

The International Legal Path to Carbon Neutrality under the Sustainable Development Goals

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Abstract: This paper aims to study and analyze the progress towards carbon neutrality goals across different countries, and explore the significance of international institutions and organizations in fostering international cooperation. It also intends to shed light on the challenges faced in achieving these goals, focusing on areas like inter-country cooperation, technology transfer, and international supervision. Furthermore, this paper proposes enhancements to international laws and regulations, national responsibilities, and moral concepts in order to strengthen the global response to climate change. By doing so, we aim to contribute to a more comprehensive understanding of the global journey towards carbon neutrality, the roles of various actors in this journey, and the potential measures to improve this collective effort.

Keywords: Carbon Neutrality Goal, International Cooperation, International Laws

1. Introduction

As global warming increases significantly, it becomes more important to achieve carbon neutrality and net emissions reduction goals for many countries. Based on the principles of sustainable development, countries are striving to set and achieve carbon neutrality goals to achieve energy conservation, emission reduction, green development, and promote a beautiful vision of harmonious coexistence between humans and nature within the framework of international law and ethics. According to the *Kyoto Protocol* and the *Paris Agreement*, each country quantifies its emission reduction targets, invests heavily in funds, technology, and labor, flexibly controls CO₂ emissions and decomposition, and aims to achieve the goal of carbon neutrality by 2050. International institutions and organizations such as the United Nations, the World Energy Research Institute, and the CDP Center for Global Environmental Information play an important guiding role in addressing carbon emissions. However, there are still some challenges in achieving carbon neutrality goals, such as insufficient cooperation between countries, technology transfer, and international supervision, which need to be further improved. In this paper, we have studied and analyzed the progress toward carbon neutrality goals in different countries, explained and illustrated the significance of international institutions and organizations in fostering international cooperation, and proposed enhancements to international laws and regulations, national responsibilities, and moral concepts.

2. Current Status and Significance of International Law to Achieve Carbon Neutrality

2.1. Major International Agreements Related to Carbon Neutrality

The global community has dedicated substantial efforts to establish international agreements in response to the climate crisis. In 2015, the *Paris Agreement* emerged as a significant milestone, playing a pivotal role in advancing the goal of carbon neutrality [1]. This groundbreaking agreement provides a framework for worldwide endeavors to combat climate change. It sets the objective of limiting global temperature rise to well below 2 degrees Celsius above pre-industrial levels, with an ambition to restrict it to 1.5 degrees Celsius. Notably, the *Paris Agreement* places a strong emphasis on nationally determined contributions (NDCs) and aims for global carbon neutrality by the second half of the century. Each participating country must submit its own NDC, outlining its efforts to reduce greenhouse gas emissions and adapt to climate change while considering its specific capabilities and aspiring for the highest possible ambition.

The *Paris Agreement* also establishes a transparent and robust framework to monitor progress and facilitate international cooperation toward carbon neutrality. It recognizes the vital role of financial and technological support to assist developing countries in transitioning to a low-carbon path. Developed nations are expected to provide financial resources to support climate mitigation and adaptation efforts in developing countries. This financial support aims to enable developing countries to adopt cleaner technologies, enhance climate resilience, and contribute significantly to global carbon neutrality.

In addition to the *Paris Agreement*, various other international agreements and protocols contribute to the pursuit of carbon neutrality. Prior to the *Paris Agreement*, both the *Kyoto Protocol* and the *Montreal Protocol* played crucial roles in reducing CO₂ emissions [2,3]. In 2015, the United Nations adopted the Sustainable Development Goals (SDGs), which include Goal 13, calling for urgent action to combat climate change and its impacts [4]. Although not exclusively focused on climate change, the SDGs recognize the interconnectedness between climate action, sustainable development, poverty eradication, and other global challenges. They underscore the need for a comprehensive approach to achieve carbon neutrality. These agreements and protocols, among others, provide a solid foundation for international cooperation and collaboration in addressing climate change and advancing efforts toward carbon neutrality.

2.2. The Significance of Achieving Carbon Neutrality

To ensure ecological balance and achieve sustainable development, every country has a responsibility to achieve carbon neutrality. Low-carbon, clean, and efficient energy development is the trend. Energy conservation and emission reduction promote energy utilization, and strengthening governance focuses on industrial transformation. It is necessary to vigorously develop the economy and enhance the country's comprehensive strength without consuming resources and damaging the environment.

