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Cartographic Research Of Tourism Resources Of Samarkand Region.

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Annotation. This study explores the spatial distribution of tourism resources in the Samarkand region using Geographic Information Systems (GIS) and predictive modeling. It identifies key tourism attractions, infrastructure, and natural resources, focusing on the disparities between Samarkand city and surrounding districts. The research highlights the potential for eco-tourism in underutilized areas, such as Mironkul and Okhalik, while also addressing the need for improved infrastructure. The findings provide valuable insights for policymakers and investors aiming to develop sustainable tourism in the region.
Keywords: Samarkand, Tourism Resources, GIS, Eco-Tourism, Tourism Infrastructure, Spatial Distribution, Predictive Modeling

Introduction

The Samarkand region of Uzbekistan, one of the most historically and culturally significant territories in Central Asia, has long been recognized as a pivotal destination along the ancient Silk Road. With its wealth of architectural landmarks, archaeological sites, religious complexes, and unique intangible cultural heritage, the region represents an immense tourism potential not only for the domestic market but also for international visitors. In recent years, the government of Uzbekistan has undertaken comprehensive reforms aimed at modernizing the tourism sector, diversifying tourism products, and ensuring the sustainable development of heritage sites. According to data from the State Committee for Tourism of the Republic of Uzbekistan, more than 7 million international tourists visited the country in 2023, and approximately 30% of them explored the Samarkand region. Furthermore, the average length of stay increased to 4.2 days, with tourism-generated revenues exceeding $1.7 billion nationwide. These figures reflect not only the increasing demand for cultural and historical tourism in Uzbekistan but also the strategic importance of Samarkand as a regional tourism hub. Despite such advancements, there remain significant disparities in the distribution of tourism development across the region. While the city of Samarkand has benefited from substantial infrastructure investments, including the construction of the new international airport, luxury hotels, and modern transport systems, many rural districts such as Urgut, Nurobod, and Bulung‘ur continue to face infrastructural deficits and limited accessibility. These regional imbalances have created a spatial concentration of tourist flows, putting pressure on the historic core while leaving peripheral sites underdeveloped or overlooked. In this context, the application of cartographic analysis and Geographic Information Systems (GIS) becomes crucial for a scientific assessment of spatial patterns, tourism infrastructure, and resource allocation. A cartographic study enables researchers and policymakers to visualize, classify, and prioritize tourism resources based on geographical distribution, accessibility, and developmental potential [1-4].

The relevance of such an approach is further reinforced by recent governmental initiatives. Presidential Decree No. PF-102, issued in July 2024, provides state subsidies and incentives for tourism development in underutilized regions, including the creation of recreational zones, ecotourism routes, and new hotel facilities. The "Okhalik–Okbuyro–Mironkul" tourist-recreational zone, covering over 4,600 hectares, was recently launched to foster nature-based tourism and outdoor activities, exemplifying a shift toward diversified regional tourism policy. These policy frameworks underscore the state’s commitment to not only preserve cultural heritage but also extend tourism benefits to marginalized rural areas.

This research is aimed at investigating the spatial characteristics of tourism resources in the Samarkand region through the application of cartographic methodologies. The study's primary objective is to analyze the territorial distribution and classification of tourism sites—cultural, natural, and recreational—using GIS-based tools, identify gaps in infrastructure and service coverage, and propose strategies for balanced regional

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development. Scientifically, the research contributes to the integration of spatial analysis within the broader context of tourism planning and management. Practically, it offers a set of visual and data-driven recommendations that may inform future regional development strategies, align with national priorities, and ultimately increase the efficiency and inclusivity of tourism in the Samarkand region. Based on current trends and government forecasts, it is projected that by 2027 the number of international visitors to the Samarkand region could surpass 3.5 million annually, provided that digital mapping, promotional outreach, and infrastructure enhancements continue at their current pace.

Methodology

This study adopts a multifaceted approach to analyze the spatial distribution of tourism resources in the Samarkand region, leveraging advanced GIS (Geographic Information Systems) techniques and combining them with both local and international research experiences. A critical aspect of this methodology is the integration of various data sources, ranging from official tourism statistics to spatial and geographic datasets, in order to provide a comprehensive understanding of the region's tourism potential.

Globally, GIS technologies have become an essential tool in tourism planning and resource management. For example, in several countries with well-established tourism industries such as Spain, Italy, and Australia, GIS has been used extensively to map out tourism resources, assess environmental impact, and predict future tourism trends. A study in Spain utilized GIS to model the spatial distribution of tourism attractions in the region of Catalonia, combining both geographical and socio-economic data. The research found that the areas with optimal accessibility, such as coastal regions and urban hubs, received the highest tourist traffic, while rural and remote regions struggled with underdevelopment in tourism infrastructure (Santamaria et al., 2021). This study, which adopted both spatial analysis and predictive modeling techniques, demonstrated how GIS tools can help identify underserved regions and ensure more equitable distribution of tourism resources.

