Strategic Development of Tourism and Hospitality for Sustainability in Uzbekistan

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Abstract. This study comprehensively analyzed the economic, environmental, and social factors that affect the sustainable development of tourism and hospitality in Uzbekistan. The study conducted an analysis using semi-logarithmic regression models based on statistical data for the period 2000–2023. The results showed that the growth rate of gross domestic product, the use of renewable energy sources, the well-being of the population, the level of use of public transport, and the ecological footprint index have a positive impact on the number of tourists visiting the country. In particular, an increase in the share of renewable energy improves the country's image in the international tourism market by ensuring environmental sustainability. However, the impact of the level of drinking water supply was not significant. Based on the results of the study, practical recommendations were developed for the development of green hotels, ecological transport systems, and digital technologies in Uzbekistan.

Keywords: Sustainable Tourism · Tourist Demand · Economic Growth · Ecological Footprint · Renewable Energy · Social Well-Being

1 Introduction

Uzbekistan is one of the most ancient and culturally rich countries in Central Asia, attracting tourists with its unique architectural monuments, rich historical heritage and natural beauty. The country's strategic location, the presence of ancient cities as an important center of the Silk Road, and the measures taken in recent years to develop tourism infrastructure are bringing Uzbekistan to an important place in the global tourism market.

According to the World Travel and Tourism Council, by 2028, the tourism sector in Uzbekistan is expected to create more than 1.2 million jobs and contribute $16.147 billion to the country's GDP [1]. At the same time, a significant increase in the number of international tourists in 2023 indicates that the country's tourism potential is growing.

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O. Gervasi et al. (Eds.): ICCSA 2025 Workshops, LNCS 15899, pp. 187–196, 2026.
https://doi.org/10.1007/978-3-031-97663-6_16

However, along with the economically efficient development of tourism, it is important to analyze its environmental and social impacts. The concept of sustainable tourism involves the development of tourism by protecting the environment, taking into account the interests of the local population, and ensuring long-term economic stability. Especially in countries with limited natural resources but high tourism potential, such as Uzbekistan, the development and implementation of a sustainable tourism model is an important strategic direction.

This study aims to identify the main factors influencing the formation of sustainable tourism demand in Uzbekistan, analyzing them, including economic, environmental, and social aspects. The results of the study will serve to study the possibilities of ensuring long-term sustainability through the use of renewable energy sources, reducing the ecological footprint, and modernizing infrastructure, which are important for tourism development.

2 Literature Review

Sustainable tourism is a strategic approach aimed at ensuring a balance between people and the environment, and its main goal is to harmonize the social, economic and ecological aspects of tourism activities. This concept has been widely recognized since the end of the 20th century and is now considered an integral part of sustainable development. The World Tourism Organization defines sustainable tourism as tourism that increases the well-being of local populations and preserves cultural heritage, while causing minimal damage to the environment [2].

Tourism is one of the important factors of economic development, and its growth has a significant impact on the overall well-being of a country [3–5]. According to studies conducted based on the gravity model, the economic stability of countries, transport costs and exchange rates directly affect the flow of tourists [6]. At the same time, increasing consumer spending, improving the quality of services and modernization of tourist facilities also lead to an increase in tourism demand [7].

Climate change and environmental factors are among the main factors affecting the long-term development of tourism [8]. Research shows that rising temperatures and an increase in extreme weather events can reduce the attractiveness of tourism in some regions [9]. For example, research conducted in Kazakhstan found that regions with moderate temperature conditions are more preferred by tourists [10]. Therefore, environmental protection and reducing carbon emissions are important aspects of sustainable tourism development.

The impact of tourism on local culture and infrastructure is also important. Involving local communities in tourism development and increasing their economic benefits is essential for sustainable development. Research shows that tourists tend to use environmentally friendly and socially responsible services [11–14]. Therefore, the introduction of ecotourism, green hotels and ecological transport systems can help increase tourism demand.

Digital technologies and innovations are playing an important role in shaping the demand for sustainable tourism today. For example, artificial intelligence, blockchain, and IoT technologies can be used to effectively manage tourism services, provide personalized services to tourists, and use natural resources wisely [15]. These innovations

can help increase the sustainability of the tourism industry and reduce environmental impact.

Thus, the scientific basis of sustainable tourism includes economic, environmental, and social factors that shape tourism demand. By managing these factors in a balanced way, sustainable tourism development in Uzbekistan can be ensured.

3 Data and Methodology

In the study, we use time series data, which includes extensive data from 2000 to 2023, to assess the factors influencing the number of tourists arriving in Uzbekistan.

