

Article

The Impact of China's Carbon Neutrality on Natural Disaster Risk Management: Perspectives on Sustainable Development

Xiang Yan Jin

Crisisonomy, Chungbuk National University, Chungbuk 28644, Korea
National Crisisonomy Institute, Chungbuk National University, Chungbuk 28644, Korea;
xiangyan0723@163.com

Abstract: The purpose of this study is to explore the impact of China's carbon neutrality on natural disaster risk management and assess it from a sustainable development perspective. The specific objectives include studying the influence of China's carbon neutrality policies on climate change and how they can mitigate natural disaster risks. The study aims to evaluate the effectiveness of China's carbon neutrality policies in enhancing the capacity for natural disaster risk management, including disaster reduction and recovery capabilities. It will analyze the advantages and challenges of China's carbon neutrality policies from a sustainable development perspective, as well as their impact on social, economic, and environmental sustainability.

Keywords: carbon neutrality; natural disaster; sustainable development

1. Introduction

Carbon neutrality refers to a state where the amount of carbon dioxide emissions released into the atmosphere is equal to the amount of greenhouse gases absorbed and removed. It signifies a condition where the concentration of greenhouse gases in the atmosphere no longer increases. Net-zero, which means the limitation of emissions to the extent that they are balanced by removals, is synonymous with achieving carbon neutrality. In order to achieve carbon neutrality, it is necessary to absorb an equivalent amount of greenhouse gases to offset the emissions resulting from human activities.

Natural disasters cause immense damage and losses to human society and the environment. Climate change exacerbates the frequency and intensity of natural disasters, posing a severe threat to sustainable development. As one of the most populous countries in the world and an area prone to frequent natural disasters, China faces significant challenges in natural disaster risk management. However, China is also striving to achieve its carbon neutrality goals and has implemented a series of policy measures to reduce greenhouse gas emissions and promote sustainable development. Therefore, studying the impact of China's carbon neutrality on natural disaster risk management from a sustainable development perspective is of great theoretical and practical significance.

By achieving the aforementioned research objectives, this study aims to provide a comprehensive understanding of the impact of China's carbon neutrality on natural disaster risk management. It intends to offer valuable insights to policymakers, decision-makers, and researchers in China, as well as other countries and regions. The study aims to provide scientific evidence and decision support for the integration of sustainable development and disaster risk management.

2. Current Status and Characteristics of China's Carbon-Neutral Policy

The green transition of the industrial economy, circular economy, and sustainable development have emerged as key concepts in China's efforts to address the climate crisis and transform its socio-economic structure. China has been laying the foundation for related legislation and policies for a long time. In 2007, the 17th National Congress of the Communist Party of China mentioned the construction of an ecological civilization for the first time at the party level. In 2021, the 18th CPC National Congress further incorporated the concept of ecological civilization into the party's constitution, explicitly specifying relevant content in central-level policy documents.

The concept of carbon neutrality, which refers to achieving a net-zero carbon emission level, gained significant attention following President Xi Jinping's announcement during the United Nations General Assembly on September 22, 2020. President Xi declared that China aims to peak its carbon emissions before 2030 and achieve carbon neutrality before 2060. Since then, there has been an increased emphasis on carbon neutrality in key policy documents. The 14th Five-Year Plan (中华人民共和国国民经济和社会发展第十四个五年规划和 2035 年远景目标纲要), released in March 2021, and the Government Work Report (政府工作报告) presented at the National People's Congress in 2021 incorporated more substantial content related to carbon neutrality.

3. Chinese Government's Strategy for Industrial Carbon Neutrality

This study has several limitations. First, of the many variables in public crisis management, this study focused only on the risk perception of the public in regard to anxiety and efficacy. There is a need to explore other variables (e.g., social capital, culture, beliefs, values, etc.) that influence public crisis management in the future. Second, the participants in this study were limited to Koreans during the COVID-19 pandemic. Since research on overcoming a pandemic has a worldwide impact, there is a need to examine various countries, types of damage, victims, and private organizations, and to compare the results in the future.

Third, this study was not able to include data of individuals who were infected or cured of COVID-19 in its analysis. Research on individuals infected with or undergoing treatment for infectious diseases has hitherto focused mainly on analyzing medical connections [124–127]. Thus, additional research on public awareness of the danger of anxiety due to concerns over employment, family health (spreading the infectious disease), and financial difficulties of individuals infected with or undergoing treatment for infectious diseases is warranted.

3.1. Key objectives

By 2025, a preliminary formation of an economic system characterized by green, low-carbon, and circular development will be achieved in China. The energy efficiency of key industries will be significantly improved. Energy consumption per unit of GDP will decrease by 14% compared to the year 2020, and the reduction rate of CO₂ emissions per unit of GDP will meet the national targets. The proportion of non-fossil energy consumption will reach 25%. Forest coverage will reach 57%, with a forest stock volume of 280 million cubic meters. These efforts will lay a solid foundation for achieving the goals of peaking carbon emissions and achieving carbon neutrality.

