Approved by the order of the
Chairman of the Committee of
Science No. 112-nzh

Competition documentation for program-targeted financing for scientific, scientific and technical programs for 2022-2024

1. General regulations

1. The competition is held on program-targeted funding for scientific, scientific and technical programs for 2022-2024 (hereinafter referred to as the Competition) aimed at implementing the Messages of the President of the Republic of Kazakhstan to the people of Kazakhstan, the Strategy "Kazakhstan-2050", the national project "Technological breakthrough through digitalization, science and innovation", the Concept of the development of science of the Republic of Kazakhstan on 2022-2026 and other strategic and program documents.

The purpose of the competition is to solve strategically important state tasks through the implementation of scientific, scientific and technical programs.

2. This competition documentation for program-targeted financing for scientific, scientific and technical programs for 2022-2024 (hereinafter referred to as the Competition Documentation) was developed in accordance with the Law of the Republic of Kazakhstan "On Science" dated February 18, 2011, the Regulation on National Scientific Councils approved by the Decree of the Government of the Republic of Kazakhstan dated May 16, 2011 No. 519 (next – Regulations on the NSC), the Rules of basic and program-targeted financing of scientific and (or) scientific and technical activities, as well as grant financing of scientific and (or) scientific and technical activities and commercialization of the results of scientific and (or) scientific and technical activities, approved by the Decree of the Government of the Repuoblic of Kazakhstan dated May 25, 2011 No. 575 (hereinafter – the Rules of Financing), and the Rules of organization and conduct of the state scientific and Technical expertise, approved by the Decree of the Government of the Republic of Kazakhstan dated August 1, 2011 No. 891 (hereinafter – the Rules of Expertise).

3. The competition documentation was developed by the Committee of Science of the Ministry of Education and Science of the Republic of Kazakhstan (hereinafter referred to as the Committee of Science).

4. The total amount of funding for 2022-2024 is 24,001.2 million tenge, including by year: 2022 – 4,436.6 million tenge, 2023 – 9,807.4 million tenge, 2024 – 9,757.2 million tenge, recommended by the National Scientific Councils (hereinafter – NSC) and approved by the Higher Scientific and Technical Commission.

5. Type of research: fundamental and applied research.

2. Names of priority and specialized scientific directions

Priority areas, amount of funding	Specialized scientific directions
Rational use of water resources, flora and fauna, ecology. The amount of financing is – 2 083.38 million tenge *(including 416.78 million tenge for 2022, 833.3 million tenge for 2023, 833.3 million tenge for*	1. Research of actual problems of soil quality, land degradation and desertification. 2. Conservation and rational use of the animal and plant world; 3. Development of geoinformation systems and monitoring of environmental objects; 4. Water purification, gas purification, soil and dust collection systems.

2024)	
Geology, extraction and processing of mineral and hydrocarbon raw materials, new materials, technology, safe products and structures The amount of financing is – 2,127.5 million tenge *(including – 425.5 million tenge for 2022, 851 million tenge for 2023, 851 million tenge for 2024)*	1. Geology and development of mineral deposits 2. Complex processing of hydrocarbon raw materials 3. Composition materials 4. Nanomaterials and nanotechnologies 5 New multipurpose materials based on natural raw materials and man-made waste 6. Production and processing of metals and materials
Energetics and mechanical engineering The amount of financing is – 1,420 million tenge *(including for 2022 – 284 million tenge, for 2023 – 568 million tenge, for 2024 – 568 million tenge)*	1. Heat and power industry and the impact of the energy sector on the environment, energy conservation; 2. Alternative energy and technologies: renewable energy sources, nuclear and hydrogen energy, other energy sources; 3. Transport, agricultural, oil and gas, mining and metallurgical engineering.
Information, communication and space technologies. The amount of financing is – 833.3 million tenge *(including for 2022 – 166.6 million tenge, for 2023 – 333.4 million tenge, for 2024 – 333.3 million tenge)*	1. Space technologies 2. High-performance computing technologies 3. Geoinformation technologies and systems. 4. Methods and systems of information security and data protection 5. Technologies and software-technical means of information protection. 6. Monitoring and forecasting of space and geodynamic processes, natural resources, remote sensing of the Earth
Scientific research in the field of natural sciences. The amount of financing is – 5,125,2 million tenge *(including 915,2 million tenge for 2022, 2,130 million tenge for 2023, 2,080 million tenge for 2024)*	1. Fundamental and applied research in mathematics and mechanics 2. Fundamental and applied research in physics and astronomy 3 Fundamental and applied research in the field of chemistry 4. Fundamental research in the field of biology 5. Fundamental research in the field of ecology and geography
Life and Health Science The amount of financing is – 3,750,15 million tenge *(including for 2022 –*	1. Innovative biological research to increase the productivity and sustainability of plant varieties and animal breeds in agriculture. 2. Innovative research in medicine and public health. 3. Development of domestic pharmaceutical science, industrial and

750.15 million tenge, for 2023 – 1,500 million tenge, for 2024 – 1,500 million tenge)	environmental biotechnology.
Research in the field of education and science The amount of financing is – 1,850 million tenge *(including 250 million tenge for 2022, 800 million tenge for 2023, 800 million tenge for 2024)*	1. Fundamental, applied, interdisciplinary research of problems of education, science, culture and sports in the XXI century: 2. Current problems in the field of education and linguistics 3. Research in the field of physical culture and sports
Sustainable development of the agro-industrial complex and safety of agricultural products The amount of financing is – 250 million tenge *(including 50 million tenge for 2022, 100 million tenge for 2023, 100 million tenge for 2024)*	1. Processing and storage of agricultural products and raw materials;
Research in the field of social sciences and humanities. The amount of financing is – 5, 520 million tenge *(including for 2022 – 970 million tenge, for 2023 – 2,275 million tenge, for 2024 – 2,275 million tenge)*	1. Fundamental, applied interdisciplinary research in the field of social sciences: 2. Topical issues of social sciences, legal and interdisciplinary research. 3. Structural and technological modernization and sustainable spatial development of the economy and society 4. Actual problems of social modernization: demography, migration, quality of human resources, quality of life and social inequality, problems of employment and unemployment, scientific organization, rationing and labor safety 5. Research of actual problems of modern international relations, global, regional and cross-border geopolitical, geo-economic, geospatial processes, sociology, sociolinguistics, ethnology, ethnolinguistics, ethnopolitics, conflictology, humanitarian geography, interethnic relations and ethno-confessional relations 6. Fundamental, applied, interdisciplinary research in the field of humanities: 7. Spiritual Modernization and the Seven Facets of the Great Steppe 8. New humanitarian knowledge. Synergetic and philosophical research in the humanities. Humanitarian informatics. 9. Spiritual shrines of Kazakhstan. Sacred geography of Kazakhstan. 10. Historical and cultural heritage and spiritual values of Kazakhstan 11. Commonality of history and culture, literature and language, traditions and values 12. The study of humanitarian aspects and the formation of an ideological platform for the sustainable development of Kazakh society
National security and defense. The amount of financing is	1 Ensuring information security 2. Development of the military-industrial complex, weapons and military equipment, military space technologies

– 1 041.69 million tenge *(including 208.39 million tenge for 2022, 416.7 million tenge for 2023, 416.6 million tenge for 2024)*	

3. Qualification requirements for the supervisor and research group, as well as other qualification requirements that contribute to ensuring the effectiveness of programs

1. Accredited subjects of scientific and (or) scientific and technical activities, as well as autonomous educational organizations and their organizations, including as co-executors, participate in the competition for program-targeted financing.

2. The target scientific, scientific and technical program being formed should be aimed at solving the technical task for research work. No more than one program can be approved for each technical task for research work.

The target scientific, scientific and technical program may include several subprograms aimed at solving specific tasks within the target program. The division of the target program into subprograms is carried out based on the scale and complexity of the problems being solved, as well as the need for rational organization of their solution to obtain a specific result.

The performers must ensure that the final results are achieved in accordance with the goals and objectives of the program.

The supervisor of the scientific and (or) scientific and technical program (hereinafter referred to as the program manager) must have at least 5 (five) years of experience in scientific and (or) scientific and pedagogical work, must be a resident of the Republic of Kazakhstan and meet the following minimum qualification requirements:

– the degree of a doctor of philosophy (PhD), or a doctor in the profile, or an academic degree (doctor / candidate of sciences); at the same time, passing the procedure for recognizing the equivalence of diplomas obtained abroad is not required;

– the area of scientific research of the program manager and (or) his experience in research and (or) scientific and pedagogical work should correspond to the direction of the scientific program;

- it is desirable to have experience in managing scientific projects and (or) programs.

3. Program supervisor, must have for 2017-2021:

3.1 for industries in the field of natural sciences, engineering and technology:

for basic research:

– at least 2 (two) articles and (or) reviews in peer-reviewed scientific publications included in the first three quartiles (Q1, Q2, Q3) by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty).

for applied research:

– at least 2 (two) articles and (or) reviews in peer-reviewed scientific publications that have a non-zero impact factor in the Web of Science database and (or) have a CiteScore percentile in the Scopus database of at least 35 (thirty-five);

– or at least 1 (one) article in the above-mentioned scientific publications and at least 1 (one) foreign or international patent included in the Derwent Innovations Index database (Web of Science, Clarivate Analytics).

3.2 for branches in the field of medicine and healthcare, agricultural and veterinary sciences:

for basic and applied research:

– at least 2 (two) articles and (or) reviews in peer-reviewed scientific publications that have a non-zero impact factor in the Web of Science database and (or) have a CiteScore percentile in the Scopus database of at least 35 (thirty-five);

– or at least 1 (one) article in the above-mentioned scientific publications and at least 1 (one) foreign or international patent included in the Derwent Innovations Index database (Web of Science, Clarivate Analytics).

3.3. for branches in the field of social sciences and humanities:

for basic and applied research:

- at least 2 (two) articles and (or) reviews in peer-reviewed scientific publications indexed in the Social Science Citation Index or Arts and Humanities Citation Index of the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 25 (twenty-five);

or:

- at least 10 (ten) articles in journals recommended by the Committee for Quality Assurance in the Field of Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan (hereinafter – CQAES) for publication of the main results of scientific research.

3.4. For the heads of scientific and scientific-technical programs submitted under the priority "National Security and Defense" and (or) containing information constituting state secrets, as well as official information of limited distribution, the requirements 3.1, 3.2, 3.3 do not apply. For this category, the program supervisor for 2017-2021 must have:

- at least 8 (eight) articles in journals recommended by CQAES.

3.5. As articles or reviews in journals from the Web of Science databases (including the Science Citation Index Expanded, Social Science Citation Index or Arts and Humanities Citation Index) and Scopus, only publications indexed (present) in these databases and having the type Article (Article), Review (Review) or Article are counted in Press (Article in print). The quartile of the journal according to the Web of Science database and the percentile of the Cinescore journal in the Scopus database are taken into account for the year of publication or the last one at the time of application submission.

Articles and reviews published in journals whose indexing in the Scopus database was terminated at the time of application submission for various violations (the Discontinued titles sheet in the "Source title list" file on the page https://www.elsevier.com/solutions/scopus/how-scopus-works/content) are not taken into account.

3.6. The section "Basic information" in the information system of the Center hould contain a list of publications that meet the requirements of paragraph 3 of section 3 of this competition documentation, with a full bibliographic description, mandatory indication of quartiles and/or percentiles of journals in the Web of Science and/or Scopus database, as well as DOI or URL.

3.7 The publications of the program supervisor in the publications recommended by CQAES are taken into account only if the URL of the web page on the original website of the journal, where it is located on the Internet, or its Digital Object Identifier (DOI) is given, except for scientific and scientific-technical programs submitted under the priority "National Security and Defense" and (or) containing information constituting state secrets and for official use.

The following publications are equivalent to an article in a scientific publication recommended by CQAES:

– an article or review in a foreign scientific publication indexed in the Web of Science and (or) Scopus database;

– either a patent for an invention or an act of implementation;

– or a monograph with the contribution of the scientific supervisor of the program.

4. No more than 30 (thirty)% (of the total number of members of the research group, not including the supervisor) of industrial engineers who are residents of the Republic of Kazakhstan and (or) foreign scientists (except for the heads of scientific and scientific-technical projects containing information constituting state secrets and official information) may be involved in the group information of limited distribution). A foreign scientist must comply with the requirements of Section 3 of this competition documentation for scientific supervisors, with the exception of the requirement of residence of the Republic of Kazakhstan.

5. At least 30 (thirty)% of the members of the research group must be from among specialists, scientists, doctoral students and (or) undergraduates aged not older than 40 (forty) years inclusive at the time of submission of the competitive application.

6. An individual (from among the members of the research group), including the heads of organizations, has the right to be a supervisor in no more than one program, while his participation as a performer in other programs within the framework of this competition is not allowed.

7. An individual (from among the members of the research group) who is not a supervisor has the right to be a performer in no more than one program within the framework of this competition.

All applications exceeding the requirements of paragraphs 6 or 7 of section 3 of this competition documentation are subject to revision.

8. Based on the results of the competition for program-targeted financing, the authorized body in the field of science may determine the parent organization for the scientific, scientific and technical program, which provides support for its implementation and coordinates the activities of implementing organizations within the framework of the program. The parent organization is responsible for the implementation of the target scientific, scientific and technical program coordinated by it.

4. Required documents for participation in the competition

1. A copy of the certificate of accreditation of the applicant – the subject of scientific and (or) scientific and technical activity;

2. Application for participation in the competition according to Appendix 1. State, Russian and English languages are used for the abstract, and the explanatory note and the calculation of the requested funding are available in the State or Russian, as well as in English.

3. Positive conclusion of the local and (or) central commission on bioethics (for biomedical research on humans and animals).

4. An agreement on the contribution from a private partner (on partial provision of the program with the necessary resources, including financial, with the exception of applied research programs in the field of national security and defense, the use of atomic energy, social, humanitarian and social sciences), for basic research, preferably, for applied research, mandatory, at least 1% of the total amount of the application for the entire period of the program *(according to the Financing Rules).*

5. Requirements for the form and content of the application for participation in the competition for program-targeted financing of scientific, scientific and technical programs, the amount and conditions of the contribution from the private partner(s)

1. The application for participation in the competition is drawn up according to Appendix 1. The abstract is drawn up in the state, Russian and English languages, and the explanatory note and the calculation of the requested funding - in the state or Russian, as well as English. The application containing information constituting state secrets, as well as official information of limited distribution, is made in the state or Russian languages.

The content of the application in Word format must be identical to the content in the information system is.ncste.kz.

2. The application must contain information about the deadline for the implementation of the program – 27 months (the start of work in the calendar plan is October 2022).

3. The application must correspond to the selected technical task for research work within the framework of program-targeted financing in accordance with Annex 2 with the mandatory indication of the technical task number.

4. The participant applying for the target program ensures the participation of a private partner(s) with partial provision of the programs with the necessary resources, including financial, at least 1% of the total amount of the application for the entire period of implementation of the applied research program, with the exception of applied research programs in the field of national security and defense, the use of atomic energy, social sciences, humanities and social sciences *(According to the Rules of Financing).*

Confirmation of the intention of the parties is an agreement on a contribution in any form indicating the name of the program, the timing of implementation, the amount of the contribution or the necessary resources, as well as signed and stamped by the two parties.

For every 5% of the co-financing of the total cost of the program at the stage of its consideration by the NSC, 1 point is added, but in total no more than 4 points *(according to the Regulations on the NSC).*

In cases of refusal of the private partner from the intention to contribute during the implementation of the program or the absence of an equivalent replacement, by the decision of the NSC, the financing of the program may be terminated.

6. The application process for the competition

1. The applicant submits an application for the competition to the Committee of Science in electronic form, certified by the electronic digital signature of the program manager and the applicant, as well as members of the research group who are residents of the Republic of Kazakhstan, through the information system of JSC "National Center for State Scientific and Technical Expertise" (hereinafter - the Center) at the link: www.is.ncste.kz . In accordance with paragraph 12) of paragraph 2 of the Examination Rules, after signing the application an individual registration number (hereinafter referred to as IRN) is assigned in the information system of the Center.

