ISSN 2518-170X (Online)
ISSN 2224-5278 (Print)

NEWS OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN, SERIES OF GEOLOGY AND TECHNICAL SCIENCES

№1
2026

ISSN 2518-170X (Online)
ISSN 2224-5278 (Print)

CENTRAL ASIAN ACADEMIC
RESEARCH CENTER

N E W S
OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN, SERIES OF GEOLOGY AND TECHNICAL SCIENCES

1 (475)

JANUARY – FEBRUARY 2026

THE JOURNAL WAS FOUNDED IN 1940

PUBLISHED 6 TIMES A YEAR

ALMATY, 2026

The scientific journal News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences has been indexed in the international abstract and citation database Scopus since 2016 and demonstrates stable bibliometric performance.

The journal is also included in the Emerging Sources Citation Index (ESCI) of the Web of Science platform (Clarivate Analytics, since 2018).

Indexing in ESCI confirms the journal's compliance with international standards of scientific peer review and editorial ethics and is considered by Clarivate Analytics as part of the evaluation process for potential inclusion in the Science Citation Index Expanded (SCIE), Social Sciences Citation Index (SSCI), and Arts & Humanities Citation Index (AHCI).

Indexing in Scopus and Web of Science ensures high international visibility of publications, promotes citation growth, and reflects the editorial board's commitment to publishing relevant, original, and scientifically significant research in the fields of geology and technical sciences.

«Қазақстан Республикасы Ұлттық ғылым академиясының Хабарлары. Геология және техникалық ғылымдар сериясы» ғылыми журналы 2016 жылдан бастап халықаралық реферативтік және ғылымиметриялық Scopus дерекқорында индекстеледі және тұрақты библиометриялық көрсеткіштерді көрсетіп келеді.

Сонымен қатар журнал Web of Science платформасының (Clarivate Analytics, 2018) халықаралық реферативтік және наукометриялық дерекқоры Emerging Sources Citation Index (ESCI) тізіміне енгізілген.

ESCI дерекқорында индекстелуі журналдың халықаралық ғылыми рецензиялау талаптары мен редакциялық этика стандарттарына сәйкестігін растайды, сондай-ақ Clarivate Analytics компаниясы тарапынан басылымды Science Citation Index Expanded (SCIE), Social Sciences Citation Index (SSCI) және Arts & Humanities Citation Index (AHCI) дерекқорларына енгізу қарастырылуда.

Scopus және Web of Science дерекқорларында индекстелуі жарияланымдардың халықаралық деңгейде жоғары сұранысқа ие болуын қамтамасыз етеді, олардың дәйексөз алу көрсеткіштерінің артуына ықпал етеді және редакциялық алқаның геология мен техникалық ғылымдар саласындағы өзекті, бірегей және ғылыми тұрғыдан маңызды зерттеулерді жариялауға ұмтылысын айқындайды.

Научный журнал «News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences» с 2016 года индексируется в международной реферативной и наукометрической базе данных Scopus и демонстрирует стабильные библиометрические показатели.

Журнал также включён в международную реферативную и наукометрическую базу данных Emerging Sources Citation Index (ESCI) платформы Web of Science (Clarivate Analytics, 2018).

Индексирование в ESCI подтверждает соответствие журнала международным стандартам научного рецензирования и редакционной этики, а также рассматривается компанией Clarivate Analytics в рамках дальнейшего включения издания в Science Citation Index Expanded (SCIE), Social Sciences Citation Index (SSCI) и Arts & Humanities Citation Index (AHCI).

Индексирование в Scopus и Web of Science обеспечивает высокую международную востребованность публикаций, способствует росту цитируемости и подтверждает стремление редакционной коллегии публиковать актуальные, оригинальные и научно значимые исследования в области геологии и технических наук.

News of the National Academy of Sciences of the Republic of Kazakhstan. Series of geology and technology sciences.
ISSN 2518-170X (Online),
ISSN 2224-5278 (Print)
Owner: «Central Asian Academic Research Center» LLP (Almaty).
The certificate of registration of a periodical printed publication in the Committee of information of the Ministry of Information and Communications of the Republic of Kazakhstan Nº KZ50VPY00121155, issued on 05.06.2025
Thematic scope: *geology, hydrogeology, geography, mining and chemical technologies of oil, gas and metals*
Periodicity: 6 times a year.
http://www.geolog-technical.kz/index.php/en/

News of the National Academy of Sciences of the Republic of Kazakhstan. Series of geology and technology sciences.
ISSN 2518-170X (Online),
ISSN 2224-5278 (Print)
Меншіктеуші: «Орталық Азия академиялық ғылыми орталығы» ЖШС (Алматы қ.).
Қазақстан Республикасының Ақпарат және коммуникациялар министрлігінің Ақпарат комитетінде 05.06.2025 ж. берілген № KZ50VPY00121155 мерзімдік басылым тіркеуіне қойылу туралы куәлік.
Тақырыптық бағыты: *геология, гидрогеология, география, тау-кен ісі, мұнай, газ және металдардың химиялық технологиялары*
Мерзімділігі: жылына 6 рет.
http://www.geolog-technical.kz/index.php/en/

News of the National Academy of Sciences of the Republic of Kazakhstan. Series of geology and technology sciences.
ISSN 2518-170X (Online),
ISSN 2224-5278 (Print)

Собственник: ТОО «Центрально-Азиатский академический научный центр» (г. Алматы).

Свидетельство о постановке на учет периодического печатного издания в Комитете информации Министерства информации и коммуникаций и Республики Казахстан № KZ50VPY00121155, выданное 05.06.2025 г.

Тематическая направленность: *геология, гидрогеология, география, горное дело и химические технологии нефти, газа и металлов*

Периодичность: 6 раз в год.

http://www.geolog-technical.kz/index.php/en/

CONTENTS

Abdullaev A.U., Kamberov I.M.
Possibilities of mercury studies in seismic hazard assessment and earthquake forecasting....8

Agzamova I.A., Abdurakhmanov B.M., Normatova N.R., Ermatova Ya.S., Agzamova N.Sh.
Forecast assessment of disturbances and fracturing during development of solid mineral deposits....18

Arystanov M.B., Zhandiyar A.G., Kaipbayev Y.T., Sultanbekova A., Nikam B.R.
A geospatial approach to managing irrigation water resources of the big almaty canal.....32

Babii K., Kiriia R., Smirnov A., Kuttybayev A., Mishchenko T.
Justification of parameters of a steeply inclined tubular conveyor of cyclic-flow technology at a deep open pit in Kryvbas....55

Bryukhanova N.N., Gladkikh V.A., Idigova L.M., Lepekhina Yu.A., Kondratiev V.V.
Engineering control of blast-induced seismicity and environmental safety in underground ore mining under complex geodynamic conditions....74

Evsyukov D.Yu., Pchelintseva S.V., Vakhrusheva I.A., Ermolaeva O.S., Modina M.A.
Geophysical investigation of technogenically disturbed areas for environmental assessment in Southern Russia....90

Galiyev S.Zh., Axanaliyev N.E., Sarsenbayev Y.Ye.
Justification of technological parameters and energy consumption of quarry excavators taking into account the quality of rock preparation for excavation....109

Hryhoriev Y., Lutsenko S., Hryhoriev I., Kuttybayev A., Kuantayev N.
Adaptive modeling of mining schedule using genetic algorithm in a dynamic environment....120