By 2030, significant progress will be made in achieving a comprehensive green transformation of China's economic and social development. Energy efficiency in key energy-consuming industries will reach international advanced levels. Energy consumption per unit of GDP and CO₂ emissions will continue to decline. The proportion of non-fossil energy consumption will reach 28%. Forest coverage will be maintained steadily, and the forest stock volume will reach 310 million cubic meters. Carbon dioxide emissions will peak and start to decline, indicating effective measures in addressing climate change and achieving carbon neutrality.

By 2060, a comprehensive green, low-carbon, and circular economic system will be established, along with a clean, low-carbon, safe, and efficient energy system in China. Energy efficiency will reach international advanced levels, and the proportion of non-fossil energy consumption will exceed 80%. The carbon neutrality goal will be successfully achieved, and significant achievements will be made in ecological civilization construction. This will mark a new era of harmonious coexistence between humans and nature, where fruitful results are attained in promoting sustainable development.

3.2. Accelerate the All-round Green Transformation of Economic and Social Development

(1) Strengthen the guidance of green and low-carbon development planning.(2) Establish a regional layout for green and low-carbon development.(3) Coordinate efforts to reduce carbon emissions, pollution, promote green growth.(4) Accelerate the adoption of green production and lifestyles.(5) Promote the green and low-carbon transformation of industries.(6) Facilitate the green and low-carbon upgrading of the service sector.(7) Deepen the green and low-carbon development of agriculture.(8) Cultivate and expand emerging industries related to green and low-carbon sectors.(9) Continuously improve energy efficiency.(10) Control the consumption of fossil energy in an orderly manner.(11) Actively develop non-fossil energy sources.(12) Ensure energy supply security.(13) Deepen reforms in the energy system and mechanisms.(14) Construct green and low-carbon transportation infrastructure.(15) Optimize transportation structures and enhance organizational efficiency.(16) Promote the application of low-carbon transportation tools and equipment.(17) Facilitate low-carbon transformation in urban and rural construction and management models.(18) Enhance building energy efficiency comprehensively.(19) Promote the use of renewable energy in buildings.(20) Strengthen the capacity for green and low-carbon innovation.(21) Accelerate the research, development, and promotion of green and low-carbon technologies.(22) Collaboratively promote green and low-carbon transformation in the Chengdu-Chongqing region.(23) Jointly advance the green development of the Yangtze River Economic Belt.(24) Incorporate green development into the Belt and Road Initiative.(25) Consolidate the carbon sequestration capacity of ecosystems.(26) Enhance the increment of carbon sequestration in ecosystems.(27) Improve local regulations and standards.(28) Establish a statistical monitoring system.(29) Enhance investment and financial policies.(30) Improve fiscal and pricing policies.(31) Promote the construction of market-oriented mechanisms.(32) Strengthen organizational leadership.(33) Implement rigorous supervision and assessment.

3.3. Importance of natural disaster risk management

Over the past 30 years, the Chinese economy has grown at an average annual rate of around 10%, creating a "miracle" of global economic development. China has experienced multiple transitions, from an agricultural society to an industrial society, from a planned economy to a market economy, from a closed and inward-looking economic system to an open and globally integrated economic system, and from a social management system based on ethnocentric rule (人治) to a more diverse society. In recent years, natural disasters have been occurring with increasing frequency worldwide, and the severity of their destruction is escalating. The accelerated process of social transformation in China has also coincided with a rise in natural calamities, indicating the interplay between these two phenomena. As society rapidly develops, the forms, frequency, and magnitude of disasters continue to change and increase. The effective utilization of China's public emergency system and the ability to address these challenges legally have become new issues for contemporary constitutional societies.

Disasters, also known as calamities, can escalate and lead to catastrophic events. They encompass various elements that have a destructive impact on the environment, such as locusts. The proliferation of locusts, for example, can result in significant damage to crops,

leading to famine and further exacerbating the disaster. The spread and outbreaks of contagious diseases and computer viruses can also result in calamitous situations. Disasters can be classified as either anthropogenic or natural disasters, depending on their causes. They can further be categorized into geological disasters, meteorological disasters, environmental disasters, biochemical disasters, marine disasters, and others, based on the cause, affected areas, and mechanisms of occurrence.

Disasters can be described as sudden events caused by natural or anthropogenic factors that significantly impact the living environment and result in substantial harm to human life and property. In essence, disasters are uncontrollable occurrences originating from the natural environment, which can jeopardize human survival and cause damage to the ecological environment in which humanity exists.

Effective management of natural disaster risks is crucial for protecting human lives, maintaining social stability, promoting economic development, and achieving sustainable development. It involves multiple dimensions, including government responsibility, societal participation, scientific and technological support, and international cooperation. By implementing comprehensive risk management measures, it is possible to reduce the damages caused by natural disasters, enhance societal resilience, and attain the goals of sustainable development.