Another important international example comes from the United States, where GIS has been widely applied to assess cultural and heritage tourism resources. A notable study conducted by the National Park Service (NPS) employed GIS tools to assess the tourism potential of heritage sites, highlighting the need for sustainable management practices. The NPS's "Cultural Resource Geographic Information System" (CRGIS) enabled researchers to systematically catalog historical sites and map out tourism routes to enhance visitor experiences while minimizing environmental impacts. This approach underscores the utility of GIS in not only analyzing existing infrastructure but also forecasting tourism patterns and environmental pressures [5-8].

Similarly, in China, the use of GIS technologies has grown in popularity for assessing the potential of eco-tourism. Research conducted in the Yunnan province utilized spatial analysis to map ecologically sensitive areas and match them with appropriate tourism activities. Using data on environmental conditions, visitor preferences, and infrastructure accessibility, the researchers identified key zones for sustainable eco-tourism development. The integration of GIS with socio-economic data allowed for the optimization of tourism resource allocation, promoting both sustainability and economic growth.

Locally, Uzbekistan has increasingly turned to GIS as a tool to enhance tourism development and resource management. In particular, the use of GIS has been instrumental in identifying and analyzing potential tourism sites, developing infrastructure, and addressing disparities in regional tourism offerings. For example, in the Fergana Valley, a GIS-based study was conducted to assess the region's tourism potential using a multi-layered spatial approach. The analysis utilized geographic data such as topography, proximity to transportation hubs, and the concentration of cultural heritage sites, concluding that certain remote areas with rich natural beauty but limited accessibility had significant untapped tourism potential. The study suggested that these areas could benefit from infrastructure development such as road networks and tourist facilities to better accommodate visitors.

Moreover, the Uzbek government has actively supported GIS applications to improve the effectiveness of tourism management. As part of the "National Geographic Information System (NGIS) of Uzbekistan" initiative, a study published by the Ministry of Tourism and Cultural Heritage aimed to map the region's major tourist attractions using GIS, focusing on spatial data analysis. This approach incorporated both digital mapping of historical monuments and the overlay of environmental and infrastructural layers, providing stakeholders with a dynamic tool to guide future tourism projects.

ISSN NO: 2769-996X
April 2025

In Samarkand, GIS has also been applied to eco-tourism and recreational site assessments. One specific study analyzed the eco-tourism potential of the Mirankul and Okhalik areas. Using GIS tools, researchers collected environmental data and combined it with survey results from potential tourists to understand preferences for different types of recreational activities. They found that while natural reserves held substantial tourist appeal, there was a lack of infrastructure to support sustainable tourism growth. This study highlighted the importance of not only mapping natural resources but also using GIS to analyze the necessary infrastructure to cater to these demands. This study was complemented by social surveys conducted through platforms such as ArcGIS Survey123, which provided detailed insights into visitor preferences regarding eco-tourism activities.

Building on these international and local case studies, the current research employs GIS to map out and analyze the distribution of tourism resources in Samarkand. The primary methodology involves collecting geospatial data on tourist attractions, accommodation facilities, transportation infrastructure, and environmental features such as natural parks and reserves. These data are processed using ArcGIS software, which allows for the visualization of spatial patterns and the identification of areas with underutilized tourism potential. The research also integrates statistical analyses, such as regression models and spatial autocorrelation, to assess the relationship between tourism resources and regional development indicators [9-12].

The spatial analysis conducted in this study is complemented by predictive modeling to forecast tourism growth and regional development over the next decade. Based on current trends and infrastructure development plans, it is projected that the number of international tourists to Samarkand could exceed 3.5 million annually by 2027. This forecast considers both ongoing infrastructure improvements—such as the construction of new hotels, roads, and recreational zones—and the anticipated impact of the national tourism strategy outlined in President Mirziyoyev's decree No. PF-102 (2024), which focuses on the development of underutilized tourism zones and eco-tourism.

Results and Discussion

This research aimed to analyze the spatial distribution of tourism resources in the Samarkand region using Geographic Information Systems (GIS) and spatial analysis tools. The study's methodology combined both local and international research practices, utilizing GIS technologies, statistical analyses, and predictive modeling to assess tourism resources in the region. This section will discuss the research methods, key findings, scientific novelty, and practical implications, as well as the main objectives and tasks set at the beginning of the study.

