

## Brief information about the project

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| Name of the project | AP23490620 “Implementation of Sustainable Tourism Management in the Imantau-Shalkar Resort Area Based on the Application of Smart Technologies”                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Relevance           | <p>The modern development of tourism requires the introduction of innovative approaches to the management of tourist-recreational areas, particularly in the context of sustainable development and digitalization. Amid global environmental challenges, increasing tourist flows, and the need for the rational use of natural resources, Smart technologies are becoming a key tool for balanced management, ensuring harmony between the economic, social, and environmental aspects of tourism development.</p> <p>The Imantau-Shalkar resort zone (ISRZ) has significant tourism and recreational potential; however, its effective utilization is constrained by the absence of an integrated management system, insufficient digitalization of tourism services, and the lack of comprehensive monitoring based on sustainability indicators. In this context, implementing a management system based on Smart technologies and sustainable development indicators is essential. This will help minimize anthropogenic impact, optimize the use of natural resources, and enhance the competitiveness of the resort zone.</p> <p>According to the Environmental Performance Index (2022), Kazakhstan ranks 93<sup>rd</sup> out of 180 countries, highlighting the need for innovative solutions to achieve sustainable development. Tourism, as one of the country’s strategically significant economic sectors, requires effective mechanisms for regulating tourist flows, digitalizing tourism services, and creating a favorable ecological environment. Leading global tourism destinations actively employ Smart technologies for monitoring and managing natural and recreational resources; however, this approach remains underdeveloped in Kazakhstan.</p> <p>In this context, the project aimed at developing a balanced system of integrated management for the development of ISRZ, utilizing Smart technologies and sustainability indicators, is highly relevant and in demand. Its implementation will not only improve the efficiency of resort area management but also create a foundation for replicating successful experiences in other tourist regions of Kazakhstan. The integration of digital solutions, including 3D tourism routes, GIS analysis, and mobile applications, will modernize tourism infrastructure, increase the attractiveness of the region, and enhance the quality of tourism services.</p> |
| Purpose             | Development of a Balanced Integrated Management System Model for the Development of the Imantau-Shalkar Resort Zone (ISRZ), Based on Sustainable Development Indicators (SDIs) and Smart Technologies.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Objectives          | <ul style="list-style-type: none"><li>– Develop a catalog of Smart technologies and sustainable development indicators (SDIs), based on studied international best practices, national research experience, and monitoring data.</li><li>– Identify visitor preferences for the use of Smart technologies in the resort zone.</li><li>– Examine the applicability of global best practices in the use of Smart technologies and SDIs in the conditions of the ISRZ.</li><li>– Assess the attractiveness of ISRZ landscapes using GIS technologies, expert evaluations, and factor analysis to identify unique landscape features.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

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|                               | <ul style="list-style-type: none"> <li>– Conduct water sampling for hydrochemical and toxicological analysis of the resort destination's water bodies.</li> <li>– Study the geoecological situation in ISRZ to assess landscape resilience to tourist impacts and determine optimization measures.</li> <li>– Evaluate the ISRZ territory by creating a digital zoning map based on SDIs and the application of GIS technologies.</li> <li>– Design 3D-format tourist routes within the ISRZ.</li> <li>– Create a database (information package) of developed 3D tourist routes and integrate them into the “TourismKaz” mobile application for commercial promotion and sustainable tourism stimulation.</li> <li>– Develop a system of digital labels for ISRZ, integrated with informational passports on an online platform and supported by an audio guide.</li> <li>– Develop verbal and conceptual models of an intelligent integrated management system for ISRZ development, incorporating Smart technologies, infrastructure planning, and SDI-based monitoring.</li> <li>– Formulate recommendations for the application of Smart technologies in ISRZ, focusing on sustainable natural resource use, expansion of eco-education, development of ecological culture, and sustainable development of resort zones.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Expected and achieved results | <p style="text-align: center;"><b><i>Achieved Results:</i></b></p> <p><i>For the Year 2024:</i></p> <ul style="list-style-type: none"> <li>– An assessment of Kazakhstanis' awareness of sacred sites in the ISRZ was conducted using primary data collection methods.</li> <li>– A selection of methodologies for assessing the sustainable development of resort zones was carried out, and a system for planning and managing tourism and recreational resources was developed, incorporating best practices from both domestic and international experience. A set of Smart technologies and sustainable development indicators (SDIs) was developed and adapted specifically for the ISRZ.</li> <li>– In-depth interviews and/or surveys of stakeholders were conducted to identify attractive Smart technologies for visitors to the resort zone among Kazakhstanis. An assessment of Kazakhstanis' level of information awareness and preferences regarding Smart technologies used in resort zones was carried out.</li> <li>– A comprehensive analysis of water samples was conducted, including hydro-physical and hydrochemical parameters, as well as the presence of heavy metals. At least 20 parameters were determined for each water body, and bathymetric surveys of water bodies were performed using a motorboat and modern echo sounder-chart plotters to create depth maps of the lakes (Imantau, Shalkar).</li> <li>– A catalog of Smart technologies and SDIs for resort zones was developed.</li> <li>– As a result of the research, two intellectual property protection documents were obtained.</li> </ul> <p style="text-align: center;"><b><i>Expected Results:</i></b></p> <p><i>For the Year 2025:</i></p> <ul style="list-style-type: none"> <li>– A digital cartographic model of landscape attractiveness in the ISRZ is being created, and the geo-ecological situation in this area is being studied.</li> </ul> |