3.4. Relationship between sustainable development and natural disaster risk management

There is a close relationship between sustainable development and natural disaster risk management. Here are some aspects of the relationship:

Emphasizing holism: Sustainable development seeks the overall balance between the economy, society, and the environment, and natural disaster risk management also needs to consider these aspects comprehensively. In disaster risk management, it is essential not only to reduce the impacts on people but also to maintain social equity, economic stability, and the health of ecosystems. Sustainable development provides a framework that enables the comprehensive consideration of these factors in disaster risk management.

Long-term sustainability: Sustainable development emphasizes long-term growth and considers the needs of future generations. Similarly, natural disaster risk management needs to have long-term sustainability by not only addressing current disasters but also preventing potential future disasters. The application of sustainable development principles can ensure that environmental protection, social equity, and economic stability are taken into account during the post-disaster recovery and reconstruction process, aiming to achieve long-term sustainable development.

Climate change adaptation: Climate change has led to increased frequency and intensity of natural disasters, and therefore, disaster risk management needs to be integrated with climate change adaptation strategies. One of the goals of sustainable development is to address climate change by reducing greenhouse gas emissions and enhancing adaptive capacity to mitigate natural disaster risks. The implementation of sustainable development strategies can assist communities and nations in adapting to the impacts of climate change, thereby reducing the occurrence and impacts of disasters.

Community participation and social resilience: Sustainable development emphasizes the importance of community participation and enhancing social resilience. In the context of disaster risk management, community participation is crucial because local residents have a better understanding of local risks and vulnerabilities. Through community participation, community resilience and adaptive capacity can be strengthened, enhancing society's ability to cope with the impacts of natural disasters.

Economic stability and sustainable development: Natural disasters cause severe damage to the economy, resulting in property losses, production interruptions, and economic instability. Through effective disaster risk management measures, economic losses caused by disasters can be reduced, maintaining economic stability and promoting sustainable development. At the same time, sustainable development can enhance economic resilience, enabling it to better respond to and recover from the impacts of disasters.

Environmental protection and ecological restoration: Natural disasters not only impact human society but also cause damage to the environment and ecosystems. Through disaster risk management, the impacts of disasters on the environment can be reduced, and measures can be taken for ecological restoration. Sustainable development emphasizes environmental protection and sustainable use of ecosystems. By incorporating these principles into disaster risk management, it can promote environmental protection and sustainability.

Social equity and protection of vulnerable groups: Natural disasters have a greater impact on vulnerable groups and fragile communities, exacerbating social inequality. Sustainable development emphasizes social equity and inclusiveness. Through disaster risk management, the protection and care of these vulnerable groups can be ensured. This includes providing appropriate warning systems, evacuation plans, and emergency response measures to ensure the safety and well-being of vulnerable populations.

Education and awareness-raising: Sustainable development emphasizes the importance of education and raising awareness to enhance people's understanding of the environment and disasters. Through disaster risk management, education and training can be provided to increase public awareness of disaster risks and cultivate their safety awareness and coping abilities. This helps promote the dissemination of sustainable development concepts in society and encourages the adoption of sustainable behaviors.

3.5. Relationship between sustainable development and natural disaster risk management

Carbon neutralization refers to the reduction or offsetting of greenhouse gas emissions by reducing greenhouse gas emissions, increasing carbon absorption or storage. It is one of the most important tools to combat climate change and a key initiative to promote global green development.

Carbon neutralization and its impact on future development are mainly manifested in the following areas:

Firstly, carbon neutrality contributes to promoting sustainable development. Achieving carbon neutrality requires long-term, comprehensive, and scientifically planned implementation. This involves developing relevant policies in the areas of economy, society, environment, and more. These policies include the formulation of low-carbon economic development strategies, strengthening research and development as well as the promotion of energy-saving and emission reduction technologies, and encouraging low-carbon consumption. By doing so, it is possible to reduce excessive reliance on fossil fuels, gradually transition to renewable energy sources, mitigate environmental pollution, and ultimately achieve sustainable development.

Secondly, carbon neutrality contributes to driving economic transformation and upgrading. Achieving carbon neutrality requires the vigorous development of the clean energy industry, which will bring about new industry opportunities and employment positions. Additionally, the development of carbon trading markets will also generate new business prospects and benefit industries such as finance, real estate, and technology. This will promote economic structural adjustments and transformation, thereby driving China's economy towards high-quality development.

Thirdly, carbon neutrality contributes to advancing global climate governance. Carbon neutrality is an integral part of global climate governance and requires collaborative efforts and consensus among countries. As the world's largest emitter of greenhouse gases, China actively participates in global climate governance, working with other nations to develop emission reduction plans and enhance the global climate governance system. This will contribute to the establishment and improvement of global climate governance mechanisms, facilitating collective efforts of countries worldwide in addressing climate change.

Lastly, carbon neutrality contributes to the building of a community with a shared future for humankind. Achieving carbon neutrality requires international cooperation, which entails establishing mechanisms for mutual trust and collaboration. Under the goal of carbon neutrality, countries can jointly explore emission reduction technologies, engage

in technology exchanges, and share experiences. This fosters the development of a community with a shared future for humankind and advances the global process of sustainable development.

