policy, as it established a framework for coordinated international efforts to address climate change. Its universal character and the introduction of nationally determined contributions (NDCs) constitute a significant shift compared to previous international commitments. Nevertheless, the Agreement is not without shortcomings. The absence of a sanctioning mechanism, the voluntary nature of compliance, and the persistent gap between declared commitments and actual policy measures all undermine its overall effectiveness.

Despite these limitations, the Paris Agreement remains the central instrument of global efforts aimed at decarbonisation and sustainable development. In this context, it is therefore particularly important to analyse the role of BRICS countries and the expanded BRICS+ format, which rank among the world's largest emitters of CO_2 while simultaneously pursuing ambitious economic development goals. Their approach to fulfilling commitments under the Paris Agreement, as well as their actual performance in reducing emissions, is of crucial importance for achieving global climate objectives. The following chapter therefore focuses on a detailed analysis of the development of carbon dioxide emissions in BRICS and BRICS+ countries between 2015 and 2024, with the aim of assessing the extent to which they have succeeded in meeting their climate commitments.

From a political science perspective, the Paris Agreement can be understood within the broader framework of global climate governance, which is characterised by the absence of a central enforcing authority and a reliance on cooperation among sovereign states. In this context, the principle of common but differentiated responsibilities (CBDR) plays a key role, as it recognises the unequal contribution of countries to global emissions as well as their differing capacities to address climate change. The Paris Agreement reflects a shift from a top-down regulatory model toward a more flexible, bottom-up system based on nationally determined contributions. While this approach increases inclusiveness and political feasibility, it simultaneously raises questions regarding the effectiveness of implementation, as states retain a high degree of autonomy in setting and fulfilling their commitments. For this reason, a central analytical problem in contemporary climate governance lies in the gap between formally declared commitments and actual policy outcomes. This study builds on this perspective by examining whether the emission trajectories of BRICS and BRICS+ countries correspond to their stated climate ambitions, thereby providing an analytical framework for assessing the effectiveness and limitations of current global climate governance arrangements.

Methodology and Data

This study employs a comparative and analytical research design aimed at examining the development of CO_2 emissions in the countries of BRICS and the expanded BRICS+ format over the period 2015–2024. The selection of these countries reflects their role as a politically defined grouping of emerging and strategically important economies within the framework of global climate governance. Although the analysed states differ significantly in terms of their economic structure, level of development and emission profiles, this heterogeneity is analytically relevant. It allows for a comparative assessment of how structurally diverse economies approach climate commitments and emission trajectories within a shared political framework.

The analysis is based on a combination of comparative analysis, time-series analysis and interpretative methods. The comparative approach enables the identification of similarities and differences in emission trends across countries, while time-series analysis is used to examine the dynamics of change in both absolute and relative emissions over time. Particular attention is paid to key turning points, such as the impact of the COVID-19 pandemic and subsequent economic recovery. In the interpretative phase, both inductive and deductive reasoning are applied, allowing broader conclusions regarding the effectiveness of climate policies to be derived from empirical observations.

In addition to total national emissions, this study also considers CO_2 emissions per capita. While the Paris Agreement primarily operates with national-level emissions, the per capita perspective provides an important complementary dimension, particularly in the context of equity and the principle of common but differentiated responsibilities. It allows for a more nuanced comparison of emission intensity across countries with significantly different population sizes.

The analysis focuses specifically on carbon dioxide (CO_2) emissions, although international climate negotiations and policy frameworks, including the Paris Agreement, primarily address total greenhouse gas emissions expressed in CO_2 equivalents (CO_2eq). This methodological choice is justified by the dominant share of CO_2 in global emissions, as well as by the higher availability, consistency and comparability of CO_2 data across countries. At the same time, this approach represents a partial analytical perspective, and the findings should be interpreted with this limitation in mind.

Carbon removals and natural sinks are not included in the analysis. While they constitute an important component of climate mitigation strategies, their measurement is subject to higher uncertainty and methodological variability across countries. For this reason, the study focuses on gross emissions in order to ensure analytical clarity and comparability of results.

