

Research on the Influence of Energy Consumption Structure on the Development of "Double Carbon" in Tibet

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Abstract: Tibet is not only rich in mineral energy resources, but also rich in renewable energy such as solar, wind, and hydropower. Vigorously developing clean and renewable energy resources in Tibet can further reduce Tibet's dependence on traditional mineral energy resources and accelerate the transformation of Tibet's energy consumption structure. By analyzing the impact of the objective natural environment on the "dual carbon" development of the energy consumption structure in Tibet, we can further understand the internal motivation and external conditions for the low carbon development of the energy consumption structure in the Tibet Autonomous Region, and thus attempt to propose a development strategy for implementing the low carbon development of the energy consumption structure in the Tibet Autonomous Region, which plays a key role in the low carbon development of the energy consumption structure in the Tibet Autonomous Region.

Keywords: Tibet region, Energy consumption structure, Clean energy, Impact Study.

1. Introduction

The Tibet Autonomous Region is located in the southwestern frontier of China, with a vast territory, accounting for about one eighth of the total land area. The region is rich in mineral energy resources and clean renewable resources. In addition to the oil, natural gas, and coal resources that have been explored, the Tibet Autonomous Region also contains a large amount of energy resources such as solar, wind, hydro, geothermal, and biological energy[1]. Vigorously developing clean and renewable energy resources in the Tibet Autonomous Region can further reduce the region's dependence on traditional mineral energy resources and accelerate the transformation of the energy consumption structure in the Tibet Autonomous Region.

Currently, the constraints of external objective natural conditions are not only reflected in the abundance or scarcity of local mineral energy resources, but also in the local climate and environment, which will affect the energy consumption structure of the Tibet Autonomous Region. In northern and western Tibet, due to high altitude and cold winter temperatures, coal is burned to keep warm; Due to the relatively low altitude in southern and eastern Tibet, the demand for mineral energy resources in winter is relatively small compared to northern and western Tibet. Increasing the development of clean and renewable energy such as hydropower in southern, eastern, and southeastern Tibet is conducive to improving the development and utilization of mineral energy resources in the entire Tibet Autonomous Region, and promoting the low-carbon development of the energy consumption structure in the entire Tibet Autonomous Region[2].

2. The Impact of Objective and Subjective Conditions on The Development of "Dual Carbon"

2.1. Impact of objective conditions

In a type of region, the impact of natural conditions on the low-carbon energy consumption structure in the Tibet Autonomous Region is not obvious. The reason is that these areas are rich in mineral energy resources, with small mining difficulties and low costs, which are sufficient to meet the needs of the local and surrounding areas[3]. Therefore, there is no need to spend a lot of cost to develop other clean and renewable alternative energy sources, which is known as "relying on mountains to eat mountains, relying on water to drink water." Objectively, these places appear relatively passive in adopting low-carbon measures for energy conservation and emission reduction. Currently, the proven coal reserves in the Tibet Autonomous Region have reached over 8 million tons, ranking 26th in China in terms of total reserves, mainly concentrated in the northern Tibet region. According to the latest data, the proven oil reserves in the Tibet Autonomous Region have reached 100 million tons, and the prospective reserves have reached 150 million tons, mainly concentrated in the northern and western regions of Tibet. In these places, the mining of mineral energy resources can not only meet local needs, but also meet the radiation surrounding areas[4]. Due to the rich mineral energy resources stored in such areas, they will not actively change the local energy consumption structure without being affected by strong external forces.

In areas where the development of mineral energy resources cannot fully meet local demand, but where clean and renewable energy development is available, objective natural conditions have a small impact on the low-carbon energy consumption structure of the Tibet Autonomous Region. Due to the fact that the development of mineral energy resources in these regions cannot fully meet their own

needs, they have chosen to step up the development of clean and renewable energy while gradually reducing the development of existing mineral energy resources in the long-term interest. For example, in southwestern Tibet, although there is a considerable reserve of mineral energy resources, based on the overall energy consumption structure strategy of the country and the Tibet Autonomous Region, it is also actively engaged in the development of local clean and renewable energy.

2.2. Impact of subjective conditions

Through field research, this article found that the main aspects of daily energy use in rural Tibet are heating, cooking, and household appliances. The specific proportion of energy use is shown in Figure 1. From Figure 1, it can be seen that the proportion of heating energy used by farmers and herdsmen in Heishui County (48.7%) is higher than that in Naqu region (38.6%), Shigatse region (34.8%), and Linzhi region (38.1%) in Tibet. This is due to the fact that the vast majority of villages in Heishui County belong to high altitude areas in Sichuan, with a monsoon high prototype climate, overcast, humid, and cold weather, shorter sunshine duration, and longer winter heating requirements than in Tibet. Resulting in a higher proportion of overall heating energy consumption. In terms of the proportion of energy used in cooking, Heishui County has the lowest compared to Tibet. This is due to the higher proportion of electricity used in Heishui County, where farmers and herdsmen can use household appliances such as rice cookers and electric cookers to conduct cooking activities. In Tibet, cooking activities are mainly conducted through cow dung stoves, and the combustion calorific value efficiency of cow and sheep dung is low, resulting in low energy utilization rates and not clean and environmentally friendly. The proportion of energy used by household appliances is mainly related to factors such as the income level of local farmers and herdsmen, the amount of household appliances owned, and the stability of

the power grid.