In summary, carbon neutrality has significant implications for future development. By achieving the goal of carbon neutrality, we can drive sustainable development, promote economic transformation and upgrading, advance global climate governance, and foster the building of a community with a shared future for humankind. Therefore, it is essential that we actively promote the cause of carbon neutrality and strive to build a greener, healthier, and more sustainable future.

China's carbon neutrality policy refers to a series of measures taken by the Chinese government to address climate change and promote sustainable development, with the aim of reducing carbon emissions and ultimately achieving carbon neutrality. Carbon neutrality means achieving a net-zero carbon emissions by reducing greenhouse gas emissions and increasing carbon sinks. The core objective of China's carbon neutrality policy is to reduce greenhouse gas emissions. As one of the world's largest emitters of greenhouse gases, China can significantly mitigate global climate change by implementing carbon neutrality policies. This helps to reduce global temperature rise, decrease the frequency and intensity of extreme weather events, and protect ecosystems and human societies from the adverse impacts of climate change. China's carbon neutrality policy encourages and promotes the development and application of clean energy. This entails increasing investments in renewable energy sources such as solar and wind power and reducing reliance on traditional fossil fuels. Through the transition to clean energy, China can reduce carbon emissions, improve energy efficiency, reduce environmental pollution, and promote the development of sustainable energy. The implementation of carbon neutrality policies drives the research, development, and innovation of green technologies. To achieve carbon neutrality goals, China needs to adopt cleaner and low-carbon technologies and processes. This stimulates the innovation and application of green technologies, including energy efficiency improvements, carbon capture and storage, renewable energy technologies, among others. This technological innovation not only promotes sustainable development but also facilitates economic transformation, upgrading, and the greening of industries. Carbon neutrality policies have a positive impact on the sustainable development of the economy. By promoting the development of clean energy and green technologies, carbon neutrality policies create opportunities for green job creation and the emergence of new industries. This promotes economic restructuring and transformation, driving the development of a low-carbon economy. Moreover, carbon neutrality policies encourage companies to adopt environmental protection measures and promote corporate social responsibility.

4. Impact of China's Carbon Neutral Policy

4.1. *Reducing the impact of carbon emissions on climate change*

On December 12, 2020, General Secretary Xi Jinping delivered an important speech titled "Taking Actions to Address Climate Change and Opening up a New Journey of Global Climate Governance" at the Climate Ambition Summit via video. He announced a series of new measures in China's nationally determined contributions. In his speech on carbon emissions, he stated, "We aim to have CO₂ emissions peak before 2030 and achieve carbon neutrality before 2060."

Carbon emissions is a general term or abbreviation referring to greenhouse gas emissions. The primary gas among greenhouse gases is carbon dioxide, hence the use of the term "carbon" to represent it. Although not entirely accurate, a simplified way to understand "carbon emissions" is as "carbon dioxide emissions." Any human activity has the potential to cause carbon emissions. In our surroundings, activities such as burning fossil fuels, vehicle exhaust, industrial production, and cooking with fire all contribute to carbon emissions in our daily lives. In 2019, the wildfires in Australia burned for four months,

emitting over 400 million tons of carbon dioxide, surpassing the total annual emissions of the lowest 126 emitting countries combined.

Mitigating global climate change: Greenhouse gas emissions are one of the main causes of global warming. By reducing carbon emissions, particularly the emissions of carbon dioxide (CO₂), we can decrease the concentration of greenhouse gases in the atmosphere and slow down the rate of global climate change. This helps to reduce the frequency and intensity of extreme weather events and protects ecosystems and human societies from the adverse impacts of climate change.

Alleviating sea-level rise: Global climate change leads to the melting of glaciers and permafrost, as well as the expansion of seawater, resulting in rising sea levels. Reducing carbon emissions can slow down climate change, thereby reducing the rate of glacier and permafrost melting and mitigating the extent of sea-level rise. This is crucial for coastal cities and island nations as it can help to reduce risks such as floods, storm surges, and coastal erosion.

Protecting biodiversity: Climate change has a negative impact on biodiversity, leading to species extinction, habitat destruction, and ecosystem collapse. Reducing carbon emissions can slow down climate change, reducing pressure on biodiversity and protecting the integrity of endangered species and ecosystems. This helps to maintain ecological balance, protect biodiversity, and preserve the normal functioning of various ecosystems on Earth.

Improving air quality: Carbon emissions are often associated with the release of other air pollutants. By reducing carbon emissions, not only can the concentration of greenhouse gases be reduced, but also the release of air pollutants can be decreased, leading to improved air quality. This is beneficial for human health, reducing the occurrence of respiratory diseases and other health issues, and enhancing overall quality of life.

4.2. Excessive emissions of hazards

Global warming: Due to the burning of fossil fuels such as oil and coal, or deforestation and the burning of forests, a significant amount of carbon dioxide is produced. Carbon dioxide gas has the property of absorbing and trapping heat. The consequence of its increasing presence in the atmosphere is the formation of an invisible glass-like barrier that prevents the heat from the sun's radiation on Earth from reflecting back into outer space. As a result, the Earth's surface becomes warmer, a phenomenon known as the greenhouse effect.

