Project name, IRN	AP27511521 Geoecological assessment of the state of green spaces and soil quality of the urban environment of the cities of Aktau and Atyrau using GIS technology
Completion date	30.06.2025-31.12.2027
Project supervisor	Makhambetov Murat Zharakovich
Report	Today is cities of Aktau and Atyrau in the Republic of Kazakhstan are among largest industrial and cultural centers country with developed chemical, oil and gas industries. The increase material and cultural standard of living population is reflected issues of city improvement, where green spaces play an important role formation of normal living conditions, the corresponding landscape and aesthetic appearance. Today, state of green spaces and quality of soils in cities of Aktau and Atyrau is unsatisfactory, which requires a modern geoecological assessment. The increasing pace of urbanization leads to an increase urban population, an increase in the number of industrial enterprises and motor transport, which leads to inevitable anthropogenic pressure natural environment of the city. Thus, a reliable fundamental step towards geoecological assessment of the state of green spaces and quality of urban soils is the identification of changes, resistance of woody plants to unfavorable and anthropogenic environmental factors, recreational loads and accurate mapping of urban areas based on GIS technology. This study will present improved methods of cartographic and field research, inventory methods and determination age and growth of green spaces, assessment by the vegetation index NDVI, processing and comparison of satellite images to analyze changes state of green spaces in cities Atyrau and Aktau in the Republic of Kazakhstan. The innovative features of this method include: 1) mapping study area, determining state of green spaces, based on non-linear relationships between NDVI values; 2) mapping ecological state of green spaces taking into account influence soil condition and weather seasonality; 3) creating a modern Atlas of the geoecological state green spaces and soils with a complete biological, physical and geographical description and illustrated digital thematic maps; 4) new methods of accounting green spaces and developing a system of practical recommendations creating a system for monitoring green spaces, improving the current ecological state and increasing the environmental sustainability of green spaces in the studied cities; 5) study of the dendrological composition green spaces in various landscape-functional zones of the cities of Aktau and Atyrau; 6) determination of the degree of plant resistance to adverse (frost, frost, drought, heat, gas resistance) and anthropogenic (industrial pollution) environmental factors. The novelty of the work lies in the creation of an Atlas of the current geoecological state of green spaces and soil quality in

	the cities of Atyrau and Aktau, the development system of practical recommendations creation of a system for monitoring green spaces based on the results of the analysis of dendrological, phenological, laboratory, phytochemical, cartographic, field studies and observations in the cities of Atyrau and Aktau, allowing to achieve the stated goal and objectives of the project. Scope. The results of the conducted field, dendrological, laboratory and cartographic studies and observations will be used for geoecological assessment of the current state of green spaces and soils of the cities of Atyrau and Aktau, and further monitoring of green spaces. The results research will be discussed in the scientific community in the form of publication in high-ranking journals from Web of Science, Scopus database, international conferences, forums, and it is also planned to publish a monograph based on the results of the research.
Purpose	The aim of the project is to assess the current geoecological state of green spaces and the quality of soils in the urban environment of the cities of Aktau and Atyrau using GIS technology. The idea of the project is to create an Atlas of the current geoecological state of green spaces and soils in urban areas of the cities under study based on the results of laboratory, field, dendrological and cartographic studies, as well as on the basis of analysis of remote sensing materials.
Expected results	The following will be published based on the research results: 1) at least 2 (two) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the project, indexed in Science Citation Index Expanded and included in the 1st (first), 2nd (second) or 3rd (third) quartile of the impact factor in the Web of Science database and (or) having a CiteScore percentile of at least 50 (fifty) in the Scopus database; - at least 2 (two) articles or review in a peer-reviewed foreign or domestic publication recommended from lists 1 and 2 of the KOKNVO; - or at least 1 (one) article or review in a peer-reviewed scientific publication indexed in Science Citation Index Expanded and included in the 1st (first) quartile by impact factor in the Web of Science database and (or) having a percentile by CiteScore in the Scopus database not less than 80 (eighty). - at least 1 (one) article or review in a peer-reviewed foreign or domestic publication recommended from lists 1 and 2 of the KOKNVO. 2) It is planned to publish a collective monograph and issue an Atlas of the current geoecological state of green spaces and soils of the urban environment of the cities of Atyrau and Aktau based on the results of fundamental research, which will cover the problems and solutions to the problem under study based on the project being implemented. As well as an electronic dendroplan of the cities of Atyrau and Aktau of the

	Republic of Kazakhstan. 3) The new knowledge and results obtained during the project implementation will be shared with students and researchers, as well as among potential users, the scientific community and the general public. It is planned to publish the results of scientific research in the open press. 4) other measurable results in accordance with the requirements of the tender documentation and the specifics of the project: - The target consumers of the results obtained are the land resources committees, forestry, ecology departments and the agriculture department of the Atyrau and Mangistau regions, urban development departments of the cities of Atyrau and Aktau, the Ministry of Ecology and Natural Resources, Agriculture of the Republic of Kazakhstan, universities and research laboratories dealing with this problem. Also, the compiled thematic maps on the geoecological state of green spaces, soils and the Atlas of the current geoecological state of green spaces and soils of the urban environment can be used to develop a system of practical recommendations for creating a system for monitoring green spaces, improving the current ecological state and increasing the environmental sustainability of green spaces in the cities under study;. - These studies are interdisciplinary related to physical geography, cartography, dendrology, geoinformatics, plant ecology, mathematics and geoecology. - The expected socio-economic effect will be to improve the ecological state and increase the sustainability of green spaces in the cities of Aktau and Atyrau to adverse environmental conditions and anthropogenic load. - Within the framework of this project, 1 (one) PhD or doctor in the profile and 1 master's degree on the topic of the project from the corresponding educational program will be trained. - The practical significance of the work is to develop a methodology for assessing the geoecological state and the degree of disturbance of green spaces of the urban environment based on the results obtained; and the development of a system of practical recommendations for creating a green space monitoring system.
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List of published works	1. Sayanov A.A., Makhambetov M.Zh., Sarkulova Zh.S., Shapalov Sh.K., Izimova R. Comprehensive environmental assessment of the state of green spaces of the urban environment of the city of Atyrau / KazNU Bulletin. Ecological Series. Vol. 84, №3 (2025). P. 145-154. **https://doi.org/10.26577/EJE20258434** 2. Саянов А.А., Махамбетов М.Ж., Хамит А.Б., Сергеева А.М. Комплексная оценка городских зеленых пространств города Актау на основе мультиспектральных спутниковых данных / Вестник КазНУ. Серия географическая. №3 (78) 2025. С. 110-127. **https://doi.org/10.26577/JGEM20257838**