Applications containing information constituting state secrets, as well as official information of limited distribution, are provided in accordance with the legislation of the Republic of Kazakhstan on state secrets, in paper form (in 2 copies) and on CD-ROM (2 pcs.).

Applications are submitted in paper and electronic versions (on disk) in the state or Russian languages. The paper carrier is filed as a brochure with an inventory, a final entry is made on the last page indicating the number of sheets (the number of sheets of secret and unclassified) and sealed with a sticker. An inventory number is assigned to the paper carrier, the disk with the electronic version of the application must have an IRN.

The certificate of justification for assigning the secrecy stamp of the application with reference to the articles of the Departmental List of information of the Republic of Kazakhstan (hereinafter referred to as the UPU of the Republic of Kazakhstan), approved at a meeting of the permanent commission for the protection of state secrets of the subject, is filed in the application.

The forwarding of applications containing information constituting state secrets, as well as official information of limited distribution within the Republic of Kazakhstan is carried out, as a rule, by the courier service or through JSC "Kazpost" – "Republican Special Communications Service" (JSC "Kazpost – RSCS"). At the same time, it is necessary to indicate on the envelope (package) the secrecy stamp and the note "For official information of limited distribution".

2.1 Applications containing official information of limited distribution are issued in accordance with the requirements of the Decree of the Government of the Republic of Kazakhstan dated December 31, 2015 No. 1196 "On approval of the Rules for assigning information to official information of limited distribution and working with it" on the terms of confidentiality of official information of limited distribution.

2.2. In applications where there is an indication of the place for stamp – stamp is mandatory.

3. Applications are sent to the applicant for revision in the following cases:

1) inconsistencies in the registration of the application in accordance with Annex 1 and failure to submit the required documents of Section 4 of this competition documentation;

2) the presence of facts of duplication of the topic or content of the SSTE object with previously submitted, but not approved for financing, or simultaneously submitted SSTE objects;

3) absence of the certificate of accreditation of the subject of scientific and (or) scientific and technical activities specified in section 4 of this competition documentation from the participant of the competition for grant or program-targeted financing;

4) non-compliance of the supervisor with the requirements of section 3 of this competition documentation;

5) inconsistencies of expected results with the requirements of section 7 of the competition documentation.

6) exceeding the number of submitted applications specified in paragraph 6 of section 3;

7) failure to provide a contribution agreement from a private partner for an application project.

The applicant submits the revised application through the Organizer's information system within 3 (three) working days from the date of receipt of the specified comments from the Organizer.

From the date of receipt of the finalized applications from the applicants, the Organizer checks for the elimination of the previously mentioned comments. In case of non-removal of comments by the applicant, the Organizer returns the application to the Customer within 3 (three) working days.

7. Requirements for expected results based on the results of the implementation of scientific and (or) scientific and technical programs

1. The direct and final results of the program must fully comply with the selected technical task for research work within the framework of program-targeted funding.

2. According to the results of the implementation of the scientific and (or) scientific and technical program, the minimum number of publications specified in the selected terms of reference, according to Appendix 2 of this competition documentation.

3. Scientific and technical products prepared as a result of the implementation of the program (*new technologies, methods, software, technical documentation, recommendations for solving problems, scientific and technical, experimental design and industrial developments, geographical, geological, seismic and other maps, new materials, substances, equipment, drugs, tools and others)* along with the security document, the act of implementation, recommendations for implementation, license agreement, application for a commercialization project can be submitted in the form of a documentary confirmation, certified by the head of the implementing organization with the attachment of photos, videos, and other information.

4. The act of implementation should contain data on the achieved and (or) expected socio-economic effect.

5. When publishing scientific work, research results (articles, reviews, security documents, including patents, monographs, materials of conferences, forums and symposiums, textbooks, etc.) obtained during and (or) after the completion of the program, the authors must necessarily refer to the program and the source of funding (the Committee of Science Ministry of Science and Higher Education of the Republic of Kazakhstan). *The text on financing in English-language publications should be as follows: «This research has been/was/is funded by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant No. BR00000000)», where BR00000000 – IRN of the program.*

6. The right to publish the IRN, the name of the approved program and the applicant, the surname, first name, patronymic of the program manager, the annotation of the application, the expected results, and the annotation of the results obtained for each year of the program (in printed and (or) electronic form) without requesting the consent of the applicant and (or) the program manager, it is provided to the Center.

To popularize science, disseminate information about the results, increase the likelihood of their implementation and commercialization, a separate website should be created for each program, which should contain brief information about the program: relevance, purpose, expected and achieved results, names and surnames of the members of the research group with their identifiers (Scopus Author ID, Researcher ID, ORCID, if available) and links to relevant profiles, a list of publications (with links to them) and patents; information for potential users, as well as other information important to society. The information on the website should be updated regularly (at least 2 times a year). For each scientific publication within the framework of the program, information about its content and possible application should be published on its website and in social networks and (or) mass media.

7. The results of scientific research obtained within the framework of the program are subject to mandatory state registration in the Center in accordance with the procedure established by law.

8. All program reports, including the results achieved, must be checked in the license systems (platform) for the detection of borrowings. Information about the investigation should be reflected in the reports.

8. Financing of the program

1. The implementation of programs approved for financing should be carried out in the Republic of Kazakhstan.

2. The funds of targeted financing are distributed by the scientific director of the program.

3. The program implementing organization is not allowed to withhold funds from program-targeted financing and interfere with the distribution of funds within the program.

4. The funds of targeted financing to achieve the goals, objectives and expected results of the application should be directed to the types of expenses directly related to the conduct of scientific research specified in the application for participation in the competition for program-targeted financing of scientific and (or) scientific and technical programs prepared in accordance with the Rules of Financing, and approved by the decision of the NSC.

5. Inefficient and unjustified use of funds of program-targeted financing is the responsibility of the applicant and the program manager, established by the legislation of the Republic of Kazakhstan.

6. The contract for the implementation of the program with the winners of the competition for program-targeted financing is concluded in accordance with Annex 3 of this competition documentation, which may be amended and supplemented in accordance with the procedure established by law. The expected results of the program specified in the contract must correspond to the calendar plan and the expected results specified in the terms of reference of the program and the application.

7. The applicant provides accounting and reporting on the program in accordance with the procedure established by law.

8. In case of failure to achieve the results of the program specified in the terms of reference, which led to the disapproval of the final report by the decision of the NSC, the supervisor is suspended from participating as a supervisor in subsequent competitions for program-targeted funding announced by the Committee of Science until the results are achieved (the Committee of Science and the Center are notified of the achievement of the results), but not for more than 2 years. In case of detection of violations of scientific ethics (plagiarism and false co-authorship, duplication, misappropriation of other people's data, fabrication and falsification of scientific data, etc.) or disapproval of the interim report on the program by the decision of the NSC, the head is suspended for 3 years from participating in subsequent competitions announced by the Committee of Science.

Appendix 1
to the Competition documentation
for program-targeted financing
for scientific, scientific and technical
programs for 2022-2024

Application
or the implementation of a scientific, scientific and technical program within the framework of program-targeted financing

The application consists of the following parts:
1) Abstract;
2) Explanatory note;
3) Calculation of the requested financing.

1. Abstract

The abstract contains a brief description of the purpose of the program, the problems it is aimed at researching, the main approaches to conducting research, the expected results, the relevance of the tasks solved as a result of research for the purposes of socio-economic development on the scale of the Republic of Kazakhstan specified in state strategic and program documents, the degree of influence of research results on the relevant branch of the economy, the sphere of public relations and (or) branch of science, practical significance of research results, that is, the degree of their readiness for commercialization or in another capacity to solve urgent problems of socio-economic and scientific-technical development of the Republic of Kazakhstan.

The abstract should not exceed 800 words.

2. Explanatory note

The content of the explanatory note includes the following sections (in this case, tables, diagrams, diagrams to which there are references in the application form are included in the appendix to the explanatory note and are not taken into account when calculating the number of words in the relevant sections and the total number of pages of the application).

1. General information

1.1. The name of the topic of the scientific, scientific and technical program [no more than 20 words].

1.2. The name of the priority and specialized scientific direction.

1.3. Scope and type of research.

1.4. Number of the selected technical task

1.5. A strategically important state task, for which a program has been developed.

1.6. Place of implementation of the program.

1.7. Estimated start and end date of the program, its duration in months.

1.8. The applicant organization of the program.

1.9. The executors of the program (specify the name of all entities involved in the implementation of the program).

1.10. The requested amount of program-targeted financing (for the entire duration of the program and by year, in thousands of tenge).

1.11. Keywords characterizing the industry and the direction of the program for the selection of independent experts.

2. The general concept of the program [no more than 750 words].

2.1. Introductory part [no more than 200 words].

A brief description of the program idea is indicated.

2.2. The purpose of the program is [no more than 50 words].

The goal is stated concisely and concretely, should correspond to the theme of the program and the strategically important state task for which the program was developed, be achievable and reflect the

nature of the solution that is expected to result from the implementation of the program.2.3. Задачи программы [не более 500 слов].

This section describes a way to achieve the goal of the program through logically interrelated, sequential tasks. The list of tasks is given:

1) measurable indicators of the solution of the problem;

2) a brief justification of the role of each of the tasks in achieving the goal of the program and the relationship with other tasks and expected results of the program;

3) other important, in the applicant's opinion, parameters.

3. Scientific novelty and significance of the program [no more than 2,000 words].

The section includes the following information:

1) scientific groundwork for the development of the program, justification of scientific novelty with a mandatory review of previous scientific research conducted in the world and the Republic of Kazakhstan related to the topic of the program, and their relationship with this program (in the context, references to the literature used in the review should be indicated, the full transcript of which should be provided in section 8 “Bibliography”), (if available, preliminary results and (or) results previously obtained by the applicant related to the topic of the program are indicated);

2) the compliance of the program with the strategically important state task for which it was developed, the applicability of the results to solve a strategically important state task, the significance of the program on a national and international scale, the impact of the expected results on the development of science and technology, the expected social and economic effect;

3) scientific and technological needs justifying the importance of the results of the program (if available, include social demand and (or) economic and industrial interest, other supporting data);

4) the competitiveness of the expected results of the program, their comparison with known existing analogues in the Republic of Kazakhstan and the world, the experience of solving similar problems in the world, its application within the framework of the program;

5) the fundamental differences between the idea of the program from existing analogues, or competing ideas. If the idea or the result of the research already exists in the world and (or) in Kazakhstan, it is necessary to justify why investments in the program are still profitable;

6) If one of the final results of the program

the product, it is necessary to describe the current state of the art in the subject area of the program;

7) If the program is a continuation of scientific research previously conducted by the applicant or contains elements of previously funded and completed scientific research, it is necessary to clearly and concisely state the relationship of the program with previously conducted scientific research and its differences from them.

4. Research methods and ethical issues [no more than 1,500 words].

The section includes the following information:

1) description of the main scientific issues and hypotheses of the program, justification of the research strategy and approaches used in the program types of research (descriptive, correlative and / or experimental), the sequence of research;

2) a brief description of the most important experiments;

3) description of the research methods used in the program as a justification of ways to achieve the goals, their relationship with the purpose and objectives of the program, among themselves;

4) methods of collecting primary (source) information, its sources and application for solving program tasks, methods of data processing, as well as ensuring their reliability and reproducibility;

5) conditions for registration and division of intellectual property rights to the results of the study (it is necessary to specify which method of intellectual property protection will be chosen, justify the choice).

5. Research Group and program management.

The scheme of program management is described, including the order of interaction between performers, ways of coordinating their work and making decisions on the implementation of the program.

The composition of the research group is drawn up according to Table 1. Details of at least 70% (seventy percent) of the planned staff are indicated (the main staff of the research group). For additional personnel (up to 30% of the members of the research group who will be involved in the case of a grant), the table indicates their position and role in the project, the nature of the work performed and the approaches that will be applied for their selection.

All publications confirming their compliance with the requirements of the competition documentation, including the citation index, the quartile (percentile) of the publication and links to information about publications in the relevant scientometric databases (DOI), must be indicated for the scientific director of the program. It is necessary to indicate which programs he managed during the 5 (five) years preceding the application date, and what results were obtained within them.

Information on publications of the main staff of the research group in the direction of the program (at least 10 publications of members of the research group in total) with a citation index and links to information about publications in the relevant scientometric databases should be provided. The names of the members of the research group should be underlined.

6. Research environment [no more than 1,000 words].

The section includes the following information:

1) justification of the participation of each performer in the program, based on their role, background and contribution to achieving the goal of the program, (the performers of the program are considered subjects of scientific and (or) scientific and technical activities involved in the implementation of the program throughout the period);

2) involvement of third-party organizations in the implementation of the program with justification of the need to involve each organization, description of its role in the program, the nature of the work performed and contribution to the achievement of the goal and expected results;

3) description of the material and technical base available to the performers (equipment, instruments, inventory, transport, buildings, structures, etc.) directly used for the implementation of the program, indicating the direction of its use and members of the research group who have the skills to work with research equipment;

4) key domestic and international relations (collaborators and partners) used for the implementation of the program, indicating the nature and justification of their use, the use of infrastructure of other domestic and foreign organizations (laboratories) with justification;

5) justification of mobility: (1) scientific trips and their impact on the implementation of the program, (2) periods of work on the basis of partner organizations and their impact on the implementation of the program. For each foreign business trip, the goal, the expected result of the business trip and the performer's contribution to achieving the program goal are briefly indicated.

7. Justification of the requested funding [no more than 2,000 words].

The section includes the following information:

1) summary calculation of the program (budget) according to Table 2. The program budget is distributed by the program supervisor in accordance with the work plan and cannot be directed to other items of expenditure not related to this program.

The article “Remuneration of labor (including taxes and other mandatory payments to the budget)” specifies the expenses to be paid as remuneration for work to members of the research group of the program, including postdoctoral students, doctoral, master's and bachelor's students, as well as persons engaged in financial, economic and legal support, taking into account individual income tax and mandatory pension contribution according to table 3. The calculation also takes into account the payment of vacation pay, except for compensatory and incentive payments. The article also indicates the costs of paying social tax, social insurance and other mandatory payments to the budget.

The article “Business trips” indicates all expenses related to business trips within and outside the Republic of Kazakhstan, directly related to conducting research, including participation in conferences, seminars, symposiums, trips to use the infrastructure of other organizations according to Table 4 (for tickets (auto, rail, air tickets), attach price offers with websites of serviced companies, a draft business trip plan). When filling out this table, it is necessary to be guided by the Rules on Official Business trips within the Republic of Kazakhstan of employees of state institutions maintained at the expense of the

state budget, approved by Resolution of the Government of the Republic of Kazakhstan dated September 22, 2000 No. 1428 and Resolution of the Government of the Republic of Kazakhstan dated May 11, 2008 No. 256 “On approval of the Rules for Reimbursement of Expenses for official Business trips at the expense of budget funds, including to foreign countries”.

The article “Scientific and organizational support, other services and works” specifies the costs of services purchased by the contractor from business entities, the result of which is necessary to achieve the goal of the program, including (1) services of scientific laboratories for collective use and other laboratories, (2) services of organizations of co-executors, (3) organizational fees for participation in conferences, seminars, symposiums, (4) patenting of scientific results obtained as a result of the project, (5) publication of research results, (6) purchase of analytical materials according to Table 5 (attach at least 1 (one) price offer and (or) price list for the purchased goods, works, services). If foreign scientists and employees of other organizations involved in the implementation of the program are members of the research group, the costs of their participation are reflected in the “Remuneration” section.

The article “Purchase of materials (for individuals and legal entities), purchase of equipment and (or) software (for legal entities)” specifies all the costs of materials and costs for the purchase of equipment and software necessary to achieve the goal of the program, including chemical reagents, solvents, standard samples, consumable laboratory materials, spare parts for research equipment, fuels and lubricants and others according to table 6 (for purchased goods, works, attach at least 1 (one) price offer and (or) price list to the services). At the same time, the purchase of equipment and software is not allowed to individuals.