Sea-level rise: Over the past century, sea levels have been rising, and in recent decades, the rate of sea-level rise has accelerated. According to data released by the National Oceanic and Atmospheric Administration (NOAA) in the United States, the global average sea level in 2018 was 81 millimeters higher than the average in 1993, making it the highest annual average recorded by satellites. Rising sea levels pose a threat to the infrastructure necessary for coastal areas, including roads, bridges, subways, oil and gas wells, power plants, sewage treatment plants, and landfills. Additionally, higher baseline water levels can result in destructive storm surges, such as those caused by hurricanes or intense winter storms, pushing waves to unprecedented heights along coastal areas. Higher sea levels also mean an increased risk of frequent inundation for coastal areas, leading to destructive and costly impacts.

Threat to human habitation: Scientific research indicates that increasing carbon emissions contribute to global climate change. In recent years, there has been a growing severity of abnormal climate phenomena, including an increase in extreme and severe weather events such as typhoons, heatwaves, heavy rainfall, mudslides, and droughts. These natural disasters have resulted in the destruction of our habitats and living environments. The climate-related natural disasters not only cause significant economic losses but also pose a threat to human life and safety.

The problem of biodiversity loss is becoming increasingly severe: Today, the environment has suffered significant damage, and thousands of species are facing extinction.

If the climate conditions on which these organisms depend undergo changes, the rate of species extinction would be unimaginable.

Cities are not only places where people concentrate their production and daily lives, but also regions with high energy consumption and environmental pollution. They are major sources of carbon emissions. Currently, most cities in our country are in the process of industrialization, characterized by high energy consumption and limited environmental protection efforts. Therefore, it is necessary to establish a low-carbon economic development system in cities. On the one hand, it is important to promote low-carbon awareness in daily life and reduce carbon dioxide emissions. On the other hand, it is crucial to rely on technological progress to vigorously promote industrial energy conservation and emission reduction, and strengthen environmental governance. So, what are some behaviors in daily life that can reduce carbon emissions?

In terms of clothing, changing your wardrobe according to the seasons can help reduce the use of air conditioning. Opt for eco-friendly fabrics and minimize washing frequency. Choose handwashing when possible and reduce the overall consumption of clothing.

In terms of food, buying locally sourced and seasonal produce can help reduce carbon dioxide emissions by minimizing the food processing and transportation involved. Opt for cooking methods that use less oil, salt, and processing, promoting both personal health and the health of the planet.

In terms of housing, choosing a reasonable and appropriate living space instead of pursuing excessive size can help reduce water and electricity consumption, indirectly leading to a decrease in carbon dioxide emissions.

In terms of transportation, choosing an appropriate car model and utilizing public transportation more frequently can contribute to reducing carbon dioxide emissions. Cars are significant contributors to carbon dioxide emissions, so opting for fuel-efficient and environmentally friendly vehicles is highly recommended.

5. Natural Disaster Risk Management from the Perspective of Sustainable Development

5.1. Natural resources are mainly refers to human resources and energy to produce production and energy. Main classified soil, water, climate, biological and mineral resources.

Resource utilization and conservation are core principles of sustainable development aimed at achieving sustainable use of resources and protecting the natural environment. Resource utilization forms the foundation for human societal development and economic growth. However, excessive and unsustainable resource utilization can lead to resource depletion and environmental degradation. The principles of sustainable resource utilization involve ensuring long-term supply and renewable capacity while meeting current needs. This includes rational planning and management of natural resources, promoting circular economy and resource recycling, and reducing waste and overconsumption.

Ecosystems are the foundation of biodiversity and ecological processes on Earth and are vital for maintaining the health and well-being of human societies. One of the core goals of resource utilization and conservation is to protect and maintain the integrity and functionality of ecosystems. This includes safeguarding protected areas, wildlife habitats, and critical ecological regions, reducing damage to ecosystems, and preventing species extinction and ecosystem collapse.

Energy is a crucial support for human activities, but excessive energy consumption and pollution have negative impacts on the environment and human health. Another important aspect of resource utilization and conservation is energy conservation and pollution reduction. This includes promoting energy efficiency and clean energy technologies, reducing greenhouse gas and other pollutant emissions, improving air and water quality, and minimizing adverse impacts on the natural environment.

Resource utilization and conservation are not only the responsibility of governments and institutions but also require individual and societal participation. By raising public

awareness and consciousness about resource issues, promoting environmental education, and practicing sustainable lifestyles, broader goals of resource protection and sustainable development can be achieved. Additionally, collaboration and coordination among governments, businesses, and non-governmental organizations are crucial for effective and sustainable resource management.

The utilization and protection of resources is an important cornerstone of sustainable development, which involves many economic, environmental and social aspects and society. Through the rational use and protection of resources, we can achieve economic prosperity, environmental health and social well-being

Social resilience and adaptability are the ability of social systems to cope with shocks, changes and uncertainties.

