

USING ARTIFICIAL INTELLIGENCE TO DEVELOP TOURISM POTENTIAL IN THE MOUNTAINOUS REGIONS OF QASHQADARYA

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Annotation: Mountainous areas of Qashqadarya region (especially Shahrissabz, Kitob, Dehqonobod, Qamashi, Yakkabog) possess rich cultural and natural tourism resources but have seen limited development. This study analyzes the tourism potential and five-year trends in these districts, reviews recent government decisions and programs to promote mountain tourism (e.g. 2019–2025 national tourism strategy, 2023 decrees), and examines current applications of artificial intelligence (AI) and data analytics in tourism (globally and in Uzbekistan). Notable examples (e.g. AI-driven marketing, chatbots, personalization) demonstrate how AI can improve operational efficiency, targeted promotion, and visitor experience. We discuss how such technologies could enhance Qashqadarya's mountain tourism (e.g. through personalized services, data-driven planning, digital guides), and present strategic recommendations (including infrastructure development, AI-based marketing platforms, and sustainable management) to leverage these opportunities.

Keywords: Tourism development; mountain regions; Qashqadarya; Uzbekistan; Artificial Intelligence; tourism policy.

Аннотация : Горные районы Кашкадарьинской области (в особенности Шахрисабз, Китаб, Дехканабад, Камаши, Яккабаг) обладают богатым культурным и природным туристическим потенциалом, однако развитие туризма здесь остаётся ограниченным. В данном исследовании анализируются туристические возможности и тенденции за последние пять лет в этих районах, рассматриваются недавние решения и программы правительства, направленные на развитие горного туризма (например, Национальная стратегия по туризму на 2019–2025 годы, указы 2023 года), а также изучаются современные применения искусственного интеллекта (ИИ) и аналитики данных в сфере туризма (в Узбекистане и за рубежом). Значимые примеры (такие как ИИ-маркетинг, чат-боты, персонализация) демонстрируют, как ИИ может повысить операционную эффективность, точечное продвижение и улучшить впечатления туристов. Обсуждается, как такие технологии могут усилить развитие горного туризма Кашкадарьи (например, за счёт персонализированных сервисов, планирования на основе данных, цифровых гидов), и представлены стратегические рекомендации (включая развитие инфраструктуры, ИИ-платформы для маркетинга и устойчивое управление), направленные на эффективное использование этих возможностей.

Ключевые слова : Развитие туризма; Горные регионы; Кашкадарья; Узбекистан; Искусственный интеллект; Туристическая политика.

The tourism sector is one of the fastest-growing industries globally, significantly contributing to national economies [1]. Uzbekistan has high tourism potential, with historical monuments and rich cultural heritage playing a key role. Qashqadarya region is also considered a region with

abundant tourism resources: its mountainous and foothill zones are particularly noteworthy. The city of Shahrissabz, the birthplace of Amir Temur, is a center of historical monuments and is included in UNESCO's World Cultural Heritage List. Additionally, districts such as Yakkabog', Qamashi, and Kitob stand out for their unique natural landscapes and historical sites. However, compared to the country's leading tourist regions like Samarkand and Bukhara, Qashqadarya's tourism revenue and infrastructure remain at a lower level [2][3]. In particular, the Maydanak high-altitude astronomical complex located in Qamashi district is one of the world's unique sites, serving to increase the flow of tourists on a large scale [4].

In recent years, the local government has been developing specific measures to promote tourism in mountainous areas. Discussions in 2024–2025 meetings also addressed issues such as improving transport and infrastructure and increasing the flow of domestic and foreign tourists. In this regard, this article analyzes the existing tourism resources in Qashqadarya's mountainous regions and statistical trends over the past five years. Government decisions and programs related to tourism (e.g., the 2019–2025 tourism strategy, presidential decrees, and resolutions) are studied, and directions specific to mountainous regions are identified. Additionally, global and local examples of the application of artificial intelligence (AI) and big data analytics in tourism are reviewed, and the advantages and solutions resulting from their use in Qashqadarya's mountains are analyzed. Based on the research findings, clear recommendations and strategic proposals for tourism development in the region are provided.

