



RESEARCH PAPER

Pakistan's Path towards Carbon Neutrality: Analyzing Process and Challenges Since the Paris Agreement Commitments

¹Qiza Shahid, ²Amina Shahid and ³Esha Ihsan

1. MS Scholar, Department of Politics & International Relations, GC Women University Sialkot, Punjab, Pakistan
2. MS Scholar, Department of Politics & International Relations, GC Women University Sialkot, Punjab, Pakistan
3. MS Scholar, Department of Politics & International Relations, GC Women University Sialkot, Punjab, Pakistan

Corresponding Author shahidqiza@gmail.com

ABSTRACT

The study focused on an examination and analysis of Pakistan's efforts, challenges, and policy response towards its journey towards a carbon-neutral future in the Paris Agreement (PA) with specific focus on both mitigation and adaptation aspects. Climate change is a ceaseless and so far an ongoing concern around the world, pushing countries to become low-carbon and in line with the PA goal of keeping global warming between 1.5°C and 2°C. While Pakistan accounts for only a small fraction of the Global GHG emissions of less than 1% of the total emissions, it is one of the most climate change fragile countries. Pakistan has developed new Nationally Determined Contributions (NDCs) and implemented various climate policies since joining the PA in 2016 that take both economic and environmental aspects into consideration. The approach is a qualitative-descriptive and analytical approach where secondary data from key policy documents is used. Analysis indicates that Pakistan has implemented a wide range of climate change measures, which includes measures for mitigation like more focus on RE, more EVs, no more coal, and extensive afforestation; and adaption which primarily concerns flood management, ecosystem restoration, and water resources governance. Although there have been some emission reductions with support from these efforts, investments in implementation on the ground are still constrained by financial resources, lack of institutional capacity and strong dependence on external climate funds. In summary, this study indicates that the shift of Pakistan towards a carbon neutral economy will be contingent on the enhancement of governance framework, strengthening of domestic capabilities along with ongoing international assistance in the form of funding and technical know-how.

Keywords: Climate Change, Pakistan, Paris Agreement, Mitigation Policies, Adaptation Strategies

Introduction

High levels of pollution because of the continuous release of carbon emissions also have a negative impact on the environment, accelerating global warming and the increasing number of extreme weather events. That makes reducing states' carbon emissions a major priority. Under these conditions, green development plays an important role in the structural change of world economy. On December 12, the Paris Climate Change Conference was a success and the Paris Agreement was adopted as a strategic plan for international action. Climate action beyond 2020. The agreement is intended to limit the extent of global warming to less than 2 °C, and further curbing it to 1.5 °C. (Nadeem, et. al. 2023; Farooqi, 2005).

In addition, this agreement outlines a simple vision for a global transition towards green and low-carbon development, detailing the steps that need to be taken to safeguard

the environment and human life. Countries are encouraged to attain their GHG emission peaks as soon as feasible, to be climate neutral by the middle of the 21st century. The study will look at the position of Pakistan for climate change and, in particular, at how its legislation was updated to align with the Paris Agreement. As we explore the ways in which climate change poses risks to national security, we also gain insights into Pakistan's strategies for mitigating the impact and aligning its policies with international commitments. Pakistan ratified the PA on 22nd April 2016, as a non-Annex 1 party (104th). The PA member nations establish their own obligations on emissions cuts, and they report their NDCs every 5 years (Ramzan, 2025). Under the deal, countries are required to detail and reveal what steps they will take to combat climate change after 2020, in the form of NDCs. All these contributions are essential to the PA and to be able to reach its long-term vision of goals. The Intergovernmental Panel on Climate Change (IPCC) has conducted a comprehensive assessment to assess the consequences of global warming of 1.5 °C.

According to recent studies, the PA's goals of keeping global temperature rises to 2 °C and 1.5 °C are just preliminary measures. If all countries reach their pledged NDCs (Meinshausen, 2022), global temperature is expected to increase by 3 °C. For the last decade, the United Nations Environment Program (UNEP) has been compiling and publishing reports estimating GHGs emissions and suggesting actions for reducing them. These reports indicate that greenhouse gas emissions reduction efforts are inadequate – and emissions are actually continuing to increase. The Combined NDCs (as included in the PA) would lead to a projected increase in global mean temperature of 3.2 °C (Report, 2022). Full achievement of the PA's 1.5 °C goal would require the carbon emissions to be cut by 7.6% annually from 2020 until 2030. Continuously, to maintain a growth rate of 2 °C, emission would need to be reduced by 2.7% annually during the same time period (Report, 2022). Despite this, there remains a huge disparity between national carbon reduction targets and 1.5°C. The reduction of emissions and the ambition of NDCs are important for countries looking for reduction of potentially severe and persistent climate impacts (Khan, 2016).