The empirical analysis is based on data obtained from the Our World in Data (OWID) database, which compiles and harmonises data from a range of authoritative sources, including the Global Carbon Project, the International Energy Agency (IEA), and United Nations datasets. The use of OWID allows for a high level of data consistency, comparability, and transparency across countries and over time. While more specialised datasets are available, OWID provides a unified and methodologically standardised dataset that is particularly suitable for comparative time-series analysis.

Analysis and Comparison of the Implementation of the Paris Agreement in BRICS Countries

This chapter presents the results of a comparative analysis of the implementation of the Paris Agreement in BRICS countries and the expanded BRICS+ format, with particular emphasis on the development of CO_2 emissions over the period 2015–2024. The aim is to assess the extent to which these states have fulfilled their commitments arising from the Agreement and to identify the main trends in both absolute and per capita emission levels. The chapter focuses on the interpretation of emission trajectories across individual countries and highlights key similarities and differences in their approaches to decarbonisation and climate policy. By linking empirical findings with the broader framework of global climate governance, it provides a more comprehensive understanding of the role of BRICS and BRICS+ countries in shaping global climate outcomes.

Table 1. The Development of CO_2 Emissions in Brazil from 2015 to 2024

Year	CO_2 emissions (million tonnes)	Per Capita Emissions (tonnes)
2015	528.17	2.62
2016	491.74	2.42
2017	497.25	2.43
2018	476.60	2.31
2019	476.72	2.30
2020	448.00	2.15
2021	496.56	2.37
2022	480.06	2.28
2023	483.99	2.29
2024	483.01	2.28

Source: *Author's own elaboration based on current data from Our World in Data*

Based on the data presented in Table 1, it can be stated that Brazil experienced a moderately fluctuating but overall stagnating to slightly declining trend in CO_2 emissions over the period 2015–2024. Following relatively high emission levels in 2015 (528.17 million tonnes), a gradual decline can be observed until 2020, a development that was further reinforced by the COVID-19 pandemic. After 2021, emissions partially rebounded; however, they did not return to pre-pandemic peak levels. A similar pattern can be observed in per capita CO_2 emissions, which decreased from 2.62 tonnes in 2015 to approximately 2.28 tonnes in 2024. This trend suggests that Brazil maintained a relatively low emissions intensity compared to other countries under review, largely due to the high share of renewable energy sources in its energy mix. From a political science perspective, however, the post-2021 stagnation points to the limitations of existing decarbonisation measures and highlights the need for more consistent implementation of climate commitments adopted under the Paris Agreement (Santos et al., 2024).

Table 2. The Development of CO_2 Emissions in Russia from 2015 to 2024

Year	CO_2 emissions (billion tonnes)	Per Capita Emissions (tonnes)
2015	1.64	11.25

Year	CO_2 emissions (billion tonnes)	Per Capita Emissions (tonnes)
2016	1.63	11.18
2017	1.66	11.36
2018	1.71	11.68
2019	1.70	11.63
2020	1.63	11.15
2021	1.67	11.48
2022	1.68	11.51
2023	1.73	11.92
2024	1.78	12.29

Source: *Author's own elaboration based on current data from Our World in Data*

The data in Table 2 indicate that Russia maintained a consistently high level of CO_2 emissions over the period 2015–2024, with a moderate but clearly upward trend in recent years. Following relative stability between 2015 and 2019 and a more pronounced decline in 2020 associated with the pandemic-related economic slowdown, total emissions began to increase gradually and continuously from 2021 onward, reaching a peak in 2024 (1.78 billion tonnes). Particularly noteworthy is the development of per capita CO_2 emissions, which rank among the highest of the countries examined and increased from 11.25 tonnes to 12.29 tonnes during the observed period. This trend reflects the strong dependence of the Russian economy on fossil fuels and its energy-intensive industrial structure. From a political science perspective, the findings suggest that declared climate commitments have not yet translated into a systematic reduction in emissions intensity, while geopolitical tensions after 2022 may further reinforce this trajectory in the medium term. (Hulio et al., 2023; Kim et al., 2025).