Ismailov V.A., Aktamov B.U., Yodgorov Sh.I., Yadigarov E.M., Avazov Sh.B.
Assessment of the possible seismic risk of residential buildings in the Samarkand region based on a scenario earthquake....135

Ismayilov S.Z., Aliyev I.N., Karimov I.C.
Real-time monitoring and statistical analysis: optimizing sand detection in oil wells.....155

Kazakov A.N., Khakberdiyev M.R., Qurbonov H.A., Turgunov Sh.Sh., Obidov M.I.
Effect of rock mass discontinuities on underground mine stability (Uzbekistan)............170

Kukartsev V.V., Stupina A.A., Khudyakova E.V., Stepantsevich M.N., Matasova I.Yu.
Diagnostics of the structure of crystalline materials of rock formations by the method of thermally stimulated depolarization....182

Medetov Sh.M., Zaidemova Zh.K., Suyungariev G.E.
Oscillatory dynamics of rigging operations in the development of exploration wells......196

Mustapayeva S., Nikolaeva S., Kabanov P., Omarova G., Assambayeva A.
New ammonoid records and gamma-spectrometry in the stratotype of the Beleutian regional substage (Central Kazakhstan) 215

Nurpeissova M., Menayakov K., Aitkazinova Sh., Nukarbekova Zh., Bakyt N.K.
Environmental and industrial safety of subsurface development near a nuclear power plant...231

Obeidat M.A., Shmoncheva Y.Y., Jabbarova G.V.
Immiscible displacement of Herschel–Bulkley fluids in porous media: a modified Buckley–Leverett approach...247

Sakhmetova G.E., Uralov B.K., Brener A.M., Turymbetova G.D., Absamatova Z.
System analysis of scaling problems while designing biogas plants in the context of energy...274

Salikhov T.K., Issayeva Zh.B., Onal H., Akhmetzhanov Zh.B., Atasoy E.
Using GIS technologies and traditional ground-based methods to analyze the vegetation cover of ecosystems in the West Kazakhstan Region...286

Satybaldina D., Teshebayev N., Shmitov N., Kissikova N., Zakarina A.
Methods for improving oil production efficiency using pumping units...........................303

Shalabaeva G.S., Abdimutalip N.A., Koishiyeva G.Zh., Ozler M.A., Toychibekova G.B.
Study of hydrological and geostructural changes in the koskorgan reservoir due to climatic changes...318

Suiintayeva S.Ye., Bakhtybayev N.B., Imangazin M.K., Andagulov D.T., Atageldiyev K.T.
Experience in the use of self-propelled drilling rigs to increase the efficiency of drilling and blasting operations with sublevel mining systems..................................332

Tolesh A.B., Mamitova A.D., Karlykhanov O.K., Tazhieva T.Ch., Kalmakhanova M.S.
Flow regulation of the Syrdarya River at Shardara under energy releases.......................345

Torekhanova M.T., Tleuzhanova G.B., Yeserkegenova B.Zh., Kadyrov Zh.N., Kadyrova B.B.
Innovative technical approaches to the development of automatic control systems for bitumen-chip spreading...362

Tynchenko V.S., Krasovskaya L.V., Ashmarina T.I., Kononenko R.V., Shtyrkhunova N.A.
Geomechanical justification of underground mining technologies for ore deposits in complex rock massifs from the standpoint of nature and resource conservation.............382

Zholtayev G.Zh., Rassadkin V.V., Umarbekova Z.T., Mashrapova M.A., Miniskul S.D.
Formation and development prospects of placer gold deposits in Southern Junggar.......396

NEWS OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC
OF KAZAKHSTAN, SERIES OF GEOLOGY AND TECHNICAL SCIENCES
ISSN 2224–5278
Volume 1.
Number 475 (2026), 231–246

https://doi.org/10.32014/2026.2518-170X.601

UDC 622.528
IRSTI 38.27.01

©Nurpeissova M.[1]*, Menayakov K.[1], Aitkazinova Sh.[1], Nukarbekova Zh.[1], Bakyt N.K.[2], 2026.
[1]Kazakh National Technical University named after K.I.Satpayev, Almaty, Kazakhstan;
[2]International Information Technologies University, Almaty, Kazakhstan.
e-mail: marzhan-nurpeissova@rambler.ru

ENVIRONMENTAL AND INDUSTRIAL SAFETY OF SUBSURFACE DEVELOPMENT NEAR A NUCLEAR POWER PLANT

Nurpeissova Marzhan — Doctor of technical sciences, Professor of Satbayev University, Almaty, Kazakhstan,
E-mail: marzhan-nurpeissova@rambler.ru, https://orcid.org/0000-0002-3956-5442;
Menayakov Канат — Candidate of Technical Sciences, Associate Professor of Satbayev University, Almaty, Kazakhstan,
E-mail: k.menayakov@satbayev.university, https://orcid.org/0000-0001-8578-3515;
Aitkazinova Shynar — PhD, Associate Professor, Satbayev University, Almaty, Kazakhstan,
E-mail: sh.aitkazinova@satbayev.university, https://orcid.org/0000-0002-0964-3008;
Nukarbekova Zhupargul — PhD student, Satbayev University, Almaty, Kazakhstan,
E-mail: z.nukarbekova@satbayev.university, https://orcid.org/0000- 0002-1605-8907;
Bakyt Nurperzent — Master of Engineering Sciences, Assistant of the International Information Technologies University, Almaty, Kazakhstan,
E-mail: nurperzentbakyt@gmail.com, https://orcid.org/0009-0003-3545-4328.

Abstract. The article analyzes existing methodologies for determining the boundaries of exclusion zones around nuclear power plants (NPPs), with a focus on radiation safety criteria established by the International Atomic Energy Agency (IAEA). International experience gained from the Chernobyl and Fukushima NPP accidents, as well as studies conducted at the Semipalatinsk nuclear test site, is reviewed.

Special attention is given to the application of geographic information systems (GIS) and the Google Earth Engine platform for the analysis, modeling, and visualization of exclusion zones in accordance with the zoning principles applied after the Fukushima NPP accident. The paper presents calculations based on geospatial data and exclusion zone radii recommended by the IAEA. The advantages of using GIS and remote sensing technologies for accurate boundary delineation, radiation risk assessment, and decision-making support are demonstrated.

In the context of the Republic of Kazakhstan, where the rational use of mineral resources is a priority of the national economy, the study emphasizes the need to ensure environmental and industrial safety within the impact zones of proposed NPP construction sites. Particular attention is paid to the protection of strategically important mineral deposits, including the Akbakay gold-bearing zone located near the planned NPP site.

The article presents the results of geodetic monitoring of surface deformation processes and the zoning of radiation-contaminated lands with the determination of their cadastral value.

The scientific novelty lies in the proposed method for creating a geodynamic polygon that enables effective control of land deformation dynamics and adjustment of land valuation depending on the level of radiation contamination.

The practical significance of the method is confirmed by its application in the dissertation research of master's and doctoral students at K.I. Satbayev Kazakh National Research Technical University.

Keywords: NPP, Akbakay deposit, radiation safety, industrial safety, environmental safety, radiation contamination zone, exclusion boundary

The study was conducted within the framework of grant funding from the Ministry of Science and Higher Education of the Republic of Kazakhstan (AP26100471).

