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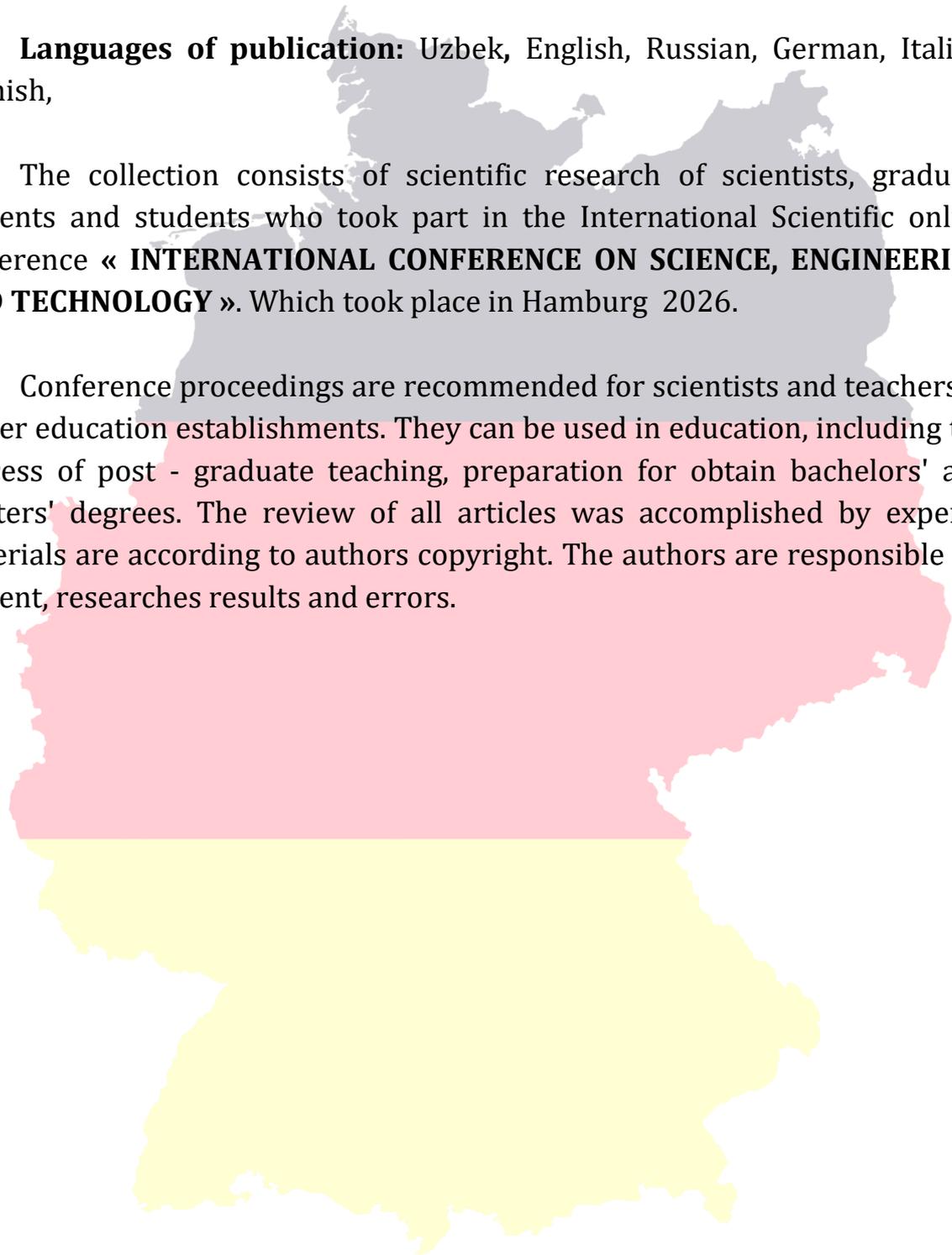
THE ROLE OF SMART TOURISM TECHNOLOGIES IN SUSTAINABLE TOURISM DEVELOPMENT

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Abstract: This article scientifically explains the role, importance and impact of smart tourism technologies in the development of sustainable tourism and tourism infrastructure. Through these smart technologies, it is possible to achieve not only speed but also a number of achievements in the tourism sector. For example, online platforms, mobile communication tools, artificial intelligence, smart transport services and augmented reality technologies help ensure tourism travel, booking, service delivery and convenience. At the same time, with the help of artificial intelligence, many of the listed services can be organized efficiently, quickly and easily without the need for human labor. In other words, virtual excursions and digital pilgrimage systems allow tourists to get acquainted with cultural and historical monuments remotely. This, in turn, facilitates the travel process, regulates tourist flows and provides high-quality and safe services. In the future, the introduction of digital and smart technologies will remain an important factor in increasing the competitiveness of tourism with other sectors, ensuring regional sustainability and expanding the economic interests of the local population.