Pakistan is a member of the PA under UNFCCC was actively participating in the global climate mitigation efforts. Although it accounts for only 0.9% of the total GHG emissions globally, this is one of the most climate change-vulnerable countries (GOP, 2021). Examples of such events include increased frequency and severity of climate-driven natural disasters, spread of vector-borne diseases such as dengue fever, and extreme flooding, which also disrupts rain patterns, leading to rapid melting of Himalayan glaciers (Adnan, 2024). In 2016, the Government of Pakistan released an initial NDC, setting its goal to 1603 MtCO₂e in 2030 (GOP, 2021).

The government has highlighted that four sectoral projects—renewable energy, transportation, coal and land-use change and forestry that are of great importance for the future emission reduction are reliant on international financial and technical support. Pakistan is aiming for 50% reduction in expected emissions from 2015 to 2030, 15% will be fulfilled from local resources and 35% through foreign financial assistance, but the financial assistance is still not received. As part of NDC3.0, Pakistan would reduce its GHG emissions by as much as 50% by 2035 on a voluntary basis. Of this, 17% will be implemented in a naïve manner, with international funding via grants or concession: 33% will require to be adequate means and assistance from the rest of the world; the remaining amount (37%) can be secured by the exchange of technology and capacity-building support (Iacob Uta, 2022).

Literature Review

The Paris Agreement is an international agreement for climate change that is legally recognized. It was agreed upon by 195 Parties at the United Nations Climate Change Conference (COP21) held in Paris, France on December 12th, 2015. It went into force on November 4th 2016. It is aimed at "holding the increase in global mean temperature to well

below 2°C above pre-industrial levels" and "strengthening the global response to the threat of a warming of 1.5°C above pre-industrial levels. In recent years, however, countries have emphasized the importance of limiting global warming to 1.5 degrees Celsius at the end of this century (Ahmed 2025). That's because the UN's Intergovernmental Panel on Climate Change states that remaining above 1.5°C would lead to far more devastating climate change in the form of an increase in the frequency and severity of heatwaves, droughts and rainfall. GHG emissions need to start increasing by 2025 at the latest and then decline by 43% by 2030 to limit global warming to 1.5°C. For Implementation of the Paris Agreement will require:

Reforms in economic and social fields. Key to the Paris Agreement is a 5-year plan of increasingly ambitious climate action by governments.

Since 2020, nations have started presenting their NDCs. The ambition of a new NDC should be greater than the ambition of the previous NDC. Acknowledging the necessity to step up efforts and align 2030 targets in their NDCs with the Paris Agreement temperature limits by the end of 2023, the COP27 cover resolution calls for Parties to redesign and rewrite their 2030 targets in their NDCs in pursuance of this goal, mindful of various national circumstances. To support interventions towards the long-term goal, the Paris Agreement also calls on nations to develop and document long-term low GHG emission development strategies (LT-LEDS). The goal of LT-LEDS is to give NDCs a long-term perspective.

In keeping with this commitment made at the global level and with the aim to this end set forth in Article 4 of the Paris Agreement,

By taking account of what GHG emissions are, "parties aim to reach global saturation of GHG emissions as soon as possible".

To achieve a balance between minimizing the expected impact of climate change, particularly on coastal ecosystems, and the representation of the developing nations Parties in the revised NDCs.