The level of economic development is assessed based on statistical indicators collected in the Sustainable Development Goals database. In this process, the GDPgrowth variable is used, which reflects the annual growth rate of GDP per capita and plays an important role in assessing economic development. The relationship between economic growth and sustainable development has been widely covered in modern economic research. In particular, Armeanu et.al [16] have confirmed the effectiveness of this methodology in their scientific works and substantiated the inextricable link between economic growth and sustainable development.

Renewable energy use is an important issue in sustainable development discussions and is measured by the variable RenewableEnergy (the variable that measures the share of renewable energy sources in total energy consumption). This approach is consistent with the analytical models developed by C.Hall et.al [17].

Additionally, the study evaluates natural resource availability through WaterResources and DrinkingWater, which measure available freshwater resources and the proportion of freshwater biodiversity areas, respectively. These variables are critical for understanding environmental sustainability in tourism, as Eagles [18] discuss in the broader context of ecological conservation. The proportion of mountain key biodiversity areas, represented by MountainArea, is also included to underscore the region's unique ecological attributes.

The environmental impact is analyzed through CO_2 emissions, where data on emissions are taken from the Sustainable Development Goals database. Safarov et.al [8] have studied in detail how CO_2 emissions from tourism and economic activities contribute to global climate change. Their research highlights the need for measures to reduce the negative impact on the environment and increase environmental responsibility in the tourism sector.

Social wellbeing and support mechanisms are captured through LifeLadder, the indicator based on the Gallup World Poll that assess subjective wellbeing and the availability of social support, which have been widely used in social research to evaluate quality of life and community support networks [19].

The variable used in this analysis, Ecological Footprint per Tourist (EFT), serves as a key sustainability metric for Uzbekistan's tourism sector. EFT is calculated as the ratio of the total number of tourist arrivals in Uzbekistan to the ecological footprint index, providing a quantitative measure of the environmental impact associated with tourism activities. The data obtained from the United Nations World Tourism Organization database,

ensuring a robust basis for international tourism analysis. Complementarily, the ecological footprint index, derived from the Happy Planet Index database, provides a measure of environmental impact relative to biocapacity, which has been previously validated in sustainability research [20].

Furthermore, this study incorporates the Human Development Index (HDI) to reflect broader socio-economic dimensions within each country, including health, education, and standard of living. The HDI ranges from 0 to 1, with higher values indicating better living conditions.

This comprehensive approach not only aligns with established methodologies in the literature but also introduces a nuanced framework for evaluating the multifaceted impacts of tourism on sustainable development in Uzbekistan. This comprehensive approach not only aligns with established methodologies in the literature but also introduces a nuanced framework for evaluating the multifaceted impacts of tourism on sustainable development in Uzbekistan.

In our study, we construct the following Semi-Log regression model to assess the factors affecting the number of tourists visiting Uzbekistan:

$$Ln(TouristArrivals)_t = \beta_0 + \sum_{i=1}^{12} \beta_i X_{i,t} + \varepsilon_t \quad (1)$$

This model serves to assess the relationship between the number of tourists and 12 main independent variables that affect it. The components of the model are explained as follows: $Ln(TouristArrivals)_t$ – the number of tourists arriving in Uzbekistan (thousand people); β_0 – a constant value, which indicates the initial level of the number of ourists when all independent variables are zero; $X_{i,t}$ – independent variables in Table 1.

The natural logarithm is a mathematical transformation widely used in econometric research. It is important for overcoming various methodological problems and for interpreting research results. Since economic data in most cases have non-linear relationships, the use of the natural logarithm helps to solve this problem. Firstly, the natural logarithm can be used to linearise non-linear relationships between economic variables, allowing the effective use of linear regression models. As Wooldridge [21] noted, in economic research the non-linearity of data can cause difficulties in its analysis. In such circumstances, the logarithmic transformation simplifies these relationships and facilitates their analysis in statistical models. Secondly, the natural logarithm serves to stabilise the variance of the variables, i.e. it reduces the problem of heteroscedasticity, since in this case the diversity of the variables is reduced and they become closer to each other. Thirdly, the estimated coefficients obtained as a result of logarithmisation can be interpreted as elasticities. This allows a more meaningful interpretation of the research results in economic terms. Fourth, the natural logarithm reduces the scale of large numbers, which allows for the creation of economic models that are comparable and convenient for analysis.

Taking these aspects into account, the use of natural logarithms in this study ensures the stability and interpretability of the results and simplifies the analysis process. The results obtained using natural logarithms are used to better understand economic relationships and to make effective policies and decisions.