The article “Rental costs, operating costs of equipment and equipment used for the implementation of research” indicates the costs of renting premises, equipment and equipment necessary to achieve the goal of the project, in the absence of appropriate premises from the applicant, as well as the costs of utilities related to the implementation of the project and maintenance of premises, equipment and equipment, directly involved in conducting research according to table 7 (for purchased goods, works, services, attach at least 1 (one) price offer and (or) price list);2) расчеты к каждой статье расходов согласно таблицам 3 – 7.

3) brief explanations of the content and calculation of the amount of each expenditure item with mandatory justification of their necessity to achieve the goals, objectives and expected results of the program, as well as indicating the sources of information on prices on the basis of which the corresponding expenditure item is calculated.

The total amount of all expenditure items is the requested amount for financing and should be equivalent to the amount stated in paragraph 1.10. of the section “General information”.

8. Program implementation plan [no more than 750 words]

The section includes a detailed, sequential work plan for the implementation of the program according to Table 8.

9. Expected results of the program [no more than 1,000 words].

The expected results provided for by the program should not be lower than the results provided for in the scientific and technical task. In the relationship, the results should provide a comprehensive solution that provides for the impact on all aspects of a strategically important state task.

The results of the program are described with the indication of quantitative and qualitative characteristics and the form of implementation. The justification of the result is given in accordance with the purpose and objectives of the program.

Regardless of the requirements of the competition documentation, as a result of the implementation of the program, the following should be provided:

1) publication of articles in international peer-reviewed scientific journals (prospective publications for the publication of the results of the program, the citation index of the publication with reference to information about the publication in the corresponding scientometric database). The requirements for the number of articles based on research results are set in the competition documentation. Each article should contain information about the identification registration number and the name of the program under which it is funded, indicating the program-targeted funding as a source.

2) publication of monographs, books and (or) chapters in books of foreign and (or) Kazakhstani publishers;

3) obtaining patents in foreign patent offices (European, American, Japanese), Kazakh or Eurasian patent offices;4) разработка научно-технической, конструкторской документации;

5) activities for the pilot implementation of the results of the program and (or) dissemination of knowledge and results obtained during the implementation of the program among potential users, the community of scientists and the general public;

6) other measurable results in accordance with the requirements of the competition documentation and the specifics of the project. Additionally, the section specifies:

1) scope of application, target consumers, social, economic, environmental, scientific and technical, multiplicative and (or) other effect of each of the expected results in accordance with a strategically important state task, for which a program has been developed with justification;

2) the impact of expected results on the development of the main scientific direction and related fields of science and technology;

3) applicability and (or) the possibility of commercialization of the obtained scientific results.

4) other direct and indirect results of the program, indicating their qualitative and quantitative characteristics.

10. References

The section indicates the publications referred to in paragraph 3 “Scientific novelty and significance of the program”.

Each publication must contain the full name of the journal, the publication number, the year of publication, page numbers, the full name of the article, the names of all the authors of the article.

Appendix:

1) the plan of contribution to the implementation of the program by the partner by analogy with Table 9 (for applied scientific research).

3. Calculation of the requested financing

The part “Calculation of the requested financing” is drawn up in the form of tables 2-7 justifying the calculation of the amount of funding requested for the implementation of the program, which are filled in the information system of the center of expertise.

Explanations to the calculations are given in section 7 “Justification of the requested financing” in the part “Explanatory Note”.

Table 1 – The composition of the research group for conducting scientific research, including foreign scientists, young scientists (postdoctoral students, doctoral students, master's and bachelor's degree students)

No. in sequence	Full name (if available), education, degree, academic title	Main place of work, position[1]	Hirsch index, ResearcherID, ORCHID, Scopus Author ID identifiers (if available)	The role in the project or program, as well as the nature of the work performed	Brief justification of participation

Table 2 – Summary estimate of expenses for the requested amount

No. in	Name of the expense item	The amount of financing, thousand tenge

[1] For members of the research group who are not related to the main staff and who are not identified at the date of preparation of the application, a dash is indicated in the column “Main place of work, position”. For postdoctoral, doctoral, master's and bachelor's degree students whose data are not known at the date of preparation of the application, the column "Main place of work, position" indicates the status (postdoctoral, doctoral, master's or bachelor's degree student, specialty and organization of higher and (or) postgraduate education, from which it is expected to attract relevant employees to the research groups).

sequence		Total	20___ (1st year)	20___ (2nd year)	20___ (3rd year)
1.	Remuneration of labor (including taxes and other mandatory payments to the budget)				
2.	Business trips				
3	Scientific and organizational support, other services and works				
4.	Purchase of materials (for individuals and legal entities), purchase of equipment and (or) software (for legal entities)				
5.	Rental costs, operating costs of equipment and equipment used for the implementation of research				
Total					

Table 3 – Remuneration of labor (including taxes and other mandatory payments to the budget)

No. in sequence	Position	Remuneration of labor, tenge												
		1st year				2nd year				3rd year				Total (col.6+ col.10+ col.14)
		Employment (full/part-time)	Labor remuneration, tenge per month	Number of months of work	Amount (col.3× col.4× col.5)	Employment (full/part-time)	Labor remuneration, tenge per month	Number of months of work	Amount (col.7× col.8× col.9)	Employment (full/part-time)	Labor remuneration, tenge per month	Number of months of work	Amount (col.11× col.12× col.13)	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	Core staff of the research group			x				x				x		
1.1.														
1.														

2.														
…														
2.	Additional staff			x				x				x		
2.1.														
2.2.														
…														
3.	Total wage fund (col.1+col.2)	x	x	x		x	x	x		x	x	x		
4.	Taxes and other mandatory payments to the budget, (total col.4.1+ col.4.2+ col.4.3)	x	x	x		x	x	x		x	x	x		

4.1	Calculation of social tax expenses	x	x	x		x	x	x		x	x	x		
4.2	Calculation of expenses for payment of social contributions to the State Social Insurance Fund	x	x	x		x	x	x		x	x	x		
4.3	Deductions for compulsory medical insurance	x	x	x		x	x	x		x	x	x		
Total (col.3+ col.4)		x	x	x		x	x	x		x	x	x		

Table 4 – Business trips

No. in	Destination (country, city, name of the	The rate of reimbursem	The rate of expenses for	Average annual number of	The average annual number	Average annual number of	Average cost of one	Amount of expenses (thousand tenge)

sequence	locality)	ent of daily expenses for 1 person (2 monthly calculation index) (tenge)	the rental of residential premises per day for 1 person (tenge)	person/days for calculating daily expenses (person/days)	of people / days to calculate the cost of renting a living space (people/ days)	people sent (person)	round trip (tenge)	(col.3 x col.5 + col.4 x col.6+ col. 7 x col.8)/1000
1	2	3	4	5	6	7	8	9
1.	20___ (1st year) total						x	
1.1.								
1.2.								
…								
2.	20___ (2nd year) total						x	
2.1.								
2.2.								
…								
3.	20___ (3rd year) total						x	
3.1.								
3.2.								
…								
Total (col. 1 + col. 2 + col. 3)							x	

Table 5 – Scientific and organizational support, other services and works

No. in sequence	Name	Unit of measurement	Q-ty, units	Cost per unit, tenge	Total cost, tenge (col.4 × col.5)
1	2	3	4	5	6
1.	20___ (1st year), total			x	
1.1.					
1.2.					
…					

2.	20___ (2nd year), total			x	
2.1.					
2.2.					
…					
3.	20___ (3rd year), total			x	
3.1.					
3.2.					
…					
Total (col.1 + col.2 + col.3), tenge				x	

Table 6 – Purchase of materials, equipment and/or software (for legal entities)

No. in sequence	Name	Unit of measurement	Q-ty, units	Cost per unit, tenge	Total cost, tenge (col.4 × col.5)
1	2	3	4	5	6
1.	20___ (1st year), total			x	
1.1.					
1.2.					
…					
2.	20___ (2nd year), total			x	
2.1.					
2.2.					
…					
3.	20___ (3rd year), total			x	
3.1.					
3.2.					
…					
Total (col.1 + col.2 + col.3), tenge				x	

Table 7 – Rental costs, operating costs of equipment and equipment used for the implementation of research

No. in sequence	Name	Unit of measurement	Cost per unit, tenge	Q-ty, units	Total, tenge (col.4 × col.5)

1	2	3	4	5	6
1.	20__ (1st year), total	x	x		
1.1.					
1.2.					
…					
2.	20__ (2nd year), total	x	x		
2.1.					
2.2.					
…					
3.	20__ (3rd year), total	x	x		
3.1.					
3.2.					
…					
Total (col.1 + col.2 + col.3)		x	x		

Table 8 - Implementation work plan

No. in sequence	Name of tasks and measures for their implementation	Date for implementation		Expected results of the project (in terms of tasks and activities), the form of completion
		Beginning (month)	Ending (month)	
20____				
20____				
20_____				

Table 9 - Partner's contribution plan

No. in sequence	Partner's name, address, contact information	Contribution form (no more than 50 words)	The cost of the deposit, thousand tenge	Date posted (dd.mm.yyyy)
1	2	3	4	5

Appendix 2
to the Competition documentation
for program-targeted financing
for scientific, scientific and technical
programs for 2022-2024

Technical task No. 1
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Rational use of water resources, flora and fauna, ecology.

1.2. Name of the specialized direction of the program:

Research of actual problems of soil quality, land degradation and desertification

2. Goals and objectives of the program

2.1. The purpose of the program:

To develop a scientific and applied justification for sustainable management of natural and agricultural systems (hereinafter referred to as NAS) to prevent the development of desertification processes in the southern regions of Kazakhstan (Almaty, Zhetysu, Zhambyl, Turkestan and Kyzylorda regions), which allows ensuring economic development, food security and a high standard of living of the population.

2.2. To achieve this goal, the following tasks must be solved:

– To develop scientific and methodological foundations for management, assessment and mapping of natural and agricultural systems subject to desertification;

– Create an information and analytical database;

– To develop scientific and methodological foundations (approaches, principles, methods) of management, assessment and thematic multi-scale mapping of natural and agricultural systems subject to desertification;

– To determine the main parameters for assessing the risk of desertification in natural and agricultural systems;

– To develop criteria, indicators, evaluation indicators of degradation of agricultural and pasture use of agricultural and pasture;

– To conduct field studies of the state of natural and agricultural systems of agricultural and pasture use;

– To carry out monitoring observations of the development of desertification processes in natural and agricultural systems;

– To develop and create an information and analytical database on three blocks – natural, agricultural and environmental;

– To develop and create a map of modern landscapes as a basic basis for the development of a series of applied assessment maps of special content to combat desertification.

– To carry out inventory and evaluation mapping of the development of desertification processes in natural and agricultural systems based on data from remote sensing of the Earth and monitoring observations;

– To carry out: field studies of natural and agricultural systems, monitoring observations on key areas of the NAS for the development of desertification processes;

– Develop and create multi-scale assessment and application maps:

1) agricultural development of natural complexes;

2) manifestations of desertification processes in natural-agricultural systems of pasture and agricultural use;

3) resistance of natural complexes to agricultural impact;

4) the degree of degradation of natural and agricultural systems;

5) functional zoning of NAS subject to desertification (degradation);

– Conduct an assessment:

1) productivity of natural-agricultural systems of agricultural and pasture use;

2) dynamics of the development of desertification processes in natural and agricultural systems;

3) landscape and ecological state of natural and agricultural systems.

– To develop a system of sustainable management of natural and agricultural systems aimed at preventing the development of desertification processes;

– Conduct a survey of farms on the use of soil-water-saving technologies;

– To develop and create a database on technologies that prevent the development of desertification in natural and agricultural systems;

– To develop a set of scientifically-based requirements, recommendations and measures to prevent the development of desertification processes in natural and agricultural systems;

– To evaluate the effectiveness of the developed recommendations and measures to prevent the development of desertification processes in natural and agricultural systems;

– Create a flow chart of the organization of agricultural environmental management;

– To develop a map of environmental protection measures to prevent the development of desertification processes in natural and agricultural systems;

– To develop and create a Web-application for sustainable management of agricultural and pasture use;

– To conduct seminars, trainings in agricultural formations on measures to prevent desertification (degradation), to popularize soil-water-saving technologies and the introduction of scientific results of the Program.

3. Which points of strategic and program documents are solved:

1. "Strategy "Kazakhstan-2050", "New political course of the established state" Message of the President of the Republic of Kazakhstan dated December 14, 2012.
2. Decree of the President of the Republic of Kazakhstan dated May 30, 2013 No. 577 "On the Concept for the transition of the Republic of Kazakhstan to a "green economy".
3. The State Program "Digital Kazakhstan" dated December 12, 2017 No. 827.
4. The State program "Development of the agro-industrial complex of the Republic of Kazakhstan" for 2017-2021 dated February 14, 2017 No. 420.
5. Decree of the President of the Republic of Kazakhstan dated February 15, 2018 No. 636. "On approval of the Strategic Development Plan of the Republic of Kazakhstan until 2025".
6. Law of the Republic of Kazakhstan dated January 6, 2012 No. 527-IV. "On the national security of the Republic of Kazakhstan".
7. "National project on water Resources management of Kazakhstan until 2025".
8. Strategic Plan of the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan for 2017-2021 dated 09/10/2019 No. 26.
9. Strategic measures to combat desertification in the Republic of Kazakhstan until 2025.

4. Expected results

4.1 Direct results:

As a result of the implementation of the program, there should be:

– theoretical and methodological developments, criteria, indicators, evaluation indicators of degradation of natural and agricultural systems, which are in demand by management structures and agricultural formations of the republic;

– scientific and applied substantiations of sustainable management of natural and agricultural systems to prevent the development of desertification processes in the southern regions of Kazakhstan have been developed, implemented in the form of scientific reports, a series of assessment and cartographic models, an information and analytical database, scientific articles and a Web application created;

– scientifically-based requirements and measures to prevent the development of desertification processes in natural and agricultural systems have been developed; block diagram of the organization of agricultural environmental management, assessment maps, which are a scientific platform for programs and comprehensive actions aimed at combating desertification (degradation), both at the regional and local levels;

– assessment cartographic models have been developed for state, public and administrative structures of the Republic of Kazakhstan in the field of land use and land management, which allow reducing the level of

land degradation, increasing the productivity of agricultural development lands and increasing agricultural production, which will ensure food security of the Republic;

– at least 3 (three) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty);

– at least 3 (three) articles or reviews in a peer-reviewed foreign or domestic publication recommended by CQAES.

4.2 The end result:

As a result of the implementation of this Program, a Web application for the sustainable management of agricultural and pasture-based NAS should be created; requirements, measures, recommendations have been developed to prevent the development of desertification processes in the natural and agricultural systems of the southern regions of Kazakhstan, which will improve the productivity of agricultural development lands, increase the volume of agricultural products, increase the welfare of the rural population and ensure food security in the republic.

Economic effect. The scientifically-based evaluation and cartographic materials obtained during the implementation of the Program should ensure high efficiency of agriculture (crop production and animal husbandry) in agricultural formations (especially farms), which will increase land productivity, increase the production of gross agricultural products and organize profitable farming.

Environmental effect. The use of the obtained research results should ensure the rational management of agricultural environmental management; conservation of natural diversity; reduction of degraded land areas, increase of land fertility, sustainable functioning of natural and agricultural systems.

Social effect. Improving the quality of life of the rural population based on the growth of their material base and profitability of farms, by: improving the productivity of agricultural land and increasing the volume of agricultural products received; increasing the level of scientific and practical knowledge on preventing land degradation (trainings, seminars, farm management training, etc.).

Target consumers of the results obtained: government agencies; Kazakhstan scientific organizations dealing with problems of agriculture, land degradation, etc.; Universities; state republican and territorial administrative structures; agricultural formations (farms, households, etc.); project organizations in the field of developing integrated plans for the socio-economic development of Kazakhstan; public organizations, experts in the field of agriculture and environmental protection, ecology.

