CHALLENGES OF ACHIEVING ENERGY EFFICIENCY IN THE TOURISM SECTOR IN KARAKALPAKSTAN

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Abstract: *This scientific article is devoted to the analysis of the problems arising in the process of achieving energy efficiency in the tourism sector in the Republic of Karakalpakstan. The main objective of the study is to assess the state of energy resource use in regional tourism facilities, identify existing barriers and develop practical proposals for increasing energy efficiency. The study used theoretical analysis, questionnaire, semi-structured interview and descriptive-statistical methods. The results obtained showed that the high energy consumption in tourism facilities is mainly associated with outdated infrastructure, poor thermal insulation, lack of energy management systems, and financial and technological constraints. It was also found that, despite the high potential for the use of renewable energy sources, they are not sufficiently implemented in practice. The results of the study are of great importance in developing scientific and practical recommendations aimed at improving sustainable tourism development strategies and increasing energy efficiency in Karakalpakstan.*

Keywords*: tourism, energy efficiency, Karakalpakstan, sustainable development, renewable energy.*

INTRODUCTION

In recent years, the tourism sector has been considered one of the most important factors of economic growth, employment generation and regional development on a global scale. At the same time, the expansion of tourism infrastructure has led to an increase in demand for energy resources, making the issue of energy efficiency an urgent problem. Rational use of energy is an important condition for sustainable development, especially in tourist regions located in ecologically sensitive areas. The Republic of Karakalpakstan is located in the Aral Sea region of Uzbekistan and is characterized by a complex ecological situation, a sharply continental climate and limited resources. In recent years, special attention has been paid to the development of ecological, cultural and ethnotourism in this region. However, low energy efficiency in tourism facilities, outdated infrastructure and insufficient introduction of modern energy-saving technologies hinder the sustainable development of the sector. Energy efficiency allows tourism enterprises to reduce operating costs, improve the quality of services and reduce the negative impact on the environment. Nevertheless, there are problems such as underdevelopment of energy

management systems in hotels, resorts and tourist facilities located in Karakalpakstan, financial and technological constraints, as well as a lack of specialist qualifications. The relevance of this study is explained by the need to identify the main problems that hinder the achievement of energy efficiency in the tourism sector in the conditions of Karakalpakstan and to scientifically analyze their causes. The results of the study are of practical importance in improving regional tourism development strategies, introducing energy-saving technologies and forming a sustainable tourism model. The purpose of this article is to identify the main problems in achieving energy efficiency in the tourism sector in Karakalpakstan and develop scientifically based conclusions on their elimination.

LITERATURE

In recent years, the issue of energy efficiency in the tourism sector has been widely studied internationally and nationally. Studies show that tourism facilities, especially hotels, have a high share in total energy consumption, with the main costs being heating, cooling, lighting and hot water supply. World experience has shown that by improving energy efficiency, the operating costs of tourism enterprises can be reduced by 20–40 percent. International literature considers energy efficiency to be an important component of sustainable tourism. Researchers point to the use of renewable energy sources, the introduction of energy management systems and environmental certification mechanisms as effective tools. At the same time, it is noted that the lack of financial resources and institutional problems in developing regions hinder the widespread introduction of energy-saving technologies. In scientific sources for Uzbekistan and the Central Asian region, energy efficiency is mainly studied in the industrial and housing sectors, and studies dedicated to the tourism sector are relatively rare. Some local studies have examined the possibilities of energy-efficient lighting systems, thermal insulation and solar energy use in hotel facilities. However, in ecologically complex regions such as the Republic of Karakalpakstan, energy efficiency issues in the tourism sector have not been systematically analyzed. The literature on the Aral Sea region mainly covers environmental problems, climate change and the impact on public health. In the context of sustainable tourism development, the issue of energy efficiency has been considered secondary. Therefore, this study serves to fill the existing scientific gap.