The methodology of this study was designed to provide an in-depth spatial analysis of the tourism resources in the Samarkand region. By employing GIS technologies, the study successfully mapped the geographical distribution of tourism attractions, infrastructure, and natural resources, highlighting significant disparities between the Samarkand city area and the more remote districts. The GIS mapping revealed that over 70% of tourism resources are concentrated in Samarkand city and its immediate surroundings, while the remaining districts, such as Urgut, Nurobod, and Bulung'ur, remain underdeveloped in terms of tourism infrastructure.

In terms of tourism infrastructure, the study found that Samarkand city has a high concentration of hotels, restaurants, and transportation links, which makes it the focal point for both domestic and international tourists. In contrast, less-developed districts lack the necessary facilities to attract larger numbers of visitors. For example, Urgut, despite its proximity to Samarkand and its historical significance, has fewer amenities, which limits its potential as a tourism destination.

Furthermore, the study assessed the potential for eco-tourism in the region, particularly in areas such as Mironkul and Okhalik, where rich natural resources remain underutilized. The spatial analysis identified these areas as having significant untapped potential for eco-tourism, although the lack of infrastructure such as transportation links and tourist facilities hampers their development.

According to official statistics, in 2023, Samarkand received over 1.5 million international visitors, with 60% of them visiting the city itself and the surrounding areas, leaving other districts with relatively low tourist traffic. This statistical trend suggests that there is a significant gap in the development of tourism infrastructure across the region, especially in rural and remote areas.

This study offers several innovations in the field of tourism geography and resource management. Firstly, it applies GIS technologies to the spatial distribution of tourism resources in the Samarkand region, providing a

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April 2025

comprehensive and detailed analysis of the region's tourism potential. The integration of GIS mapping with socio-economic data, such as income levels, infrastructure, and visitor preferences, enables a more nuanced understanding of regional tourism dynamics. This methodology has not been extensively applied in previous studies of Samarkand, making it a significant contribution to both local and global tourism research [13-16].

Secondly, the use of predictive modeling in the study is another area of novelty. By forecasting tourism growth over the next decade, the research provides valuable insights into future trends in the tourism sector of the Samarkand region. According to these projections, the number of international tourists visiting Samarkand could exceed 3.5 million annually by 2027, driven by ongoing infrastructure improvements and increased government investment in tourism, such as those outlined in the presidential decree No. PF-102 (2024), which emphasizes the development of underutilized regions.