Social resilience refers to the ability of a social system to quickly recover and adapt in the face of shocks or pressures, in order to maintain normal functioning and stability. A socially resilient system can effectively respond to and recover from conflicts, disasters, or emergencies while adapting to changing environments. Key characteristics of social resilience include robustness, flexibility, adaptability, and innovation.

Adaptability refers to the ability of a social system to adjust and change itself in response to changes and uncertainties, in order to meet new conditions and requirements. A socially adaptable system can identify and understand the needs of change and take appropriate measures to adapt to new environments and challenges. Key elements of adaptability include learning ability, responsiveness, resource management ability, and collaboration ability.

Social resilience and adaptive capacity are closely interconnected and mutually supportive. A society with strong social resilience is better able to adapt to and cope with change, while a society with strong adaptive capacity enhances social resilience. Together, they constitute the overall ability of a social system to remain resilient, stable, and sustainable in the face of external shocks and changes. The continuous improvement of social resilience and adaptive capacity is crucial for addressing complex social challenges and changing environments.

In the framework of sustainable development, social resilience and adaptive capacity are crucial because social systems need to address various challenges, including climate change, natural disasters, economic crises, and social transformations. By cultivating social resilience and adaptive capacity, social systems can better respond to these challenges and achieve the goals of sustainable development.

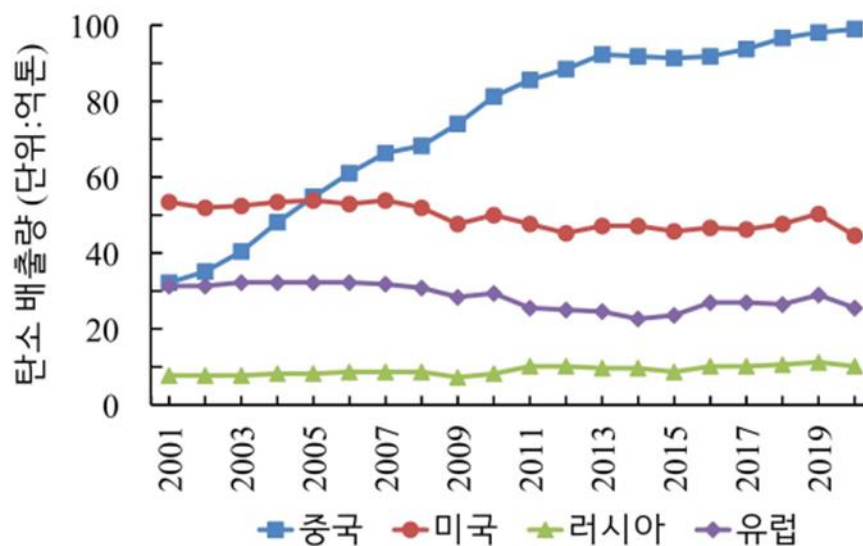
Social resilience and adaptive capacity refer to the ability of a social system to quickly adjust, adapt, and recover in the face of uncertainty, shocks, and changes. They require the social system to quickly identify shifts and challenges and take swift actions in response. This includes the capacity of governments, organizations, and individuals to adapt to new environmental demands and respond to emergencies. Rapid adaptability involves flexibility, innovation, and responsiveness to address emerging issues and changing needs. Social resilience demands the ability of the social system to quickly recover and rebuild in the face of shocks and crises. This includes establishing robust infrastructure, emergency response mechanisms, and social safety nets to swiftly restore normal functioning during natural disasters, economic recessions, or other crises. Enhancing social resilience and recovery capabilities can reduce the negative impacts of crises on the social system and promote sustainable development.

Social resilience and adaptive capacity require social systems to possess diversity and inclusiveness. Diversity means that different social groups and stakeholders have varying knowledge, skills, and experiences that can collectively address challenges. Inclusiveness means that the social system can incorporate the voices and interests of various participants to ensure fairness and sustainability in decision-making. Diversity and inclusiveness form the foundation for building resilience and adaptive capacity in the social system.

Social resilience and adaptive capacity necessitate long-term planning and awareness of sustainable development within the social system. This includes formulating and implementing sustainable development strategies, establishing adaptive management mechanisms, and improving resource efficiency to ensure that the social system can cope with long-term environmental, economic, and social changes. Long-term planning and sustainable development can enhance the social system's resilience to risks and its future sustainability.

Social resilience and adaptive capacity are of crucial significance in addressing changes and uncertainties. By establishing resilience and adaptive capacity, social systems can better respond to challenges and achieve the goals of sustainable development.

6. Effects of Carbon Neutralization on Natural Disaster Risk Management in China



https://www.climatewatchdata.org/ghg-emissions?breakBy=countries&end_year=2018®ions=CHN&source=CAIT&start_year=1990

China has been the world's largest emitter of carbon dioxide since 2005. In 2020, its carbon emissions reached 9.899 billion metric tons, significantly higher than any other country, approximately double that of the United States and 9.2 times that of Russia. The overall trend of China's carbon emissions has seen rapid growth before 2004, followed by a period of maintaining a growth rate of less than 6% since 2011. There was a decline from 2014 to 2015, and then a rise again since 2016.