Table 1. Variables used in the analysis.

Abbreviation	Full name	Description
GDPgrowth	Gross Domestic Product Growth	The growth rate of a country's GDP expressed as a percentage
CPI	Consumer Price Index	An index that reflects changes in the prices of consumer goods and services
CO2	CO_2 Emissions	The amount of carbon dioxide emissions released into the atmosphere
HDI	Human Development Index	An index measuring a country's level of health, education, and economic development
RenewableEnergy	Renewable Energy Consumption	The share of renewable energy sources in total energy consumption
PubTranPop	Population Using Public Transport	The proportion of the population using public transportation
LifeLadder	Life Quality Index	An index reflecting the quality of life and well-being of the population
ForestSize	Forest Area	An index reflecting the quality of life and well-being of the population
DrinkingWater	Drinking Water Supply	The proportion of the population with access to safe drinking water
MountainArea	Mountainous Area Share	The share of mountainous land in a country's total area
WaterResources	Water Resources	The availability of drinking water and other natural water resources
EFT	Ecological Footprint per Tourist	Represents the environmental impact per tourist in Uzbekistan. It is calculated as the number of tourist arrivals divided by the ecological footprint index, measuring sustainability in tourism

4 Results and Discussion

At the initial stage of the study, we constructed a correlation matrix (Fig. 1) to further analyze the relationships between the factors under study. This matrix allows us to determine the degree of correlation between the factors.

Correlation coefficients of 0.7 or higher indicate that there is a strong relationship between the factors [22]. This can lead to the problem of multicollinearity, which is avoided by analyzing highly correlated independent variables in separate regression equations.

Additionally, variables exhibiting strong multicollinearity were carefully reviewed and selected based on their theoretical importance and statistical significance to maintain the accuracy of the regression results. To further ensure the reliability of our findings, VIF tests were also performed, confirming that all selected variables fell within acceptable multicollinearity thresholds. Consequently, this approach strengthened the validity and interpretability of the econometric analysis conducted in this study.

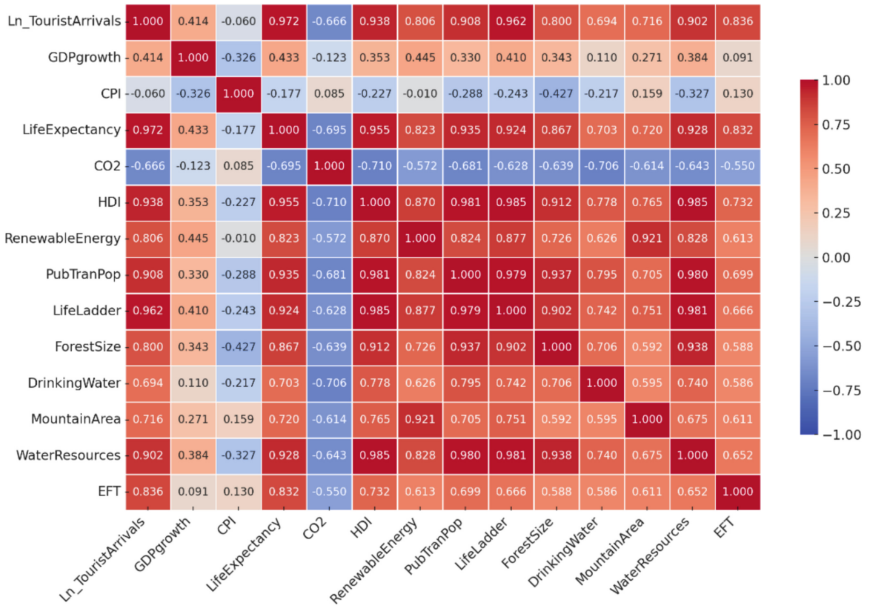

Fig. 1. Correlation matrix of variables

During the analysis, 6 regression models were built and their results were compared (Table 2). In each model, independent variables were tested in different combinations and the level of statistical significance was assessed. In addition, the robust standard error method was used in the regression analysis to reduce the problem of heteroscedasticity and stabilize the results. This approach helped ensure the reliability and accuracy of the relationships between variables.

Variance Inflation Factor (VIF) is widely used to measure the degree of correlation of a factor with other independent variables (degree of multicollinearity) [23]. If the VIF value is high, this factor is strongly correlated with other factors, which can make the results of the regression model unreliable. Typically, VIF < 5 is considered an acceptable indicator [24]. The highest VIF value is 3.80 (PubTranPop), which is also in the acceptable range. Also, the average VIF values range from 1.18 to 2.37 (Table 2), which confirms that the independent variables are not strongly correlated and the reliability of the regression results. Thus, multicollinearity does not pose a significant problem in the model and indicates that all variables are suitable for reliable analysis.