Achieving carbon neutrality can reduce a country's dependence on fossil fuels such as coal and oil, saving resources and protecting the environment. The combustion of fossil fuels produces a large amount of greenhouse gases, such as carbon dioxide, which further accelerates global warming. To prevent hazards such as glacier melting and rising sea levels, controlling greenhouse gas emissions plays an important role in regulating global temperatures and improving the climate environment. Countries need to accelerate industrial transformation, industrial restructuring, promote the integration of digital and physical economies, and promote the development of emerging industries, so that energy conservation and emission reduction can be implemented in the process of economic development. This will ultimately achieve the substitution of clean energy for fossil fuels, which has

a significant impact on a country's economic development. Therefore, people from all countries need to work together to achieve carbon neutrality goals, promote intergenerational fairness, and promote coordinated development of pollution reduction.

2.3. Ethical and Moral Obligations

Saving resources and protecting the environment is an obligation that every country cannot shirk. We live in the same world, and everyone should do their best for the needs of society's beautiful development. Individuals, countries, and international organizations should aim for green development and take action to promote sustainable development between humans and nature. Although the *Paris Agreement* is implemented in the form of national goals, and there are no strict punishment measures, it is still an ethical and moral requirement for countries to undertake obligations such as energy conservation, emission reduction, and environmental protection.

On the basis of fair carbon emission responsibilities for both developed and developing countries, each country needs to assume corresponding carbon emission responsibilities according to the principle of responsibility division. Carbon emissions are not the responsibility of a single country, and countries need to cooperate with each other to achieve carbon neutrality goals. Developed countries can provide financial and technological support to countries with limited resources or poverty, demonstrating their magnanimity and assuming their responsibilities as major powers.

3. International legal and cooperation mechanisms for achieving carbon neutrality

3.1. Legal Mechanisms for Achieving Carbon Neutrality

In the pursuit of carbon neutrality, nations employ legal frameworks that establish targets for reducing emissions and implement policies aligned with this objective. Extensive research indicates the pivotal role of robust legal frameworks in driving effective emissions reduction efforts. A recent study conducted by Wang et al. examined the legal framework underpinning China's commitment to carbon neutrality, emphasizing the importance of enacting comprehensive climate legislation to provide a solid legal basis for achieving this goal [5]. Additionally, Laing et al. explored the role of emissions trading within the European Union and concluded that it had contributed significantly to emissions reductions and the advancement of low-carbon technologies [6]. Therefore, legal mechanisms play a critical role in attaining carbon neutrality.

One fundamental legal mechanism entails the enactment of legislation addressing climate change. Such legislation provides a comprehensive framework that guides national climate action and establishes precise legal obligations for reducing emissions. National governments frequently develop climate action plans or strategies that delineate specific policies, measures, and targets geared toward achieving carbon neutrality. These plans encompass diverse sectors, including energy, transportation, industry, and agriculture, and incorporate mechanisms for monitoring, reporting, and verifying progress in emissions reductions. Moreover, legal frameworks may encompass regulatory instruments like emissions standards and sector-specific regulations. These instruments establish limits on emissions and stipulate requirements for the adoption of cleaner technologies, implementation of energy efficiency measures, and adoption of sustainable practices.

International law has increasingly recognized the prominence of carbon pricing mechanisms, emissions trading schemes, and market-based approaches as means to incentivize emissions reductions and facilitate the transition to carbon neutrality. Carbon pricing involves assigning a financial value to greenhouse gas emissions that reflects their environmental impact. It can take the form of carbon taxes or cap-and-trade systems. These mechanisms create economic incentives for reducing emissions by rendering them financially disadvantageous. In essence, robust legal

frameworks serve as the bedrock for effective climate action and play a crucial role in driving the global shift toward carbon neutrality.

3.2. International Cooperation and Collaboration

Collaboration between nations is paramount to achieving the goal of carbon neutrality. Climate change is a global challenge that necessitates collective action and shared responsibility. By working together, countries can combine their resources, expertise, and efforts to address the complex and interconnected issues associated with carbon neutrality. However, in the current climate, international cooperation on technology transfer, capacity-building, and financial assistance presents both challenges and opportunities in the pursuit of carbon neutrality. De Coninck & Sagar explore the challenges and opportunities of international climate finance, underscoring the need for collaborative efforts to mobilize financial resources for climate action in developing countries [7].