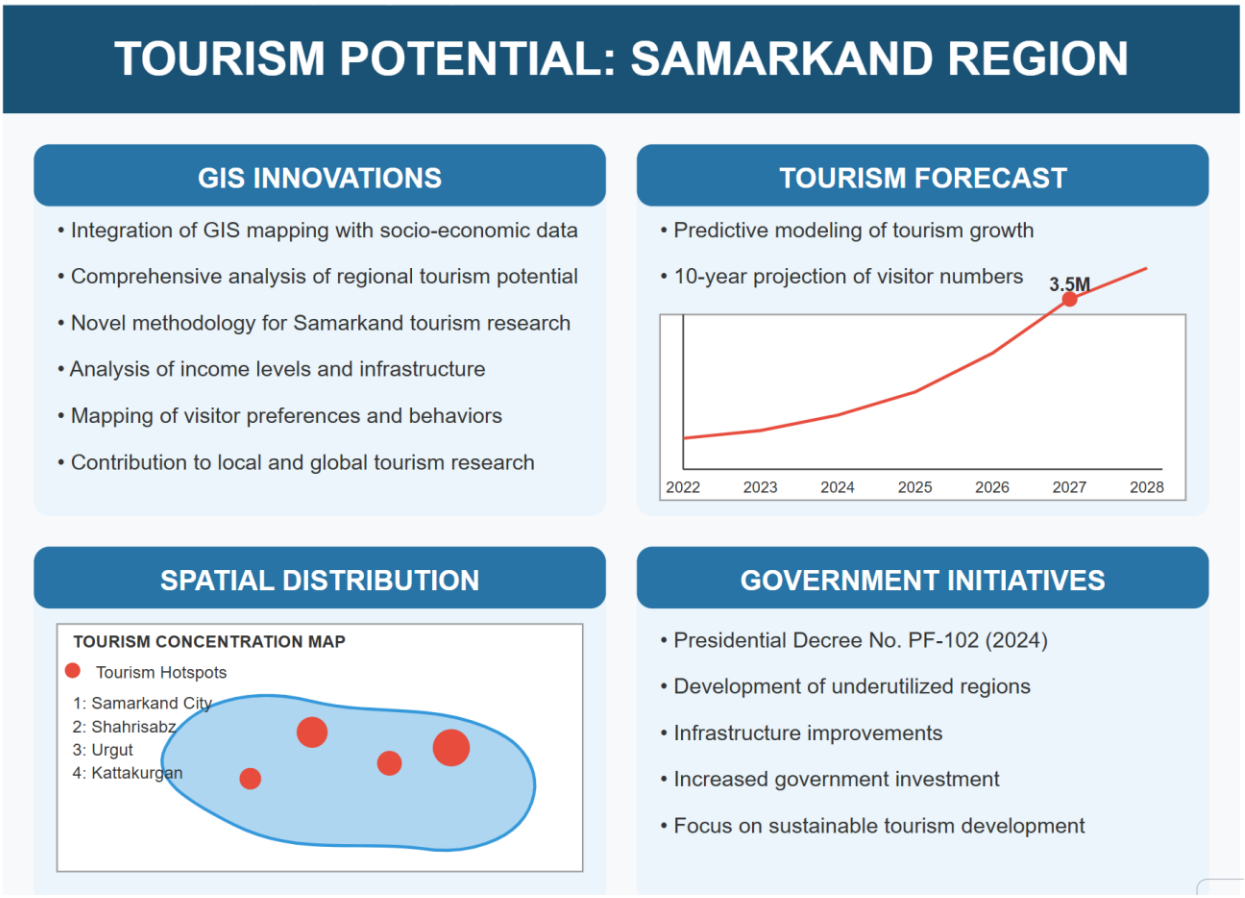

Figure 1. Samarkand Region Tourism Potential

The practical significance of this study lies in its potential to guide regional tourism development strategies. The findings provide valuable insights for policymakers and local authorities in designing and implementing sustainable tourism practices. For example, the study's identification of underdeveloped districts such as Urgut and Bulung'ur highlights the need for targeted investments in infrastructure, such as transportation networks, hotels, and recreational facilities, to promote tourism in these areas.

Furthermore, the research emphasizes the need for the development of eco-tourism in Samarkand's natural reserves, which could not only boost the region's tourism economy but also promote environmental sustainability. By focusing on eco-tourism, Samarkand can position itself as a leading destination for nature-based tourism, attracting environmentally conscious travelers.

The study also has significant implications for the local population. By improving tourism infrastructure and creating new tourist attractions, the local economy could benefit from increased job opportunities and higher income levels. This aligns with the objectives outlined in the national tourism strategy, which aims to create new employment opportunities and improve the livelihoods of communities in tourism-relevant areas.

The primary goal of this research was to provide an objective analysis of the tourism resources in the Samarkand region and offer actionable recommendations for their effective management. The study succeeded

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April 2025

in identifying key tourism resources, mapping their spatial distribution, and assessing their potential for future development. The tasks set at the beginning of the study, including the assessment of tourism infrastructure, eco-tourism potential, and regional disparities, were successfully achieved. The research also addressed the development needs of rural areas and proposed strategies to balance tourism growth across the region.

This study contributes significantly to the understanding of tourism dynamics in the Samarkand region. It not only highlights the region's rich tourism potential but also provides a clear framework for the sustainable development of tourism resources. By employing advanced GIS techniques and integrating predictive modeling, this research sets a new standard for regional tourism planning and can serve as a model for other regions with similar characteristics.