5. The maximum amount of the program is 370,000 thousand tenge, including by year:
for 2022 – **86,000 thousand** tenge, for 2023 – **142,000 thousand** tenge, for 2024 – **142,000 thousand** tenge

Technical task No. 2
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Rational use of water resources, flora and fauna, ecology.

1.2. Name of the specialized direction of the program:

Water purification, gas purification, soil and dust collection systems.

2. Goals and objectives of the program

2.1. The purpose of the program:

Development and implementation of innovative ecological technology for groundwater purification and

ensuring access to drinking water for the population and animals of an agricultural enterprise in accordance with the standards of sanitary and epidemiological rules and regulations for drinking water.

2.2. To achieve this goal, the following tasks must be solved:

- To develop scientific and methodological foundations for assessing the features of the formation of resources, fresh groundwater of a business partner enterprise in the conditions of climatic and anthropogenic changes;
- To develop scientific and methodological foundations of prospective water demand of a settlement and an agricultural enterprise to create an information and analytical database;
- To develop methods of groundwater purification based on electrochemical methods with bactericidal-energy-saving LED lamps and a filter system with nanofiltration membranes for obtaining drinking water for an agricultural enterprise;
- Develop basic parameters for modeling resource flow and groundwater quality using the Aquifer Simulation Model (aquifer simulation model) for Windows (ASMWIN to implement a complete two-dimensional model of groundwater flow and transportation;
- Develop programs for automated remote control of multiparametric monitoring of water quality in real time, as well as from a mobile application;
- To create a modular underground water treatment unit based on electrochemical methods with bactericidal-energy-saving LED lamps and a filter system with nanofiltration membranes;
- Get an expert opinion on the quality of drinking water when using environmental technology from the National Center of Expertise of the RK;
- To conduct annual monitoring of the work of the modular unit with an assessment of the impact on the sanitary and epidemiological state of the population and the agricultural enterprise;
- Get data on changes in the productivity of an agricultural enterprise;
- To develop a system of sustainable freshwater management based on water-saving technology to prevent anthropogenic and climatic influences using data obtained by software modeling of the imitation of the aquifer of an agricultural enterprise and a settlement;
- To develop a standard for innovative technology of providing drinking water in accordance with the requirements of sanitary and epidemiological rules and regulations of the Republic of Kazakhstan;
- To develop a map of the aquifer resource flow of groundwater of an agricultural enterprise with a projected volume;
- Develop and create a Web application for sustainable management of water resources of the enterprise;
- To develop scientific and technical documentation for the proposed technology in order to further advance the commercialization program;
- To conduct seminars, trainings at enterprises of the agricultural sector and events to popularize advanced water-saving technologies that ensure sanitary and epidemiological safety of the population and the introduction of scientific results of the Program.

3. Which points of strategic and program documents are solved:

- Message of the First President of the Republic of Kazakhstan dated January 10, 2018 “New development opportunities in the conditions of the Fourth Industrial Revolution”;
- The State program of industrial and innovative development of the Republic of Kazakhstan for 2020-2025. Action plan for the implementation of the SPIID of the Republic of Kazakhstan for 2020 – 2025. Task 4;
- Message of the Head of State dated March 16, 2022, item 1. Ensuring the country's food security, item 2. Issues of health and epidemiological security of the country in the post-coronavirus period;
- Decree of the President of the Republic of Kazakhstan dated February 15, 2018 No. 636. “On approval of the Strategic Development Plan of the Republic of Kazakhstan until 2025”;
- “National Project on Water Resources management of Kazakhstan until 2025”.

4. Expected results

4.1 Direct results:

As a result of the implementation of the program, there should be:

- Theoretical and methodological substantiations of the technology, criteria, indicators, estimated indicators of the aquifers of the enterprise have been developed, which will be in demand by management structures and agricultural formations of the republic;

- Scientifically-based requirements, measures for the conservation of water resources on the lands of the agricultural partner enterprise have been developed; a block diagram of the organization of management of underground aquifers;
- The indicators of mathematical calculations and water quality for each investigated source are obtained on the basis of software modeling of groundwater flow;
- A program has been developed for automated remote control of multiparametric monitoring of water quality in real time, as well as their mobile application;
- Scientific, technical, design and methodological documentation has been developed with the approval of the organization's standard for environmental technology of groundwater purification in accordance with the requirements of sanitary and epidemiological rules and regulations for drinking water;
- at least 10 (ten) articles have been published over the entire research period of the program, including 5 (five) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1 (first), 2 (second) and (or) 3 (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty);
- at least 3 (three) articles and (or) reviews in peer-reviewed foreign and (or) domestic publications (recommended by CQAES),
- obtaining 1 patent for a purification method based on electrochemical methods with bactericidal-energy-saving LED lamps and a filter system with nanofiltration membranes for drinking water;
- obtaining 5 copyright certificates for environmental technology of groundwater treatment in the Kazakhstan patent office.

4.2 The end result:

The results of the program should contribute to increasing the intensity of industrialization through an automated remote control system for multiparametric monitoring of water quality in real time, as well as their mobile applications.

The social effect of the program should contribute to increasing the life expectancy of the population (due to the consumption of clean water) and reducing diseases.

Ecological effect. The use of the obtained research results should ensure the rational management of water resources, the preservation of natural diversity; the removal of ecotoxicants entering groundwater, the improvement of the sanitary and epidemiological state of the region and contribute to the sustainable functioning of natural and agricultural systems.

Main consumers/users of the program results: government agencies, Kazakhstan scientific organizations dealing with water resources problems, universities, state republican and territorial administrative structures, agricultural formations (farming enterprises, households of the population and etc.), project organizations in the field of development of integrated plans of socio-economic development of Kazakhstan, public organizations, USAID, experts in the field of water resources and environmental protection, ecology, international scientific and educational centers and departments, working in the field of "green technologies" of membrane distillation, analytical research laboratories for water purification, water desalination.

5. The maximum amount of the program – **325,000 thousand** tenge, including by year:
for 2022 – **80,000 thousand** tenge, for 2023 – **120,000 thousand** tenge, for 2024 – **125,000 thousand** tenge.

Technical task No. 3
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Rational use of water resources, flora and fauna, ecology.

1.2. Name of the specialized direction of the program:

Development of geoinformation systems and monitoring of environmental objects

2. Goals and objectives of the program

2.1. The purpose of the program:

Creation of a unified ecosystem for collecting and processing atmospheric air monitoring data on the example of industrial cities in Kazakhstan. Creation of an algorithm for processing big data collected by existing air quality monitoring systems.

2.2. To achieve this goal, the following tasks must be solved:

1. Analysis of long-term historical data on air pollution in industrial cities of Kazakhstan;
2. Determination of the list of priority (marker, most dangerous from the point of view of influence on atmospheric air and characterizing the main industry) pollutants for inclusion in the information and analytical platform;
3. Collection and integration of heterogeneous metadata from various sources, including contact measurement data and remote sensing data;
4. Formation of an up-to-date database of atmospheric air quality based on archival materials and data from our own monitoring of atmospheric air quality;
5. Selection of big data analysis tools for the development of the analytical part of the platform;
6. Adaptation of models of transport and transformation of impurities in the atmosphere to the conditions of the selected industrial city;
7. Data processing based on computationally efficient mathematical algorithms for the joint use of models and observational data for the identification of pollution sources, including algorithms based on variational and ensemble approaches, conjugate problems and operator equations;
8. Analytical processing of big data based on data mining methods to identify hidden patterns and development of an expert system using artificial intelligence methods and machine learning algorithms;
9. Analysis of historical data using the developed mathematical apparatus;
10. Identification and ranking of atmospheric air quality factors affecting the quality of life of the population;
11. Creation of a prototype of a unified digital information and analytical platform for support and decision-making in the field of regional environmental policy, based on recognized international indices for assessing the quality of the atmosphere;
12. Deployment of a network of mobile and stationary atmospheric air monitoring sensors for suspended particles $PM_{2,5}$ и PM_{10};
13. Organization of a situational center for monitoring and forecasting air pollution in industrial cities.

3. Which points of strategic and program documents are solved:

1. Strategy “Kazakhstan-2050”: A new political course, which talks about the proper management of natural resources and the most effective transformation of the country's natural resources into sustainable economic growth.
2. National project “Green Kazakhstan”.
3. Strategic Development Plan of the Republic of Kazakhstan until 2025.
4. National project “Technological breakthrough through digitalization, science and innovation”.
5. The state program “Digital Kazakhstan”:

- Goals, objectives, target indicators and indicators of the results of the program implementation, Direction 1. Digitalization of economic sectors.

6. Environmental Code of the Republic of Kazakhstan..
7. ST RK BSI PD 8101-2016 “Smart cities. A guide to assessing the role of planning and development”.

4. Expected results

4.1 Direct results:

As a result of the implementation of the program, there should be:

- A scientifically-based list of priority (marker, most dangerous from the point of view of the impact on atmospheric air and characterizing the main industry) pollutants for inclusion in the information and analytical platform;
- The architecture of the database collected from various sources, including contact measurement data and remote sensing data, has been developed;
- The database of atmospheric air quality is filled on the basis of archival materials and data of own monitoring of atmospheric air quality, on the example of one industrial city;
- A big data analysis toolkit has been developed for the analytical part of the platform;
- Situational models of atmospheric air quality changes in industrial cities of East Kazakhstan region have

been developed based on the use of specialized software products: SILAM and WRF;
- A complex of computationally efficient mathematical algorithms for the joint use of models and observational data for the identification of pollution sources, including algorithms based on variational and ensemble approaches, conjugate problems and operator equations, has been developed;
- Data mining methods have been developed to identify hidden patterns;
- An expert system has been created using artificial intelligence methods and machine learning algorithms;
- The reanalysis of historical data using the developed mathematical apparatus is carried out;
- A list of reasonable factors of atmospheric air quality affecting the quality of life of the population has been obtained;
- A prototype of a unified digital information and analytical platform has been created to support and make decisions in the field of regional environmental policy, based on recognized international indices for assessing the quality of the atmosphere;
- An extensive network of mobile and stationary atmospheric air monitoring sensors for suspended particles $PM_{2,5}$ и $PM_{10;}$
- A situational Center for monitoring and forecasting atmospheric air pollution in industrial cities has been created, using the example of one industrial city;
- Obtaining 2 (two) copyright certificates for software products;
- Publication of at least 6 (six) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a percentile by CiteScore there are at least 50 (fifty) in the Scopus database;
- Publication of at least 3 (three) articles or reviews in a peer-reviewed foreign or domestic publication recommended by CQAES;
- Publication of at least one monograph of at least 4 p.s.;
- Submission of at least 2 (two) applications for protection documents.

4.2 The end result:

- A unified digital information and analytical platform for analyzing atmospheric air quality monitoring data in industrial cities of Kazakhstan, which should ensure accessibility to environmental information by government agencies, industry and the civilian population of the Republic of Kazakhstan, which will allow for faster response to changes in the state of the environment, develop effective programs for its conservation.
- Improvement of the State environmental monitoring system.
- Improving the quality of life based on the assessment received in the developed platform.
- Formation of an eco-oriented information space in Kazakhstan.
- Sustainable development of urban areas of the Republic of Kazakhstan in the long term.
- A new applied information and analytical complex in the field of environmental protection ready for further commercialization.

Received results of the program should be reflected in such target indicators as:

The target consumers of the results are: Ministry of Digital Development, Innovations and Aerospace Industry of the Republic of Kazakhstan, Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan, local executive bodies, industrial enterprises, population and public.

Economic effect. The main expected economic effect should be the commercialization of an innovative project, the growth of the quality and competitiveness of the products of the Republic of Kazakhstan, in accordance with international standards. The economic effect is expressed in improving the quality of life of the population of the Republic of Kazakhstan, the stability of the country's economy, its human capital, improving national security and sustainable development of the state.

Environmental effect. The implementation of the program should affect the improvement of the quality of atmospheric air in industrial cities of Kazakhstan on the example of East Kazakhstan region.

Social effect. Improving the quality of life of the population through the creation of a system for modeling and forecasting atmospheric air pollution, increasing public awareness of the quality of atmospheric air through free access to the created information and analytical platform, which will affect the creation of conditions for the development of environmental awareness of the population, increase the level of

interaction between government agencies and the scientific environment, the air pollution forecasting system will help local executive bodies apply effective policies to reduce air pollution.

5. The maximum amount of the program – 325,000 thousand tenge, including by year: for 2022 – 75,000 thousand tenge, for 2023 – **125,000** thousand tenge, for 2024 – **125,000** thousand tenge

Technical task No. 4
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Rational use of water resources, flora and fauna, ecology

1.2. Name of the specialized direction of the program:

Conservation and rational use of the animal and plant world

2. Goals and objectives of the program:

2.1. The purpose of the program

The study of the current state of the species diversity of vascular plants and the monographic publication of the regional floras of Mangystau, Atyrau, Akmola, Kostanay, Karaganda and East Kazakhstan administrative regions, taking into account the modern botanical nomenclature of plants, electronic maps, databases and illustrations of vascular plants.

2.2. To achieve this goal, the following tasks must be solved:

– To make preliminary lists of flowering and higher spore plants of the administrative regions of Kazakhstan according to classical and modern literary sources (Western, Central, Northern and Eastern Kazakhstan);

– To develop scientific and methodological approaches to floristic research, nomenclature, classification and taxonomy of plants;

– Develop routes of field trips to study the regional flora of Kazakhstan;

– To conduct a literary review on the study of the species diversity of the flora of Kazakhstan;

– To make preliminary lists of flora species of administrative regions of Kazakhstan;

– To carry out an inventory of the species composition of higher vascular and spore plants of the administrative regions of Kazakhstan, determine the distribution of species and create an electronic database of regional floras based on the results of field research and herbarium materials of domestic and foreign funds;

– To organize expedition trips to study the regional flora of the administrative regions of Kazakhstan in different seasons of the year;

– To carry out an audit of herbarium materials in domestic and foreign herbarium funds to clarify the species diversity and distribution of higher vascular and spore plants on the territory of Kazakhstan;

– To develop software and create an electronic database of regional floras based on the results of field research and data from the revision of herbarium materials of domestic and foreign funds;

– To make a summary of the higher vascular and spore plants of the administrative regions of Kazakhstan (Mangystau, Akmola, Karaganda and East Kazakhstan regions), including taxonomic, arealogical, ecological characteristics, life forms, phyto-conservation status and economic properties;

– Make a list of rare and endemic plants and their distribution in the administrative regions of Kazakhstan;

– Make a list of alien plants and their distribution in the administrative regions of Kazakhstan;

– To hold a scientific and practical conference on the study of species diversity, sustainable use and conservation of plants

– To analyze the flora of higher vascular and spore plants of Kazakhstan, to develop proposals and

recommendations for the creation of new specially protected natural areas, a monographic publication of regional flora of the Republic of Kazakhstan;
– To organize expedition trips to study the regional flora of the administrative regions of Kazakhstan in different seasons of the year;
– To make a summary of the higher vascular and spore plants of the administrative regions of Kazakhstan (Atyrau, Kostanay, Karaganda and East Kazakhstan regions), including taxonomic, arealogical, ecological characteristics, life forms, phyto-conservation status and economic properties;
– To analyze the floristic composition of the Administrative regions of Kazakhstan, taking into account taxonomic, arealogical, ecological characteristics, life forms, phyto-conservation status, economic properties, to identify weed-ruderal and drift taxa;
– To publish monographs of the regional flora of the Republic of Kazakhstan taking into account the ecological and biological characteristics of plants, life forms, distribution areas;
– To develop proposals and recommendations for the creation of new specially protected natural areas based on the species abundance of rare plants of local areas of territories, taking into account the recommendations of the IUCN;
– To conduct seminars, trainings on plant identification by a complex of morphological features, popularization of modern methods of floristic research.