For citations: *Nurpeissova M., Menayakov K., Aitkazinova Sh., Nukarbekova Zh., Bakyt N.K. Environmental and Industrial Safety of Subsurface Development near a Nuclear Power Plant. News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences. 2026. No.1. Pp. 231–246. DOI: https://doi.org/10.32014/2026.2518-170X.601*

©Нұрпейісова М.[1]*, Менаяқов Қ.[1], Айтказинова Ш.[1], Нукарбекова Ж.[1], Бақыт Н.К.[2], 2026.

[1]Қ.И. Сәтбаев атындағы Қазақ ұлттық техникалық зерттеу университеті, Алматы, Қазақстан;

[2]Халықаралық ақпараттық технологиялар университеті, Алматы, Қазақстан.

E-mail: marzhan-nurpeissova@rambler.ru

АТОМ ЭЛЕКТР СТАНЦИЯСЫНА ЖАҚЫН АУМАҚТАРДА ЖЕР ҚОЙНАУЫН ИГЕРУДІҢ ЭКОЛОГИЯЛЫҚ ЖӘНЕ ӨНЕРКӘСІПТІК ҚАУІПСІЗДІГІ

Нұрпейісова Маржан — техника ғылымдарының докторы, Қ.И. Сәтбаев атындағы Қазақ ұлттық техникалық зерттеу университетінің профессоры, Алматы, Қазақстн,
E-mail: marzhan-nurpeissova@rambler.ru, https://orcid.org/0000-0002-3956-5442;

Менаяқов Қанат — техника ғылымдарының кандидаты, Қ.И. Сәтбаев атындағы Қазақ ұлттық техникалық зерттеу университетінің қаумд.профессоры, Алматы, Қазахстан,

E-mail: k.menayakov@satbayev.university, https://orcid.org/0000-0001-8578-3515;
Айтказинова Шынар — PhD, ассоциированный профессор, Казахский национальный технический исследовательский университет имени К.И. Сатпаева, Алматы, Қазақстан;
E-mail: sh.aitkazinova@satbayev.university, https://orcid.org/0000-0002-0964-3008;
Нукарбекова Жұпаргүл — PhD докторант, Қ.И. Сәтбаев атындағы Қазақ ұлттық техникалық зерттеу университеті, Алматы, Қазахстан,
E-mail: z.nukarbekova@satbayev.university, https://orcid.org/0000- 0002-1605-8907;
Бакыт Нұрперзент — техника ғылымдарының магистрі, Халықаралық ақпараттық технологиялар университетінің ассистенті, Алматы, Қазақстан,
E-mail: nurperzentbakyt@gmail.comhttps://orcid.org/0009-0003-3545-4328.

Аннотация. Мақалада атом электр станциялары (АЭС) айналасындағы оқшаулау аймақтарының шекараларын анықтаудың қолданыстағы әдістемелері Халықаралық атом энергиясы агенттігі (МАГАТЭ) ұсынған радиациялық қауіпсіздік критерийлері тұрғысынан талданады. Чернобыль және Фукусима АЭС-теріндегі апаттардан кейін жинақталған халықаралық тәжірибе, сондай-ақ Семей ядролық сынақ полигоны аумағында жүргізілген зерттеулер қарастырылған.

Геоақпараттық жүйелерді (ГАЖ) және Google Earth Engine платформасын пайдалану арқылы Фукусима АЭС-індегі апаттан кейін қолданылған аймақтарға бөлу қағидаттарына сәйкес оқшаулау аймақтарын талдау, модельдеу және визуализациялау мәселелеріне ерекше назар аударылған. Мақалада МАГАТЭ ұсынған оқшаулау аймақтарының радиустары мен геокеңістіктік деректер негізінде орындалған есептеулер келтірілген. ГАЖ және Жерді қашықтан зондтау технологияларын қолданудың радиациялық тәуекелдерді бағалау, оқшаулау аймақтарының шекараларын дәл анықтау және басқарушылық шешімдер қабылдау тиімділігін арттырудағы артықшылықтары көрсетілген.

Қазақстан Республикасы жағдайында, минералдық-шикізат ресурстарын ұтымды пайдалану ұлттық экономиканың басым бағыттарының бірі болып табылатындықтан, болашақта салынуы жоспарланған АЭС алаңдарының әсер ету аймақтарында экологиялық және өнеркәсіптік қауіпсіздікті қамтамасыз ету қажеттілігі атап өтіледі. Әсіресе жоспарланған АЭС құрылысы аймағына жақын орналасқан Ақбақай алтын кен орны сияқты стратегиялық маңызы бар пайдалы қазба кен орындарын қорғау мәселесіне көңіл бөлінген.

Мақалада жер бетінің деформациялық үдерістерін геодезиялық мониторингтеу және радиациялық ластанған жерлерді аудандастыру нәтижелері, сондай-ақ олардың кадастрлық құнын анықтау ұсынылған.

Ғылыми жаңалығы радиациялық ластану деңгейіне байланысты жерлердің бағасын түзетуге және деформация динамикасын тиімді бақылауға мүмкіндік беретін геодинамикалық полигон құру әдісін ұсыну болып табылады.

Ұсынылған әдістің практикалық маңыздылығы оның Қ.И. Сәтбаев атындағы Қазақ ұлттық техникалық зерттеу университетінің магистранттары мен докоранттарының диссертациялық жұмыстарында қолданылуымен расталады.

Түйін сөздер: АЭС, Ақбақай кен орны, радиациялық қауіпсіздік, өндірістік қауіпсіздік, экологиялық қауіпсіздік, радиациялық ластану аймақ, қауіпсіздік аймағы

©Нурпеисова М.[1]*, Менаяков К.[1], Айтказинова Ш.[1], Нукабекова Ж.[1], Бакыт Н.К.[2], 2026.

[1]Казахский национальный исследовательский технический университет имени К. И. Сатпаева, Алматы, Казахстан;

[2]Международний университет информационных технологий, Алматы, Казахстан.

E-mail: marzhan-nurpeissova@rambler.ru

ЭКОЛОГИЧЕСКАЯ И ПРОМЫШЛЕННАЯ БЕЗОПАСНОСТЬ ОСВОЕНИЯ НЕДР НА ТЕРРИТОРИИ, ПРИЛЕГАЮЩИХ К АТОМНОЙ ЭЛЕКТРОСТАНЦИИ

Нурпеисова Маржан — доктор технических наук, профессор Казахского национального исследовательского технического университета имени К.И. Сатпаева, Алматы, Казахстан,
E-mail: marzhan-nurpeissova@rambler.ru, h ttps://orcid.org/0000-0002-3956-5442;
Менаяков Канат — кандидат технических наук, ассоциров.профессор Казахского национального исследовательского технического университета имени К.И. Сатпаева, Алматы, Казахстан,
E-mail: k.menayakov@satbayev.university, https://orcid.org/0000-0001-8578-3515;
Айтказинова Шынар — PhD, ассоциированный профессор, Казахский национальный исследовательский технический университет им. К.И. Сатпаева, Алматы, Казахстан,
E-mail: sh.aitkazinova@satbayev.university https://orcid.org/0000-0002-0964-3008;
Нукарбекова Жупаргуль — докторант Казахского национального исследовательского технического университета имени К.И. Сатпаева, Алматы, Казахстан,
E-mail:z.nukarbekova@satbayev.university, https://orcid.org/0000-0002-1605-8907;
Бақыт Нұрперзент — магистр технических наук, ассистент, Международний университет информационных технологий, Алматы, Қазақстан,
E-mail: nurperzentbakyt@gmail.com, https://orcid.org/0009-0003-3545-4328.