Methodology . This study is primarily based on the analysis of existing data. Official information from the Qashqadarya Region Statistics Department (e.g., tourism-related reports, statistical bulletins) was used. Specific statistical indicators include data on the number of tourists, the volume of tourism services, and the number of accommodation facilities from 2017 to 2023 [4]. Information on government decrees and resolutions was collected from the Republic of Uzbekistan's legislative information portal (lex.uz) and official news agencies (e.g., UZA). The 2019–2025 tourism development strategy (PF-5611, 2019) and 2023 decrees (PQ-135, PQ-238, PQ-376) [2][5][6] were analyzed. International scientific articles and practical examples related to artificial intelligence and tourism were also reviewed. Specifically, the Samarkand case study published in the Academic Journal of Digital Economics and Stability (2024), research by Destinations International (2025), and a scientific article on India's Uttarakhand region were analyzed. Qualitative and quantitative data collected in this manner were used as a basis to identify the prospects and challenges for tourism development in Qashqadarya's mountainous regions.

Tourism Potential and Statistical Analysis

Qashqadarya region's mountainous areas are rich in historical heritage and natural landscapes. In particular, Shahrissabz is known for its Timurid-era monuments, with the Hazrati Sultan shrine and the landscapes of G'ilon village being noteworthy. Alongside Samarkand and Bukhara, it is included in the UNESCO list. Tourist complexes in Yakkabog', such as the village of Khoja Xiyol where Amir Temur was born, the beautiful mountainous landscapes of Tatar and Zarmas, and Amir Temur's cave, as well as the Qadamjo pilgrimage site in Kitob, are also attractive to tourists. Additionally, these regions offer opportunities for mountain ecotourism, pilgrimage tourism, and gastronomic directions.

Over the past five years, Qashqadarya's tourism has seen rapid growth. According to statistics, the volume of tourism services in the region was only ~2.0 billion UZS in 2017, but by 2023, this figure reached ~81.2 billion UZS. Similarly, the number of tourists visiting the region was ~1.833 million in 2017 (1.799 million in 2019), dropped sharply to 119,000 in 2020 due to

COVID-19, and then recovered to 1.442 million (2021), 1.487 million (2022), and ~2.010 million in 2023. This recovery is linked to the expansion of tourism infrastructure, the creation of new hotels, and the development of road maps. For example, in the last three years, the number of hotels and tourism facilities in the region increased from 81 to 327, accommodation capacities reached 5,500, and the number of tour operators grew to 34. As a result, in 2023, Qashqadarya welcomed 2.109 million domestic and 222,000 foreign tourists, with tourism service exports reaching ~\$45 million USD [4].

However, these figures are below the national average. For instance, in 2023, neighboring Samarkand and Bukhara regions each attracted ~3.5 million tourists, while Qashqadarya received only ~2.3 million. From this perspective, it is emphasized that the region has the potential to develop tourism year-round, but currently, only Shahrisabz and certain mountainous districts (e.g., Kitob's Qadamjo, Yakkabog's mountainous areas) have managed to attract tourists' attention. As part of long-term plans, for example, a master plan for three tourism neighborhoods in Shahrisabz district has been prepared, aiming to attract \$450 million USD in investments and 1 million tourists annually. This is projected to generate an additional 500 billion UZS in revenue and create over 5,000 permanent jobs for the region [3].

Additionally, the importance of opening new directions is emphasized. For instance, scenic areas around the Hisorak reservoir, ropeway systems, and high-speed boats on the reservoir are planned to establish a new tourist route capable of accommodating 300–500 tourists daily. Local authorities are working to package Qashqadarya's mountainous natural and historical sites into "tourism villages," "gastronomic corridors," and "pilgrimage routes," while introducing innovative concepts such as "Barrier-Free Tourism."

Government Policy and Programs

In Uzbekistan, the 2019–2025 tourism development strategy (Presidential Decree PF-5611) was adopted, outlining tasks for the rapid development of the country's tourism potential [2]. In this strategy, Qashqadarya is mentioned as one of the regions to attract significant investments and opportunities. Decree PQ-135, signed on April 26, 2023, outlined general measures such as improving tourism infrastructure, addressing transport-logistics issues, and supporting operators [5]. The decree emphasized the need to "fully utilize tourism potential, primarily by promptly resolving transport-logistics and infrastructure issues."