Table 3. The Development of CO_2 Emissions in India from 2015 to 2024

Year	CO_2 emissions (billion tonnes)	Per Capita Emissions (tonnes)
2015	2.23	1.68
2016	2.35	1.75
2017	2.43	1.78
2018	2.60	1.89
2019	2.61	1.88
2020	2.42	1.73
2021	2.68	1.89
2022	2.83	1.99
2023	3.06	2.13
2024	3.19	2.20

Source: *Author's own elaboration based on current data from Our World in Data*

The data in Table 3 indicate that India experienced a pronounced and sustained upward trend in CO_2 emissions over the period 2015–2024, interrupted only by a temporary decline in 2020 because of pandemic-related restrictions. Total emissions increased from 2.23 billion tonnes in 2015 to 3.19 billion tonnes in 2024, reflecting the country's dynamic economic growth, ongoing industrialisation, and rising energy demand. Although per capita CO_2 emissions remain relatively low compared to other countries under review, their increase from 1.68 tonnes to 2.20 tonnes points to a gradual rise in the emissions intensity of both consumption patterns and production. From a political science perspective, this development illustrates the fundamental tension between India's development priorities and global climate objectives, with the country consistently emphasising the principle of "common but differentiated responsibilities." The findings further suggest that without more substantial structural changes in the energy sector, continued emissions growth will pose a significant challenge to the fulfilment of India's long-term climate commitments (Desai, 2025; Chateau et al., 2023).

Table 4. The Development of CO_2 Emissions in China from 2015 to 2024

Year	CO_2 emissions (billion tonnes)	Per Capita Emissions (tonnes)
2015	9.86	7.06
2016	9.75	6.94
2017	10.00	7.08
2018	10.35	7.29
2019	10.71	7.53
2020	10.90	7.64
2021	11.28	7.91
2022	11.71	8.22
2023	12.17	8.56
2024	12.29	8.66

***Source:** Author's own elaboration based on current data from Our World in Data*

The data in Table 4 indicate that China experienced a continuous and substantial increase in CO_2 emissions over the period 2015–2024, with total emissions rising from 9.86 billion tonnes to 12.29 billion tonnes. A short-term slowdown in 2016 did not constitute a turning point, as emissions began to increase steadily from 2017 onward, a trend that intensified further after the pandemic year of 2020. An upward trend is also evident in per capita CO_2 emissions, which rose from 7.06 tonnes to 8.66 tonnes, bringing China closer to the levels observed in advanced industrial economies. This development reflects the persistent reliance of the Chinese economy on coal and its energy-intensive growth model. From a political science perspective, the data point to a pronounced discrepancy between Beijing's ambitious climate declarations and actual emissions trajectories, while the timing of the country's emissions peak remains a key challenge for global climate policy (The State Council, 2025; Zhong - Zhang, 2025).

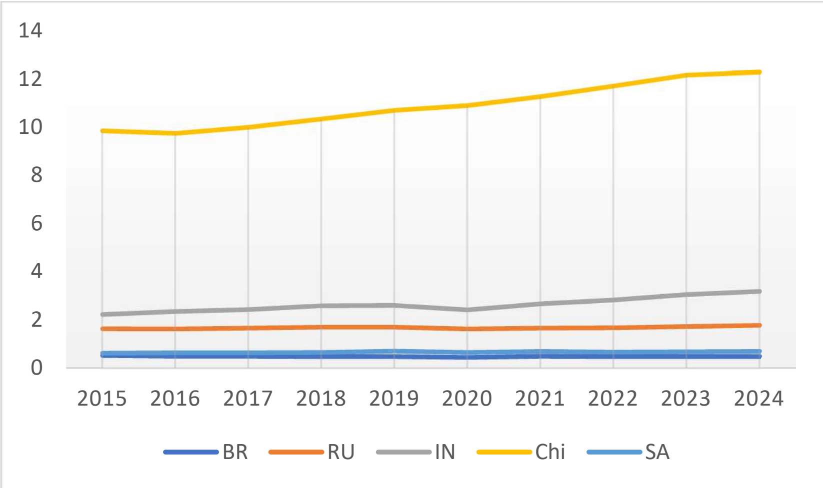
Table 5. The Development of CO_2 Emissions in South Africa from 2015 to 2024

Year	CO_2 emissions (million tonnes)	Per Capita Emissions (tonnes)
2015	457.47	8.06
2016	457.05	7.98
2017	440.01	7.63
2018	453.77	7.74
2019	470.73	7.90
2020	435.30	7.19
2021	439.46	7.15
2022	428.78	6.87
2023	436.60	6.91
2024	439.83	6.87