Keywords: smart tourism technologies, sustainable tourism, digital innovations, ecological sustainability.

Introduction. In the context of globalization, the tourism industry is considered one of the fastest-growing sectors of the economy. However, along with the rapid development of tourism, a number of problems have arisen such as pressure on the environment, depletion of natural resources, degradation of cultural heritage and the limitation of the interests of the local population. For this reason, in recent years the concept of "sustainable tourism" has begun to become an important direction of scientific research and public policy. Sustainable tourism includes the preservation of natural resources, improvement of the welfare of local communities and ensuring economic stability. Since traditional tourism management has not been able to fully solve these tasks, modern digital technologies are considered an effective tool for ensuring sustainable tourism. Artificial intelligence and large-scale data (Big Data) play an important role in planning and managing sustainable tourism. With the help of AI technologies, tourist flows, seasonal demand and the level of load in regions can be analyzed. This makes it possible to prevent the problem of overtourism, develop alternative destinations and use resources rationally.

The main role of smart technologies in the development of sustainable tourism:

• Saving resources and environmental protection: IoT (Internet of Things) sensors monitor energy and water consumption, while "smart" buildings save resources.

• Managing tourist flows: Through Big Data it becomes possible to reduce congestion in crowded places and distribute tourist flows more evenly.

• Environmentally friendly transport and infrastructure: Managing electric transport and smart transport systems helps reduce carbon emissions.

• Supporting local culture and economy: Digital platforms connect tourists directly with local craftsmen and services, ensuring that income remains within the region.

The ecological aspect of sustainable tourism is also strengthened through smart technologies. Smart monitoring systems allow control of tourist flows, reduction of pressure on natural resources and improvement of environmental safety. For example, the introduction of smart transport systems and electric vehicles reduces air pollution and helps save energy resources. At the same time, solar panels, energy-efficient technologies and smart water supply systems in hotels and tourism facilities play an important role in the development of sustainable tourism.

The analysis of scientific literature shows that the impact of smart tourism technologies on tourism development has been studied by many researchers. For example, studies conducted by Gretzel, Sigala and Xiang analyzed the theoretical foundations of the smart tourism concept. The authors emphasize that smart tourism technologies accelerate information exchange processes in the tourism sector, improve the quality of services for tourists and allow effective management of tourism infrastructure. In their opinion, smart tourism technologies form new innovative approaches in tourism management.

In another study, Buhalis and Amaranggana analyzed the concept of smart tourism destinations. According to them, smart tourism destinations create a convenient and efficient environment for tourists through the extensive use of information and communication technologies. The researchers emphasize that smart tourism systems help effectively manage transport, information and service infrastructure in tourist areas. At the same time, these technologies also help reduce environmental pressure by managing tourist flows.

In studies conducted by Xiang and Fesenmaier, the role of big data analytics in tourism development was examined. The researchers emphasize that big data analysis in the tourism sector allows the study of tourist behavior, optimization of tourism services and effective planning of tourism policy. In their opinion, smart technologies are an important strategic tool in tourism management. As a result of analyzing the level of use of smart tourism technologies, it was found that the digitalization of tourism services has significantly increased. The following diagram shows the share of smart tourism technologies used in 2024.