The carbon neutrality policies of Europe, Japan, and South Korea hold implications for China as well. China is not only the world's largest developing country but also one of the major emitters of carbon dioxide. Countries such as the United Kingdom, the United States, and Japan have set targets for carbon neutrality, with expected time gaps from the carbon peak to achieving carbon neutrality of 59 years, 43 years, and 37 years, respectively.

Achieving carbon neutrality entails profound and systematic changes in China's extensive economic and social systems. China's carbon neutrality goal, aligned with the objectives of the Paris Climate Agreement and sustainable development worldwide, represents a significant and formidable challenge. In line with this, China has set forth a vision for carbon neutrality starting in 2020 and plans to achieve this goal 40 years later.

From a governmental perspective, achieving carbon peak and carbon neutrality requires long-term strategies. Firstly, policies should be classified and implemented based on the varying difficulty and cost of carbon emission reduction across different industries. The government needs to tailor strategic plans accordingly. Many advanced countries have developed long-term strategies and plans for climate change mitigation and energy transition. Some have even set specific targets for greenhouse gas reduction in different sectors in the medium to long term.

Secondly, international experience with carbon neutrality legislation suggests that the achievement of carbon neutrality can be pursued through the establishment of relevant climate laws and policies. In the process of carbon neutrality legislation, China should sufficiently consider the legal aspects of related policy measures to provide legal guarantees for carbon emission reduction. Simultaneously, efforts should be made to expedite the formulation of regulations, measures, and management methods related to policy development. Additionally, the revision of existing environmental protection laws, air pollution prevention laws, and energy conservation laws should include provisions related to carbon peak and carbon neutrality.

Thirdly, deeper international cooperation is necessary. Carbon neutrality benefits the entire world, and international experience has provided insights for policy formulation and implementation in China. Furthermore, China's development situation can offer valuable experiences to other developing countries. It is crucial to strengthen cooperation and exchanges with countries worldwide, learn from the desirable pathways and measures adopted by countries that have already achieved carbon peak, and foster collaboration on a global scale.

7. Conclusion

The implementation of China's carbon neutrality policy will significantly reduce greenhouse gas emissions, especially carbon dioxide emissions. This will help mitigate the pace of global climate change and reduce the frequency and intensity of extreme weather events. Reducing extreme weather events is crucial for natural disaster risk management, as these events are major drivers of many natural hazards.

The advancement of China's carbon neutrality policy will promote the development and application of clean energy, enhance energy efficiency, and improve environmental quality. This will contribute to enhancing societal resilience, reducing reliance on high-carbon energy sources, and strengthening the societal systems' ability to cope with natural disasters. The promotion of clean energy can also reduce the risk of energy supply disruptions, ensuring the resilience of societal systems in the aftermath of natural disasters.

The implementation of carbon neutrality policies will facilitate sustainable development and the growth of a green economy, providing more sustainable solutions for post-disaster recovery and reconstruction. By leveraging clean energy and sustainable technologies, it is possible to reduce environmental impacts during the rebuilding process, enhance disaster resilience, and foster rapid socioeconomic recovery.

The implementation of China's carbon neutrality policy will promote international cooperation and exchanges, driving global efforts to mitigate climate change. International cooperation is crucial for natural disaster risk management, as the impacts of natural disasters often transcend national borders. By sharing experiences and technologies with other countries, strengthening cooperation mechanisms, and facilitating information sharing, we can collectively address the challenges posed by climate change and natural disasters.

Overall, the implementation of China's carbon neutrality policy will have positive impacts on natural disaster risk management in terms of mitigating climate change, enhancing adaptive capacity, promoting post-disaster recovery, and fostering international cooperation. It will contribute to reducing the risk and impact of natural disasters, protecting lives and property, and advancing sustainable development.