Source: *Author's own elaboration based on current data from Our World in Data*

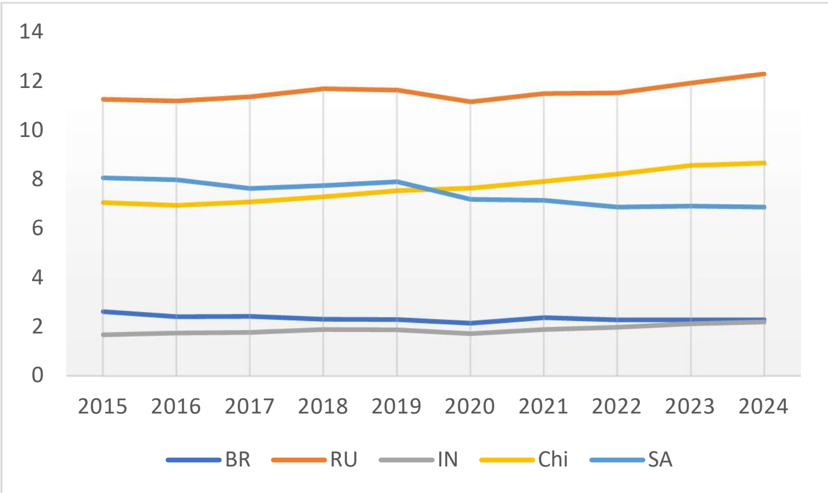
The data presented in Table 5 indicate that South Africa exhibited a slightly declining to stagnating trend in total CO_2 emissions over the period 2015–2024, accompanied by a more pronounced decrease in per capita emissions. Following a fluctuating pattern between 2015 and 2019, a noticeable decline occurred in 2020 because of the pandemic-related economic slowdown, while the subsequent recovery in emissions remained only partial. Total emissions decreased from 457.47 million tonnes in 2015 to 439.83 million tonnes in 2024, whereas per capita CO_2 emissions declined from 8.06 tonnes to 6.87 tonnes. This development suggests a gradual reduction in emissions intensity, although the country continues to rank among the more emissions-intensive states when measured on a per capita basis. From a political science perspective, these findings reflect increasing pressure to reform an energy sector heavily dependent on coal, while simultaneously highlighting the structural constraints of decarbonisation in the context of South Africa's socio-economic inequalities and energy security challenges (Msimango et al., 2023).

Figure 1. CO_2 Emissions Trends in BRICS Countries (2015–2024, billion tonnes)



Source: *Author's own elaboration based on Our World in Data*

Figure 2. Per Capita CO_2 Emissions Trends in BRICS Countries (2015–2024, tonnes per capita)



Source: *Author's own elaboration based on Our World in Data*

The graphical representation of CO_2 emissions trends in BRICS countries (Figure 1) provides a more comprehensive overview of the differences in emission trajectories among the analysed states. The data clearly confirm a high degree of heterogeneity within the grouping. China and India emerge as the dominant contributors to the overall increase in emissions, with both countries displaying a sustained upward trend throughout the observed period. In contrast, Russia maintains relatively stable but high emission levels, while Brazil and South Africa exhibit more stagnating or slightly declining trajectories. These patterns highlight the fundamentally different structural and economic conditions shaping national emission pathways, particularly with regard to energy systems, industrial development, and the role of fossil fuels. A similar level of differentiation can be observed in the case of per capita CO_2 emissions (Figure 2). While India remains at a comparatively low level despite its rapidly growing total emissions, countries such as Russia and South Africa display significantly higher per capita values, reflecting their energy-intensive economic structures. China occupies an intermediate position, with a steady increase in per capita emissions that gradually brings it closer to developed economies. Brazil, by contrast, maintains relatively low and stable per capita emissions, which can be partly attributed to its energy mix characterised by a higher share of renewable sources. These findings underline the importance of complementing aggregate emission data with per capita indicators, as they provide a more nuanced perspective on emission intensity and the distribution of responsibility across countries. Taken together, the graphical analysis reinforces the argument that BRICS countries cannot be treated as a homogeneous group in the context of global climate governance. Instead, their emission trajectories reflect a complex interplay of economic priorities, development stages, and political commitments. At the same time, these differences become even more pronounced when the analysis is extended beyond the original BRICS framework. The inclusion of additional countries within the BRICS+ format introduces a broader spectrum of emission profiles, ranging from major hydrocarbon-based economies to low-emission developing states.

