

Tourism, Environment and the Climate — Based on the Application of Nordhaus's Model

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Abstract: The economy and the environment have been constantly discussed, and the economy will lead to the destruction of the environment. Economic development usually leads to several negative impacts on the environment, such as air pollution, water pollution, soil pollution, ecological damage, and climate change. For example, the exploitation of natural resources is caused by the production of resources, industrial emissions and so on. In turn, the environment can also promote economic progress. For example, a beautiful environment can develop tourism, rich minerals can increase the number of resources for better production, and coastal areas also have the advantage of developing fisheries. So, this paper will discuss the relationship between the economy and the environment. Based on the data of Tibet, the RICE model and its theory are used to analyze how the two influence each other. After that, this paper makes recommendations to the Tibetan government based on the research results, which have achieved sustainable development.

Keywords: RICE model, Tibet, economic, environment.

1. Introduction

Despite being the subject of extensive research only a century ago, greenhouse warming has become the primary global environmental concern in the past ten years. The Framework Convention on Climate Change, which was negotiated at the Rio Earth Summit in 1992, has been ratified by most countries. Countries committed to limiting their emissions of carbon dioxide (CO₂) and other greenhouse gases (GHGs) before they reach "dangerous" levels under the terms of the Convention [1]. The 28th Conference of the Parties to the United Nations Framework Convention on Climate Change, held in the United Arab Emirates on November 30, 2023, reaffirmed the necessity of the 1.5 °C temperature rise target of the Paris Agreement and clarified the global CO emissions by 2050. The goal of net zero emissions. Carbon neutrality is the complex result of the interaction between multiple systems such as land, atmosphere, ocean, and cryosphere. Therefore, the goal of carbon neutrality is a comprehensive issue involving climate, ecology, energy, environment, society, and other fields. The path and strategy of global carbon neutrality must be based on the scientific relationship between mitigating climate change and reducing human greenhouse gas emissions [2]. To ensure the timely achievement of carbon peak and carbon neutrality goals, there is an urgent need for comprehensive support from multiple disciplines such as natural sciences, humanities, and social sciences [3].

In this case, this paper uses the Rice model which belongs to environmental economics to research the whether effort of the government works or not. This paper focus my research on climate change

in China. Recently, China's total emissions rose by 2.95 million ton a day. The climate issue matters a lot. In 2022, China released 11.4 billion ton of carbon which is a terrible number and led to an increase of temperature of 0.62°C higher than the average and made it the second-highest year since 1961 [4-6]. More specially, I'm doing regional research on Tibet where the most valuable to investigate since Tibet has an obviously higher rising temperature rate than higher than the growth rate of national and global temperatures.

The rest of this paper is divided into three parts, including methodology, results, and policy recommendation.

2. Methodology

2.1. Introduction of Theory

The paper cites the Rice Model of Nordhaus to connect the economies and the causes of climate change, and then evaluate the consequences. The Regional Integrated Model of Climate and the Economy, or RICE model, is a dynamic, regional general-equilibrium model of the economy that combines the sources, emissions, and effects of climate change and greenhouse gas emissions with economic activity. The majority of current models of climate change consider the perspective of the global commoner when advising governments on how to create practical adaptation plans. The RICE model adopts a positive stance by posing the question of how countries might actually decide on climate change policy in light of trade-offs between the economy and national interests. Stated differently, global optimization models inquire as to how countries would select the Pareto-efficient or ideal course for GHG reduction. Not only can we determine the cooperative strategy, or efficient path, using the RICE model, but we can also compare it against noncooperative approaches [5].

Second, the fact that the model is globally aggregated provides a straightforward explanation for it. The RICE-2010 model is essentially the same, with the distinction that production and abatement have regional frameworks for 12 regions. The neoclassical economic growth theory is applied to the study of climate change economics using the RICE model. Economies invest in capital, education, and technologies to increase consumption in the future, thereby reducing consumption in the present. The RICE model builds on this concept by include the "natural capital" of the climatic systems as an additional category of capital assets. It sees emissions reductions as investments that increase the quantity of natural capital and GHG concentrations as negative natural capital. Through allocating production towards lowering emissions, economies curb consumption in the present while averting detrimental climate change, which in turn expands the opportunities for consumption in the future [6]. The model is also designed for policy optimization, although it can also be run as an evaluation model for given policies [7-9].

2.2. Equation

$$\phi^i(t) = \frac{1}{\frac{\sum_{i=1}^n \frac{1}{\phi^i(t)}}{\phi^i(t)}} \quad (1)$$

ϕ^i is the time dependent Negishi weights, and through allocating production towards lowering emissions, economies curb consumption in the present while averting detrimental climate change, which in turn expands the opportunities for consumption in the future.

3. Application

3.1. Analyses based on the theory

For Tibet, the Rice model can act on it. Tibet is suffering from economic environment problems. The city depends on tourism to develop its economy. According to the data, Tibet received 55.1697 million domestic and foreign tourists, and its tourism revenue reached 65.146 billion yuan, up 83.73% and 60.04% year on year respectively [8]. The natural scenery is most composed for tourism. For example, Mount Qomolangma, the main peak of the Himalayas, is the highest mountain in the world. It is located on the border between China and Nepal. Mount Qomolangma is to the north in Tibet, China, and to the south in Nepal. In addition to the magnificent snow mountains, Tibet also has many beautiful lakes, among which the three holy lakes of Namtso, Yamdrok, and Mansarovar are the most popular among tourists. However, based on the RICE model, the increase in tourism leads to higher emissions caused by transportation and heating than trigger economic loss. It occurs when pollution and emissions from tourism damage the environment then discourage other people visiting Tibet and hurt the economic.