3. Which points of strategic and program documents are solved:

1. Strategy "Kazakhstan 2050": A new political course for a new Kazakhstan in rapidly changing historical conditions.
2. Message of the President of the Republic of Kazakhstan to the People of Kazakhstan dated September 01, 2020. "Kazakhstan in a new reality: time for action" – VII. Ecology and protection of biodiversity.
3 Message of the President of the Republic of Kazakhstan dated September 01, 2021 "Unity of the people and systemic reforms – a solid foundation for the prosperity of the country"
4. Environmental Code of the Republic of Kazakhstan, with amendments dated January 02, 2021 No. 400-VI ZRK
5. Draft Law of the Republic of Kazakhstan "On Flora", based on the Resolution of the Government of the Republic of Kazakhstan dated December 30, 2020 No. 921.
6. Resolution of the Government of the Republic of Kazakhstan dated December 12, 2017 No. 827. On the approval of the State Program "Digital Kazakhstan".
7. The concept of conservation and sustainable use of biological diversity of the Republic of Kazakhstan, aimed at the implementation of priority areas such as "Conservation of biodiversity and "Sustainable use of biodiversity".
8. The Law of the RK "On specially protected natural territories".
9. Ratification of the Convention "On Biological Diversity".

4. Expected results:

4.1 Direct results:

According to the results of the program , there should be:

– Monographs of modern regional floras of administrative regions of Kazakhstan with a detailed description of taxonomic, arealogical, ecological characteristics, life forms, phyto-conservation status of plants, economic properties, isolation of weed-ruderal and invasive plant taxa (in book and electronic format) have been published.
– Certificates for the object of copyright for electronic versions of databases of regional floras of vascular plants of Kazakhstan have been obtained.
– Electronic databases on the components of the natural flora of Kazakhstan and herbarium material have been created.
– Recommendations have been developed for the creation of SPNA in the regions of Kazakhstan with transfer to representative bodies, departments of agriculture, ecology, protection of forests and wildlife, etc.
– Collaboration with leading institutes of the botanical profile of neighboring countries, training of qualified personnel was carried out.
– At least 3 (three) articles have been published and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by

impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty).

– Publication of at least 3 (three) articles or reviews in a peer-reviewed foreign or domestic publication recommended by CQAES.

4.2. The end result

Scientific and technical effect. Floristic studies of individual territories are of both theoretical interest, consisting in the knowledge of the laws of florogenetic processes, and practical, being the basis for assessing biodiversity and developing measures for its conservation. The monographic edition of the regional floras of the administrative regions of Kazakhstan should serve as the basis for the reissue of the new multi-volume "Flora of Kazakhstan". The results of the scientific and technical program obtained on the basis of the assessment of the current state of the species diversity of higher vascular plants and the compilation of regional floras of the Republic of Kazakhstan should contribute to obtaining new information on the floristic diversity of the regions of the Republic of Kazakhstan.

Scientific effect: compilation of critically analyzed summaries of the regional floras of the Republic of Kazakhstan, which should reflect the features of the species composition, arealogical, taxonomic and ecological analyses indicating the ecological and biological characteristics of plants.

The development of software and the creation of an electronic database on the components of regional flora and herbarium material of vascular plants of the Republic of Kazakhstan should allow the formation of a scientific base of special information on the floristic diversity of regions in the form of electronic maps, botanical descriptions and illustrations of species.

Economic effect: reduction of environmental risks aimed at reducing anthropogenic impact on the vegetation cover of the regions of the Republic of Kazakhstan. Obtaining income from the introduction of promising useful plants growing in the studied territories into production.

Social effect. The results of scientific research from the implementation of the program should dynamically fit into the overall strategy for the conservation and sustainable use of biodiversity on a national and international scale. The social effect should also manifest itself in the formation and involvement of qualified domestic personnel in the knowledge-intensive process.

The target consumers of the results obtained.

Scientists of botany, introducers, ecology: scientific research organizations of botanical profile, state institutions and authorized bodies; specially protected natural territories, regional economic entities,, the population of urban and rural territories.

5. The maximum amount of the program is 680,000 thousand tenge: including by year: for 2022 – **92,000 thousand** tenge, for 2023 – **294,000 thousand** tenge, for 2024 – **294,000 thousand** tenge.

Technical task No. 5
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program):

Rational use of water resources, flora and fauna, ecology.

1.2. Name of the specialized direction of the program:

Research of actual problems of soil quality, land degradation and desertification.

2. Goals and objectives of the program

2.1. The purpose of the program

Scientific and technical support of ecological and reclamation measures to improve hydrological, soil and agro-climatic conditions to increase the efficiency of the use of water-earth resources on irrigated agricultural landscapes.

2.2. To achieve this goal, the following tasks must be solved:

1. Ecological and reclamation survey of irrigated agricultural landscapes;
2. Development of agro-reclamation measures to preserve and improve the condition of irrigated agricultural landscapes;
3. Assessment and monitoring of ecosystem degradation and desertification using modern digital technologies;
4. Reduction of damage from the harmful effects of marginal waters on agroecosystems;
5. Development of a regulatory and methodological framework in the field of land reclamation and ecology of irrigated lands;
6. Introduction of innovative methods of restoration of irrigation and drainage networks to provide irrigation water to the demanded lands of regular and inundation irrigation.

3. Which points of strategic and program documents are solved:

- Message of the Head of State dated September 2, 2019 "Constructive public dialogue is the basis of stability and prosperity of Kazakhstan";
- Message of the President of the Republic of Kazakhstan "New development opportunities in the context of the Fourth Industrial Revolution" dated January 10, 2018;
- Strategic Development Plan of the Republic of Kazakhstan until 2025, approved by the Decree of the President of the Republic of Kazakhstan dated February 15, 2018;
- Law of the Republic of Kazakhstan No. 534-IV dated January 9, 2012 "On State support of industrial and innovative activities";
- "Water Code of the RK" No. 481 dated July 9, 2003;
- The concept of Kazakhstan's entry into the top 30 most developed countries in the world. Decree of the President of the Republic of Kazakhstan dated January 17, 2014 No. 732. (Sub-paragraphs 3.3 and 4.6.);
- The plan for the development of irrigated agriculture until 2028. Resolution of the Government of the Republic of Kazakhstan dated December 28, 2018 No. 904;
- Strategic Plan of the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan for 2020-2024;
- Environmental Code of the Republic of Kazakhstan No. 400-VI ZRK dated January 2, 2021.

4. Expected results

4.1 Direct results should be obtained:

Technologies:

1. Technology for preserving and improving the condition of irrigated agricultural landscapes using a complex of ecological and reclamation measures;
2. Technology of forecasting ecological and reclamation processes on irrigated lands (salinization, alkalinization, salinization, compaction, etc.);
3. Water-saving technology to increase the efficiency of the use of inundation irrigation;
4. Technology for restoring (increasing) the productivity of vertical drainage wells by pneumatic pulse method;
5. Technology for improving the fertility of saline irrigated lands of the Aral Sea region;
6. Technology of creation of water protection protective forest plantations on hydro-reclamation systems.

Recommendations:

1. Recommendations for the preservation and improvement of the condition of irrigated agricultural landscapes using a complex of ecological and reclamation measures;
2. Recommendations on the assessment of degradation and desertification of ecosystems using GIS technologies and remote sensing of the Earth;
3. Recommendations for reducing damage from the harmful effects of marginal waters on irrigated agroecosystems;
4. Recommendations for improving the condition and effective use of estuaries of Western Kazakhstan;
5. Recommendations for the use of a pneumatic pulse method for restoring (increasing) the productivity of vertical drainage wells;
6. Recommendations for the use of agro-reclamation measures to improve the fertility of saline irrigated lands of the Aral Sea region;
7. Recommendations for the creation and operation of water protection protective forest plantations on

hydro-reclamation systems.

Database:

1. Regulatory and methodological framework in the field of land reclamation and ecology of irrigated lands.

Methods:

1. Methodology for assessing degradation and desertification of ecosystems using GIS technologies and remote sensing.

Forecasts:

1. Forecast of degradation and desertification of ecosystems;
2. Forecast of the volume of marginal water discharge to irrigated agroecosystems;
3. Forecast on quantity and quality of water resources for reclamation purposes (inundation irrigation) of the West Kazakhstan region.

Publications:

- at least 3 (three) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty);

- at least 3 (three) articles or reviews in a peer-reviewed foreign or domestic publication recommended by CQAES.

Patents and inventions:

- at least 3 (three) applications for security documents.

4.2 The end result:

Electronic maps have been developed:

1. Electronic maps on the assessment of degradation and desertification of ecosystems in the southern regions of Kazakhstan – 4 pcs.;
2. Electronic map of ecological and meliorative state of estuaries of Western Kazakhstan - 1 pc.;
3. Electronic map of water protection protective forest plantations on hydro–reclamation systems - 1 pc.

Introduction of modern water-saving technologies (total area of 3000 hectares):

– Introduction of technology to preserve and improve the condition of irrigated agricultural landscapes using a complex of ecological and reclamation measures on a total area of 1,500 hectares (2023);

– Introduction of technology to preserve and improve the condition of irrigated agricultural landscapes using a complex of ecological and reclamation measures on a total area of 1,500 hectares (2024).

Program effect:

The effect of the introduction of the developed ecological reclamation technologies and measures is manifested in a number of aspects:

- expansion of the area of radically improved agricultural landscapes by involving degraded, saline, unproductive and other lands in circulation;
- increasing the coefficient of land use as a result of eliminating the unfavorable water regime, removing toxic salts and substances from the soil, carrying out other agro-reclamation measures;
- the contour of irrigated fields is increasing and their configuration is improving, which creates conditions for high-performance agricultural production and the use of modern technical and other means of agro-reclamation;
- increasing soil fertility and creating conditions for improving the structure of agricultural landscapes and acreage and cultivation of more intensive crops;
- ensuring efficient use of water and land resources;
- ensuring ecological balance under anthropogenic impact on agricultural landscapes.
- efficient use of water-earth resources.

The economic effect of the introduction of the developed ecological and reclamation technologies and measures, depending on the cultivated crops, is 120-160 thousand tenge/ha. The annual economic effect when implemented on an area of 3000 hectares will amount to 360 - 480 million tenge per year.

Social effect: As a result of the implementation of the program, the ecological and meliorative state of agricultural landscapes should improve, which will lead to an increase in rural employment, improve the socio-economic situation and reduce the migration outflow of villagers to cities, facilitate working

conditions, create additional jobs.

The target consumers of the results are: MEG&NR, MA, regional and district akimats, state institutions for the management of natural resources and agriculture, water management and agricultural organizations, agricultural producers, farmers and peasant farms.

5. The maximum amount of the program is 383,380 thousand tenge, including by year: for 2022 – **83,780 thousand** tenge, for 2023 – **152,300 thousand** tenge, for 2024 – **147,300 thousand** tenge.

Technical task No. 6
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program):

Geology, extraction and processing of mineral and hydrocarbon raw materials, new materials, technology, safe products and structures.

1.2. Name of the specialized direction of the program:

- New multipurpose materials based on natural raw materials and man-made waste
- Production and processing of metals and materials

2. Goals and objectives of the program

2.1. The purpose of the program:

Development of technology for processing complex alloy steels in the process of primary crystallization by the introduction of NPM (nanopowder materials), inoculators, vibration, magnetic and other methods of influence to improve the quality of the structure of materials and parts based on them and the introduction of technology into production.

2.2. To achieve this goal, the following tasks must be solved:

1. Monitoring of the Kazakhstan market in order to select the optimal type of out-of-furnace processing technology;
2. Development and implementation of logistics measures for the effective implementation of all technological stages;
3. Development of out-of-furnace processing technology taking into account the selected type of technology and the grades of steel being smelted;
4. Investigation of the properties of steel treated with the proposed technology of out-of-furnace processing;
5. Approbation of the developed technology and its adjustment taking into account the results obtained.
6. Development of technological documentation;
7. Conducting an advertising campaign of the developed technology among potential consumers.

3. Which points of strategic and program documents are solved:

1. "Strategy "Kazakhstan – 2050".
2. Strategic Development Plan of the Republic of Kazakhstan until 2025
3. The Law of the Republic of Kazakhstan "On Industrial Policy"
4. Speech of the Head of State at the third meeting of the National Council of Public Trust on May 27, 2020.
5. The program of industrial and innovative development of Kazakhstan for 2020-2025. (approved by the Government of the Republic of Kazakhstan on December 31, 2019) is "... creating conditions for stimulating the competitiveness of the manufacturing industry by developing high-value-added industries in the domestic and foreign markets ...".
6. The program of industrial and innovative development of Kazakhstan for 2020-2025:

- increase of industrial capacity by stimulating the development of basic production facilities and the implementation of strategic projects;
- technological development and digitalization of manufacturing industries.

4. Expected results

4.1 Direct results:

As a result of the implementation of the program, there should be:

- new scientific knowledge about crystallization processes and the influence of various factors on it has been obtained;
- new methods of out-of-furnace processing of complex alloy steels have been developed, including the introduction of NPM, inoculators, vibration and magnetic field treatment;
- prototypes were obtained using the developed steel processing technology;
- the technological documentation of the process has been developed, which will allow the implementation of this technological process at an enterprise of any form of ownership, provided that the necessary fixed assets are available;
- at least 5 (five) articles and (or) reviews have been published in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a percentile by CiteScore there are at least 50 (fifty) in the Scopus database;
- at least 6 (six) articles and (or) reviews in peer-reviewed foreign and (or) domestic publications (recommended by CQAES);
- 3 applications for patents of the RK and 1 application for a Eurasian patent have been filed;
- published 1 monograph in a domestic edition and 1 monograph in a foreign publishing house;
- 2 articles have been published in the media in order to popularize the results of the work;
- at least 4 reviews of experimental products have been received;
- at least 3 agreements of intent have been concluded with potential consumers;
- a license agreement has been concluded for the use of intellectual property results with industrial enterprises in order to further commercialize the results;
- at least 3 “Round tables” were organized with the involvement of potential consumers and scientists in this field of research;
- a web page has been created to post information about the Program, its current status, the results obtained, information about the participants of the Program, etc.

4.2 The end result:

The technology of out-of-furnace processing of complex alloy steels for the production of mining and metallurgical complex parts should be developed taking into account the level of development of national metallurgical production and global trends in this direction and contributing to the effective improvement of the quality and added value of the final product;

The economic effect: the implementation of the Program should ensure:

- production of a national product (high-quality alloy steel and parts based on it) with high added value;
- expansion of the range of production and processing of complex alloy steels with a high proportion of Kazakhstan content;
- decrease in the share of imports in this segment of the economy;
- increasing the service life of parts by improving their quality;
- reducing the frequency of replacement parts by increasing the service life;

Social effect: the implementation of the program should ensure:

- efficient utilization of man-made waste;
- creation of new jobs in the mining and metallurgical sector;
- development of subcontracting – a modern tool of interaction between large and small businesses;
- expansion of the use of mineral resources of the RK;
- development of metallurgical science of the RK in accordance with the world's leading trends;
- improvement of the environmental situation in the zone of metallurgical enterprises.

5. The maximum amount of the program is 300,000 thousand tenge, including: for 2022 – **60,000 thousand** tenge, for 2023 – **120,000 thousand** tenge, for 2024 – **120,000 thousand** tenge.

Technical task No. 7
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program):

Geology, extraction and processing of mineral and hydrocarbon raw materials, new materials, technologies, safe products and structures.

1.2 Name of the specialized direction of the program:

New multipurpose materials based on natural raw materials and man-made waste.

2. Goals and objectives of the program

2.1. The purpose of the program:

Improving the quality of asphalt concrete roads by modifying road bitumen with micro and nanomaterials based on mineral raw materials and man-made waste (inorganic and organic oxides, rubber chips, polymer materials, etc.), cleaning the mineral part (crushed stone, screening, etc.) by hydro-pulse impact.

2.2. To achieve this goal, the following tasks must be solved:

- to develop scientific and methodological bases for assessing the physico-chemical, physico-mechanical properties of bitumen depending on the nature and origin:

- to investigate the composition and physico-chemical properties of bitumen.
- to determine and systematize the physical and mechanical properties of bitumen.
- conduct rheological studies of bitumen.
- to develop scientific recommendations on the use of bitumen in various climatic conditions of regions.