The following section therefore expands the analysis to BRICS+ countries in order to provide a more comprehensive assessment of the role of these actors in global decarbonisation efforts.

Table 6. The Development of CO_2 Emissions in Saudi Arabia from 2015 to 2024

Year	CO_2 emissions (million tonnes)	Per Capita Emissions (tonnes)
2015	624.55	20.84
2016	641.17	20.87
2017	644.49	20.94
2018	652.20	21.48
2019	708.33	23.24
2020	653.56	21.09
2021	695.39	22.20
2022	666.99	20.73
2023	677.44	20.37

Year	CO_2 emissions (million tonnes)	Per Capita Emissions (tonnes)
2024	692.13	20.38

***Source**: Author's own elaboration based on current data from Our World in Data*

The data in Table 6 indicate that Saudi Arabia exhibited a markedly volatile yet overall stagnating trend in total CO_2 emissions over the period 2015–2024, without a clear trajectory toward systematic reduction. Following a gradual increase in emissions up to 2019, when they reached a peak of 708.33 million tonnes, emissions declined in 2020 due to the pandemic but subsequently returned to higher levels. Particularly striking are per capita CO_2 emissions, which remained at very high levels throughout the entire period (approximately 20–23 tonnes), placing Saudi Arabia well above most of the countries examined. This pattern reflects the economy's extreme dependence on fossil fuels, an energy-intensive lifestyle, and a low level of diversification in the energy mix. From a political science perspective, the data suggest that despite declared strategies aimed at economic diversification — such as Vision 2030 — effective decarbonisation remains a secondary priority when compared to objectives related to energy security and economic stability (Saudi Embassy, n.d.).

Table 7. The Development of CO_2 Emissions in Egypt from 2015 to 2024

Year	CO_2 emissions (million tonnes)	Per Capita Emissions (tonnes)
2015	226.65	2.28
2016	245.16	2.41
2017	253.36	2.44
2018	241.90	2.29
2019	234.06	2.18
2020	246.32	2.25
2021	266.84	2.40
2022	249.90	2.22
2023	250.23	2.18
2024	258.37	2.22

***Source**: Author's own elaboration based on current data from Our World in Data*

The data presented in Table 7 suggest that Egypt experienced a moderately increasing but markedly volatile trend in total CO_2 emissions over the period 2015–2024. Following an increase in emissions up to 2017, a phase of stagnation and short-term decline ensued, while the pandemic year of 2020 did not produce a significant turning point in emissions development. After 2021, emissions began to rise again, reaching 258.37 million tonnes in 2024, representing an increase compared to 2015. Per capita CO_2 emissions remained within a relatively narrow range of approximately 2.2–2.4 tonnes throughout the observed period, indicating a low to moderate emissions intensity in comparison with other countries under review. From a political science perspective, this development reflects a combination of demographic growth, gradual industrialisation, and efforts to expand energy infrastructure, while the scope for more substantial emissions reductions remains limited despite formal climate commitments (Abdallah – Shennawy, 2017).

Table 8. The Development of CO_2 Emissions in UAE from 2015 to 2024

Year	CO_2 emissions (million tonnes)	Per Capita Emissions (tonnes)
2015	225.04	25.94
2016	227.90	25.24
2017	196.49	21.28
2018	204.10	21.84
2019	204.06	21.76
2020	215.27	22.78
2021	212.17	21.67
2022	207.10	20.22
2023	210.43	19.77
2024	221.99	20.13

***Source**: Author's own elaboration based on current data from Our World in Data*

The data in Table 8 indicate that the United Arab Emirates recorded a slightly declining to stagnating trend in total CO_2 emissions over the period 2015–2024, accompanied by a more pronounced decrease in per capita emissions. Following relatively high emission levels in the mid-period under review, total emissions began to decline after 2017, a trend that was only partially disrupted by the COVID-19 pandemic in 2020 and a subsequent modest rebound. The most notable change can be observed in per capita CO_2 emissions, which fell from a very high level of 25.94 tonnes in 2015 to approximately 20.13 tonnes in 2024. This development suggests a reduction in the emissions intensity of the economy, although the values remain among the highest globally. From a political science perspective, the data point to a partial shift toward energy diversification and technological modernisation, while simultaneously confirming that a carbon-intensive growth model continues to dominate in the Emirati context (Aydin et al., 2026).