Reduce anthropogenic sources and increase sinks of GHGs in the second half of this century, in line with equity, and with an eye to sustainable development and GHG sinks. Eliminate poverty." (UNFCCC, 2015)

These subsequent decisions of the parties are set forth in this submission. Pakistan's third NDC is a revamped and more robust plan to combat climate change. It follows up on previous commitments and establishes a clear plan for two over-arching objectives – GHG emission reductions and adaption to the impacts of climate change. In the first place, pursuant to the Article 4.2 and 4.3, Pakistan is required to develop and present an updated NDC every 5 years, while still improving the ambition level of the previous NDC (Hussain, 2020). Second, it requires introducing domestic policies and actions in line with its NDC targets, and this will be done through legislative and policy frameworks, including the Pakistan Climate Change Act (PCCA, 2017), and the updated National Climate Change Policy (NCCP, 2021). Thirdly, the country is obligated to provide Biennial Transparency Reports (BTRs) in accordance with the Enhanced Transparency Framework (ETF) (Article 13), to monitor progress towards its commitments, the next one of which was submitted in June 2025.

An improved transparency framework for action and assistance, with a built-in flexibility considering the parties' capacities and collective experience, is hereby established." (UNFCCC, 2015)

Fourth, Pakistan follows the Global Stock take process (Article 14) after every 5 years to review the progress of collective efforts towards achieving the agreed goals. Last, it connects with the transparent, non-adversarial, non-punitive compliance mechanism of the Paris Agreement, which encourages the implementation of the Agreement's obligations.

A mechanism to facilitate implementation of, and ways to ensure compliance with, such provisions of this Agreement is hereby established. (UNFCCC, 2015)

Carbon neutrality (also called achieving "net zero CO₂" or GHG) can be achieved by offsetting or removing an equal amount of CO₂ or GHG emissions by a country, corporation, product, activity or person over a period of time. Moreover, the Intergovernmental Panel on Climate Change (IPCC) made a strong assertion about fossil fuels substitution (mitigation) and scaling up renewables (energy transition) and their need in cities to be carbon-neutral in its special report on 1.5 °C global warming. In addition, the removal or the accumulation in the terrestrial or marine ecosystems must be promoted for achieving net-zero carbon emissions and sustainable development. Each geography, nation, and city has developed plans for better carbon removal and sequestration and for becoming carbon neutral, but it is difficult to reach the target of zero carbon emissions.

Material and Methods

This study is carried out with such research design which is qualitative, descriptive and analytical to explore the journey of carbon neutrality in Pakistan in the wake of climate change commitment under the Paris Agreement. Secondary data sources are the only ones used, to ensure methodological uniformity and policy relevance. International climate governance documents have been included as a part of the primary sources, such as the Paris Agreement, Conference of the Parties (COP), and Pakistan's official climate submissions to the United Nations Framework Convention on Climate Change (UNFCCC). Deductive and inductive reasoning were used to develop a coding framework for systematically analyzing policy documents.

Results and Discussions

Within this framework Mr. Khawaja highlighted Pakistan's target of reducing emissions in 'Combined' manner by 50% by 2030 as determined in the current ELS. To reach these ambitious objectives, Pakistan plans to shift towards a national energy generation mix of up to 60% renewable energy, 30% of all new vehicles to EVs by 2030 and a complete ban on importation of coal. Furthermore, Pakistan aims

To promote and scale up "Nature-based Solutions", the Ten Billion Trees Tsunami Program (TBTTP), Recharge Pakistan, Protected Areas Initiative will be implemented. CEIC data suggests that Pakistan's total GHG emissions (including land use, land use change and forestry) were 521.92 MtCO₂e in 2023. Sequestration by fully implementing the Billion Trees Afforestation Project (BTAP) and TBTTP is around 500 MtCO₂e by 2040. For the realization of the transition targets, there is a need for scientific and technical (STCs) capacity building in Pakistan. Pakistan's expertise in the use of the NB for solving the global concerns serves in taking the role of a solution-giver. Pakistan has done more than its share of mitigation step up and taken up climate change issue above its NDC levels - between 2016 to 2018 emissions have been reduced by 8.7%.

Though the policies developed around climate in the context of Pakistan are comprehensive, weak institutions and limited resources make them difficult to implement. Pakistan has already committed to follow the Paris Agreement, yet overall the level of domestic policies and targets is in line with the international climate regulation goals.