– to develop scientifically-based recommendations for the creation of modified bitumen with organic and inorganic stabilizers:

- to develop a method for synthesizing modified oxides to add them as additives to asphalt concrete, which will significantly increase its quality characteristics (plasticity, frost resistance, lack of road rubble, service life).
- to develop a method for obtaining modified bitumen, including the addition of rubber chips and polymer materials obtained by recycling. The use of a bitumen-rubber composition will expand the temperature range of plasticity, increase frost resistance, resistance to cyclic deformations at subzero temperatures, and improve the vibration-damping properties of asphalt concrete.
- to improve the quality of the road base for asphalt concrete coatings, create a new modified stabilizer of ground concrete,

– to develop methods for hydrophobization of mineral additives used in the production of asphalt mixture:

- using the method of hydro-pulse discharge to develop a method for cleaning crushed stone, screening and other materials from clay and silty impurities that degrade the operational quality of asphalt concrete.
- to conduct pilot tests of the developed technologies with new domestic additives.
- to develop initial data and technological regulations for the design of a pilot plant for the production of modified road bitumen with new nanomaterials.

3. Which points of strategic and program documents are solved:

The implementation of the Program should make it possible to implement the tasks, achieve the goals and indicators defined in the following strategic and program documents:

1. Law of the Republic of Kazakhstan dated February 18, 2011 No. 407-IV “On Science”;
2. Development strategy of the Republic of Kazakhstan until 2050;
3. Decree of the President of the Republic of Kazakhstan dated April 17, 2017 No. 462;
4. Decree of the President of the Republic of Kazakhstan October 26, 2017 No. 569;
5. Decree of the President of the Republic of Kazakhstan February 19, 2018 No. 637;
6. Message of the President of the Republic of Kazakhstan K.Tokayev to the People of Kazakhstan “New Kazakhstan: the path of renewal and modernization” (2022);
7. The concept of Kazakhstan's entry into the top 30 most developed countries in the world;

4. Expected results:

4.1 Direct results:

According to the results of the program , there should be:

- a new method of synthesis of modified oxides and methods of their addition to asphalt concrete as an additive designed to improve the plasticity, frost resistance, crushed stone formation of the pavement and its other qualitative characteristics has been developed.

- modified bitumen was obtained in the form of a bitumen-rubber composition, which expands the range of plasticity, resistance to cyclic deformations at negative temperatures, and improves the vibration-damping properties of asphalt concrete.
- a new domestic stabilizer of ground concrete has been obtained, which will improve the quality of the road base under asphalt concrete coatings.
- a method of hydroimpulse discharge has been developed for cleaning crushed stone, screening and other materials from clay and silty impurities that impair the adhesion of the bitumen binder to the mineral part.
- the results of pilot tests of the developed technologies with new domestic additives were obtained.
- technological regulations have been developed for the design of a pilot plant for the production of modified road bitumen with new nanomaterials and recycled polymers.
- at least 3 (three) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty);
- at least 3 (three) articles or reviews in a peer-reviewed foreign or domestic publication recommended by CQAES.

4.2 The end result:

Scientific and technical effect: the implementation of the program should ensure:

Obtaining asphalt concrete with improved quality characteristics based on a scientific approach to modifying bitumen with various additives, obtaining a bitumen-rubber composition, cleaning the mineral part, using a new stabilizer of ground concrete.

Implementation of the results obtained in the production of new import-substituting products and materials.

Scientific effect – the implementation of the program should ensure: obtaining new materials in the process of studying the mechanisms of interaction and production of high-quality asphalt concrete coatings.

Developed additives that can serve as an alternative for imported products used in the production of bitumen and concrete in the Republic of Kazakhstan.

Economic effect – The implementation of the program should ensure: improving the quality and service life of roads in Kazakhstan, creating new import-substituting products and materials to increase the Kazakh content in the products of enterprises of the Republic of Kazakhstan. The secondary use of polymer materials and rubber should lead to cost savings and solve environmental pollution problems.

The use of special additives and modification of bitumen should expand the plasticity interval by 1.5 times, increase the resistance to cyclic deformations at negative temperatures by 20%, and improve the vibration-damping properties of asphalt concrete by 1.2 times. The cleaning of the mineral part and the use of new ground concrete stabilizers should increase the adhesion of the bitumen binder to the mineral part by 25%.

Social effect - The implementation of the program should ensure: increasing the prestige of the scientific potential of Kazakhstan, the integration of science and production. Creation of new jobs, increase in budget revenues for social needs. The influx of young specialists into science and high-tech industries. With the widespread introduction of this technology, more than 1,000 specialists of chemists, technologists, materials scientists, etc. will need to be trained. The introduction of the proposed technology and materials will increase the inter-repair service life of roads in comparison with crushed stone-mastic “polymer asphalt concrete” by 2 times.

Target consumers of the results obtained: government agencies and organizations, enterprises engaged in road construction, research organizations, higher education institutions, scientists.

5. The maximum amount of the program is 260,000 thousand tenge, including by year: for 2022 – **60,000 thousand** tenge, 2023 – **100,000 thousand** tenge, 2024 – **100,000 thousand** tenge.

Technical task No. 8
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program):

Geology, extraction and processing of mineral and hydrocarbon raw materials, new materials, technologies, safe products and structures

1.2. Name of the specialized direction of the program:

Complex processing of hydrocarbon raw materials

2. Goals and objectives of the program

2.1. The purpose of the program:

Development of technology for the disposal of solid household and organic waste (oil sludge, coal dust, resins) through their complex processing to solve regional environmental problems.

2.2. To achieve this goal, the following tasks must be solved:

1. Study of the most accessible, effective and economically justified foreign technologies for waste disposal and recycling;
2. Development and creation of a pilot plant for conducting physico-chemical and chemical, technical, structural and technological tests that contribute to the implementation of industrial (oil sludge, coal dust, tar) and household waste disposal processes;
3. Conducting a technical and economic assessment of the processing and disposal of solid household, organic and industrial waste;
4. Conducting mass experiments in different waste ratios to select the optimal operating mode of the installation;
5. Improvement of the method of processing and disposal of organic waste using new technological methods;
6. Development of recommendations on the method of processing and disposal of solid household and organic, historical waste (oil sludge, coal dust, resins) on a production scale.

3. Which points of strategic and program documents are solved:

- Environmental Code of the Republic of Kazakhstan No. 400-VI dated 02.01.2021;
- The concept of transition to a "green economy" by 2030;
- Strategic Development Plan of the RK until 2025, approved by the Decree of the President of the Republic of Kazakhstan dated February 15, 2018 No. 636. Policy 6. "Green" economy and environmental protection". Task 5. Improving the efficiency of use and protection of water resources; Task 5. Improving the efficiency of use and protection of water resources;
- "Strategy "Kazakhstan-2050": a new political course of the established state" December 14, 2012;
- Strategic Development Plan of the RK until 2025. Reform 5, the priority is to ensure the basic quality of life in all regions. Task: improving the environmental situation;
- Development strategy of the Republic of Kazakhstan until 2050. The fifth challenge is global energy security. Alternative and "green" energy technologies;
- The concept of science development for 2022-2026.

4. Expected results

4.1 Direct results:

1. Development of waste disposal technology based on high-speed pyrolysis, as a result of which components suitable for secondary use as commercial products should be obtained;
2. Introduction of the recycle into the technological scheme, in which a number of important technological tasks are solved, such as: the use of the initial components; the exclusion of harmful emissions into the environment; the use of reaction heat to heat the initial components;
3. Development of modern, safe and environmentally friendly technologies through high-speed pyrolysis of SDW and oil sludge, coal dust, resins;
4. Adoption of the concept of technological solutions providing for compliance with the process of waste-free production, taking into account technological solutions for the processing, disposal and waste neutralization by sharing SDW, oil sludge, coal dust, resins, etc. as a feedstock
5. Publication of scientific articles in journals:

- at least 3 (three) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty);
- at least 5 (five) articles in journals recommended by CQAES;

- 1 patent of the RK for the invention.
6. Development and creation of a pilot plant;
7 Creation of a material and technical base for technological scaling of the program results.

4.2 The end result:

The implementation of the Program should have high economic efficiency, which is based on waste-free processing of solid waste, oil sludge, coal dust and smeared soils with the production of synthetic oil, gas, heat and electricity, building materials, asphalt and valuable chemical products.

Scientific and technical effect:

- the technology of high-speed pyrolysis for the processing of solid household and industrial waste, which contribute not only to recycling, but also to the absence of waste sorting without the formation of dioxins and the absence of the use of energy costs, consistent with the principles of the best available technologies;
- selection of the temperature regime during heating of the energy carrier in a continuous process without oxygen access with the formation of a vapor-gas mixture and intermediates;
- development of technology for processing any low-potential organic raw materials;
- production of commercial pyrolysis products (liquid fuel, electric and thermal energy, alloy, valuable chemical products, etc.) with the possibility of use in the technological process (pyrolysis gas, excess heat of the pyrolysis process).

Scientific effect of the program implementation:

- the results of the work should serve as a justification for the use of high-speed pyrolysis technology for the processing of both previously stored and newly received municipal and industrial solid waste and sludge in various mixtures and proportions.
- solving the problems of industrial waste disposal (oil sludge, coal dust, resins), SDW with the production of building materials, asphalts, fertilizers from the resulting ash, and when melting the coke residue of ferroalloys and calcium carbide.

Economic effect of the program implementation:

- the economic component of this technology should be based on the reduction of payments for environmental pollution in accordance with the reduction of emissions from the impact of the waste itself, as well as the use of waste as a starting component in the production of commercial products.
- reduction of mandatory payments for environmental pollution, including over-established standards.

Environmental effect of the Program:

- the operation of the installations should reduce environmental damage from landfills with waste, greenhouse and landfill gas emissions into the atmosphere and groundwater pollution;
- the result of reducing the volume of actual emissions of pollutants should be up to 100%.
- use of waste to cover energy needs and gradual release from coal and liquid fuels.

Social effect of the Program:

- improving the environmental situation by reducing the use of industrial waste landfills, landfills and SDW landfills.
- the destruction of previously accumulated industrial and municipal waste at existing and closed landfills will help to free up the lands occupied by waste and sanitary protection zones, clean and neutralize the soil under the former landfills, and involve these lands again in economic turnover.
- solving problems with the formation of dioxins, and other harmful gaseous products released.

Target consumers of the results obtained: Research organizations, state and regional executive authorities of the Republic of Kazakhstan, industrial enterprises, regional economic entities involved in the framework of the Concept of "green economy" and urban planning, the population of cities and large settlements.

5. The maximum amount of the program is 300,000 thousand tenge, including by year: for 2022 – **60,000 thousand** tenge, for 2023 – **120,000 thousand** tenge, for 2024 – **120,000 thousand** tenge

Technical task No. 9
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program):

Geology, extraction and processing of mineral and hydrocarbon raw materials, new materials, technologies, safe products and structures

1.2. Name of the specialized direction of the program:

Complex and waste-free use of mineral raw materials.

New multipurpose materials based on natural raw materials and man-made waste.

Production and processing of metals and materials.

2. Goals and objectives of the program

2.1. The purpose of the program:

To develop new technologies for processing difficult-to-enrich poor ores and man-made waste with the extraction of non-ferrous, noble, rare and rare earth metals with the issuance of initial data for the introduction and production of new materials.

2.2 To achieve this goal, the following tasks must be solved:

– develop new technological schemes for processing hard-to-enrich copper ores, man-made waste and obtaining new materials:

– to develop a technology for deep processing of gold and copper-containing technogenic raw materials by hydrometallurgical methods using new catalyzing oxidants;

– to develop a technology for the enrichment of gold-containing technogenic raw materials using ultrafine grinding and hydrometallurgical processing of concentrate using new catalyzing oxidants;

– to develop a comprehensive waste-free technology for processing copper sulfide concentrates;

– to develop a technology for carbonation extraction of scandium from red sludge;

– to investigate the material and chemical compositions of recycled soda and underslam waters of the groove; to investigate the salting mechanism and to work out the technological parameters of precipitation of aluminum hydroxide and gallium-containing product.

– search for optimal ways to extract REM and impurity components from technogenic waste of phosphorus-containing and substandard titanium-containing raw materials;

– to investigate the distribution of zinc and cadmium impurities during the distillation of magnesium from double alloys under equilibrium and nonequilibrium conditions;

- to develop an innovative composition of a heat-curing molding mixture that ensures the production of molds using burnable models from photopolymers;

– to develop high-alumina refractory mixtures using man-made waste with an assessment of their characteristics;

– to determine the influence of mechanical activation conditions of copper-containing ore and technogenic raw materials on the physico-chemical characteristics and phase composition of processing products.

– to develop the main technological parameters for the processing of difficult-to-enrich poor ores, man-made waste and the production of new materials:

– to develop a technology for the enrichment of gold-containing technogenic raw materials using ultrafine grinding and hydrometallurgical processing of concentrate using new catalyzing oxidants;

– to develop a technology for deep depletion of slag smelting sulfide copper concentrates;

– to develop methods for sorption concentration of scandium and purification of regenerate from impurities to obtain commercial scandium;

– to develop technologies for sorption extraction of gallium using selective ion-exchange resins and the production of metallic gallium on an electrolyzer with a gallated cathode;

– to determine the optimal parameters of hydrometallurgical processing of phosphogypsum and pyrometallurgical processing of substandard ilmenite;

– to investigate the distribution of aluminum and copper impurities during the distillation of magnesium from double alloys under equilibrium and nonequilibrium conditions;

- to work out the modes of forming and casting to obtain castings from titanium alloys with the specified parameters of size, composition and structure;

- to work out the conditions of forming and sintering of high-alumina refractory products with an assessment of their characteristics;

– to develop conditions for the leaching of mechanically activated copper-containing ore and man-made raw materials with non-aqueous and mixed solvents, ensuring the economic efficiency of extracting copper from raw materials.

– to test the developed technologies for processing difficult-to-enrich poor ores, man-made waste and obtaining new materials with recommendations for implementation:

– to test technologies for processing gold- and copper-containing technogenic raw materials in production conditions; to issue initial data for the preparation of technological regulations;

– to develop a technology for obtaining new materials based on slags after deep depletion;

– conduct large-scale laboratory tests of scandium extraction technology from industrial products of alumina production; provide initial data for the development of Technological regulations and recommendations for introduction into production;

– large – scale laboratory tests of technology for obtaining gallium from industrial products of alumina production. Issuance of initial data for the development of Technological regulations and introduction into production;

– to develop technological schemes for complex processing of phosphorus-containing raw materials and ilmenite concentrate with a high chromium content;

– to investigate the distribution of nickel impurities during the distillation of magnesium from an alloy under equilibrium and nonequilibrium conditions. To test the developed distillation technology on the remelting of light alloy scrap;

- to test the developed technology for obtaining castings from titanium alloys using additive models on an enlarged laboratory scale;

– to test the developed technology for the production of high-alumina refractory products with the use of man-made waste on an enlarged laboratory scale;

– to develop conditions for the extraction of copper from non-aqueous and mixed solutions after leaching to obtain a marketable product, to test the developed technologies for the solvometallurgical processing of mechanically activated copper-containing ore and man-made raw materials, to issue recommendations for implementation.

3. Which points of strategic and program documents are solved:

1. Strategy “Kazakhstan-2050”.
2. State Program of Industrial and Innovative Development of the Republic of Kazakhstan for 2020-2025: section 5. Main directions, ways to achieve the set goals, subsection 1.5. Development of technologies and innovations; 1.10. Development of manufacturing sectors; 1.9. Training of qualified personnel.
3. Strategic Development Plan of the RK until 2025.
4. Message of the President of the Republic of Kazakhstan dated January 10, 2018 “New development opportunities in the context of the Fourth Industrial Revolution”.
5. Message of the President of the Republic of Kazakhstan dated October 5, 2018 “The growth of the well-being of Kazakhstanis: increasing income and quality of life”.
6. The Message of the President of the Republic of Kazakhstan dated September 1, 2021 “The unity of the people and systemic reforms are a solid foundation for the prosperity of the country”.
7. The Law “On commercialization of the results of scientific and (or) scientific and technical activities”.
8. The development strategy of the Republic of Kazakhstan until 2050: A new political course for the proper management of natural resources.