References

1. Sui Kim. The concept and justification of carbon neutrality. *Journal of Biography*, 2021, 18-24.
2. Sohee Park. China's '1+ N' carbon neutrality strategy. *KIET Industrial Economics Monthly*, 2021, 278: 21-31.
3. A ki Yo. "A Study on Disaster Management and Countermeasures for Large-scale Earthquakes in China." Master's Thesis, Jeju National University Graduate School, 2022.
4. Meng Zhaohua "History of disasters and famines in China[M]". < China Social Publishing >.
5. https://www.climatewatchdata.org/ghg-emissions?breakBy=countries&end_year=2018®ions=CHN&source=CAIT&start_year=1990
6. Bayer Patrick, Aklin Michaël. The European Union Emissions Trading System Reduced CO2 Emissions Despite Low Prices. *Proceedings of the National Academy of Sciences of the United States of America*, 2020, 117(16).
7. Wiga Yi. "The Impact of China's Carbon Neutrality Policy on China's Industrial Development." Master's Thesis, Soongsil University Graduate School, 2022. Seoul
8. LYU Zhongmei. Wang Guofei. Construction of China's Carbon Emission Market: Judicial Issues and Countermeasures. *Gansu Social Sciences*, 2016(5):161-168.
9. Kim Sung jin, A Study of China's 2060 Carbon Neutrality Promotion Strategy. *Comprehensive Chinese Research*, 2021, 1-285.
10. Jeong Kiwoong; Imputation; Kang Taek-gu. U.S. Strategic Competition and Carbon Neutrality: Cooperation or Conflict?. *Chinese Studies*, 2022, 93: 295-319.
11. Sungkyu Lee, A comparative analysis of the carbon neutrality strategies of the world's major countries and China's low-carbon strategies. *Journal of Chinese Studies*, 2021, 1-243.
12. Yoo Jungho, The Impact of China's Carbon Neutrality Policy on China's Trade Dependence. *Journal of Trade and Commerce*, 2023, 23.2: 141-156.
13. JUNG, Jihyun, et al. Impact and Implications of China's Carbon Pricing Policy on Changes in China-Korea Economic Relations (Effects and Implications of China's Carbon Pricing Policy on Changes in Korea-China Economic Relations). *KIEP Research Paper, (PA)*, 2022, 22-25.
14. Ko Race Ko Tae Ho Kang Young-hoon. "Disaster Management System Priority Study Focusing on Jeju Special Self-Governing Province"< *Korean Journal of Crisis Management* >. 2011,7(4); 44-10.
15. Park Sohee." The focus of China's carbon neutral standardization development, system construction and international standardization," *KIET Monthly Industrial Economic Review* 296, (2023):74-74.
16. Xu Huaining,Dong Pirong. How Digital Transformation Promotes Sustainable Development of Enterprises— —Based on the Perspective of Shaping the Core Competitiveness of Enterprises[J/OL].*Contemporary Economic Management*:1-14[2023-06-25].<http://neimeng.zssgdsb-85176920tsgjnz.com:80/rwt/CNKI/http/NNYHGLUDN3WXTLUPMW4A/kcms/detail/13.1356.F.20230530.1006.002.html>
17. YE Maoxin,GONG Shun. The impact and mechanism of regional natural disasters on the income of different groups:Based on the data from 2006 to 2019 in CGSS and CSS[J].*Social Development Research*,2023,10(02):201-222+246.)
18. Zhang Ju,Wang Huimin. Research on countermeasures to improve the effect of public participation in natural disaster emergency relief[J].*Safety and Health*,2022(12):66-68.)
19. Weng Yijing,Yang Yue,Du Lei. Deconstruction of factors and system reconstruction of urban green transformation under the goal of carbon neutrality[J].*Ecological Economy*,2023,39(06):93-100.)
20. Wu Lei,Zhao Yuechen. Energy cooperation between China and Middle East countries under the goal of carbon neutrality[J].*Social Science Digest*,2023(03):64-66.)
21. Li Junjia,Zhang Yuan. Accelerated integration and mutual promotion of production safety and emergency management in the new era[J].*Science and Technology Today*,2022(09):63-65.)
22. Jia Guibo,Xia Jiangtao. Research on emergency management strategy of public emergencies[J].*Hubei Emergency Management*,2022(09):58-59.)
23. Chen Chen,Shen Chen,Zhang Xiaoyan. Thinking on strengthening community emergency management in public health emergencies[J].*Economic Research Guide*,2022(22):140-143.)
24. Wang Yunping, Wei Li." Under the requirements of carbon peaking and carbon neutrality, China's industrial low-carbon transformation faces four major obstacles[J].*China Economic and Trade Herald*,2023(03):46-48.)
25. Liu Qi,Fan Xinkun. Research on the development path of low-carbon transformation of logistics industry under the goal of carbon neutrality[J].*Journal of Business Economics*,2023(08):80-84.)
26. Zhao Hui. Accelerate low-carbon transformation and promote green development[N]. *Wuhai Daily*,2023-05-05(001). DOI:10.28819/n.cnki.nwhbr.2023.000511.

27. Yang Youqi." Progress of green and low-carbon transformation of energy and chemical enterprises under the situation of "dual carbon"[J].Modern Industry,2023,43(01):1-12.DOI:10.16606/j.cnki.issn0253-4320.2023.01.001.
28. Xinxiang Development and Reform Commission. Led by the goal of carbon peaking and carbon neutrality, the strategy of green and low-carbon transformation is fully implemented[N]. Xinxiang Daily,2022-08-03(001). DOI:10.28909/n.cnki.nxxbr.2022.001188.
29. Social Survey Research Group, Zhang Wenming. Taking the whole people's practice of green and low-carbon actions as the starting point to help achieve the goal of carbon peak and carbon neutrality — —2022 reform public opinion questionnaire survey report[J].China Economic and Trade Herald,2023(03):43-45.)
30. Hou Zhen. Comprehensively promote energy security and green and low-carbon development[N]. China Discipline Inspection and Supervision Daily,2023-03-08(004). DOI:10.28423/n.cnki.njjc.2023.000868.