

Exploring Climate Change and Global Economic Inequality Through Carbon Emission Policy Practices

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Abstract: Climate change represents a critical global challenge, exacerbating both ecological and economic inequalities. This article examines how global economic disparities influence carbon emission reduction policies, particularly in the United States and China. The study highlights the historical responsibility of developed countries in emissions and their greater capacity to mitigate climate impacts, contrasted with the development pressures faced by emerging economies. Through case studies of U.S. and Chinese policies, the article explores how current climate governance frameworks reflect these imbalances and the institutional challenges of implementing effective, equitable carbon policies. The findings suggest that while developed nations have greater resources to address climate change, developing nations face significant barriers in balancing economic growth with environmental responsibility. However, the study has limitations, particularly in its geographical focus on just the U.S. and China, overlooking experiences from other countries, especially developing ones. Future research should expand the scope to include a wider range of nations, particularly low-income countries, to gain a more comprehensive understanding of global climate governance and the disparities within it.

Keywords: Climate Change, Global Economic Inequality, Carbon Emission Reduction, U.S. and China, International Climate Politics

1. Introduction

Climate change has become one of the most pressing global challenges in the 21st century. With rising global temperatures, frequent occurrence of extreme weather events, and gradual rise in sea level, climate change not only threatens the stability of natural ecosystems, but also profoundly affects the sustainable development of human society [1]. At the same time, the inequality of the global economic system has been further magnified by the climate crisis: the vast differences in greenhouse gas emissions, climate adaptive capacity and environmental governance resources among different countries and regions have made climate governance a complex issue involving both ecological and developmental dimensions. There is a long-standing dispute between developed and developing countries in international climate politics over "who should bear more responsibility". Developed countries have historically accumulated large amounts of carbon emissions due to earlier industrialization. Still, their economic and technological conditions have also made them more capable of responding to climate change. On the other hand, many developing countries, although their current emissions are relatively low, face the absolute pressure of industrialization and economic development, and the demand for "simultaneous emission reductions" is often regarded as an

initiative to restrict their right to development. This contradiction has repeatedly been the focus of international climate negotiations, highlighting the equity challenge to the design and implementation of global carbon policy [2].

Against this backdrop, achieving a balance between the right to development and environmental responsibility has become a key challenge in global climate governance. This article examines how China and the United States have approached carbon emission reduction by analyzing current policies and conducting case studies. It further investigates how carbon policies reflect and reinforce global economic inequalities. The discussion will focus on how climate change deepens economic disparities worldwide, while also addressing the institutional constraints and implementation challenges faced by current carbon emission frameworks. Finally, the article seeks to propose a fair and effective carbon policy path within the framework of sustainable development.

2. The relationship between climate change and global economic inequality

2.1. Distribution of global carbon emissions and differences between developing and developed countries

Global carbon emissions' spatial and temporal distribution reveals the deep economic structural inequality behind climate change. According to Carbon Brief's analysis of historical emissions data, the world has cumulatively emitted about 260.7 billion tons of carbon dioxide (CO₂) since the Industrial Revolution, accounting for 94% of the 1.5°C carbon budget [3]. Of this, developed countries, particularly the United States, have been responsible for the vast majority of historical emissions. The cumulative emissions of the United States alone amount to 532 billion tons, or more than 20% of the global total, with per capita emissions reaching 1,570 tons. In contrast, although China is currently the most significant annual emitter, its cumulative emissions are 312 billion tons, or only 227 tons per capita, far lower than those of traditional industrialized countries [3]. This discrepancy clearly reflects the reality of "who developed earlier, who emits more".