Table 1

Pakistan's key mitigation initiatives under updated NDCs 2021 aim at reducing greenhouse gas emissions

| Policy/Initiative | Key Actions | Timeline | Expected Outcome | Challenges | Source |
|--|---|------------------|--|--|----------------|
| Renewable Energy | Increase renewable energy production so that 60% of all energy comes from renewable sources, including hydropower. | By 2030 | Stabilizing the energy mix in favor of renewables is expected to reduce approximately 22 MtCO₂e emissions. | High upfront capital costs, weak grid integration capacity, delayed project financing, and dependence on imported equipment. | MoCC&EC, 2021 |
| Transportation / Electric Vehicles (EVs) | Ensure that 30% of all new vehicles sold are electric vehicles. | By 2030 | Expected reduction of approximately 24 MtCO₂e emissions. | Limited charging infrastructure and reliance on imported batteries. | Pakistan, 2023 |
| Coal Moratorium | No new imported coal power plants; two planned coal plants were shelved in favor of hydropower. | From 2020 onward | Estimated saving of 1.7 MtCO₂e ; emissions from coal plants were estimated at 8.8 MtCO₂e . | Energy security concerns. | MoCC&EC, 2021 |
| Ten Billion Tree Tsunami Programmed (TBTP) | Implement Pakistan's largest afforestation initiative. | 2016 onward | Estimated sequestration of 148.76 MtCO₂e over 10 years; BTAP and TBTP together could sequester around 500 MtCO₂e by 2040 . | Monitoring and verification challenges. | MoCC&EC, 2021 |
| Transmission Network Upgrade | Upgrade transmission infrastructure to support renewable energy integration. | By 2040 | Improved grid stability and better renewable energy integration. | High infrastructure costs and technical capacity limitations. | Pakistan, 2023 |
| Energy Transition Total | Complete renewable energy projects, expand hydropower, upgrade transmission networks, and phase out coal. | By 2030 and 2040 | Supports the implementation of Pakistan's Nationally Determined Contributions (NDCs). | Policy coordination gaps and financing constraints. | Pakistan, 2023 |

While Pakistan has introduced various mitigation measures to tackle GHG emissions resulting from growth in renewable energy, afforestation, EVs and restrictions on energy production from coal, past studies indicate the country's climate challenges through mitigation measures alone cannot be managed. Pakistan continues to be among the most climate change-vulnerable countries in the world, which continue to suffer from droughts, floods, extreme temperatures, glacier melting and scarcity of water. These environmental pressures have given a push towards climate change adaptation and climate resilience, as well as reducing emissions. Hence, the four areas given by the Updated NDCs 2021 are equally important such as strengthening ecosystems; improvement of disaster management; protection of vulnerable communities; and promotion of sustainable resource management. Past studies also suggest a growing dependence of Pakistan on NBs and community-based solutions to bolster resilience and promote livelihoods and environmental protection. Beyond mitigation, the country has also had a variety of

adaptation plans and programs to increase climate adaptability, mitigate environmental risk and support long-term sustainable development as illustrated in Table 2.

Table 2
Pakistan's major adaptation and climate resilience initiatives under the Updated NDCs 2021

| Policy/Initiative | Key Actions | Tim eline | Expected Outcome | Challenges | Source |
|-----------------------------------|--|-----------|---|---|----------------|
| Recharge Pakistan | Reduce flood risk and enhance groundwater recharge at six Indus Basin sites . | By 2030 | Increased resilience for 10 million people and strengthened ecosystems. | High implementation and maintenance costs, along with limited technical capacity. | Pakistan, 2023 |
| Protected Areas Initiative | Increase protected areas from 12% to 15% . | By 2030 | Conservation of flora and fauna, creation of 5,500 green jobs , and promotion of ecotourism. | Weak enforcement of conservation laws. | MoCC&EC, 2021 |
| National Adaptation Plan (NAP) | Formulate the national adaptation framework. | Ongoing | Improved adaptive capacity. | Limited institutional capacity and funding constraints. | Pakistan, 2023 |
| Green Jobs Creation | Promote climate-related employment opportunities. | Ongoing | Increased resilience and employment. | Lack of public awareness. | MoCC&EC, 2021 |
| International Support Requirement | Seek finance, technology transfer, and capacity building under the UNFCCC and the Paris Agreement. | Ongoing | Enhanced implementation of climate actions. | Dependence on external funding and technology transfer gaps. | NYCCC, 2025 |