Аннотация. В статье анализируются существующие методологии определения границ зон отчуждения вокруг атомных электростанций (АЭС) с акцентом на критерии радиационной безопасности, рекомендованные Международным агентством по атомной энергии (МАГАТЭ). Рассматриваются международный опыт, полученный в результате аварий на Чернобыльской и Фукусимской АЭС, а также результаты исследований, выполненных на территории Семипалатинского ядерного полигона. Особое внимание уделяется применению геоинформационных систем (ГИС) и платформы Google Earth Engine для анализа, моделирования и визуализации зон отчуждения в соответствии с принципами зонирования, использованными после аварии на АЭС «Фукусима». Приведены расчёты, выполненные на основе геопространственных данных и радиусов зон отчуждения, рекомендованных МАГАТЭ. Показаны преимущества использования ГИС и технологий дистанционного зондирования Земли для точного определения границ зон отчуждения, оценки радиационных рисков и поддержки управленческих решений. В контексте Республики Казахстан, где рациональное использование минерально-сырьевых ресурсов является приоритетом национальной экономики, подчёркивается необходимость обеспечения экологической и промышленной безопасности в зонах влияния предполагаемых площадок строительства АЭС. Отдельно рассматривается защита стратегически важных месторождений полезных ископаемых, в частности золоторудной зоны Акбакай, расположенной вблизи планируемой площадки АЭС. Представлены результаты геодезического мониторинга деформационных процессов земной поверхности, а также районирования радиационно загрязнённых земель с определением их кадастровой стоимости. Научная новизна работы заключается в предложении метода создания геодинамического полигона, позволяющего эффективно контролировать деформации земель и корректировать их оценку в зависимости от уровня радиационного загрязнения. Практическая значимость предложенного подхода подтверждена его использованием в диссертационных исследованиях магистрантов и докторантов КазНИТУ имени К.И. Сатпаева.

Ключевые слова: АЭС, Акбакайское месторождение, радиационная безопасность, промышленная безопасность, экологическая безопасность, зона радиационного загрязнения, граница отчуждения

Introduction. Construction of nuclear power plant in Kazakhstan will solve environmental problems, increased consumption and depreciation of old stations, and will also create new jobs and become «solid foundation for the country's energy security». By official resolution, the Government of the Republic of Kazakhstan has designated the site for the first NPP in the country. The facility will be constructed in the village of Ulken, located in the Zhambyl district of the Almaty region (Figure 1). The village is situated on the shores of Lake Balkhash, waters of which are planned to be used to meet plant's operational needs.

The Republic of Kazakhstan, as the client for the construction of the country's first nuclear power plant (NPP), serves as the general operator within the consortium for the project. Participating in the project is Rosatom, which has extensive experience and expertise in constructing NPPs abroad. Given China's significant achievements in building civilian nuclear facilities, negotiations are also underway with the China National Nuclear Corporation (CNNC). The French company Électricité de France (EDF) has likewise expressed interest in the project.

In June 2025, an international consortium for the construction of Kazakhstan's first NPP was selected. Following a highly competitive tender, Rosatom emerged as the leader, having presented the most optimal proposal for the project's implementation. As a result, the first NPP in the settlement of Ulken, Kazakhstan, will be built according to one of the most advanced and efficient designs in the world, based on Russian technologies. Ulken is expected to become, in the future, a “garden city” and a hub attracting scientific and technological talent from across Kazakhstan.

On 8 August, 2025 a groundbreaking ceremony for the NPP was held in the Almaty Region near the village of Ulken. The settlement, located on the shores of Lake Balkhash, has now become a focal point of the country’s energy agenda. The distance to the district center is 289 km, and to the regional center, the city of Konaev, 330.

The event was attended by students of the National Research Nuclear University MEPhI in Almaty – future engineers of the nuclear industry. This is symbolic: the project is already giving impetus to the development of science, knowledge, and engineering education in the country. Thanks to the implementation of the NPP project, Kazakhstan will gain a new generation of professionals, the advancement of its research base, and opportunities for educational and technological breakthroughs.

The Chinese company CNNC is expected to construct the second and third NPPs in western Kazakhstan, a region that has recently faced power shortages and is projected to see a sharp increase in electricity demand due to the planned construction of petrochemical plants. (On approval, 2017, № 330; On approval, 2020, № KR DSM-275)

Figure 1 - Location of future nuclear power plant

The *study aims* to calculate and visualize Kazakhstan’s NPP exclusion zones using GIS in line with IAEA standards.

Research objective. To enhance industrial and environmental safety in the development of natural resources through comprehensive monitoring of areas adjacent to nuclear power plants using modern technologies.

Materials and methods. Object of the study is the future NPP of the Republic of Kazakhstan. Alienation of the territory around the NPP is achieved by conducting geodetic work using remote sensing, UAVs and the development of GIS.

Results and discussion. Decision to construct nuclear power plant in Kazakhstan has already been officially made. At present, attention is focused on identifying and protecting natural and mineral assets potentially vulnerable to radiation impact of future facility. Foremost among these is one of Kazakhstan's most valuable ecological sites- Lake Balkhash- along with its surrounding natural ecosystems. Additionally, protection measures must consider the region's mineral wealth, previously explored under guidance of K.I. Satpayev and documented in the metallogenic map of Kazakhstan. These include copper ore deposits of Central Kazakhstan and the Akbakay gold ore zone, which lies adjacent to the village of Ulken (indicated by a red star in Figure 1).

Ecological systems of Kazakhstan are characterized by low resilience to anthropogenic impacts. Approximately 75% of the country's territory including the Aral Sea region, the Semipalatinsk Nuclear Test Site (STS), the Caspian Sea coast, as well as the desert and semi-desert pastures of Central and Southern Kazakhstan is exposed to elevated risks of environmental destabilization. Of particular concern is the Semipalatinsk Test Site, which served as one of the primary locations for nuclear weapons testing over a span of 40 years, leaving a legacy of long-term ecological and radiological consequences (Zholtaev, Nalibayev. 2018; Zejlik, 2013).

Currently, various economic activities are being carried out within territory of the former Semipalatinsk Test Site, including the development of the Karazhyra coal deposit, salt extraction from Lake Zhaksytuz, geological surveying and exploration, hay harvesting, and livestock grazing. These activities, on the one hand, contribute to potential redistribution of radioactive contaminants both within the boundaries of the test site and beyond. On the other hand, they pose additional risks to workers directly involved in these operations, to local population, and to end-users of products originating from affected area (Nurpeissova et al.,2025).

