

## Brief information about the project

Name of the project	AP14972828 «GIS and RS-based agroecological zoning and assessment of the current state of pastures in Central Kazakhstan»
Relevance	<p>The important difference between the program's idea and the existing analogs is that it is based on the author's approach., which involves the formation of a system for the sustainable development of animal husbandry based on the territorial analysis and characteristics of the territory, with the definition of a long-term analysis from 1991 to the present day. A geodatabase (GDB) created on according to the main characteristics of the terrain features, including statistical, cartographic materials, remote sensing data, and a series of maps at a scale of 1:100,000 (physical-geographical, geobotanical, soil-geomorphological, slope map, exposure, irrigation system, pastures, agricultural land assessments). The proposed materials clearly show how to carry out various calculations and apply them in practice. The developed approach is relevant in the zonation of the territory, the maintenance of a grazing system, and the development of measures to improve and the management of the land use system of the Zhanaarka region (Karaganda Oblast).</p>
Purpose	<p>The purpose of the research is conducting agro-ecological and space monitoring of agricultural land use changes of the Zhanaarka region (Karaganda Oblast) since 1991 and ecological zoning based on the character of a landscape, ensuring the rational use of land for grazing while maintaining land fertility and environmental stability.</p>
Objectives	<ol style="list-style-type: none"> <li>1. Conduct agro-ecological and space monitoring of land and agro-climatic resources in Zhanaarka region, Karaganda Oblast to determine the long-term dynamics of the use and change of agricultural land.</li> <li>2. Determination of the load on the territory (number and type of animals – large and small cattle) and identification of areas with the greatest load of anthropogenic impact and analysis of regulatory and legal measures to regulate the use of land resources in the Republic of Kazakhstan</li> <li>3. Agroecological assessment and analysis of land resources (1991-2023) and their mapping using GIS</li> </ol> <p>The first year of the four-month study was aimed at determining the long-term dynamics of agricultural land use and change in Central Kazakhstan, a key area (Zhanaarka region, Karaganda Oblast). For this, statistical (land resources by types), cartographic (topographic maps, plans), satellite images (Landsat 4-5 - 9) and climatic data (temperature, precipitation) for the southern part of the Karaganda region since 1991 will be collected and analyzed. Consequently, areas affected by the impacts of anthropogenic activities and the irrational use of land resources will be identified. In addition, physical and geographical characteristics of the territory (e.g. relief, climate, soil, etc.) will be taken into account that determines the beginning of agricultural work and the selection of pasture grounds, depending on weather conditions and monitoring seasons. This analysis is needed to identify the link between climate conditions, degradation sites and agricultural systems (agriculture and livestock).</p> <p>The second year of the study was dedicated to determining the size and diversity of large and small cattle. The load is determined depending on the characteristics of the territory, the type and number of cattle. For example, large herds will trample the grass, so it is necessary to consider the number of livestock in the field relative to the area of the land. After assessing the actual state of land, its classification of land according to morphological characteristics from the global</p>

	<p>(type-class) to regional (subclass-genus) levels will be carried out. To clarify the work on the rational use of land resources, the legal documents of the Republic of Kazakhstan will be analyzed since 1991 to provide for land distribution and allocation for agricultural needs and land-growing and pasture issues and improve land quality. The relationship between changes in the number of lands allocated to agricultural land and laws and documents adopted will be determined.</p> <p>In the third year of the study, qualitative and quantitative analysis of land cover is expected to be calculated based on vegetation indicators NDVI, NDSI and MSAVI, for data correction and verification. To evaluate the impact of climate indicators (temperature, precipitation) on vegetation cover (growth, distribution), correlation regression relationships are calculated. Based on the data collected and processed throughout the study period, ArcGIS Pro-based thematic GIS (Geodatabase) for the region will be developed in accordance with the main features of the terrain characteristics (Relief, water, soil, vegetation, agricultural landscape, quantitative and qualitative indicators of land resources). The results are also reflected in a series of thematic maps (physical-geographical, geobotanical, soil-geomorphological, slope, exposure, irrigation system, pastures, land and agricultural land assessments) at 1:100,000 scale. The boundaries of the land are determined by qualitative characteristics (degraded: severely, moderately, degraded, slightly, not degraded) and a description of the agro-ecological state of the pastures is given. Consequently, recommendations are made on maintaining a livestock system and agrotechnical measures will be taken to improve and use land.</p>
<p>Expected and achieved results</p>	<p>2022</p> <ul style="list-style-type: none"> <li>• Statistical (area of land resources by types), cartographic (topographic maps, maps), satellite (Landsat 4-5 - 9), and climate data (temperature, precipitation) for the southern part of the Karaganda region since 1991 will be collected and analyzed.</li> <li>• Since 1991, agro-ecological and spatial characteristics of the land resource status in the Zhanaarka region have been investigated and clarified.</li> </ul> <p>2023</p> <ul style="list-style-type: none"> <li>• An assessment of the actual state of land, classification of the lands of the Zhanaarka region by morphological features from the global (type-class) to regional (subclass) levels will be carried out.</li> <li>• The zoning of the territory will be carried out based on the physical and geographical features of the territory with the identification of the types of agricultural land with an unequal condition.</li> <li>• The regulatory framework for the monitoring of land use and management in the Republic of Kazakhstan will be analyzed.</li> <li>• The results of scientific research will be formalized and submitted to journals from the first three quartiles by impact factor in the Web of Science database or having a CiteScore percentile in the Scopus database of at least 50.</li> </ul> <p>2024</p> <ul style="list-style-type: none"> <li>• Vegetation indices (NDVI, NDSI and MSAVI) will be calculated to assess the state of land cover changes and to analyze the development of crops.</li> <li>• Relationships between changes in land quality and climatic indicators will be established.</li> <li>• An assessment of the agricultural and ecological conditions of the pastures will be made and thematic maps (physical-geographical, geobotanical, soil-geomorphological, slope, exposure, irrigation system, pasture, agricultural land assessment maps) will be provided at a scale of 1:100,000.</li> </ul>