Programs targeting mountainous regions also exist. For example, the Presidential Resolution (PQ-238) dated July 27, 2023, outlined measures to accelerate comprehensive reforms in the tourism sector [6]. It introduced additional incentives for building new hotels and large tourism centers in mountainous and foothill areas. Specifically, restrictions on the number of floors for new hotels were lifted for areas included in the UNESCO heritage list and mountainous regions, encouraging investments in Qashqadarya's mountainous zones. The resolution also envisioned establishing services such as restaurants, spas, shopping complexes, and international brand outlets in tourism centers, with tax or customs benefits provided.

A specific document related to Qashqadarya region—PQ-376 (November 28, 2023)—also outlines clear measures for mountain tourism. This resolution focuses on improving the infrastructure of the Maydanak mountain tourism center and Shahrisabz center. For instance, a dedicated budget fund was allocated for supplying drinking water, sewage, electricity, communication networks, and road construction to the Maydanak center. A program for developing new road infrastructure for the Shahrisabz center was also planned. In Kitob district's "Qaynar" neighborhood, a master plan was commissioned to establish a modern hotel

and service complex. These initiatives are planned to be implemented through local authorities, ministries, and fund resources.

Additionally, a July 2024 decree outlined general measures, such as organizing gastronomic and cultural events (e.g., a national festival in Khiva) and modernizing museums using the Tourism Support Fund and local budgets. This broad set of measures creates opportunities for diversifying tourism in Qashqadarya as well.

Examples of Artificial Intelligence and Data Analytics

The use of artificial intelligence (AI) and data analytics in the tourism sector is growing rapidly. Global practices show AI algorithms providing personalized recommendations to tourists, offering chatbot services, managing dynamic pricing, and conducting in-depth marketing data analysis. For example, AI assistants on domestic and international travel platforms handle inquiries, provide intelligent website searches, and recommend tailored destinations based on tourists' preferences and habits. AI enables forecasting tourist flows, dynamic pricing based on demand, and analyzing sentiments from social media [7].

In Uzbekistan, AI technologies in tourism are still underdeveloped, but early studies show positive results. For instance, a theoretical study on Samarkand highlighted significant improvements in reservation systems, hotel services, and personalized offers through AI and big data analytics. These technologies have provided more convenient services, especially for young and foreign tourists. The study results indicate that AI and big data have the potential to fundamentally transform tourism operations, with a need for investment in digital infrastructure emphasized.

Recent international examples provide relevant lessons for Qashqadarya's mountains. For example, the Estes Park (Colorado, USA) tourism organization adopted ChatGPT and other generative AI tools to personalize marketing campaigns. They launched an internal content creation system called "Happy Places+" and a "Guide Geek" chatbot, offering direct question-and-answer services to tourists on social media [8]. In this application, generative AI improved travel recommendations and guides in real time. Similarly, new generative AI technologies (ChatGPT 4.0, Google Gemini, Meta AI) enhance customer interactions, automate internal processes, and optimize marketing campaigns based on real-time data.

Additionally, studies on digital innovations in mountainous regions exist. In India's Uttarakhand state, AI solutions addressed similar challenges: overcrowding, seasonal constraints, destination planning, and sustainability. In this region, AI systems optimized transport and hotel services, improved tourist experiences, and expanded opportunities for rational resource use. For example, the proposed approach recommended forecasting future tourist flows, managing accommodation facilities, and monitoring biosphere indicators for sustainability through AI. In conclusion, AI creates new opportunities for addressing complex tourism challenges.

These examples can serve as a roadmap for Qashqadarya's mountainous regions. For instance, AI chatbots could be introduced to streamline tourist reception processes. Through a website or Telegram bot, automatic responses to questions about destinations like Kitob, Shahrisabz, and Dehqonobod could make navigation more convenient for travelers. AI-driven analytics could target marketing campaigns to specific audiences (e.g., young tourists, foreigners) in Uzbek for global promotion, raising Qashqadarya's profile. Creating virtual or augmented reality (VR/AR) tours of historical sites and unique natural landscapes could expand digital tourism opportunities. Additionally, AI could analyze groundwater conditions, weather, and flow patterns to plan natural resource use in advance.

Based on the presented results and examples, the following points can be discussed for developing tourism in Qashqadarya's mountainous regions. First, the region has significant tourism potential, but it is not properly directed. So far, attention has primarily focused on urban heritage sites and a few popular destinations. However, with technological advancements and growing government support, it is time to introduce new strategies.