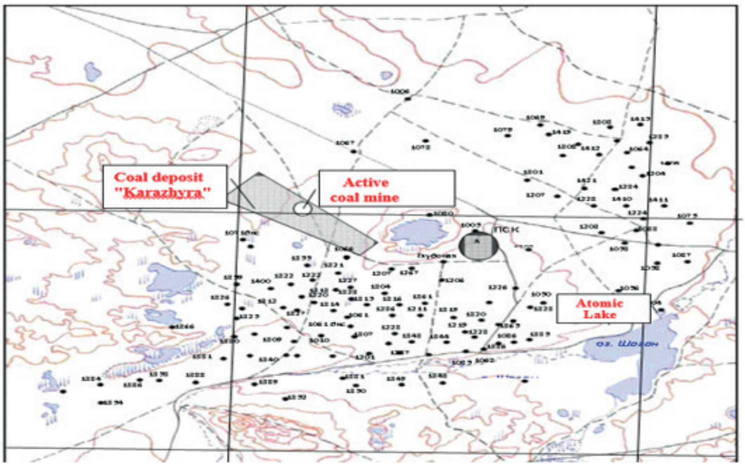

Figure 2 - Map of the location of test wells at the Balapan site, the «Karazhyra» coal deposit and the « Atomic Lake»

Exploitation of mineral deposits without due consideration of radioactive environment and without referencing hydrogeological maps of radionuclide contamination may result in the long-term loss of these resources. Contamination of territory, soil, and mineral reserves can persist for hundreds or even thousands of years, rendering them unsuitable for safe use. Therefore, comprehensive environmental studies - including assessments of soil and vegetation cover, water and air quality, wildlife, and developed mineral deposits—are of critical importance for the sustainable development of the region. Lands within and adjacent to the former test site, affected by radionuclide fallout, require continuous monitoring and evaluation to determine their suitability for use in agriculture, industry, and other economic sectors (Nurpeissova et al., 2002).

As for the Semipalatinsk test site, according to estimates by the Institute of High Energy of the Academy of Sciences of Kazakhstan, «some contaminated areas of the test site will pose a danger and remain uninhabitable for over a thousand years». Plus, a significant part of its territory and adjacent areas of the Pavlodar, Abay, East Kazakhstan and Karaganda regions are still recognized as ecological disaster zones. Radius of destruction even today reaches almost 800 kilometers, subdivided into four zones - 150, 300, 500 and 775 kilometers.

Example is explosion at the Chernobyl Nuclear Power Plant, which spread a radioactive cloud not only across Ukraine, Russia and Belarus, but also affected several European countries as far as Italy. Today, there is a 300-kilometer exclusion zone around the Chernobyl Nuclear Power Plant. Many animals died there immediately after the disaster. The forest area near the Chernobyl Nuclear Power Plant, which was called the «Red Forest», also suffered from radiation.

The Akbakay gold mining region is situated in the Moyynkum district of the Zhambyl region, approximately 450 km northwest of Almaty. Located to the west of the planned nuclear power plant, the region encompasses more than 20 primary ore deposits and associated alluvial gold placers. Notable deposits include Akbakay, Kengir, Kenjem, Svetinskoye, Duman-Shuak, Beskempir, Samorodnoye, and Karyernoye, among others (Figure 3).

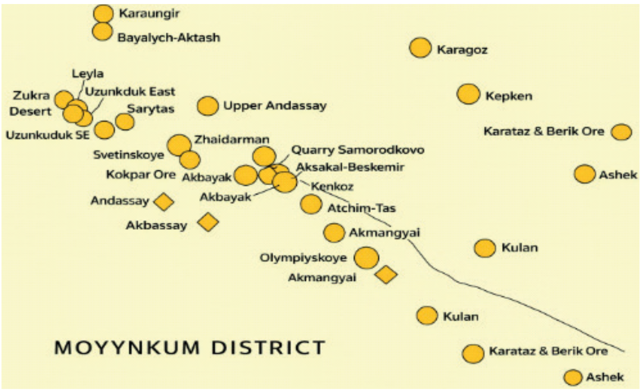

Figure 3 - Layout of the central part of the Akbakay gold mining region

Geographically, the *Akbakai* site is located within the Balkhash watershed, which represents a slightly undulating terrain with absolute elevations ranging from 460 to 515 m. Ore extracted from these sites is processed at the Akbakay gold recovery plant, where dore alloy is produced (Rafailovich, 2011; Nurpeisova et al.2004; Prague, 2021).

Geographical and Geological Characteristics of the Akbakai Ore Field and Nearby Deposits.

The Akbakai deposit is a quartz–vein type gold ore occurrence containing 3–7% sulfides in fluxing ore. Further development potential lies in the flanks, deeper horizons, and nearby occurrences within the ore field. The upper 20 m have been mined by open-pit methods; current access is via the Glavnaya and RESH-1 shafts (down to the 400 m horizon) and the NTS-1 and NTS-2 ramps. Active mining is conducted at the 260 m, 340 m, and 400 m horizons. Planned development includes shaft and ramp deepening for extraction of reserves approved by the State Commission on Mineral Reserves of Kazakhstan (GKZ RK) down to 580 m. (Vaulin, 2016; Supplemen, 2020).

The Svetinskoe deposit, 20 km west of Akbakai, comprises three stockwork ore zones and Ore Body IV, with an average gold grade of 13 g/t and fineness above 900. Rare-earth minerals of the yttrium and lanthanum groups are present.

The Kenzhem deposit, 7 km south of Akbakai, extends for 1,500 m along strike to a depth of 200 m, with widths from 2–3 m to 10 m. Notable veins include a 52 m vein (3.2 m thick, 5.3 g/t gold) and a 40 m vein (0.9 m thick, 10.4 g/t gold). Mining and drilling to 300 m depth are ongoing.

Beskempir, located 3 km east of Akbakai, is accessed via the RESH-2 shaft (down to 180 m) and the NTS-3 ramp, with mining at 180 m and 260 m. Approved reserves are to be mined to the 390 m horizon.

Aksakal, within the Akbakai ore field, is a vein–disseminated, stockwork-type deposit of medium reserves, currently accessed through the Glavnaya shaft (to 120 m). Plans include deepening to 500 m via NTS-4.

Kariernoe, also within the ore field, is a small quartz–vein deposit in the contact zone of the Kyzylzhartas granodiorite massif, mined entirely by open-pit methods.

The Duman–Shuak deposit, 6 km southeast of Akbakai, has a main ore zone 1,000 m long, 2–25 m thick, with average grades of 3.2 g/t gold (9.4 m thickness) and 6.4 g/t in the core zone (2.8 m thickness). Ores are suitable as second-grade quartz flux and contain on average 2.8 g/t silver.

Other deposits in the Akbakai gold-bearing zone — *Kengir, Karagoz, Kepken, and Taskuduk* — are under exploration.

These mineral resources, described by K.I. Satpayev, are located near the proposed site of a nuclear power plant (NPP), regarded as a key component of Kazakhstan's energy security (Satpayev, 1980).

According to the recommendations of the International Atomic Energy Agency (IAEA), the exclusion zone around a nuclear power plant (NPP) should be delineated to ensure adequate protection of the population from potential radiation exposure in the event of an accident. Different countries adopt varying approaches to determining the dimensions of such zones; however, the most widely applied method is the establishment of a 30-kilometer radius. Defining the boundaries of exclusion zones is a complex process that involves legal frameworks, mathematical modeling, geographic information systems (GIS), and remote sensing technologies. This paper examines the key criteria and methodologies used for delineating exclusion zones, as well as practical examples of their implementation in different national contexts, including the Chernobyl and Fukushima nuclear accidents.

Timely delineation of exclusion zones is critical for minimizing the consequences of radiation contamination following nuclear accidents. As a rule, exclusion zones are subdivided into several categories depending on the radiation exposure level.

According to the IAEA (International Atomic Energy Agency, 2015) regulations, the emergency planning zone should cover a radius of 30 km from the reactor.], the emergency planning zone should cover a 30-kilometer radius from the reactor. Within this area, elevated radiation levels may occur, necessitating immediate protective actions. The importance of this approach was demonstrated during the Chernobyl disaster, when the exclusion zone was expanded from the initial 3 kilometers to 30 kilometers in some areas only days after the accident.