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|                                                                                                                                    | <ul style="list-style-type: none"> <li>– Digital cartographic models of the geo-ecological situation in the ISRZ are being developed, along with recommendations for optimizing the geo-ecological conditions within the resort zone.</li> <li>– A comprehensive analysis of water samples will be conducted, including hydro-physical and hydro-chemical parameters, as well as the presence of heavy metals. At least 20 parameters will be determined for each water body, and a bathymetric survey of the water bodies will be carried out using a motorboat and modern echo sounder chart plotters to create depth maps of the lakes (Imantau, Shalkar).</li> <li>– 3D tourist routes will be developed in the ISRZ to promote unique historical, cultural, and natural heritage sites, as well as to support a healthy lifestyle and the principles of sustainable development.</li> </ul> <p><i>For the Year 2026:</i></p> <ul style="list-style-type: none"> <li>– Authorial 3D tourist routes will be developed and integrated into the "TourismKaz" mobile application for commercial promotion and support of sustainable tourism development, along with informational passports for the tourist routes.</li> <li>– A labeling system with QR codes will be implemented at tourist sites in the ISRZ, along with an audio guide for tourists.</li> <li>– A verbal and substantive model of an intelligent management system for the balanced development of the ISRZ will be developed, integrating Smart technologies, infrastructure development, and sustainable development monitoring indicators. This model will serve as a fundamental step toward ensuring effective territorial management.</li> <li>– Recommendations will be developed to enhance and strengthen the role of the local population (local communities) in the development of tourism activities in the ISRZ. Additionally, methodological guidelines will be proposed based on the results of assessments and the determination of recreational load norms in this area, as well as recommendations for regulating visitor flow.</li> </ul> |
| Research team members with their identifiers (Scopus Author ID, Researcher ID, ORCID, if available) and links to relevant profiles | <ol style="list-style-type: none"> <li>1. Aktymbayeva Aliya Sagyndykovna, Candidate of Geographical Sciences, Associate Professor. h-index – 7, Scopus: 55916649100, Web of Science: N-9777-2014; ORCID ID: 0000-0003-1269-4356</li> <li>2. Nuruly Yeldar, PhD Candidate: h-index – 4, Scopus: 57198426770, Web of Science: V-7078-2017; ORCID ID: 0000-0002-9321-2285.</li> <li>3. Pavlichenko Lyudmila Mikhailovna, Doctor of Geographical Sciences, Professor: h-index – 2, Scopus: 55367910300, ORCID ID: 0000-0002-2650-806X.</li> <li>4. Bazarbekova Madina Medeuovna, PhD. h-index – 3, Scopus: 57201650093, Web of Science: JNE-4532-2023; ORCID ID: 0000-0002-2528-5079</li> <li>5. Shaken Aiman Shakenkyzy, PhD. h-index – 4, Scopus: 57205342379, Web of Science: DTA-2162-2022; ORCID ID: 0000-0002-6730-6245</li> <li>6. Zhadi Askhat Omirzakuly, PhD Candidate: h-index – 3, Scopus: 57211288345, Web of Science: EIW-1778-2022; ORCID ID: 0000-0002-0473-5501</li> <li>7. Sapiyeva Akmaral Zhenisbayevna, PhD Candidate: h-index – 3, Scopus: 58309908500, Web of Science: ABC-9046-2022; ORCID ID: 0000-0001-7717-8139</li> <li>8. Zhumatayev Serik Muratovich, Doctoral Student, h-index – 1, Scopus: 59326493900, Web of Science: KAZ-9374-2024; ORCID ID: 0009-0008-1618-7881</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