One challenge lies in the unequal distribution of technological capabilities and resources among countries. Developed nations possess advanced technologies for emissions reduction, renewable energy, and sustainable practices. In contrast, many developing countries face technological barriers and lack the necessary resources to adopt and implement such technologies. Bridging this technology gap requires enhanced collaboration, including technology transfer mechanisms that facilitate the transfer of environmentally sound technologies to developing countries.

Capacity-building is another crucial aspect of international cooperation. Developing countries often require support in enhancing their institutional capacities, technical expertise, and human resources to implement effective climate mitigation and adaptation measures. Capacity-building efforts can encompass training programs, platforms for knowledge exchange, and technical assistance. These initiatives enable developing countries to develop and implement their climate action plans and contribute meaningfully to carbon neutrality.

Financial assistance is vital for supporting developing countries in their transition to low-carbon pathways. Popp highlights the role of international cooperation in promoting technology transfer for climate change mitigation, particularly in developing countries [8]. Many developing nations face financial constraints in implementing climate action measures and transitioning to sustainable development. International cooperation can provide financial resources, grants, concessional loans, and innovative financing mechanisms to enable developing countries to invest in renewable energy, energy efficiency, climate-resilient infrastructure, and other climate mitigation and adaptation initiatives.

While challenges exist in the process of international collaboration, opportunities also arise from cooperative efforts in technology transfer, capacity-building, and financial assistance. Collaborative endeavors can foster innovation, research, and development in clean technologies, making them more accessible and affordable for all countries. Moreover, cooperation can facilitate partnerships between governments, private sector entities, and civil society organizations, harnessing collective expertise and resources to expedite progress toward carbon neutrality.

In conclusion, achieving carbon neutrality necessitates a comprehensive and collaborative approach under the framework of international law. Legal mechanisms provide a framework for implementing carbon neutrality policies at the national level, while international cooperation fosters knowledge sharing, supports technology transfer, enables capacity-building, and provides financial assistance to developing countries. By combining these elements, the global community can accelerate the transition to a sustainable, low-carbon future and effectively address the challenges posed by climate change.

4. The Dilemma of Achieving Carbon Neutrality

Achieving the goal of carbon neutrality by 2050 requires the joint efforts of all countries. However, there are still many challenges to overcome. From the *Kyoto Protocol*, we can see that mandatory emissions reduction is not realistic as it may disrupt a country's economic balance and affect its development. Therefore, we advocate for countries to voluntarily contribute, commit to emissions reduction, and assume corresponding national responsibilities to contribute to low-carbon environmental protection and green travel.

4.1. Legal Issues

Different countries have different historical developments and national conditions, and the paths they take to achieve carbon neutrality goals are also different. The *Paris Agreement* stipulates in Articles 4 and 13 that countries need to achieve carbon neutrality targets and develop corresponding long-term strategies, and report on their progress starting in 2024 under a strengthened transparency framework [9]. Overall, the *Paris Agreement* gives countries considerable discretion to set different stage goals based on their specific situations, in order to achieve the ultimate goal of carbon neutrality. During this long period, countries transparently report their progress to achieve effective supervision and demonstrate their governance capabilities and determination to achieve their goals to their people. However, achieving carbon neutrality is not easy. Although countries advocate for energy transformation and green emissions reduction, it is difficult to achieve carbon neutrality without corresponding safeguards. The current legal system related to carbon neutrality is imperfect, and most emissions reduction principles are scattered in various laws, without a unified law to regulate factory behavior and national governance [10]. Under the principles of the *United Nations Framework Convention on Climate Change* and the *Paris Agreement*, countries need to enact corresponding laws to promote carbon neutrality, provide strong legal guarantees from a legal perspective, and ensure that there are laws to follow and enforce. Of course, the relevant departments also need to supervise and implement the laws to make them effective in actual life. This is conducive to achieving energy conservation and emissions reduction, promoting national development, and achieving various goals.

4.2. Regulatory Issues

Improving the carbon emission measurement system and establishing a sound monitoring system is one of the ways to achieve carbon neutrality [11]. Due to the invisibility of carbon emissions, we need to detect their emissions and estimate the actual amount of carbon dioxide emissions, compare emissions with decomposition, and draw corresponding conclusions. The consumption of natural resources and the demand for steel production are more or less accompanied by greenhouse gas emissions. A unified carbon accounting system with uniform standards in different industries and regions can effectively manage and govern emissions [12]. Therefore, countries need to increase their energy development efforts, accelerate industrial transformation progress, and establish unified mandatory national standards and corresponding regulatory systems. In addition to effective supervision, countries also need to establish corresponding punishment measures to ensure that supervision is implemented. If there are illegal or irregular facts related to enterprises or their related products, relevant departments need to impose penalties to ensure that supervision is effectively carried out and carbon goals are achieved.