	<ul style="list-style-type: none"> <li>• A geographic database will be created in the ArcGIS Pro software according to the main characteristics of the terrain features (relief, hydrology, soil, vegetation, agricultural landscapes, quantitative and qualitative indicators of land resources).</li> <li>• Recommendations will be given on the management of the livestock grazing system and agrotechnical measures will be given to improve and use the land.</li> <li>• The results of the scientific research will be published at least 2 (two) articles in journals from the first three quartiles by impact factor in the Web of Science database or having a CiteScore percentile in the Scopus database of at least 50.</li> </ul> <p>Scientific works, reference books, reports on Central Kazakhstan were analysed. Statistical data on land resources (area, types) were collected. Topo maps (vlasaenko.net) in M 1:100 000, cartographic schemes (agro-climatic zoning, land use), climatic data from 01.02.2005 to 2022 (rp5.ru) and from Kazhydromet (t°, precipitation) from 1991 were collected to create a database, basic, thematic maps. Space images (Landsat 4-5-9) from 1991 were processed. Images for the growing season, March-October, were selected. Optimal images of 6-9 images were selected (excluded: less than 10% cloud cover, missing areas, distorted images) for each year. Mosaics were created and optimal channels (R - 1, 5; G - 6; B - 2, 4) for land cover mapping were identified. The main agroclimatic characteristics (moisture and heat availability) were identified to assess the state of land resources. Moisture availability, which is important for vegetation growth, was taken as a basis. According to the characteristic features of soil cover 3 zones are distinguished: chernozem, chestnut and brown soils and subzones. Light chestnut soils are in the southern part of the area with an extremely arid climate with low rainfall and an extremely poorly developed hydrographic network. Therefore, the territory of Zhanaarka district was selected as the key site.</p>
<p>Research team members with their identifiers (Scopus Author ID, Researcher ID, ORCID, if</p>	<p>Шокпарова Дана Канатхановна  h-index: Scopus – 2, WoS – 1  ResearcherID - B-1656-2015 <a href="#">Dana Shokparova - Web of Science Core Collection</a>  ORCID - 0000-0002-5400-2234  Scopus Author ID – 55961222900, <a href="#">Shokparova, Dana K. - сведения об авторе - Scopus Preview</a>  Google Scholar – <a href="#">Dana Shokparova - Web of Science Core Collection</a></p>

available) and links to relevant profiles	Researcher Gate - <a href="https://www.researchgate.net/profile/Dana-Shokparova">Dana Shokparova (researchgate.net)</a>
List of publications with links to them	<p>1. Plokhikh R., Shokparova D., Fodor G., Berghauer S., Tóth A., Suymukhanov U., Zhakupova A., Varga I., Zhu K., Dávid L.D. (2023) Towards Sustainable Pasture Agrolandscapes: A Landscape-Ecological-Indicative Approach to Environmental Audits and Impact Assessments. Sustainability (Switzerland), 15 (8), art. no. 6913, <b>DOI: 10.3390/su15086913</b> (Scopus, Environmental Science (miscellaneous) – процентиль 83; WoS – Q2).  <a href="https://www.scopus.com/record/display.uri?eid=2-s2.0-85156115295&amp;origin=inward&amp;txGid=1af15206758e0dcec4ac49cb29585362">https://www.scopus.com/record/display.uri?eid=2-s2.0-85156115295&amp;origin=inward&amp;txGid=1af15206758e0dcec4ac49cb29585362</a></p> <p>2. D. Shokparova, M. Sirazhitdinova. A study on land use and environmental factors of Zhanarka region, Kazakhstan (Abstract) (2023). Abstract Book of V. International Congress on Geographical Education (ICGE-2023) “Powerful Geographical Education, Powerful Future”, 05–08 October 2023 Akdeniz Üniversitesi, Antalya, Turkey</p>
Patents	-