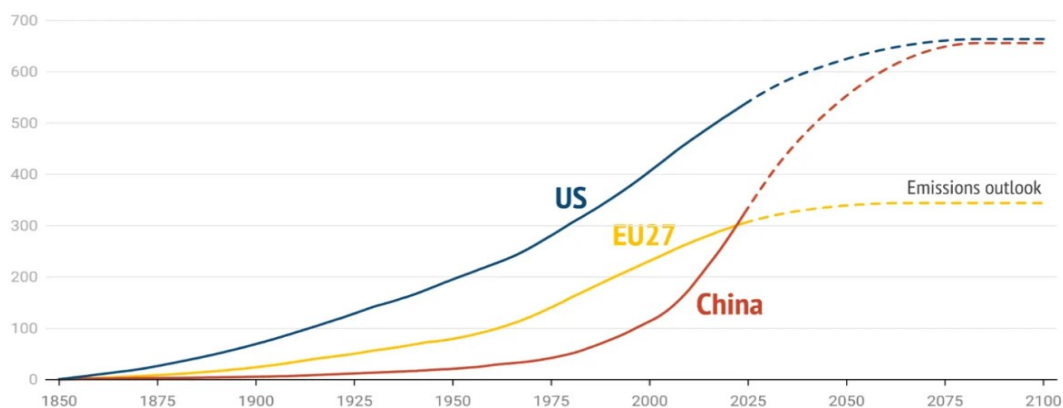


Figure 1: US, EU27 and Chinese cumulative historical CO₂ emissions [3]

This imbalance is not only reflected in historical data, but also directly affects current and future global climate governance mechanisms. Developing countries generally advocate the "principle of historical responsibility", believing that the countries that industrialized the earliest and emitted the most should bear the primary responsibility for emission reduction and climate financing. This controversy over the attribution of responsibility essentially reflects the inequality in the global economic structure: the contradiction between the advantages of early accumulation and the current development needs remains unresolved. Therefore, the distribution of carbon emissions shows that climate change is not only an environmental issue, but also a concentrated manifestation of global

economic inequality. Without consensus and an equitable framework, global cooperation will face great challenges.

2.2. Impacts of climate change on different economies

The impacts of climate change are global but not equally distributed. With their structurally weak economies and poor infrastructure, developing countries tend to suffer more from the consequences of extreme weather events. According to the United Nations Intergovernmental Panel on Climate Change (IPCC), disruptions to agriculture, fisheries and water resource systems due to global warming exacerbate food security and livelihood crises, particularly in regions such as Africa, South Asia, and the Pacific Island countries [4]. In Africa, droughts and high temperatures have led to frequent reductions in agricultural yields and a sharp drop in farmers' incomes, exacerbating poverty. In contrast, developed countries have stronger disaster early warning systems, disaster-resistant infrastructure and insurance mechanisms that can effectively reduce economic losses caused by extreme weather. For example, Hurricane Harvey in 2017 caused up to 125 billion U.S. dollars in damage in the United States, but relying on a high level of insurance system, most of the affected residents were compensated.

3. Global challenges for carbon emission policies

3.1. The Paris Agreement and its development

The Paris Agreement was adopted at the United Nations Climate Change Conference (COP21) in 2015, marking a new phase of international climate governance centered on Nationally Determined Contributions (NDCs). The goal of the agreement is to limit global average temperature rise to 2°C by the end of the century, and to work towards limiting it to 1.5°C. The agreement also aims to limit the global average temperature rise to 1.5°C by the end of the century. Unlike the previous "top-down" mandatory emission reduction mechanism, the Paris Agreement emphasizes "bottom-up" nationally owned commitments, with countries setting specific emission reduction targets based on their own level of development and capacity [5].

By 2024, more than 190 countries have submitted their NDCs, but the strength of these commitments falls far short of what is needed to achieve the temperature control goal. According to the Emissions Gap Report 2023 released by the United Nations Environment Program, the current global path of NDCs will lead to a warming of 2.5 to 2.9°C by the end of this century, a serious deviation from the target set by the agreement. In addition, some developing countries have indicated that the implementation of NDCs is dependent on international financial and technical assistance, while the low rate of the fulfilment of commitments by developed countries has resulted in limited implementation capacity [5]. Although the Paris Agreement establishes a new paradigm for global climate cooperation, it still faces challenges regarding fairness and implementation capacity. Its non-compulsory binding mechanism has led to a lack of punitive measures for emission reduction, especially under the influence of the global energy crisis and geopolitical factors, which have led to a trend of "weakening" or even "retrogression" of climate goals in some countries. Therefore, the sustainable development path of the Paris Agreement still requires countries to continue to deepen their trust, financing and cooperation mechanisms.