The referenced document further specifies an *immediate protective action zone* with a radius of 5–10 kilometers, intended for prompt evacuation and, if required, provision of shelter in specially equipped facilities. The *early protective action zone*, extending from 10 to 30 kilometers, requires additional protective measures, including iodine prophylaxis and shielding against external radiation. Beyond this, a *long-term control zone*, which may extend up to 50 kilometers from the facility, involves continuous monitoring of radiological conditions to assess and mitigate potential long-term risks to public health and the environment.

An exclusion zone is defined as a designated geographic area where public access is restricted or prohibited due to potential or actual radiological hazards. Its delineation aims to ensure radiation safety, protect the environment, and minimize adverse health impacts on the population. The recommended size of exclusion zones depends on multiple factors, including the type and capacity of the NPP, as well as the potential scale and severity of a radiological incident.

At present, the size of exclusion zones established around nuclear power plants varies significantly between countries. For example, in the United States, exclusion zones generally extend 10 miles (approximately 16 kilometers) from the facility. In contrast, Japan implemented a 30-kilometer exclusion zone around the Fukushima Daiichi Nuclear Power Plant after the 2011 accident, in line with IAEA recommendations.

The Fukushima nuclear accident of 2011 illustrates the practical application of international safety standards under emergency conditions. Following the earthquake and subsequent tsunami, which caused the release of large quantities of radioactive materials, Japanese authorities initially mandated evacuation within a 20-kilometer radius. As the situation developed—particularly in response to the trajectory of the radioactive plume and prevailing meteorological conditions—the evacuation zone was expanded to 30 kilometers. This response is often cited as a clear example of the effective application of international radiological safety protocols during a large-scale nuclear disaster (Kishin, 2008).

Discussion of the results. The Google Earth Engine (GEE) cloud platform, which has extensive spatial data processing and visualization capabilities, was used to analyze and visually display the exclusion zone for nuclear power plants. As part of the study, the exclusion zone around the Fukushima-1 nuclear power plant in Japan was also modeled based on geographic information data.

• *Fukushima coordinates*: In the first line, the fukushima object was set, which is a point on the map with coordinates 141.0344 (longitude) and 37.4213 (latitude), which corresponds to the location of the Fukushima-1 nuclear power plant.

•*Exclusion zone:* Using the buffer (30000) method, a circle with a radius of 30 km was created around the NPP point. This radius corresponds to the exclusion zone recommended by the IAEA to protect the public from radiation risks in the event of an accident.

• *Visualization:* Next, we used the Map.set center method to set the center of the map to Fukushima and set the scale. For clarity, we added two layers: Exclusion zone: The radius of 30 km around Fukushima is shown in red.

• *NPP point*: In blue, the location of the nuclear power plant is shown.

• *Result*: as a result of executing this code, a clear visual image of the exclusion zone around Fukushima was obtained on the map, which made it possible to clearly see which area of the territory falls into the zone of increased radiation risk (Figure 4).

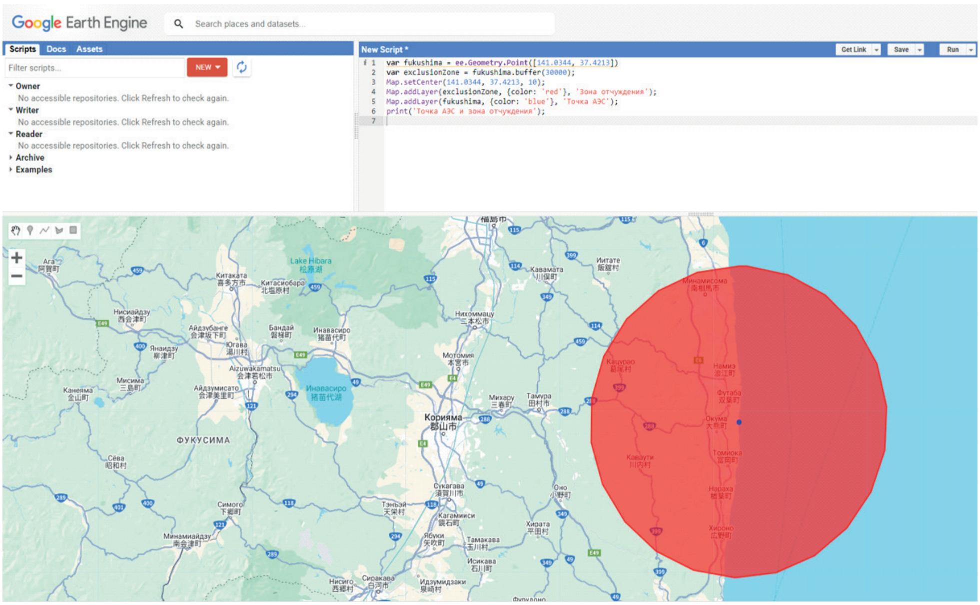

Figure 4 - Visual representation of the Google Earth Engine program with the code and the resulting image of the zone

Modern mathematical modeling techniques are increasingly employed to enhance the accuracy of predicting exclusion zone boundaries. One of the most widely used tools for assessing the atmospheric dispersion of radioactive particles is the HYSPLIT (Hybrid Single-Particle Lagrangian Integrated Trajectory) model. This model enables simulation of radionuclide transport and dispersion in the atmosphere, considering meteorological data and emission parameters. In practical applications, such models play a critical role in development of emergency planning zones, particularly in scenarios involving large-scale radioactive releases—as exemplified by measures taken in Japan following the Fukushima Daiichi nuclear accident (NP-001-15. *General Provisions*; Agee et al., 1994; Ivanov et al., 2016).

Another notable example of the effective use of monitoring and modeling technologies is the application of satellite remote sensing data. Satellite systems such as Landsat-8 and Sentinel-2 provide high-resolution imagery that enables detailed monitoring of radioactive contamination, particularly in remote or inaccessible regions. In the aftermath of nuclear power plant accidents, satellite data have become a crucial tool for the precise delineation and mapping of contaminated areas. For instance, in the Chernobyl Exclusion Zone, satellite imagery has been instrumental in detecting changes in vegetation cover, thereby facilitating the assessment of radiation-induced impacts on local ecosystems.

Remote sensing technologies also played a significant role in the post-accident rehabilitation of territories affected by the Fukushima Daiichi nuclear disaster. In particular, unmanned aerial vehicles (UAVs) were deployed to map radiation-contaminated areas, providing high-resolution data on the spatial distribution of radioactive materials at various altitudes and ground levels. This method allowed for more precise assessment of contamination patterns and facilitated targeted decontamination efforts. Moreover, UAV-based monitoring was applied to evaluate condition of critical infrastructure and natural environments, including water bodies and forested areas, which are particularly vulnerable to long-term environmental consequences of radiological exposure

Additionally, model of exclusion zone was constructed in Google Earth Engine (GEE) for the area surrounding village of Ulken, where construction of nuclear power plant is planned (coordinates: 45.206815, 73.930981). As shown in Figure 5, circular buffer with a radius of 30 kilometers was generated, in accordance with IAEA safety recommendations (Abdirov and Tursbekov 2025).

The red circle on the map delineates boundaries of projected exclusion zone, which serves as a basis for assessing the potential environmental and population-related impacts of the future facility. This approach helps to visualize potential limitations and plan safety measures.