Appendix 1

2024-yilda smart turizm texnologiyalaridan foydalanish ulushi
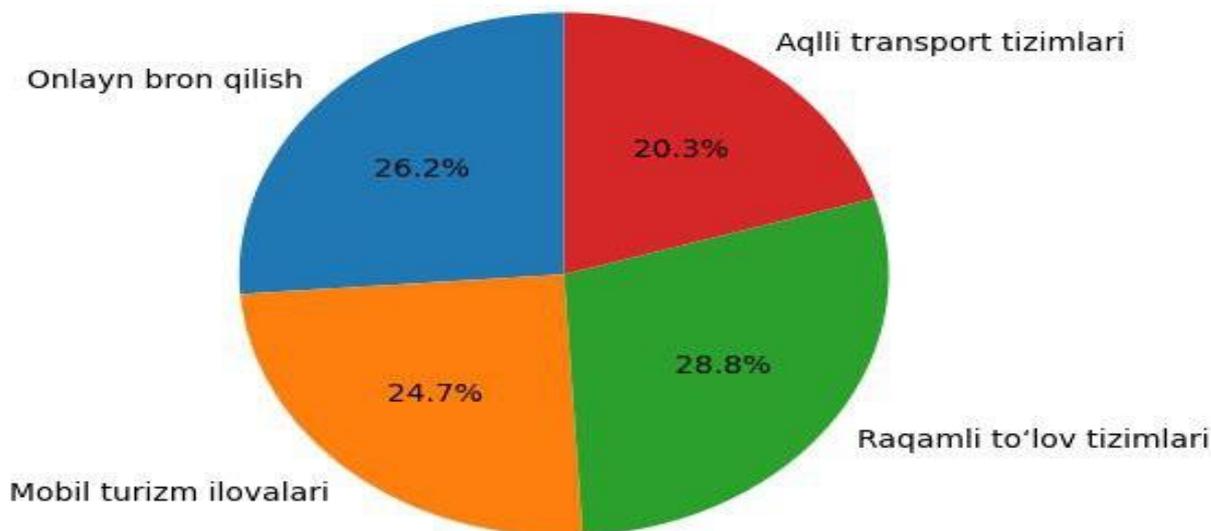
According to the data from the diagram, the use of digital payment systems accounts for the highest share at 28.8%. Online booking services represent 26.2%, mobile tourism applications 24.7%, and smart transport systems 20.3%. This indicates the widespread adoption of digital technologies in the tourism sector and the gradual development of the smart tourism concept.

Mobile tourism applications are also one of the key elements of modern tourism systems. These applications allow tourists to plan travel routes, obtain information about transport services, book hotels, and access quick information about tourist attractions. As a result, the travel experience for tourists can become more convenient and efficient. Additionally, mobile applications help manage tourist flows and reduce overcrowding in tourist areas.

Another important aspect of smart tourism technologies is their role in ensuring ecological sustainability. For instance, smart transport systems can optimize traffic flow, reduce fuel consumption, and lower the amount of harmful gases released into the atmosphere. Similarly, digital monitoring systems provide the ability to oversee the ecological conditions in tourist areas, which in turn helps reduce the negative impact of tourism activities on the environment. Smart technologies significantly improve the management of tourism infrastructure and service delivery processes. Digital platforms allow for effective management of tourism services, direct communication with clients, and efficient organization of marketing activities. This helps enhance the competitiveness of tourism enterprises. Moreover, digital technologies encourage the emergence of new business models in the tourism market.

The discussion results indicate that the implementation of smart tourism technologies has a significant impact on the sustainable development of the

tourism sector. Digital technologies enable more efficient organization of tourism services, management of tourist flows, and rational use of resources. In particular, smart technologies play a crucial role in conserving ecological resources and optimizing tourism infrastructure. However, there are also some challenges in implementing smart tourism technologies. For example, in certain regions, insufficient digital infrastructure or a lack of qualified specialists in information technologies can slow down the process. Therefore, special attention should be paid to developing infrastructure, training specialists, and introducing innovative technologies in the process of digitizing the tourism sector. Overall, the introduction of smart tourism technologies not only ensures the innovative development of the tourism sector but also plays a key role in implementing the concept of sustainable tourism. Digital platforms, mobile applications, and smart management systems help improve the quality of tourism services. They also contribute to the efficient use of ecological resources, waste management, and effective organization of tourism infrastructure.

In conclusion, smart tourism technologies are one of the essential factors for sustainable tourism development. The widespread implementation of digital technologies in tourism directly enhances service quality, modernizes tourism infrastructure, and ensures ecological sustainability. In the future, extensive use of smart technologies, digitization of tourism infrastructure, and the introduction of innovative management systems will be crucial. This, in turn, will increase the economic efficiency of the tourism sector while promoting the principles of sustainable development.

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