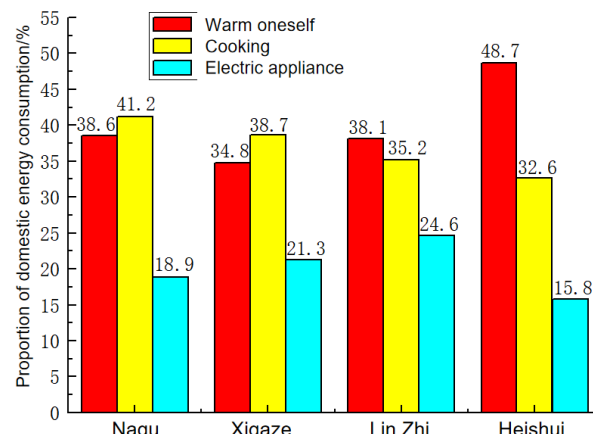


Figure 1. Comparison of living energy consumption ratios of farmers and herdsmen households inside and outside Tibet

In order to reflect the differences in living energy use among farmers and herdsmen with different income levels in the same region, this survey selected three farmers and herdsmen with different income levels in Jirong Village, Zhaxigang Township, Lazi County, Shigatse City for energy use data analysis. Through the analysis of the survey data, the differences in living energy use are shown in Table 1. Both low-income and wealthy households use biomass energy (cow dung and sheep dung) in their daily energy consumption, and account for a significant proportion of total energy consumption. The proportion of modern energy and renewable energy used is too small, especially for low-income households with a severe shortage of labor in their homes. The proportion of traditional biomass energy used for daily energy is more prominent, while the proportion of modern energy and renewable energy used is smaller.

Table 1. Difference in living energy consumption at different income levels in the same region

Householder	properties	Shard	Liquid gas	Solar cooker	Solar power supply	Sheep dung	Energy consumption ratio
Yang Zhen	Low-insurance households	7500kg/year	0.3 tans/month	1 set	1 set	/	Cooking>Heating
Wang-Dui Basang	Average household	7500kg/year	1 tank/month	1 set	1 set	300kg/year	Heating ≥ cooking
Da Pu	Affluent households	8000kg/year	1 tank/month	2 sets	2 sets	/	Heating>Cooking

3. Corresponding Measures for Low-carbon Development

3.1. Current situation and existing problems of clean energy development and utilization

After the 1980s, Tibet has made certain achievements in the application research and demonstration promotion of solar energy, wind energy, hydropower, geothermal energy, etc., but the overall level of development and utilization is relatively low. The development and construction scale of hydropower stations in the whole region is small, and hydropower resources are not effectively utilized; The development and utilization of clean energy such as solar and

wind energy is still in its infancy, with relatively weak technical strength, high utilization costs, and imperfect operational management mechanisms; Due to the lack of overall planning, the development and utilization of geothermal resources are also stagnant. In general, due to insufficient research and development capacity of clean energy, lagging scientific and technological team construction, high development and utilization costs, and imperfect industrial system, the level of clean energy development and utilization in Tibet is relatively low.

3.2. Corresponding measures

(a) Establish a cooperation mechanism for energy supply related to low-carbon development of the energy

consumption structure throughout the region. From the perspective of the reality of the development of the Tibet Autonomous Region, the low-carbon development of the energy consumption structure of the entire region has great potential. However, there is still a large gap between the economic development level of the entire autonomous region and the mainland provinces, and the development speed is relatively slow, resulting in insufficient demand for energy. With the establishment of a low-carbon organization for regional energy supply, regions with relatively backward economies in the autonomous region can effectively cooperate with economically developed regions in various aspects of energy, constructing energy supply and developing markets, coordinating relevant energy industries, and other fields based on the principles of voluntariness, reciprocity, and complementarity while utilizing their own new types of clean green energy^[5]. Finally, a new resultant force for regional energy development and a new pattern of interconnected and interactive energy development, utilization, and consumption in the Tibet Autonomous Region will be formed.

(b) Formulate a road map for the low-carbon development of energy supply in Tibet. The key to low-carbon energy supply and consumption structure in Tibet Autonomous Region is to draw a beautiful blueprint for low-carbon energy supply and consumption structure in the region, and the key is to provide development guidance using the corresponding road map. As a long-term strategic layout, the road map helps the Tibet Autonomous Region to scientifically and rationally optimize the allocation of energy resources throughout the region, thereby further combining the advantageous resources of relevant parties and forming a strong synergy. Formulating a low-carbon development roadmap for the energy supply and consumption structure is conducive to avoiding the gap between the formulation of goals and the implementation of measures, avoiding conflicts between short -, medium -, and long-term plans, avoiding the gap between energy development, utilization, consumption, and other related projects, and also avoiding unnecessary costs and expenditures between departments due to their own policies[6].

(c) Accelerate the research and development of new energy technologies in the Tibet Autonomous Region. Keep abreast of the latest and cutting-edge technologies in energy exploitation and utilization at home and abroad, and promote the leapfrog development of the development, utilization, and

consumption structure of energy resources in the autonomous region. In response to the special natural environment of the Tibet Autonomous Region, we should closely follow the latest and cutting-edge technological development of new clean and renewable energy sources such as solar, wind, hydro, geothermal, and bioenergy at home and abroad, and further expand the scale of energy development and the development of core technologies for new energy sources such as solar, wind, hydro, geothermal, and bioenergy. The specific situation of energy development and utilization among various regions within the Tibet Autonomous Region should be combined to focus on research on the transformation of efficient and energy-saving technologies and research and development achievements related to mineral energy such as coal and petroleum.

4. Supported Project Name

“Investigation and comparative analysis of the current situation of rural households' energy use inside and outside the district”

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