4. Expected results

4.1 Direct results:

According to the results of the program , there should be:

- technologies for extracting gold using ultrafine grinding and hydrometallurgical processing of concentrate using new catalyzing oxidants and technologies for extracting copper by hydrometallurgical methods using new catalyzing oxidants, initial data for the preparation of technological regulations for production. Improved technological schemes for the extraction of gold and copper, allowing to increase the extraction of valuable components by 1.5-2.0% compared to existing technologies;
- a comprehensive waste-free technology for processing sulfide copper concentrates with continuous deep depletion of slag and the use of the silicate part of the slag, initial data for implementation in production. The

technology should make it possible to process concentrates with minimal losses of copper and precious metals and obtain slags with a residual copper content of less than 0.3%, which reduces the loss of copper with slags to 50%, and use the silicate part of the slags for the production of building materials;
- technologies of concentration and extraction of metallic gallium, scandium hydroxide and silicate products of a wide range from industrial products and waste of alumina production, initial data for technological regulations and production organization.
- the technology of complex processing of substandard raw materials and man-made waste to produce a concentrate of rare earth metals, titanium dioxide with a content of at least 90%, a method for sorption extraction of rare earth metals, initial data for implementation.
- the technology of vacuum distillation recycling of secondary light alloys with the removal of magnesium into a standard industrial product, which allows to obtain double magnesium-based alloys and eliminate the loss of rare earth and refractory elements.
- a method for manufacturing shaped castings from titanium alloys using burnable models obtained from photopolymers using additive technologies, and molds made of special heat-curing molding materials with an innovative composition.
- energy-efficient technology for producing high-alumina refractory products using man-made waste, obtaining a pilot batch of products, initial data for implementation.
- technologies of solvometallurgical processing of copper concentrates and technogenic copper-containing raw materials and conducting semi-industrial tests, initial data for implementation.
– at least 3 (three) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty);
- at least 5 (five) articles or reviews in peer-reviewed foreign and/or domestic publications recommended by CQAES;
- 3 applications for the invention have been filed at the National Institute of Intellectual Property;
- tests were carried out in pilot and/or production conditions of the developed technologies; initial data for the preparation of technological regulations and recommendations for introduction into production.

4.2 The end result:

The developed technologies should contribute to a more complete extraction of the above-mentioned metals and reduce their losses, organize the production of new types of marketable products for Kazakhstan, improve the environmental performance of production. The developed technologies are focused on implementation in industrial conditions at processing plants and metallurgical enterprises of the republic.

Economic effect. In the field of processing of difficult-to-enrich and technogenic raw materials of non-ferrous metallurgy, within the framework of the Program, the developed technologies should contribute to an increase in the productivity of the production of precious, non-ferrous metals by 1.5-2%, which in turn will lead to an economic growth of the assets of the enterprise by an average of 3-5%. The use of a comprehensive waste-free technology for processing sulfide copper concentrates will give an additional 1,250 tons/year of copper. The organization of the production of metallic gallium will additionally produce 20 tons/ year of metallic Ga and up to 50 thousand tons of Al2O3 per year, scandium oxide in an amount of up to 10 tons / year. The implementation on an industrial scale of new technologies for processing man-made waste from metallurgical and chemical industries should contribute to increasing the cost of the resulting commodity products in the form of REM concentrate and titanium dioxide. The organization of domestic production of pure magnesium metal and new molding materials for the production of titanium alloys should help to increase import substitution.

Environmental effect: the implementation of the program should ensure: rational use of natural resources through the use of environmentally friendly technologies and reduction of the amount of man-made waste, the development of a “green economy”, recycling of industrial waste, up to 25% reduction in greenhouse gas emissions into the atmosphere, which in turn should lead to a reduction in administrative sanctions (fines) of enterprises. A rational approach to the use of mineral raw materials should contribute to reducing harmful emissions from spent tailings by 5-7%. The enrichment technology should help to reduce the volume of flotation tailings output by 5% and, accordingly, reduce the degree of environmental pollution. The ecological effect of the use of waste-free technology for processing copper raw materials is achieved by

eliminating about 250,000 tons of slag dumps per year.

Social effect Technologies should contribute to increasing not only the economic potential of the Republic of Kazakhstan, but also to improving the social environment by creating new industries and jobs (about 450 jobs), improving the skills of personnel of enterprises.

Target consumers of the results obtained. The developed technologies and initial data for implementation on an industrial scale should be recommended to enterprises ("Altyntau Kokshetau" JSC, "Advans Mining Technology" LLP, "Kazakhmys Smelting" LLP, Pavlodar Aluminum Plant "Aluminum of Kazakhstan" JSC, "UK TMK" LLP). The developed new technologies can also be used at non-ferrous metallurgy enterprises in other countries.

5. The maximum amount of the program is 400,000 thousand tenge, including by year: for 2022 – **70,000** thousand tenge, for 2023 – **165,000** thousand tenge, for 2024 – **165,000** thousand tenge

Technical task No. 10
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program):

Geology, extraction and processing of mineral and hydrocarbon raw materials, new materials, technologies, safe products and structures

1.2. Name of the specialized direction of the program:

Composition materials

2. Goals and objectives of the program

2.1. The purpose of the program:

Development of technology for radiation modification and assessment of the degree of radiation damage in composite structural materials based on high-entropy alloys, oxide ceramics, thin-film nitride coatings used for reactor engineering, rocket engineering and mechanical engineering.

2.2. To achieve this goal, the following tasks must be solved:

- Development of a kinetic model of radiation damage linking the processes of swelling and embrittlement with deformation changes in high-entropy alloys based on transition refractory metals;
- Development of technology for the production of composite ceramics based on refractory oxides with high resistance to external influences, including radiation embrittlement;
- Development of technology for modification of thin-film nitride coatings to increase resistance to mechanical damage;
- Investigation of the dynamics of changes in mechanical and strength properties as a result of heavy ion irradiation of inert gases in high-entropy alloys based on transition refractory metals.

3. Which points of strategic and program documents are solved:

1. Law of the Republic of Kazakhstan dated February 18, 2011 No. 407-IV "On Science";
2. Message of the President of the Republic of Kazakhstan K.K.Tokayev to the people of Kazakhstan "Kazakhstan in a new reality: time for action" (2020);
3. National Development Plan of the Republic of Kazakhstan until 2025;
4. The concept of Kazakhstan's entry into the top 30 most developed countries in the world;
5. The State program of industrial and innovative development of the Republic of Kazakhstan for 2020-2025. Action plan for the implementation of the SPIID of the Republic of Kazakhstan for 2020 – 2025. Task 4. Technological development and digitalization.
6. Message of the President of the Republic of Kazakhstan K.K.Tokayev to the people of Kazakhstan "Unity of the people and systemic reforms – a solid foundation for the prosperity of the country" (2021).

4. Expected results:

4.1 Direct results:

According to the results of the program , there should be:

- A model of the kinetics of radiation damage, swelling and embrittlement processes in high-entropy alloys

based on transition refractory metals;
- New high-entropy alloys with resistance to radiation swelling 3-5 times higher than traditional steels and alloys;
- Technology of synthesis of refractory oxide ceramics capable of withstanding temperature changes up to 700C and having high resistance to radiation damage;
- Technology of modification of thin-film nitride coatings with increased resistance to mechanical damage more than twice as compared with classical protective coatings;
- Results of the effect of radiation modification and doping of thin-film coatings on resistance to corrosion processes as a result of external influences and aggressive media;
- Recommendations on the use of various types of ionizing radiation for radiation modification of composite materials as part of the development of new applications in the use of ionizing radiation for peaceful purposes;
- New data on the effect of radiation defects on the properties of high–entropy alloys and oxide ceramics, allowing to expand the database of structural materials candidates in reactor engineering, rocket engineering and mechanical engineering;
- 10 articles and (or) reviews have been published in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database. less than 50 (fifty);
- 6 articles have been published in scientific journals included in the CQAES lists.
- 2 utility model patents have been filed.
- 1 monograph on the research topic has been published.

4.2 The end result:

The implementation of the program should contribute to increasing and improving the scientific, theoretical, applied and practical significance of research in the field of obtaining new structural composite materials for reactor engineering, rocket engineering and mechanical engineering.

Within the framework of the program, it is planned to develop the material and technical base in order to expand opportunities for research of mechanical and strength properties, as well as the creation of a technological line for testing structural materials.

Economic effect. The results of technological solutions in the future should ensure the development of new industries on the territory of the Republic of Kazakhstan and increase the growth of high-tech industries in the country.

Environmental effect. New data on the radiation resistance of candidate structural materials for use in modern materials science should lead to the expansion of Kazakhstan's prospects for entry into the EuroFussion international program aimed at finding new structural materials used in reactor engineering, the main task of which is to increase the level of safety of nuclear energy use.

Social effect should consist in the development of scientific, theoretical and practical tasks in the field of materials science, strengthening the efficiency of the pace of development of the country's research potential, increasing the prestige of science and scientific research in Kazakhstan on the world stage, creating new scientific schools and educating a new generation of young scientists.

Within the framework of the program, at least 3 PhD theses with prospects for further development and new scientific personnel should be prepared

Target consumers of the results obtained - researchers and specialists in the field of composite materials and thin-film coatings, scientific organizations and industries engaged in developments in the field of new materials for mechanical engineering, rocket engineering, defense industry, etc.

5. The maximum amount of the program is 300,000 thousand tenge, including by year: for 2022 – **60,000 thousand** tenge; for 2023 – **120,000 thousand** tenge; for 2024 – **120,000 thousand** tenge.

Technical task No. 11
for research work

within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program):

Geology, extraction and processing of mineral and hydrocarbon raw materials, new materials, technologies, safe products and structures

1.2. Name of the specialized direction of the program

Geology and development of mineral deposits

2. Goals and objectives of the program

2.1. The purpose of the program:

To identify new directions of search in promising structural-formation zones and to develop scientifically-based recommendations for setting up search operations within the most promising areas of specific structural-formation zones with geodynamic conditions favorable for ore formation, geological formations and stratolevels, in order to reduce the gap between the replenishment of minerals and their extraction as soon as possible.

2.2. To achieve this goal, the following tasks must be solved:

- collection of materials on the geology and minerageny of the paleozoic of Kazakhstan over the past 25-30 years and correction of metallogenograms of 78 structural and formation zones (hereinafter referred to as SFZ) of the paleozoic in order to prepare a modern basis for complex metallogenic analysis;
- identification of promising SFZ with metallogenically favorable stratolevels and geodynamic conditions by conducting a comprehensive metallogenic analysis based on metallogenograms and the main provisions of modern geotectonic concepts;
- comparative analysis and evaluation of metallogenic specialization of the SFZ paleozoic of Kazakhstan with modern similar structures of the Earth;
- drawing up a new scheme of structural and mineragenic zoning of the paleozoic of Kazakhstan m-ba 1:2500000 from actualistic positions;
- on the basis of the results of decoding the materials of remote sensing of the Earth (ERS) and metallogenograms of the SFZ paleozoid of Kazakhstan, the compilation of a "Map of promising areas of the paleozoids of Kazakhstan for various types of minerals" scale 1:1,000,000;
- compilation of a catalog of priority promising areas for the staging of prospecting works;
- development of scientifically-based recommendations for setting up prospecting and exploration work on the most promising areas in specific SFZ with identified favorable ore-bearing stratolevels and geodynamic conditions;
- preparation for publication and publication of the “Atlas of metallogenograms of the structural and formation zones of the Paleozoic of Kazakhstan”;

3. Which points of strategic and program documents are solved:

3.1 In the Address to the People of Kazakhstan dated January 31 , 2017 “*The third modernization of Kazakhstan: global competitiveness*” it is noted that “Great attention should be paid to the expansion of the mineral resource base”;

3.2 Strategy “Kazakhstan-2050”: A new political course, which talks about the proper management of natural resources and the most effective transformation of the country's natural resources into sustainable economic growth;

3.3 The program corresponds to the *strategic* plan *of the Ministry of Ecology, Geology and Natural Resources of the RK* and the budget program 089 “Ensuring rational and integrated use of mineral resources and increasing the geological study of the territory of the Republic of Kazakhstan”, which notes the need to “improve geological research, scientific support of the exploration process” for the speedy replenishment of the mineral resource complex of the Republic of Kazakhstan

4. Expected results

4.1 Direct results:

1. The metallogenograms of all 78 structural-formation zones (SFZ) of the paleozoic of Kazakhstan have been corrected, which are the fundamental modern basis for complex metallogenic analysis;

2. On the basis of metallogenograms and the main provisions of all modern geotectonic concepts, a

comprehensive metallogenic analysis should be carried out to identify promising SFZ with metallogenically favorable stratolevels and geodynamic conditions;

3. Based on the decoding of Earth remote sensing materials and the metallogenogram of the SFZ paleozoic of Kazakhstan, a map of promising areas for various types of minerals on a scale of 1:1,000,000 should be compiled;

4. Conducting a comparative analysis of the ore content of the SFZ paleozoic of Kazakhstan with modern similar structures of the Earth to detail their metallogenic specialization and ore content;

5. Drawing up a new scheme of structural and mineragenic zoning of the paleozoic of Kazakhstan on a scale of 1:2500000 from an actualistic perspective;

6. Compilation of a catalog of promising areas ranked by ore-bearing intensity for priority, second and third stages, for setting up prospecting works of interest to domestic and foreign investors;

7. Development of scientifically-based recommendations for setting up prospecting and exploration work on the priority most promising areas in specific SFZ with identified favorable ore-bearing stratolevels and geodynamic conditions;

8. Publication "Atlas of metallogenograms of structural and formation zones of paleozoic Kazakhstan.

9. at least 3 (three) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty);

10. At least 5 (five) articles in journals recommended by CQAES.

4.2 The end result:

1. The scheme of structural-metallogenic zoning on a scale of 1:2500000, compiled from an actualistic position on the basis of identified and refined metallogenic specialization and ore content of the structural-formation zones of the paleozoic of Kazakhstan.

2. A map of promising areas of various types of minerals of the paleozoic of Kazakhstan on a scale of 1:1000000, ranked by the intensity of ore content in the first, second and third stages.

3. Catalog of all promising areas of the paleozoic of Kazakhstan, (priority, second and third stages).

4. Scientifically-based recommendations for setting up prospecting, evaluation and exploration work on the priority most promising areas in specific SFZ with identified favorable ore-bearing stratolevels and geodynamic conditions.

5. Atlas of metallogenograms of the SFZ paleozoic of Kazakhstan, which is a huge summary of geological and metallogenic information on specific SFZ and is a kind of "determinant" that allows you to predict ore content by the type of series of formations, their composition, structure.

6. The final report on the results of research in 2022-2024 should include: a description of the ore content of all SFZ; an assessment of the industrial prospects of the most promising of them; the designation of new search directions, in connection with the identification of geodynamic environments favorable for ore deposition, stratolevels and non-traditional types of minerals for SFZ.

Socio-economic effect

The socio-economic significance of the program is determined, first of all, by the fact that the planned research solves one of the most important tasks of the geological industry – it is the replenishment and strengthening of the fund of promising areas, on the basis of which alone it is possible to plan the work of the near future to replenish the country's SMEs.

5. The maximum amount of the program is 267,500 thousand tenge, including by year: for 2022 – **55,500 thousand** tenge, for 2023 – **106,000 thousand** tenge, for 2024 – **106,000 thousand** tenge

Technical task No. 12
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program):

Geology, extraction and processing of mineral and hydrocarbon raw materials, new materials, technologies, safe products and structures

1.2. Name of the specialized direction of the program

Nanomaterials and nanotechnologies

2. Goals and objectives of the program

2.1. The purpose of the program:

Research of fundamental and applied problems of nanostructured single and multicomponent composite condensed media and the creation of innovative nanomaterials and nanotechnologies for the accelerated development of a wide range of industrial areas.