5. Effective initiatives

Although countries committed to achieving carbon neutrality goals under the *Paris Agreement*, most countries have set their targets for 2050. This has led to most carbon neutrality goals being only

discussed and not formally acted upon. Nevertheless, there are currently two countries that have achieved carbon neutrality and are negative carbon countries, such as Bhutan and Suriname. Some countries have set their targets before 2050, such as Uruguay, which plans to achieve this goal by 2030. In achieving carbon neutrality goals, both countries and international organizations are contributing to green development, energy conservation, and emission reduction [13].

5.1. At the National Level

Since signing the *Paris Agreement*, the UK has accelerated its progress towards carbon neutrality. In 2019, the UK introduced the *Climate Change Act (2050 Target Amendment)*, officially setting the goal of achieving carbon neutrality by 2050 [14]. In 2021, the US returned to the *Paris Agreement* and developed a series of plans to increase funding for transportation, construction, and clean energy, as well as accelerate technological innovation in clean energy. At the same time, the US has incorporated climate change into its foreign policy and national security strategy, strengthened international cooperation, and vigorously promoted the "3550" carbon neutrality process [15]. In April 2020, France issued a decree through its *National Low Carbon Strategy*, aiming to achieve carbon neutrality by 2050. In addition, the French government has developed and implemented several policies in recent years, such as the *Multi-Year Energy Plan* and the *National Air Pollution Reduction Plan*, which provide strong policy support for achieving energy conservation and emission reduction, and promoting green growth [16].

The United Nations-supported "Race to Zero" campaign, which aims to reduce carbon emissions by half by 2030, holds great promise for the future. The World Resources Institute conducts research and evaluates the technological, economic, and social benefits of climate action, develops tools to track global progress in addressing the climate crisis, and provides information for high-quality decision-making. The World Wildlife Fund translates the commitments of the *Paris Agreement* into concrete actions and develops relevant initiatives to promote sustainable actions.

5.2. At the Enterprise Level

Of course, achieving harmonious coexistence between humans and nature is not only the responsibility of countries and international organizations, but also some companies need to take corresponding responsibilities. Google, the world's largest search engine company, plans to become a large enterprise that operates with zero-carbon energy by 2030, leading people to jointly address the challenges of climate change [17]. BP, the British oil company, plans to become a net-zero company by 2050 or earlier and help the world achieve net-zero emissions. It is also partnering with the Danish renewable energy group Orsted to develop zero-carbon hydrogen, with the aim of expanding hydrogen production capacity to 10% of the global hydrogen core market by 2030 [18]. Ant Group is committed to energy conservation and emission reduction, and improving the ecological environment. From the online Ant Forest project to offline tree planting, they are contributing to achieving the goal of net-zero emissions by 2030 [19].

6. Conclusion

The goal of carbon neutrality is not just the goal of a country, organization, or individual but a common goal for all of humanity. Energy conservation, reducing carbon dioxide emissions, green development, and meeting the demands of a better future requires contributions from each and every one of us to achieve the goal of net emissions. Within the international framework, this study reveals the importance and necessity of carbon neutrality at the national, societal, and corporate levels, from large to small. From the national level to the corporate level, everyone is making every effort for this goal. However, there are also many challenges in the process of achieving carbon neutrality. The laws

still need to be improved, regulation still needs to be strengthened, and the principles of sustainable development still need to be implemented [20]. Upholding the concept of resource conservation and environmental protection, relying solely on ethical and moral constraints is far from enough. The country needs to enact corresponding laws and regulations to provide the final guarantee and constraints in terms of the law. When people intentionally engage in behaviors that harm the environment and waste resources, the country should impose severe penalties, warnings, or educate others about the importance of energy conservation and emissions reduction in order to instill environmental awareness in people's hearts. In this study, we can see that both the government and international organizations play important roles in achieving carbon neutrality goals. They promote the reduction of greenhouse gas emissions and the increase in renewable energy use through policy-making, providing funding, and offering technological support. At the same time, we also hope that more people can actively participate in the achievement of carbon neutrality goals by changing their lifestyles and behavior habits, reducing carbon emissions, and collectively addressing the challenges of climate change.

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