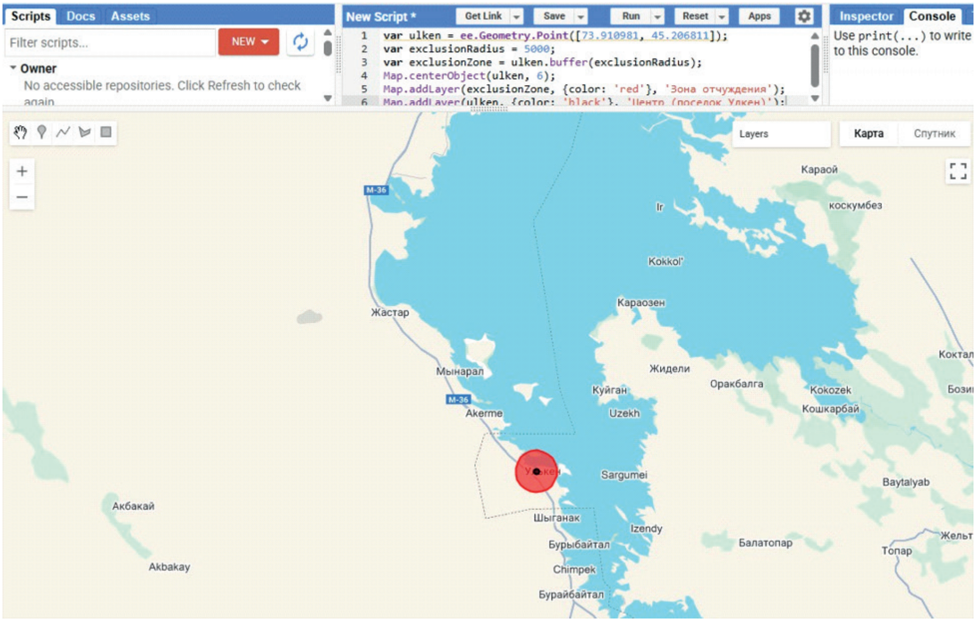

Figure 5 - Visualization of the exclusion zone around Ulken in Kazakhstan, where the first nuclear power plant is planned to be built

In addition, the use of dosimeters and spectrometers in field research makes it possible to accurately measure gamma radiation levels in infected areas. These data, in turn, are used to clarify the boundaries of exclusion zones and make decisions about possible evacuation or return of the population. In the Chernobyl zone and in the nearby regions of Ukraine, such research continues to this day, using new methods such as "smart" dosimeters that can provide real-time data (Nikitin, 2012).

As a result of the work using Google Earth Engine, a visual example of an exclusion zone around a nuclear power plant was created, based on the recommendations of the IAEA. The exclusion zone radius of 30 km has been determined, which has been successfully visualized on the map, which makes it possible to clearly see which area of the territory falls into the zone of increased radiation risk.

A model of the exclusion zone around the village of Ulken has also been created. Images reflecting the possible effects of radiation are obtained, and the results of the visualization code are presented. The exact coordinates and estimated boundaries of the potential high-risk area were obtained. The experience of Chernobyl, Fukushima and other disasters shows the importance of proper and timely assessment of radiation pollution. The accidents in Japan and Ukraine have become an example of the effective application of international standards.

The use of modern digital platforms, including GEE and remote sensing systems, ensures high accuracy in mapping radiation pollution, especially in remote areas. With the help of UAVs and satellites, regular data updates are possible, which is critically important for monitoring the dynamics of the environment. The application of the developed model to Kazakhstani conditions allows us to pre-assess the risks associated with the construction and operation of nuclear power plants, as well as to prepare the basis for the regulatory establishment of sanitary protection zones.

In addition, use of dosimeters and spectrometers in field studies allows for precise measurements of gamma radiation levels in contaminated areas. These data, in turn, are used to refine boundaries of exclusion zones and make decisions about possible evacuation or return of the population. In the Chernobyl zone and adjacent regions of Ukraine, such studies continue to this day, using new methods such as "smart" dosimeters that can provide data in real time (Nurpeisova et al., 2024).

As a result of the work carried out using the Google Earth Engine platform, a visual model of the exclusion zone around the proposed nuclear power plant was developed in accordance with the recommendations of the International Atomic Energy Agency (IAEA). A 30-kilometer radius was defined as the boundary of exclusion zone, enabling its successful geospatial visualization. This allowed for clear identification of the territory potentially falling within the zone of elevated radiological risk, thereby supporting further environmental assessments and safety planning.

Conclusions. Thus, nuclear power plants are the main cause of negative impact on the environment and safety of mineral resource development. Modern society is seriously concerned about solving the problems of mining ecology and industrial safety, on which the well-being of the current and future generations engaged in subsoil use depend.

The experience of Chernobyl, Fukushima and other disasters shows the importance of correct and timely assessment of radiation contamination. Ultimately, effective definition of exclusion zones helps to minimize damage to public health and the environment.

References

Abdirov M.M., Tursbekov S.V. (2025). O roli ekologicheskoy i promyshlennoy bezopasnosti pri opredelenii granits zon otchuzhdeniya vokrug AES [On the role of environmental and industrial safety in determining exclusion zone boundaries around nuclear power plants] Satpayev Readings. – Almaty: KazNITU. – P.125–129. (in Russian).

Ageyev, V.A., Vyrichek, S.L., Levshin, E.B., et al. (1994). Raspredelenie transuranovykh elementov v 30-kilometrovoy zone Chernobyl'skoy atomnoy elektrostantsii [Distribution of Transuranium Elements in the 30-km Zone of the Chernobyl Nuclear Power Plant] Reports of the Academy of Sciences of Ukraine. – No. 1. – P. 60–66. (in Russian).

Aitkazinova Sh.K., Imansakipova B.B., Sdvizhkova O.O., Kirgizbaeva D.M., Imansakipova A.B. (2025). Localization of the sinkhole hazard of the earth's surface during underground mining. News of the National Academy of sciences of the Republic of Kazakhstan, Series of geology and technical sciences. ISSN 2224–5278. – Vol. – 4. – No.472. – P. 8–26. DOI:10.32014/2025.2518-170x.527 (in English).

Dopolnenie i korrektirovka proekta stroitel'stva vtoroy ocheredi Akbakayskogo gorno-obogatitel'nogo kombinata po osvoeniyu mestorozhdeniya "Akbakai", etap II stroitel'stva. Vskrytie i otrabotka zapasov nizhe otmetki +296 m (gor. 180) do otmetki –104 m (gor. 580) mestorozhdeniya "Akbakai". [Supplement and adjustment to the project for the construction of the second phase of the Akbakai Mining and Processing Plant for the development of the "Akbakai" deposit, Stage II of construction. Opening and extraction of reserves below el. +296 m (el. 180) to el. –104 m (el. 580) of the “Akbakai”] deposit. JSC “AK Altynalmas”, LLP “Kaz Techno Project”. 2020. (in Russian).

International Atomic Energy Agency (IAEA). (2015). GSR Part 7: Preparedness and Response for a Nuclear or Radiological Emergency. IAEA. (in English).

Ivanov, E.A., Kosov, A.D., Illarionenkova, D.V. (2016). Problemy avariynogo zonirovaniya territoriy vokrug atomnoy elektrostantsii [Problems of emergency zoning of territories around the nuclear power plant] Moscow: ANRI. – No. 4. – P. 2–3. (in Russian)

Kishin V.V. (2012). Koncepciya upravleniya promyshlennoy bezopasnost'yu opasnykh proizvodstvennykh ob’ektov [Concept of Industrial Safety Management for Hazardous Production Facilities]. International Scientific Readings “White Nights”-2008”. Chast' II. S. 253–257. Sankt-Peterburg, 2008. (in Russian).