3.2. Tourism and ecology

Since Tibet's doors opened to visitors in 1980, it has been a popular travel destination both domestically and internationally. In particular, Tibet has seen an increase in tourists as more convenient transportation options including as the air, rail, and highway have been available. Between 2006 and 2010, when the Qinghai-Tibet Railway was opened for business, 21.25 million Chinese and foreign travelers traveled to Tibet. Between 2011 and 2019, the number of visitors to Tibet more than tripled, and the sector accounted for more than 33% of the country's economic growth [9]. The mysterious color of Tibet gives tourists a "sacred" imagination of Tibet. For tourists, the natural scenery of Tibet has strong uniqueness and attraction. Among them, tourists' vision for the scenery of Tibet mainly focuses on the sky, peaks, rivers and lakes of Tibet, and the scenic spots often mentioned by tourists include Yamdrok Yongchao, Namco, Yangbajing, Mount Qomolangma, Mount Nankyabwa, and Brahmaputra River. A survey shows that 25.7 percent of travelers choose to enjoy the natural scenery and 20.7 percent choose to experience the unique cultural atmosphere in Tibet. That is to say, tourists who visit Tibet subconsciously pay most attention to a genuine natural and humanistic experience, and bring spiritual satisfaction through the whole trip. In particular, students with higher education and personnel in enterprises and public institutions have a strong desire for knowledge in daily life, hoping to constantly learn about things other than those common in life, so as to realize themselves.

So, traveling to Tibet just meets their needs. A large number of tourists have entered Tibet, causing great pressure on the natural environment. In addition, the local environmental protection awareness and policies and measures have not been fully realized. As a result, the ecological protection situation in Tibet in tourism development has been very severe, and the excessive development of some glaciers, lakes, wetlands, and other natural resources has led to environmental deterioration. In the past 100 years, the global average temperature has increased by 0.74 degrees Celsius, while the annual average temperature in China has increased by 1.1 degrees Celsius. The source region of the Yangtze River on the Tibetan Plateau has experienced an average temperature increase of 1.42 degrees Celsius in only half the time, in the last 50 years. The temperature rise on the Tibetan plateau will have a great negative impact on China. In recent years, China's southwest regions with the most water resources, such as Yunnan and Guizhou, have experienced a continuous decrease in rainfall and frequent droughts. This is closely related to the rising temperature on the Tibetan Plateau, which makes it difficult for humid weather to frequently invade the inland [10-11].

Therefore, the agriculture is affected. In 2022, the overall meteorological conditions in Tibet are high temperature, less precipitation and more sunshine, with a historical maximum of sunshine hours and less precipitation in summer. The average annual temperature in Tibet in 2022 is 5.6 ° C, 0.6 ° C higher than usual. The average annual precipitation is 406.1mm, 13.5% less than that of the normal year (469.5mm). The average annual sunshine hours are 2840.7 h, 161.4 h more than normal years. The average temperature in summer was 14.3°C, the highest in the same period since 1981. The precipitation in summer was 165.2 mm, the lowest in the same period since 1981. Autumn precipitation was 131.5mm, the most for the same period since 1981. All these lead to local drought and pests, affecting the normal growth of crops, and decreasing the yield [11]. In addition, tourism is also affected. The survey found that 76.8 percent of tourists said they wanted to travel to Tibet, but only 19.2 percent of the respondents had actually visited Tibet¹². That's because the high temperature increases the impact of altitude stress and causes other disease. There is a negative correlation between tourism risk and the number of tourists in Tibet. The emission also leads to natural disasters like debris flow.

4. Policy suggestion

First, the paper has some suggestions for government policy. First, the government need to strengthen ecological security barriers, give priority to conservation and nature restoration, strengthen supervision over ecological protection, strengthen biodiversity protection, improve the self-repair capacity and stability of ecosystems, guard the boundaries of natural ecological security, and improve ecosystem services. Second, the government will persist in enhancing the ecological environment's quality, uphold accurate, scientific, and legally-based pollution control, integrate the incremental victories of the fight against pollution, sustain intensity, extend depth and breadth, intensify the fight against pollution, make environmental control more focused and efficient, and successfully address ecological and environmental issues in the community. Third, the government will aggressively combat climate change, uphold the objective of a carbon peak and carbon neutrality, steadfastly carry out the national strategy of combating climate change, synchronize climate change response with ecological restoration and protection, lower the intensity of carbon emissions, and investigate the possibility of building demonstration zones that set the standard for attaining carbon neutrality In order to protect the environment and public health, the government should, fourth, enhance environmental risk prevention and control, firmly establish the bottom line thinking behind it, enhance the system of regular risk management, bolster oversight of hazardous waste, medical waste, and radiation environments, and enhance the environmental emergency response system. The fifth strategy is to encourage green and low-carbon development. This involves unwaveringly following a path that is green, low-carbon, and circular in nature; concentrating on optimizing distribution, making structural adjustments, and improving efficiency; accelerating the development of new green drivers; and working together to jointly improve the quality of ecological environment and economic development in order to elevate Tibet's green development to a new level.

5. Conclusion

The research investigates the problem of Tibet's economy, based on the environment and the application Rice model which is an environmental economic model, explains the extent of ecology and climate issues. Then, the paper provides some approaches to solve the problem to make the development of Tibet more sustainable. It can be speculated that the environment will in direct proportion to economic in the future.

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