

Brief information about the project

Name of the project	IRN AP26197327 Priority Water Pollutants in Kazakhstan: Priority water pollutants in Kazakhstan: development of comprehensive and sustainable tools for chemical and toxicological characterization and study of their photodegradation
Relevance	This project is focused on development of tools for holistic chemical and ecotoxicological characterization of priority organic water pollutants in Kazakhstan and further studying of their photodegradation. For this, the methods for quantitation of target pollutants based on green sample preparation approaches, and gas chromatography with mass spectrometry will be developed. Non-targeted screening will be used for identification of the photodegradation products. In addition to chemical analysis and identification, in vitro tests will be employed at different stages of photodegradation to evaluate the overall toxicity of the mixture, including synergistic effects. The target group of pollutants are toxic organo-nitrogen compounds which belong to different classes based on their application (pesticides, rocket fuel residuals, disinfection byproducts etc.) but have common chemical structures, are highly soluble in water, and are ubiquitous in the environment.
Purpose	The aim of the project is to develop tools for holistic chemical and ecotoxicological characterization of priority organic water pollutants in Kazakhstan and further studying of their photodegradation.
Objectives	1. Development of the multiresidue analytical method for quantification of organo-nitrogen compounds in water using vacuum-assisted headspace solid-phase microextraction and gas chromatography - mass spectrometry. 2. Development and optimization of non-targeted screening method for identification of degradation and transformation products based on mass spectra and linear retention indices. 3. Design and development of the photoreactor. 4. Study of the photodegradation of priority organic pollutants in water. 5. Toxicity assessment of the freshly contaminated and treated water samples using in vitro tests.
Expected and achieved results	- two articles or reviews in peer-reviewed scientific journals indexed in the Science Citation Index Expanded and included in the 1st or 2nd quartile of impact factor in the Web of Science database and/or having a CiteScore percentile in the Scopus database of at least 70;

	- two articles or reviews or reviews in a peer-reviewed foreign or domestic publication recommended by the CQAES; - One of the articles will be in the multidisciplinary category (multidisciplinary or interdisciplinary practical application); - preparation of one PhD candidate with thesis defense no later than two years after the completion of the project; - a novel analytical method for quantification of multiclass organo-nitrogen compounds in water based on vacuum-assisted headspace solid-phase microextraction and gas chromatography mass spectrometry; - chemical and ecotoxicological data on photodegradation of Kazakhstan's priority organic water pollutants such as pesticides and rocket fuel transformation products.
Research team members with their identifiers (Scopus Author ID, Researcher ID, ORCID, if available) and links to relevant profiles	1. Dina Orazbayeva – Project Leader, Ph.D., Assistant Professor, Leading Researcher, Scopus Author ID: 57189031525; Web of Science Researcher ID: O-5505-2017; ORCID ID: 0000-0002-3535-4576 2. Marat Bektassov – Master of Technical Sciences, PhD, Senior Reseracher, Scopus Author ID: 57188593383; Web of Science Researcher ID: P-5639-2017 3. Alua Zhumadildinova – Master of Natural Sciences, PhD Candidate, Researcher, ORCID ID: 0009-0004-0322-3696, Web of Science Researcher ID: KDE-4972-2024 4. Balgyn Dyusenkulova – Bachelor of Natural Sciences, 1st-year Master's student at Al-Farabi Kazakh National University, ORCID ID: 0009-0004-0322-3696, Web of Science Researcher ID: JLL-9806-2023 5. Zhanel Zhusupova – Laboratory Assistant, 2nd-year student at Al-Farabi Kazakh National University
Usage	Analytical methods developed within the project can be applied in all laboratories engaged in chromatographic analysis of organic contaminants in water.
Priority compared to real-world alternatives	Integration of analytical, physicochemical, and bioanalytical methods for simultaneous identification, quantitative determination, and ecotoxicological assessment of pollutants and their transformation products.
List of publications with links to them	
Patents	