Table 2. Results of semi-log regression models.

	I	II	III	IV	V	VI
GDPgrowth	0.049** (2.13)	0.074*** (3.17)	0.074*** (7.15)	0.056*** (3.99)	0.079*** (7.68)	0.064*** (5.62)
CPI	0.39*** (4.55)	−0.003 (0.20)	0.028** (2.67)	0.016* (1.76)	0.029 (1.63)	0.030*** (3.44)
CO2			−0.007 (−0.93)	−0.012 (−1.59)		−0.009 (−1.33)
HDI	24.200*** (11.46)					
RenewableEnergy		0.204*** (2.97)				
PubTranPop			0.102*** (5.77)			
LifeLadder				0.548*** (5.58)		
ForestSize					0.010*** (4.42)	
DrinkingWater		0.054 (1.31)				
MountainArea					250.621 (0.77)	
WaterResources						0.449*** (6.59)
EFT		0. 00038*** (4.25)	0.00024*** (3.32)	0.00027*** (4.63)	0.00034*** (4.05)	0.00026*** (4.45)
Constant	−13.931*** (−6.76)	1.130 (0.22)	−4.257 (−1.53)	2.877 (1.66)	−7601.244 (−0.77)	−22.05 (−4.45)
Prob > F	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
R-squared	0.923	0.888	0.953	0.953	0.908	0.962
Mean VIF	1.18	2.06	2.21	1.97	2.37	2.07

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

According to the results of the study, factors affecting the number of tourists coming to Uzbekistan were identified and the interrelationships between them were assessed. Based on the conducted correlation and regression analyses, it was found that factors such as economic growth (GDPgrowth), human development index (HDI), renewable energy consumption (RenewableEnergy), PubTranPop, and ecological footprint index (EFT) have a statistically significant positive impact on the flow of tourists. In particular, it was shown that a 1% increase in the level of economic growth increases the number of tourists coming to the country by an average of 0.049–0.079%. These results confirm that economic stability and prosperity in the country play an important role in shaping the demand for tourism.

In assessing environmental sustainability, it was shown that an increase in the share of renewable energy sources in total energy consumption helps to increase the environmental awareness of tourists and improve the image of the country. Also, when assessed

through the EFT, the lower the environmental impact of each tourist visiting Uzbekistan, the more opportunities it creates for long-term sustainable tourism development.

At the same time, indicators of local population well-being (LifeLadder), forest area (ForestSize) and water resources (WaterResources) also had a significant positive impact on the number of tourists visiting the country. Through these factors, the improvement of local environmental conditions and the increase in the quality of life of the population serve to increase the attractiveness of the tourism sector.

However, some factors, such as the level of drinking water supply (DrinkingWater), were found to be statistically insignificant. This may indicate that the availability of drinking water in the country does not directly affect the decision of tourists to come to Uzbekistan. This is because the level of development of tourism infrastructure is more related to the quality of infrastructure and the level of services, and water supply may not be considered a key factor. It is also possible that the statistical insignificance of some factors is also due to the short data period or variability in data quality.

Based on the identified factors, the following recommendations were developed for the development of sustainable tourism in Uzbekistan: expand the use of renewable energy sources; development of environmentally friendly hotels and transport systems; implementation of programs that take into account the interests of the local population; improvement of tourism service management systems through digital technologies.

5 Conclusion

The results of the study showed the interdependence of economic, environmental and social factors and their joint importance for the development of sustainable tourism in Uzbekistan. Economic development, especially increasing the well-being of the population and rational use of environmental resources, play a key role in increasing the country's tourist attractiveness. This requires supporting economic growth, widespread introduction of environmentally friendly technologies, digital innovations and the development of green tourism infrastructure.

However, it was noted during the study that some factors, such as the level of drinking water supply, do not have a significant impact on tourist flows. A more in-depth study of the mechanisms of influence of such factors is considered one of the main directions of future research. Also, by continuing the study based on data collected over a longer period, it will be possible to develop specific policy recommendations aimed at ensuring sustainability in the tourism sector.

Thus, it was noted that a comprehensive strategic approach that combines economic, environmental and social directions is necessary for the sustainable development of the tourism sector in Uzbekistan. This will help increase the country's competitiveness in the international tourism market, as well as achieve long-term economic and social prosperity.

Acknowledgments. The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Disclosure of Interests. The authors have no competing interests to declare that are relevant to the content of this article.

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