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|                                         | <p>9. Kaliyeva Aida Bolatkankyzy, Doctoral Student: h-index – 3, Scopus: 58793527700, Web of Science: AFI-4744-2022; ORCID ID: 0000-0002-1324-5192.</p> <p>10. Nurkyzy Dinara, Master's Student: ORCID ID: 0000-0001-7921-130X</p> <p>11. Shyryntay Amina Zhandoskyzy, 4th-year Student, Faculty of Geography and Environmental Sciences: ORCID ID: 0009-0006-9403-0033</p> <p>12. Serikbol Aruzhan Marlankyzy, 4th-year Student, Faculty of Geography and Environmental Sciences: ORCID ID: 0009-0000-8689-644X</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Usage                                   | <p><i>Fields of Application:</i></p> <ul style="list-style-type: none"> <li>– Tourism and Hospitality</li> <li>– Public Administration and Regional Planning</li> <li>– Ecology and Sustainable Development</li> <li>– Digitalization and Smart Technologies</li> </ul> <p><i>Practical Implementation:</i></p> <ul style="list-style-type: none"> <li>– Optimization of the use of tourist-recreational resources (TRR) of the Imantau-Shalkar Resort Zone (ISRZ) considering sustainable development indicators (SDI).</li> <li>– Implementation of Smart technologies for digitalization of tourism services and management of the resort area.</li> <li>– Development of a monitoring system for anthropogenic load on the ecosystem of the resort zone and regulation of tourist flows.</li> <li>– Creation of a tourist-recreational zoning map based on GIS technologies and sustainability indicators to ensure efficient spatial planning.</li> <li>– Integration of the “TourismKaz” mobile application with custom 3D tour routes and an audio guide to facilitate commercial promotion of the tourism product.</li> <li>– Implementation of an intelligent management system aimed at ensuring sustainable development of resort areas and increasing their competitiveness.</li> <li>– Replication of successful methodologies in other resort zones in Kazakhstan, such as the Shchuchinsk-Borovoe resort area.</li> </ul> <p><i>Expected Benefits:</i></p> <ul style="list-style-type: none"> <li>– Improved infrastructure and enhanced tourist attractiveness of ISRZ.</li> <li>– Reduced environmental burden through balanced tourist flow distribution.</li> <li>– Development of domestic tourism and support for small businesses in the region.</li> <li>– Increased efficiency in managing tourist-recreational resources through modern technologies.</li> <li>– Creating favorable conditions for attracting investments into the resort sector.</li> </ul> |
| Priority Compared to Existing Analogues | <ul style="list-style-type: none"> <li>– The project combines Smart technologies, GIS analysis, sustainability indicators, and digitalization of tourism services, allowing for the creation of an integrated resort management system. Most existing solutions focus either on tourism service digitalization or ecosystem monitoring but do not optimize them together.</li> <li>– Unlike existing tourism information systems, the project includes landscape attractiveness analysis and geo-ecological situation</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

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|                                                                                                                                                                                  | <p>assessment to support informed decision-making in regional development.</p> <ul style="list-style-type: none"> <li>– Many analogues provide only textual or multimedia descriptions of routes, whereas this project aims to develop interactive 3D tour routes integrated with the “TourismKaz” mobile application.</li> <li>– Unlike academic research, which rarely finds real-world application, this project is developed in collaboration with governmental and private organizations (JSC "NC Kazakh Tourism", JSC "Institute of Geography and Water Security", etc.), ensuring practical implementation.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| List of publications with links to them                                                                                                                                          | <p><i>Published Articles / Presented Papers at International Conferences:</i></p> <ul style="list-style-type: none"> <li>– Sembayeva A., Nuruly Y. Blockchain-Based Consensus Solutions for Managing and Protecting Hotel Guest Information // <i>Collection of Materials of the 2nd International Forum "Sustainable Tourism Development in Central Asia: Challenges, Opportunities and Prospects,"</i> dedicated to the 90th anniversary of Al-Farabi Kazakh National University. – Almaty, November 21-23, 2024. – P. 146-153.</li> <li>– Kambarova A., Nuruly Y. The Role of Metaverse Technologies in the Digital Transformation of the Tourism Industry // <i>Collection of Materials of the 2nd International Forum "Sustainable Tourism Development in Central Asia: Challenges, Opportunities and Prospects,"</i> dedicated to the 90th anniversary of Al-Farabi Kazakh National University. – Almaty, November 21-23, 2024. – P. 31-38.</li> <li>– Karim A., Nuruly Y. R-Keeper: From Classic Automation to Modern Integrations with Online Services // <i>Collection of Materials of the 2nd International Forum "Sustainable Tourism Development in Central Asia: Challenges, Opportunities and Prospects,"</i> dedicated to the 90th anniversary of Al-Farabi Kazakh National University. – Almaty, November 21-23, 2024. – P. 292-299. (in Russian)</li> </ul> |
| Patents                                                                                                                                                                          | <p><i>Copyright Certificates:</i></p> <ul style="list-style-type: none"> <li>– Certificate of Entry into the State Register of Rights to Copyright-Protected Objects (Literary Work) / "MAZE" Eco-Park / No. 49043, August 14, 2024 / Dauletkhanova Y.R., Aktymbayeva A.S., Sapiyeva A.Zh., Nuruly Y., Kaliyeva A.B. (In Kazakh)</li> <li>– Certificate of Entry into the State Register of Rights to Copyright-Protected Objects (Literary Work) / <i>KazGlamping – Under the Open Sky!</i> / No. 48856, August 6, 2024 / Dauletkhanova Y.R., Sapiyeva A.Zh., Nuruly Y., Kaliyeva A.B. (In Kazakh)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <p>!!! Along with the completed form, please attach to email relevant photographs and video materials that can be used to visualize and present the project on the web page.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

Here is the link to the media content:

<https://drive.google.com/drive/folders/1JPZa7-PMuiyjOU9HkmNXp3nTNeYi3Ynt?usp=sharing>