Table 9. The Development of CO_2 Emissions in Ethiopia from 2015 to 2024

Year	CO_2 emissions (million tonnes)	Per Capita Emissions (tonnes)
2015	12.56	0.12
2016	14.32	0.13

Year	CO_2 emissions (million tonnes)	Per Capita Emissions (tonnes)
2017	14.60	0.13
2018	16.12	0.14
2019	17.18	0.15
2020	16.74	0.14
2021	17.91	0.15
2022	16.96	0.14
2023	17.57	0.14
2024	17.84	0.14

Source: *Author's own elaboration based on current data from Our World in Data*

The data in Table 9 indicate that Ethiopia experienced a gradual increase in total CO_2 emissions over the period 2015–2024, although their absolute level remains very low compared to the other countries under review. Total emissions rose from 12.56 million tonnes in 2015 to 17.84 million tonnes in 2024, with the only more notable fluctuation being a slight decline in 2020 because of the pandemic-related economic slowdown. Per capita CO_2 emissions remained at an extremely low level throughout the period, ranging from approximately 0.12 to 0.15 tonnes, reflecting a low degree of industrialisation and limited access to energy-intensive forms of consumption. From a political science perspective, these data support the argument of uneven global responsibility for climate change, as Ethiopia's emissions growth is closely linked to basic development needs rather than to a carbon-intensive model of economic growth (Yalew, 2022).

Table 10. The Development of CO_2 Emissions in Indonesia from 2015 to 2024

Year	CO_2 emissions (million tonnes)	Per Capita Emissions (tonnes)
2015	551.16	2.11
2016	547.97	2.07
2017	570.93	2.14
2018	607.38	2.25
2019	665.05	2.44
2020	623.30	2.27
2021	632.95	2.29
2022	758.02	2.72
2023	762.36	2.71
2024	812.22	2.87

Source: *Author's own elaboration based on current data from Our World in Data*

The data presented in Table 10 indicate that Indonesia experienced a pronounced and sustained increase in CO_2 emissions over the period 2015–2024, interrupted only by a short-term decline in 2020 due to pandemic-related restrictions. Total emissions rose from 551.16 million tonnes in 2015 to 812.22 million tonnes in 2024, representing one of the most dynamic growth trajectories among the countries examined. An upward trend is also evident in per capita CO_2 emissions, which increased from 2.11 tonnes to 2.87 tonnes, gradually placing Indonesia among the higher-emitting developing economies. This development reflects rapid industrialisation, the expansion of energy infrastructure, and a persistent reliance on coal. From a political science perspective, the data point to a significant tension between the country's development strategy and its climate commitments, suggesting that without a fundamental transformation of the energy mix, continued emissions growth will pose a major challenge for global climate policy (Nasir – Bengi, 2024).

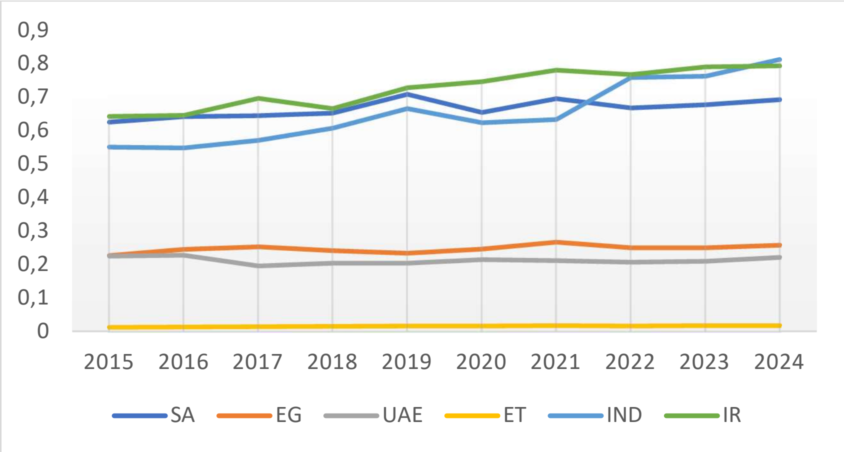
Table 11. The Development of CO_2 Emissions in Iran from 2015 to 2024