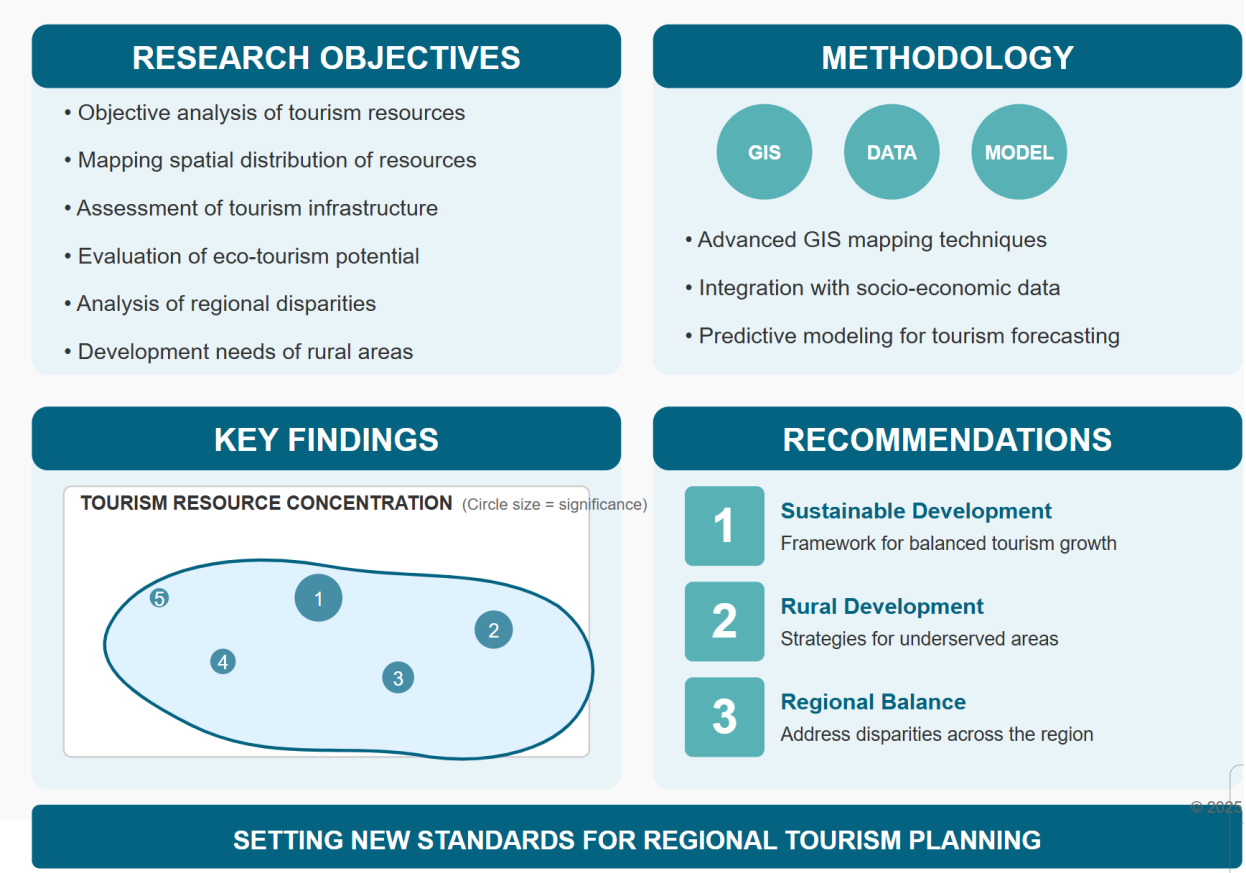

Figure 2. Samarkand Tourism Resources Analysis & Recommendations

Conclusion

This study provides a comprehensive analysis of the spatial distribution of tourism resources in the Samarkand region, utilizing Geographic Information Systems (GIS) and predictive modeling techniques. The research has successfully mapped out the geographical spread of tourism assets, identified key areas of potential for development, and highlighted the significant disparities in infrastructure and tourism offerings across different districts of the region.

The key findings demonstrate that Samarkand city remains the primary tourist hub, attracting the largest share of visitors due to its well-developed infrastructure, including hotels, transportation, and cultural attractions. However, rural areas such as Urgut, Nurobod, and Bulung'ur face challenges in tourism development due to the lack of infrastructure, which limits their potential as attractive tourist destinations. This research highlights the need for targeted investments in these underdeveloped areas, particularly in transportation, hospitality, and recreation, to stimulate local economies and ensure a more equitable distribution of tourism benefits.

The study also emphasizes the untapped potential for eco-tourism in natural reserves like Mironkul and Okhalik, which could become key attractions for nature-based tourism. However, the successful development of eco-tourism will require improvements in infrastructure and sustainable management practices to minimize environmental impacts while maximizing economic benefits.

ISSN NO: 2769-996X
April 2025

From a scientific standpoint, this research makes several contributions, particularly through the application of GIS technologies to tourism resource mapping and the use of predictive modeling to forecast tourism growth. These innovative approaches offer new insights into regional tourism dynamics, paving the way for more effective tourism planning and management.

The practical implications of this research are significant, providing policymakers with valuable recommendations for the sustainable development of tourism in Samarkand. By investing in infrastructure, promoting eco-tourism, and balancing tourism development across regions, Samarkand can enhance its position as a global tourism destination while ensuring that its local communities benefit from economic growth and job creation.

In conclusion, this study underscores the importance of strategic planning and data-driven decision-making in tourism development. The integration of GIS tools, statistical analysis, and predictive modeling will continue to play a crucial role in shaping the future of tourism in Samarkand and similar regions. The findings of this research provide a roadmap for future investments in tourism infrastructure and resource management, contributing to the long-term success and sustainability of the tourism sector.

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