3.2. Policy differences between developed and developing countries

In formulating and implementing global carbon policies, there are profound differences between the positions of developed and developing countries, centering on the "allocation of responsibilities" and the "right to development". According to the principle of "common but differentiated responsibilities"

established by the United Nations Framework Convention on Climate Change (UNFCCC), developed countries are given more responsibility for emission reduction due to their higher historical emissions, while developing countries emphasize the need to assume reasonable responsibilities under the premise of safeguarding basic development needs [6].

Developed countries have generally called on developing countries to accelerate the pace of emissions reductions, arguing that the current rate of growth of their emissions puts pressure on global climate goals. However, developing countries such as China, India and Brazil point out that their current per capita emissions are still lower than those of developed countries, and their infrastructure is not yet complete so that premature emission reductions will limit their economic growth and social stability. For example, China has set a two-phase route of "peaking and then neutralization" under its "dual-carbon" goal, while the United States has proposed a more aggressive goal of achieving carbon neutrality in its power system by 2035. The issue of financial and technical support is also a focal point of the conflict. In the Paris Agreement, developed countries promised to provide \$100 billion per year to developing countries for climate financing, but according to OECD data, by 2022, the actual funds in place will only be about \$83.7 billion, far from meeting expectations. In addition, developing countries have long called for establishing a "loss and damage" fund to deal with disasters caused by extreme weather, but progress has been slow [5].

3.3. Limitations of carbon trading mechanisms and carbon tax systems

Carbon trading and carbon tax are the mainstream market-based emission reduction policy tools aiming to regulate the carbon emission behavior of enterprises and consumers through the price mechanism. The carbon trading mechanism (Emissions Trading System, ETS) sets a cap on total emissions and allocates emission allowances through the government, so that enterprises can buy and sell allowances among themselves; whereas the carbon tax levies a fee on emissions directly to increase the economic cost of high-carbon behaviors [7]. As an example, the EU ETS has covered several industries since its launch in 2005, and the carbon price once exceeded 90 euros per ton, effectively promoting the green transformation of some industries. However, the mechanism has problems such as large price fluctuations and too many free allowances, which have led to "carbon leakage" by some enterprises, i.e. transferring high-emission industries to countries with lax regulations. Developing countries are often unable to benefit equitably from the carbon market due to the inadequacy of the mechanism and the low level of participation.

Carbon tax as another tool, in Sweden, Finland and other countries to achieve certain results. For example, since Sweden levied a carbon tax in 1991, economic growth has been accompanied by a decline in greenhouse gas emissions. However, the spread of carbon taxes in developing countries has been limited by insufficient tax administration capacity, low social acceptance, and excessive cost burdens on small and medium-sized enterprises and low-income groups.

4. Case studies

4.1. Case of developed economies – United States

As the world's second-largest carbon emitter, the United States has gradually institutionalized its climate governance. Although a unified Climate Change Act has not yet been passed at the federal level, the Biden administration rejoined the Paris Agreement in 2021 and set a goal of achieving net-zero emissions by 2050. To promote the realization of this goal, the United States introduced the Inflation Reduction Act (IRA), a bill that seeks to accelerate the green transition through strong support for clean energy investment, covering a variety of areas such as electric vehicle subsidies, renewable energy development, and green infrastructure construction.

In terms of institutional design, the U.S. relies on federal agencies such as the Environmental Protection Agency (EPA) to set and enforce emissions standards. It encourages states to develop and implement carbon markets and climate action plans based on differences in their economies, resources, and energy structures [8]. For example, California has implemented stringent emissions standards and pioneered establishing a carbon trading market. At the same time, the Regional Greenhouse Gas Initiative (RGGI) in the Northeast has worked through regional cooperation to reduce GHG emissions. These state-level measures have provided a degree of flexibility and diversity in carbon reduction in the United States. Nonetheless, the U.S. green transition faces several challenges. First, the impact of energy restructuring on coal workers and low-income households is a significant challenge in climate policymaking. For example, the decline of the coal industry has led to many unemployed low-income families, while these households often struggle to access adequate support and opportunities in the clean energy transition. In addition, changes in energy costs may disproportionately negatively impact low-income households, further exacerbating social inequality.