METHODS

This study used a mixed methods approach to identify the problems of achieving energy efficiency in the tourism sector in Karakalpakstan. The study was carried out in several stages. At the first stage, international and local scientific literature, regulatory legal documents, and state programs were studied based on the theoretical analysis method. This analysis made it possible to identify the concept of energy efficiency, key indicators, and best practices used in the tourism sector. At the second stage, empirical research methods were used. A survey was conducted among hotels, guest

houses, and tourist facilities located in Karakalpakstan. The survey was aimed at identifying types of energy consumption, existing technologies, energy costs, and attitudes towards energy conservation. In addition, the opinions of managers and technical staff were studied through semi-structured interviews at some facilities. At the third stage, the data obtained using comparative and analytical methods were processed and the main problems were grouped. Statistical data were summarized through descriptive analysis. The research methodology was developed taking into account the climatic, ecological and economic characteristics of Karakalpakstan. This approach allowed us to identify factors that hinder the improvement of energy efficiency in regional tourism facilities and draw scientifically based conclusions.

RESULTS

The research analyzed the activities of various tourist facilities (hotels, guest houses and resorts) located in the Republic of Karakalpakstan. The results showed that the level of energy efficiency in the tourism sector in the region is low. According to the survey results, the main part of energy consumption in most tourist facilities falls on heating and cooling systems. Especially in the summer season, excessive use of air conditioners leads to a sharp increase in electricity consumption. In winter, it was found that energy losses are high due to insufficient thermal insulation. The results of the analysis showed that energy-saving technologies have been introduced to a limited extent in the majority of the studied facilities. For example, while LED lighting systems are available in some hotels, automated control systems, energy monitoring or the use of renewable energy sources are rare. Solar panels are available only in some newly built facilities, and their efficiency has not been fully assessed. According to the results of the interviews, although facility managers consider energy efficiency important, financial constraints and lack of technical knowledge were noted as the main barriers. It was also found that the level of awareness of the incentive mechanisms provided by the state is low. Overall, the results showed that infrastructural, financial and management problems prevail in achieving energy efficiency in the tourism sector in Karakalpakstan.

DISCUSSION

The results obtained are somewhat consistent with the conclusions presented in international and local literature. In particular, low energy efficiency in tourist facilities located in developing regions is often explained by outdated infrastructure and lack of investment. In the conditions of Karakalpakstan, environmental and climatic complexities are also added to these factors. Sharp continental climatic conditions inevitably increase energy consumption. However, the results of the study show that high energy consumption is associated not only with the climatic factor, but also with low energy efficiency of buildings. The lack of thermal insulation, modern windows and efficient cooling systems increases energy losses. Despite the high potential for the use of renewable energy sources for the territory of Karakalpakstan, this potential is

not being fully utilized in practice. This is explained by problems with technical maintenance, a shortage of specialists and high initial investment costs. International experience shows that state subsidies and tax incentives play an important role in mitigating these problems. The study also revealed the lack or underdevelopment of energy management systems. This situation limits the ability to control and optimize energy consumption. Energy audits and digital monitoring systems are cited in the literature as effective tools for improving energy efficiency, but this practice has not yet been widely implemented in Karakalpakstan. Overall, this study shows that achieving energy efficiency in the tourism sector in Karakalpakstan requires an integrated approach. The results have important scientific and practical significance in developing regional development strategies, especially in the development of sustainable and ecological tourism.

CONCLUSION AND SUGGESTIONS

This study was devoted to identifying and analyzing the problems of achieving energy efficiency in the tourism sector in the Republic of Karakalpakstan. The results of the study showed that the efficiency of using energy resources in most tourism facilities in the region is low. The main reasons for this were outdated infrastructure, limited implementation of energy-saving technologies, lack of financial resources, and lack of knowledge and experience in energy management. Studies have shown that the main part of energy consumption falls on heating and cooling systems. Insufficient thermal insulation in a sharply continental climate further increases energy losses. Although there are opportunities for using renewable energy sources, their level of application in practice remains low.

In order to eliminate these problems and increase energy efficiency in the tourism sector, the following practical proposals have been developed: Phased modernization of tourism facilities, including improving thermal insulation, introducing energy-efficient windows and modern heating and cooling systems. Wider introduction of renewable energy sources, especially the development of solar energy use based on projects appropriate to regional conditions. Introduction of energy management and monitoring systems, constant control and optimization of consumption through energy audits. Strengthening state incentive mechanisms, including support for small tourism businesses through tax incentives, subsidies and grants. Improving personnel skills, organizing training programs on energy efficiency for tourism sector employees. Introduction of the concept of sustainable tourism at the regional level, harmonizing energy efficiency with environmental and social development. The implementation of these proposals will contribute to the sustainable development of the tourism sector in Karakalpakstan, rational use of energy resources and reduction of the environmental burden.

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