Year	CO_2 emissions (million tonnes)	Per Capita Emissions (tonnes)
2015	641.96	7.77
2016	644.68	7.69
2017	696.41	8.19
2018	664.52	7.72
2019	727.27	8.35
2020	745.60	8.50
2021	779.53	8.81
2022	767.18	8.57
2023	789.68	8.72
2024	792.63	8.66

***Source**: Author's own elaboration based on current data from Our World in Data*

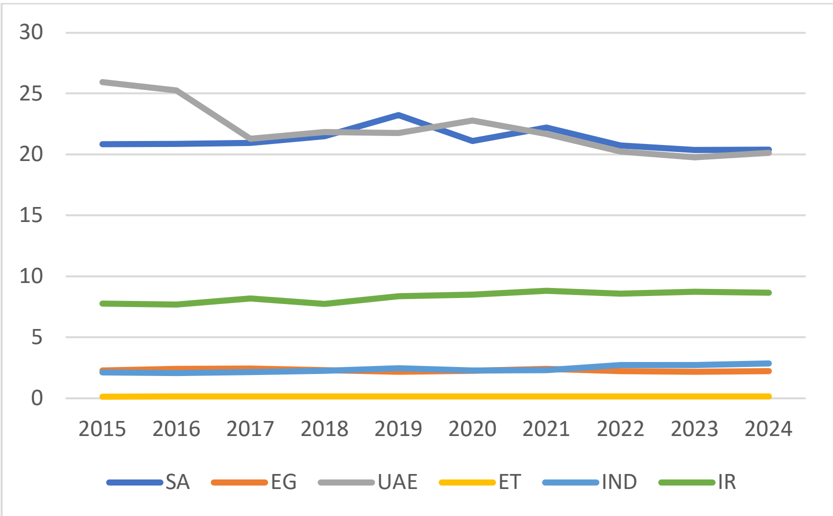
The data presented in Table 11 indicate that Iran experienced an overall upward, albeit moderately fluctuating, trend in CO_2 emissions over the period 2015–2024. Following an increase in emissions up to 2017, a phase of short-term fluctuations occurred; however, from 2019 onward a more pronounced growth trend became evident, which was not interrupted even during the pandemic year of 2020. In 2024, total emissions reached 792.63 million tonnes, representing a significant increase compared to 2015. A similar pattern can be observed in per capita CO_2 emissions, which rose from 7.77 tonnes to 8.66 tonnes over the same period. This trend points to the high energy intensity of the Iranian economy and its strong dependence on fossil fuels, particularly oil and natural gas. From a political science perspective, the data suggest that international sanctions and limited access to modern technologies may have paradoxically constrained more effective decarbonisation efforts, thereby relegating climate policy to a secondary position in favour of economic stability and energy self-sufficiency objectives (Jahandideh et al., 2026).

Figure 3. CO_2 Emissions Trends in BRICS+ Countries (2015–2024, billion tonnes)



Source: *Author's own elaboration based on Our World in Data*

Figure 4. Per Capita CO_2 Emissions Trends in BRICS+ Countries (2015–2024, tonnes per capita)