4.2. The case of emerging economies -- China's 'dual carbon' target

Guided by its dual-carbon policy, which aims to achieve carbon peaking by 2030 and carbon neutrality by 2060, China has strengthened its nationally determined contributions (NDCs). As part of this enhanced commitment, the country has set ambitious targets, including reducing carbon intensity by 65% from 2005 levels by 2030 and increasing forest stock volume by 6 billion cubic meters compared to 2005 levels [9]. These goals are central to China's strategy for transitioning to a low-carbon economy and contribute to its broader climate change mitigation efforts. According to the Ministry of Ecology and Environment, China's carbon dioxide emissions per unit of GDP will be more than 48% lower in 2023 than in 2005, reflecting a continuous improvement in energy efficiency. China's "dual-carbon" pathway emphasizes systematic policy coordination, covering energy, industry, transportation, urban planning and other areas. Specific measures include optimizing the energy mix (increasing the share of wind, light, and water), accelerating the elimination of outdated production capacity, and building a national carbon market (ETS). China officially launched its national carbon market in July 2021, initially covering the power generation sector with around 2,200 participating companies. This development made it the largest carbon market in the world in terms of emissions covered. Despite this significant progress, China still faces several challenges. These include the continued high share of coal in its energy mix, which remained over 56 percent in 2023, the uneven implementation of emission reduction targets by local governments, and the difficulty of cutting emissions in hard-to-abate sectors. Nevertheless, China actively promotes South-South cooperation by sharing its dual-carbon development experience with other developing countries through technical assistance and investment in green infrastructure.

4.3. Comparative analysis

The U.S. and China's carbon policies reflect different countries' stages of development, institutional structures and priorities in climate governance. Relying on early industrialization and a strong technological base, developed countries are more likely to adopt the "rule of law-led + market-led" model, setting long-term climate goals by legislative means and supplementing them with mechanisms such as the carbon market, green taxes, and technology subsidies, with an emphasis on high standards, systematicity, and social participation. In contrast, as an emerging economy, China's "dual-carbon" strategy is more focused on "orderly transition" and "feasibility-oriented". The policy design presents a typical structure of "national leadership + local pilots", emphasizing local adaptation and phased promotion, which steadily reduces emissions and protects energy security and economic development. Although the construction of China's national carbon market started late, it is rapidly

catching up with international standards thanks to policy promotion and technological progress. In terms of public participation, Western countries have developed strong environmental protection cultures and NGO monitoring mechanisms, while China's climate policy is more administratively guided, and the mechanism for private participation needs to be improved. All countries face the challenge of balancing fairness and implementation, but each has its own innovative path. This diversity of experiences provides a reference for global climate cooperation and helps explore models of mitigation governance that are more in line with different stages of development.

5. Conclusion

This article examined the complex relationship between climate change and global economic inequality, highlighting how carbon emission reduction policies reflect and exacerbate disparities between developed and developing countries. Through an analysis of historical and current carbon emission trends, the study found that developed countries, especially the United States, have contributed disproportionately to global carbon emissions, yet have the capacity to implement more aggressive climate policies. Conversely, developing countries, while contributing less historically to emissions, face significant challenges in balancing industrialization with climate responsibility. The case studies of the U.S. and China further illustrated the diverse approaches these countries have taken to reduce emissions, shaped by their economic capacities, technological infrastructure, and domestic needs.

This study, while examining the economic inequalities within global climate governance through the analysis of carbon emission reduction policies in China and the United States, has several limitations. Firstly, the scope is geographically limited to these two countries, overlooking the experiences of other key nations, especially developing ones, whose policies might provide further insights into the complexities and inequalities of climate governance. Future research should broaden the scope to include more countries, particularly developing ones, to explore the diverse approaches to climate governance.

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