The widespread adoption of AI technologies in tourism could positively impact Qashqadarya's mountains in several ways. First, AI-driven advertising would make it easier to promote the region to a global audience. For example, creating personalized video and text content on official tourism websites and social media, and distributing tailored offers based on interests, could overcome geographical barriers and introduce Uzbek mountains to audiences in their native languages, such as Indian or Chinese tourists.

Second, AI analytics could assist in managing tourist flows. In recent years, interest in rural tourism and extreme destinations has grown. During this period, AI tools could monitor natural reserves regularly to optimize carrying capacity and prevent anthropogenic overload. As in the Uttarakhand example, AI could forecast transport and road conditions, enabling real-time responses to crisis situations in Qashqadarya. For instance, AI-based analysis could send travelers pre-trip notifications about travel routes, current weather, and road conditions. Additionally, for new hotel projects in Kitob district, AI evaluation models could assess investment returns (revenue potential) in advance to attract investors.

Third, introducing chatbots or voice assistants on platforms could overcome language barriers. A virtual guide in English, Russian, or Chinese (e.g., based on ChatGPT technology) would serve as a unified assistant for foreign tourists. This "friendly" interactive system would quickly provide tourists with information about local services in their language, preventing potential issues. For example, an AI assistant integrated into a "Qashqadarya Travel" portal could help tourists book hotels, choose destinations, and provide information about local attractions, hotels, or road conditions. Such a solution would also enhance marketing by actively addressing tourist inquiries with tailored recommendations.

Fourth, measures are needed to improve staff qualifications and introduce innovations. For instance, presidential decrees have outlined directing 2,000 students to universities and 1,000 to colleges and technical schools for dual education in tourism. In Qashqadarya, local staff should receive professional training in English and IT to prepare them for modern service delivery. Opening grant and state programs to train tourism managers using AI and study international experiences would be beneficial.

Fifth, adherence to sustainable tourism principles is essential. AI and data analytics could enable rational resource use, waste reduction, and environmental monitoring. In mountainous areas, pre-designating "corridors" and travel routes, and using AI-modeled intervals to regulate tourist numbers, could protect against uneven impacts. Otherwise, uncontrolled tourist flows could harm nature, necessitating careful management.

This article analyzed the tourism potential and development stages in Qashqadarya's mountainous regions. Between 2017 and 2023, the region saw significant growth in tourist numbers and tourism revenue. Nevertheless, these areas are not promoted internationally to match their potential. The 2019–2025 tourism strategy and 2023 decrees emphasized developing mountain destinations. In particular, presidential resolutions concerning Qashqadarya ("Maydanak" and "Shahrisabz" tourism centers) include infrastructure projects to advance the region.

In recent years, the application of artificial intelligence and data analytics in tourism has gained momentum. Global examples (Samarkand, Estes Park, Uttarakhand) have shown significant results in automating tourism operations, offering personalized services, and marketing through AI [9]. Similar approaches could be applied in Qashqadarya's mountainous regions. Creating information centers with AI assistants, directing algorithmic promotions, and planning based on big data would facilitate attracting tourists. Additionally, modernizing regional infrastructure (road construction, hotel quality) is necessary, as decrees like PF-102 envision direct investments from the national budget.

Strategic Recommendations :

- Strengthen digital marketing : Create interactive content (video presentations, virtual tours) using AI to promote Qashqadarya's tourism sites globally. Conduct online advertising campaigns in collaboration with local and international brands.
- AI chatbots and services : Develop AI-based guides/information systems in English, Russian, and Chinese for tourism portals and mobile apps. Use chatbots to answer tourist questions, assist with bookings, and provide real-time updates.
- Data analytics : Introduce information systems to monitor tourist flows in real time. Use data collection to optimize seasonal services (hotels, transport) and sustainably manage destinations and routes. Plan infrastructure tailored to tourist numbers by involving Qarshi (main) and local authorities and transport departments.
- Professional development : Direct tourism specialists and guides in the region to training courses in modern technologies and foreign languages. Conduct marketing and "guest interaction" training for family and small hotel owners.
- Sustainable development principles : Establish ecotourism routes, limit tourist numbers, and implement environmental protection policies. Create "ecotourism reserves" in collaboration with local communities.

Overall, innovations and artificial intelligence technologies can play a significant role in rapidly developing tourism in Qashqadarya's mountainous regions. Their introduction would support economic growth while promoting local industry and culture.

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