Source: *Author's own elaboration based on Our World in Data*

The graphical representation of CO_2 emissions trends in BRICS+ countries (Figure 3) further reinforces the high level of heterogeneity identified in the previous analysis. In contrast to the original BRICS grouping, the expanded format includes countries with significantly different emission profiles, ranging from major hydrocarbon-based economies to low-emission developing states. Indonesia and Iran exhibit a pronounced upward trend in total emissions, reflecting rapid economic growth, industrial expansion, and a continued reliance on fossil fuels. In contrast, countries such as Saudi Arabia and the United Arab Emirates display relatively stable but persistently high emission levels, without a clear long-term decline. Ethiopia, by comparison, remains at a very low absolute level of emissions, despite a gradual increase over time, highlighting the asymmetry in global emission contributions. A similar pattern of differentiation is evident in per capita CO_2 emissions (Figure 4), where disparities between countries become even more pronounced. Oil-exporting states such as Saudi Arabia and the United Arab Emirates record exceptionally high per capita emissions, reflecting energy-intensive consumption patterns and structural dependence on hydrocarbons. By contrast, countries such as Egypt and Indonesia remain at moderate levels, while Ethiopia continues to exhibit extremely low per capita emissions. These differences illustrate not only variations in economic structure and energy use, but also broader inequalities in development and responsibility within the global climate system. The observed differences in emission trajectories can therefore be interpreted as the result of a combination of structural economic factors and divergent political commitments. In major emitters such as China, India, and Indonesia, emissions are largely driven by fossil fuel-based energy production, particularly coal. In contrast, oil-exporting economies are characterised by high emissions linked to hydrocarbon extraction and domestic energy consumption. At the same time, variation in long-term climate commitments further contributes to these trends. While some states have adopted relatively earlier net-zero targets (e.g. Brazil by 2050), others have set later timelines (e.g. China by 2060) or maintain less clearly defined long-term strategies. Taken together, these findings highlight that the BRICS+ format represents an even more internally differentiated group than the original BRICS framework. This diversity significantly complicates the coordination of climate policies and underscores the challenges of achieving collective progress toward global decarbonisation goals. At the same time, it confirms that any meaningful assessment of climate performance must take into account both structural economic conditions and the political context of national climate commitments (Climate Action Tracker, n.d.).

From a broader analytical perspective, the findings of this study are consistent with existing research on the challenges of climate policy implementation in emerging economies, which emphasises the tension between economic development and decarbonisation efforts (e.g. IEA, 2023; World Bank, 2022). In line with the concept of the implementation gap, the results indicate that ambitious climate commitments are not always reflected in actual emission trajectories. This is particularly evident in rapidly developing economies, where structural dependence on fossil fuels and economic growth priorities continue to limit the effectiveness of climate policies. At the same time, the results confirm that national circumstances, including economic structure and institutional capacity, play a crucial role in shaping climate outcomes.

Conclusion

The comparative analysis of CO_2 emissions trends in BRICS countries and the expanded BRICS+ format over the period 2015–2024 demonstrates that the adoption of the Paris Agreement did not lead to a uniform or systematic shift in the emissions trajectories of these states. Empirical evidence confirms a high degree of heterogeneity in approaches, capacities, and political priorities, with differences largely shaped by levels of economic development, energy structures, and geopolitical positioning. In terms of absolute emissions, China and India remain the primary drivers of global emissions growth, reflecting a persistent tension between economic expansion and climate commitments. Russia and Iran exhibit consistently high emissions intensity, pointing to the limited transformative capacity of economies heavily dependent on fossil fuels and to the marginal prioritisation of climate policy in the context of geopolitical and security concerns. By contrast, Brazil and South Africa display some potential for emissions stabilisation or modest decline, albeit without clear evidence of a long-term decarbonisation trajectory.

The expanded BRICS format further illustrates profound inequalities in emissions responsibility, most notably when comparing Ethiopia's extremely low per capita emissions with the very high levels observed in Saudi Arabia and the United Arab Emirates. These disparities reinforce the relevance of the principle of "common but differentiated responsibilities," which is central to the legitimacy of global climate policy, while simultaneously complicating efforts to achieve consensus on more ambitious measures.

From a political science perspective, the findings confirm the structural limitations of the Paris Agreement, particularly its voluntary nature and the absence of effective sanctioning mechanisms. Although BRICS countries formally endorse global climate objectives, the empirical data reveal a persistent gap between political discourse and actual implementation. Without substantial reform of energy systems, enhanced technological transfer, and stronger incentive-based mechanisms, the role of BRICS in global decarbonisation is likely to remain ambivalent rather than transformative. The results of this study therefore suggest that the success of global climate policy will depend to a significant extent on the ability to integrate BRICS countries into a more binding and coordinated governance framework capable of reconciling legitimate development ambitions with the imperative of rapid global CO_2 emissions reduction.

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