Nikitin S.G. (2012). Primenenie distantsionnogo zondirovaniya dlya monitoringa radiatsionnogo zagryazneniya [Application of Remote Sensing for Monitoring Radiation Contamination]. "Geographic Information Systems". – No. 6. – Pp. 21–34. (in Russian).

NP-001-15. Obshchie polozheniya po obespecheniyu bezopasnosti atomnykh elektrostantsiy [General provisions for ensuring safety of nuclear power plants] (in Russian).

Nurpeisova M., Umirbaeva A., Fedorov E. (2021). Assessment of deformed and radiological state territory based on integrated monitoring. Eurasian mining. – No.1. – Pp. 83–87. (in English).

Nurpeisova M.B., Madimarova G.S., Menayakov K.T. (2004). Ukazaniya po okhrane sooruzhenii i okruzhayushchei sredy ot vrednogo vliyaniya razrabotki mestorozhdeniya Akbakai [Guidelines for Protecting Structures and the Environment from the Harmful Impact of Akbakay Deposit Development]. – Almaty: KazNTU. – P. 27. (in Russian).

Nurpeisova M.B., Madimarova G.S., Menayakov K.T. (2021). Izuchenie napryazhenno-deformatsionnogo sostoyaniya porodnogo massiva mestorozhdeniya Akbakay [Study of the Stress–Strain State of the Akbakay Deposit Rock Mass] Proceedings of the scientific and practical conference. Praga. – P. 49–53. (in Russian).

Nurpeissova M., Umirbayeva A., Tursynbayev N., Donenbayeva N., Bakyt N.K. (2025) Assessment of deformation and radiation state of adjacent territories of the deposit “Karazhyra” News of the National Academy of Sciences of the Republic of Kazakhstan. Series of geology and technical sciences. ISSN 2224–5278. – Vol. 2. – No. 470. – P. 166-179. https:// DOI:10.32014/2024.2518-170X.498 (in English).

Ob utverzhdenii pravil ustanovleniya okhrannykh zon ob'ektov elektricheskikh setey i osobykh usloviy ispol'zovaniya zemel'nykh uchastkov, raspolozhennykh v granitsakh takikh zon prikaz ministra energetiki RK ot 28 sentyabrya 2017 goda № 330 [On Approval of the Rules for Establishing Protection Zones of Electric Power Facilities and Special Conditions for the Use of Land Plots Located within Such Zones: Order of the Minister of Energy of the Republic of Kazakhstan dated September 28, 2017. – No. 330. (in Russian).

Ob utverzhdenii Sanitarnykh pravil "Sanitarno-epidemiologicheskie trebovaniya k obespecheniyu radiatsionnoy bezopasnosti" Prikaz Ministra zdravookhraneniya RK ot 15 dekabrya 2020 goda № KR DSM-275/2020 [On Approval of the Sanitary Rules “Sanitary and Epidemiological Requirements for Ensuring Radiation Safety”. Order of the Minister of Health of the Republic of Kazakhstan dated December 15, 2020. – No. KR DSM-275/2020] (in Russian).

Rafailovich M.S., Mizernaya M.A., Dyachkov B.A. (2011), Krupnye zolotorudnye mestorozhdeniya v chernoslantsevykh formatsiyakh: usloviya formirovaniya i priznaki skhodstva [Large Gold Deposits in Black Shale Sequences: Formation Conditions, Similarity Indicators.]. – Almaty, EKSTU. – P. 272. (in Russian).

Satpayev K.I. (1980) Metallogeniya Kazakhstana. Rudnye formatsii. Zolotorudnye mestorozhdeniya. [Metallogeny of Kazakhstan. Ore Formations. Gold Deposits]. – Alma-Ata: Nauka. – P. 224. (in Russian).

Vaulin O.V. (2016). Zhambyl Region. Zoloto. [Zhambyl Region. Gold] Spravochnik.Taraz: «ROKIZOL». – P. 94. (in Russian).

Zejlik B.S. (2013). On the problem of strengthening of cupper-ore base in Zhezkazgan region with selection of perspective areas on new technology based of date remote sensing of the earth. News of the National Academy of Sciences of the Republic of Kazakhstan series of geology and technical. – No.6. – P.21-09. (in English).

Zholtaev G.Zh., Nalibayev M.I. (2018). Geodynamic model and oil and gas potential of the North Torgai Basin. News of the National Academy of Sciences of Kazakhstan. A series of geology and technical sciences. – No. 3. – P. 113-121. (in English).

Publication Ethics and Publication Malpractice in the journals of the Central Asian Academic Research Center LLP

For information on Ethics in publishing and Ethical guidelines for journal publication see http://www.elsevier.com/publishingethics and http://www.elsevier.com/journal-authors/ethics.

Submission of an article to the journals of the Central Asian Academic Research Center LLP implies that the described work has not been published previously (except in the form of an abstract or as part of a published lecture or academic thesis or as an electronic preprint, see http://www.elsevier. com/postingpolicy), that it is not under consideration for publication elsewhere, that its publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out, and that, if accepted, it will not be published elsewhere in the same form, in English or in any other language, including electronically without the written consent of the copyright-holder. In particular, translations into English of papers already published in another language are not accepted.

No other forms of scientific misconduct are allowed, such as plagiarism, falsification, fraudulent data, incorrect interpretation of other works, incorrect citations, etc. The Central Asian Academic Research Center LLP follows the Code of Conduct of the Committee on Publication Ethics (COPE), and follows the COPE Flowcharts for Resolving Cases of Suspected Misconduct (http://publicationethics. org/files/ u2/New_Code.pdf). To verify originality, your article may be checked by the Cross Check originality detection service http://www.elsevier.com/editors/plagdetect.

The authors are obliged to participate in peer review process and be ready to provide corrections, clarifications, retractions and apologies when needed. All authors of a paper should have significantly contributed to the research.

The reviewers should provide objective judgments and should point out relevant published works which are not yet cited. Reviewed articles should be treated confidentially. The reviewers will be chosen in such a way that there is no conflict of interests with respect to the research, the authors and/ or the research funders.

The editors have complete responsibility and authority to reject or accept a paper, and they will only accept a paper when reasonably certain. They will preserve anonymity of reviewers and promote publication of corrections, clarifications, retractions and apologies when needed. The acceptance of a paper automatically implies the copyright transfer to the Central Asian Academic Research Center LLP.

The Editorial Board of the Central Asian Academic Research Center LLP will monitor and safeguard publishing ethics.

Правила оформления статьи для публикации в журнале смотреть на сайтах:
www:nauka-nanrk.kz
http://www.geolog-technical.kz/index.php/en/
ISSN 2518-170X (Online),
ISSN 2224-5278 (Print)

Ответственный редактор *А. Ботанқызы*
Редакторы: *Д.С. Аленов, Т. Апендиев*
Верстка на компьютере: *Г.Д. Жадырановой*

Подписано в печать 06.02.2026.
Формат 70x90 $^{1}/_{16}$. 20,5 п.л.
Заказ 1.

«Central Asian Academic Research Center» LLP
Алматы, Шевченко к-сі, 28