It is highly appreciated that climate change is now declared as an issue of 'national security' but the zeal and determination required to tackle any securitized issue is still largely lacking in the decision-making processes of Pakistan. Table 1 and 2 illustrate the gradual process of development of a holistically formulated climate change policy regime in Pakistan which, as visions of the Paris Agreement, has set itself the target of transitioning towards carbon neutrality. Table 1 targets mitigation measures involving the expansion of renewable energy, electric vehicles, afforestation projects and the restriction of imported coal, all of which would have a mitigative effect on GHGs. Table 2, on the other hand, shows adaptation and resilience programs aimed at keeping vulnerable populations, ecosystems and economy from the increased climate impacts, including extreme weather events, water shortages, flooding etc. Together, these policies demonstrate Pakistan's efforts to strike a balance between reducing emissions, enhancing climate resilience, and promoting sustainable development. Yet despite these lofty promises, and growing international collaboration, implementation continues to be difficult in the face of insufficient funding and an underdeveloped institutional framework, technological limitations, as well as post-submission dependence on external climate finance. Hence, studying both the mitigation and adaptation efforts becomes significant, which will yield an overview of Pakistan's achievements, successes and ongoing issues and difficulties related to its journey toward moving to low carbon and climate resilient Pakistan.

Conclusion

The steps taken by Pakistan towards carbon neutrality reflect a slow-growing and uneven shift from policy intent to real action under the Paris Agreement. Pakistan's climate response has been incrementally strengthened since its entry to the Paris Agreement in 2016 with the successive revisions in its NDCs, establishing long-term emissions reduction

targets, and an increased focus on climate adaptation. These efforts highlight for example one of the factors towards balancing two goals at once, namely providing for economic development and the environmental pressures by favoring renewables energies and reducing coal dependency as well as by promoting EVs and investing in NBs like tree planting and ecosystem restoration.

This paper reveals that Pakistan's climate action plan follows two parallel pathways – emission cuts and resilience. As for mitigation, the policies to be done under NDCs 2021 Pakistan include improvements in the promotion of renewable energy, electric mobility projects, phasing out coal energy, and large scale afforestation projects. The TBTP and the previous Billion Tree Afforestation Project (BTAP) are a sign of a country increasingly looking to NBs as a means to keep greenhouse gases out and get them in, mitigate damages to degraded ecosystems, and promote afforestation.

Simultaneously, because of Pakistan's vulnerability to climate risks it is becoming crucial to ensure its adaptation to changing climate. Plans and policies like Recharge Pakistan and the National Adaptation Plan, Pakistan, are indicative of a growing acceptance of disaster preparedness in anticipation of climate change, more efficient management of water resources, and community level resilience. These priorities are very much in line with IPCC's Special Report on Global Warming of 1.5°C, which emphasizes the need for countries to reduce emissions and adapt to successfully address climate change. Nevertheless, although there is progress on policy design, achieving carbon neutrality has proven to be challenging. There are still several challenges Pakistan has to encounter, including weak institutional coordination, limited technical capacity, weak financial resources, high reliance on external climate assistance. Global scenarios, such as the UNEP Emissions Gap Report do demonstrate that the majority of countries, including Pakistan, are also far off track even with current commitments and policy ambition to achieve the 1.5°C target.

The overall picture of climate governance in Pakistan since the Paris Agreement sketches relatively positive efforts toward the development of climate policies but few efforts toward transformation in executive capacities. Though the country has created a good overall structure linking mitigation and adaptation, more effective on-ground implementation, capacity building, good governance, and continued international assistance will be key to achieving carbon neutrality. Pakistan's testimony is by no means unique; so many developing nations have grand plans on climate change but making it a reality in a consistent and practical way in the face of financial and structural limitations is far more challenging.

Recommendations

There is no need to switch from the current fragmented and impractical to a coordinated and practical strategy for transitioning Pakistan towards carbon neutrality under the Paris Agreement.

Policy Cohesion

Firstly, enhanced institutional coordination at the national, subnational, and local levels is needed to more effectively implement climate policy as part of NDCs.

Coordinated Governance

Such governance improvements will help ensure more policy is put into practice.

Capacity Building

Enhancing the capacity of local stakeholders through training, research and developing data systems can help Pakistan to become less reliant on external support and more sustainable in implementing climate action.

Resource Mobilization

Establishing funding gaps and enlisting funding for NAP implementation is an important element.

Operational Planning

Implement good systems to monitor and report on the implementation of climate policy and hold parties to account.

Increase Public Awareness

Engage communities by incorporating Climate Change curriculum in schools and organizing awareness campaigns for the communities.

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