2.2. To achieve this goal, the following tasks must be solved:

To achieve this goal, the following tasks must be solved:

- development of a method for changing the surface relief of a material on a micro/nano scale using plasma technologies.
- development of biosensors based on biocompatible, biophotonic silicon nanostructures functionalized with artificial polymer receptors for biomedical diagnostic analyses.
- creating nanotechnology to detect bacteria.
- obtaining effective photocatalysts for purification of aqueous media from organic impurities.
- development of technology for obtaining nanocomposite electrolytic coatings for mechanical engineering.
- investigation of structural, electrical and optical properties of porous silicon nanostructures based on complex fractal, information-entropy and spectral analysis.
- development of technologies for the synthesis of carbon nanostructures and the study of their physical and mechanical characteristics.

3. Which points of strategic and program documents are solved:

The implementation of the Program should make it possible to implement the tasks, achieve the goals and indicators defined in the following strategic and program documents:

1. Development strategy of the Republic of Kazakhstan until 2050;
2. Strategic Development Plan of the RK until 2025
3. The State Program for the development of Education and Science of the Republic of Kazakhstan for 2020 – 2025. Goal 2 “Increasing the contribution of science to the socio-economic development of the country”, paragraph 5.2.3. To increase the effectiveness of scientific research and ensure integration into the world scientific space
4. Law of the Republic of Kazakhstan dated February 18, 2011 No. 407-IV “On Science”;
5. The concept of Kazakhstan's entry into the top 30 most developed countries in the world.

4. Expected results

4.1 Direct results:

- new knowledge or solutions, the results of research, analysis, theoretical research, modeling, obtained in the course of scientific and (or) scientific and technical activities;;
- introduction of scientific developments and technologies into production, as well as models, layouts, samples of new products, materials and substances;
- results of patent research;
- scientific and technical bases for the creation of new types of products and methods of production (technologies);
- algorithms, methods, techniques for solving various technical and technological problems;
- individual technical and technological solutions for the creation of new types of products and production methods (technologies);
- calculations and mathematical (software) models of phenomena, processes, technologies, etc.,
- related to the objects of research, newly created regulatory, technical, methodological documentation;
- recommendations for the implementation of newly created (researched) methods, technical and technological solutions, technical requirements for the implementation of research results in real sectors of the economy;
- patents and applications for their receipt, indicating the number and patent office;
- other;

- at least 5 (five) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in Scopus database of at least 50 (fifty);
- 5 articles in scientific journals included in the CQAES lists;
- 2 patent applications of the RK;
- information support: 3 scientific conferences, 2 round tables; 5 seminars.
- Improving the design, optimization and modeling of the work of applying thin reliefs;
- preparation and functionalization of silicon nanostructures; development and synthesis of polymers focused on a specific biomarker;
- analysis of the effectiveness of existing methods for the determination of bacteria; development of nanotechnology for the detection of bacteria;
- determination of dopants for catalysts based on nanostructured semiconductor materials.
- investigation of the effect of technological modes of synthesis on the composition of coatings, their corrosion and wear resistance in aggressive environments; study of structural characteristics and morphology of synthesized nanomaterials;
- obtaining the equation of fractal evolution of charge carrier concentration in inhomogeneous nanoporous semiconductors;
- Development of effective and commercially profitable technologies for the synthesis and modification of carbon nanostructures with well-controlled characteristics; use of complex methods for studying the properties of synthesized carbon nanostructures and exploring the possibilities of their application.

4.2 The end result:

Socio-economic effect:

The scientific effect of the implementation of the program should consist in obtaining new fundamental knowledge in the field of fundamental problems of nanostructured single- and multicomponent composite condensed media.

Economic effect: the implementation of the program should provide: the solution of urgent problems of nanomaterials and nanotechnology. The importance of the proposed research is due to the high demand for new technologies and materials for conducting clinical analyses at an early stage of the development of serious oncological and neurotrophic diseases, and the identification of bacteria in modern healthcare, as well as the production of innovative nanomaterials with specified properties.

Social effect: The implementation of the program should contribute to the training of young qualified specialists.

Target consumers of the results obtained: Foreign universities, research institutes and research centers, representatives of small and medium-sized businesses.

5. The maximum amount of the program is 300,000 thousand tenge, including by year: for 2022 – **60,000** thousand tenge, for 2023 – **120,000** thousand tenge, for 2024 – **120,000** thousand tenge

Technical task No. 13
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program):

Energetics and mechanical engineering.

1.2. Name of the specialized direction of the program:

Transport, agricultural, oil and gas and mining and metallurgical engineering.

2. Goals and objectives of the program

2.1. The purpose of the program:

Development of scientific and technological methods of design and construction, development of design documentation and technological route maps of pumping, reinforcement, compressor (pumping equipment) products in Kazakhstan, competitive on the world market, and increase in production productivity through

the use of modern digital technology tools according to Industry 4.0 standard.

2.2. To achieve this goal, the following tasks must be solved:

- to carry out work on improving the technology of development and design of pumping equipment:
- to develop high-precision methods of designing centrifugal pumps of increased productivity based on mathematical modeling: strength calculations and hydrodynamic calculations of the designed equipment; vibration diagnostics and vibration acoustics of pumping equipment, etc.;
- to develop methods capable of determining with increased reliability the real life of the pumping unit, taking into account the specifics of the operation of specific technological cycles, as well as the modernization of operating pumps in order to increase their efficiency;
- to carry out work on the selection of composite, etc. to develop a methodology for designing pumps, valves and compressors based on new materials to increase reliability, durability and efficiency;
- to develop design documentation (DD) according to the technical specifications (TS) of customers (CWR, NWF Samruk Kazyna, CC, Rosatom, Rosneft, Gazprom and other potential customers) for the purpose of further production of pumps, pipeline fittings and compressors at domestic enterprises of the import substitution program and the development of export potential.

– to carry out work on the introduction of modern high-tech CAD systems for the design of competitive pumping equipment:

- to develop design, design and engineering documentation (DED) of new products based on modern licensed CAD systems (CAD/CAM, VPD, etc.) and their introduction into the design practice of a machine-building enterprise;
- to develop a methodology for the development of energy-efficient design, technical and technological solutions for the design of pumping equipment and components in CAD of the latest generation based on high-precision and complex dynamic calculations;
- to develop a methodology for identifying the results of virtual modeling and experimental testing of structural elements of a pumping unit.

– to carry out work on the development and implementation of digital technology and intelligent systems for the organization of production of pumping equipment in order to increase productivity:

- to develop intelligent parts of pumping equipment for monitoring the technical condition of the installation during operation;
- to develop and design research and test diagnostic stands, including for expert monitoring of the quality of manufactured products;
- develop digital algorithms and programs for modular control of components and products;
- to carry out work on workflow management;
- develop digital algorithms and programs for transparent planning and production management;
- introduction of new developments and rational transfer of technology in the field of pump engineering and to carry out an international exchange of experience.

3. Which points of strategic and program documents are solved:

1. Message of the President of the Republic of Kazakhstan dated January 10, 2018 “New development opportunities in the conditions of the Fourth Industrial Revolution”.
2. National Project “Technological Breakthrough through Digitalization, science and innovation”: Direction VII. Strengthening the human potential of science - the focus is on the scientist, Task 1. An increase in the number of scientists and researchers by 1.5 times, the share of young scientists from the total number of scientists and researchers engaged in R&D. Direction VIII. Improving the competitiveness of the scientific ecosystem, Task 1. Improving the quality of research institutes; Direction IX. Increasing the contribution of science to the development of the country “Science-production-business, Task 1. Increasing the contribution of science to the development of the country
3. The State program of industrial and innovative development of the Republic of Kazakhstan for 2020-2025. The action plan for the implementation of the SPIID of the Republic of Kazakhstan for 2020 – 2025. Task 4. Technological development and digitalization.
4. Roadmap (comprehensive plan) for the development of mechanical engineering for 2019-2024. Order of the Prime Minister of the Republic of Kazakhstan No. 115-R dated 26.06.2019. Modernization of machine-building enterprises.

4. Expected results

4.1 Direct results:

According to the results of the program, there should be:

- physical and mathematical models of the dynamics of high-precision centrifugal pumps and application programs in the analytical computing environment (for example, Maple, MatLab, MatCad, etc.) for dynamic strength and vibration calculations, hydrodynamic calculations of the turbulent flow of the designed pumping equipment (for example, turbulence model - shear stress transfer (SST));
- the method of calculation of dynamic and hydrodynamic processes and experimental studies in centrifugal pumps of the IECP type (installation of an electric centrifugal pump), taking into account real technological cycles, allowing to estimate the resource of equipment to increase their efficiency (at least by 1.5-2%);
- recommendations on the selection of materials for the design of key components and parts (for example, based on the MSC Materials Center) and methods of designing pumping equipment based on new materials (calculations for strength and durability);
- CD on the customer's TS (for example, CWR, NWF Samruk Kazyna, CC, Rosatom, Rosneft, Gazprom and other potential customers);
- the results of hydrodynamic calculations, strength calculations and PCD of pumps of the IECP type based on modern licensed CAD systems (for example, ANSYS CFX and COMSOL Multiphysics, APM Winmachine, Autodesk Inventor and MSC Software: Nastran, Adams, Marc etc.);
- methodology for the development of energy-efficient design, technical and technological solutions in the design of pumping equipment and their components based on the results of mathematical modeling (item 1) and calculations in the CAD system (item4);
- the method of identification of the results of virtual modeling and experimental testing of structural elements of the pumping unit;
- recommendations for the use of modern sensors (pressure, temperature, etc.) with intelligent software in the design of pumps of the IECP type for monitoring and diagnostics of its technical condition during operation;
- PCD of the test bench for testing pumping equipment up to 200 atm. and software for measuring, monitoring and diagnostics of the process;
- software for identifying the design of the structure of existing and future product categories. Implementing rules in CAD and PLM;
- an algorithm and a program for displaying the necessary work processes and risk management have been developed. To use workflow data between different production systems, a detailed overview of the system at all levels and information processing is required;
- 2 (two) IT applications (software programs) have been developed;
- the transfer of new knowledge, technical and technological solutions in the field of scientific research of pumping equipment was carried out on the basis of mutually beneficial international cooperation;
- proposals have been developed for the commercialization of the developed CD through licensing agreements with domestic manufacturing plants;
- published at least 3 (three) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty);
- 3 articles in scientific journals included in the CQAES;
- received 2 (two) security documents of the Republic of Kazakhstan and (or) Eurasia.

4.2 The end result:

As a result of the implementation of this Program, scientific and technological methods of design and construction, development of design documentation and technological route maps of pumping, valve, compressor (pumping equipment) products in Kazakhstan, competitive on the world market, and increase in production productivity through the use of modern digital technology tools according to Industry 4.0 standard, should be developed.

Economic effect. The scientific and practical foundations and innovative approaches of new algorithms and software obtained during the implementation of the Program for solving problems related to the

production of pumping equipment, increasing their efficiency and productivity should meet the demanded tasks of the country's manufacturing enterprises and contribute to the implementation of tasks for the modernization of machine-building enterprises according to the Roadmap (comprehensive plan) for the development of mechanical engineering for 2019-2024, as well as the commercialization of developments.

Scientific effect of the program implementation: development of new research methods for practical problems of pumping equipment development: new physical and mathematical models of the dynamics of high-precision centrifugal pumps and applied programs in the analytical computing environment; methods for calculating dynamic and hydrodynamic processes and experimental studies in centrifugal pumps; hydrodynamic calculations, strength calculations and PCD of modernized pumping equipment manufactured by Kazakhstani enterprises; intelligent systems (IS) for the test bench, IS built into the pumping equipment, IS for the organization of production in the assembly shop, etc.

Social effect: to increase the efficiency of scientific research in the field of technical sciences, the scientific potential of Kazakhstan in the field of mechanical engineering, intelligent systems and new effective methods of research of production problems, integration of science and business by introducing new approaches into production to increase their productivity. The social effect should manifest itself in attracting and forming qualified domestic personnel in the knowledge-intensive process and creating new jobs.

The target consumers of the results obtained – government agencies, machine-building enterprises for the production of pumping equipment, CAD developers, higher educational institutions, knowledge-intensive enterprises in the field of automation and development of intelligent systems, etc.

5. The maximum amount of the program is 350,000 thousand tenge, including by year: for 2022 – **50,000** thousand tenge, for 2023 – **150,000** thousand tenge, for 2024 – **150,000** thousand tenge

Technical task No. 14
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program):

Energetics and mechanical engineering.

1.2. Name of the specialized direction of the program:

Heat and power industry and the impact of the energy sector on the environment, energy conservation
Alternative energy and technologies: renewable energy sources, nuclear and hydrogen energy, other energy sources

2. Goals and objectives of the program

2.1. The purpose of the program:

To develop a set of theoretical and practical recommendations for improving energy efficiency and resource conservation in energy and mechanical engineering for the industry of Kazakhstan, as well as to modernize Kazakhstan's solar energy based on modern semiconductor materials and technologies

2.2. To achieve this goal, the following tasks must be solved:

1. To analyze the current state of energy efficiency and resource conservation processes at the enterprises of the mining and oil and gas industry of Kazakhstan;
2. To conduct a theoretical substantiation of methods and approaches to improve energy efficiency and resource conservation at enterprises of the mining and oil and gas industry of Kazakhstan;
3. To develop a set of practical solutions (including the creation of new types of equipment or modernization of existing ones), organizational, managerial and technological recommendations for improving energy efficiency and resource conservation at enterprises of the mining and oil and gas industry of Kazakhstan;
4. To develop methods for creating digital models and duplicates of technological equipment in order to optimize structures for metal consumption, energy-power parameters, to create methods of digital predictive maintenance in order to reduce the statistics of failures of technological equipment;
5. To obtain highly efficient organic solar cells with a minimal shift in energy levels between donor and acceptor materials and a high fill factor;

6. Apply composite materials in solar energy;
7. To investigate antireflection coatings based on tin oxide;
8. To obtain electrode structures for a wide range of applications based on transition metals;
9. To develop methods of synthesis and investigation of properties of films of perovskite materials for solar cells;
10. Create and investigate photosensitive structures using rare earth metals;
11. Prepare domestic cadres in solid state physics, solar energy and related practical applications;
12. Upgrade HIT technologies to form a multilayer structure of antireflection coatings to improve the efficiency of solar cells in high-altitude terrain;
13. To develop technologies for obtaining heterojunction solar cells at the AK-1000 installation;
14. Develop flow-through energy storage based on vanadium.

3. Which points of strategic and program documents are solved:

1. "Kazakhstan 2050" in the context of the complete renewal of production assets by enterprises in accordance with the latest technological standards;
2. The seventh challenge is within the framework of the Third Industrial Revolution;
3. Strategic Development Plan of the Republic of Kazakhstan until 2025 dated February 15, 2018 No. 636. (Chapter 5. The evolutionary path: priority directions of the implementation of the Strategy "Kazakhstan-2050". Policy 2. Competitiveness of economic sectors, Task 1. Strengthening the positions of basic industries in world markets. Fuel and energy complex);
4. The address of the Head of State "Unity of the people and systemic reforms - a solid foundation for the prosperity of this country" dated 01.09.2021 – item III Quality education, item IV Improvement of regional policy

4. Expected results

4.1 Direct results:

According to the results of the Program , there should be:

- at least 3 research laboratories have been established with the purchase of modern equipment and devices for conducting scientific research within the provided funds in the amount of at least 35% of the requested amount of funding (directions - energy, mechanical engineering, alternative energy);
- new knowledge and technical solutions have been obtained to improve energy efficiency and resource conservation in technological processes and thermal power equipment;
- algorithms, methods, and techniques for improving various technical and technological tasks of production have been created;
- samples of upgraded or new equipment with increased operational and environmental performance were obtained;
- separate proposals have been received to improve technologies, modernize equipment or samples of new equipment that will be introduced into production;
- as a result of patent research, at least 5 patents of the Republic of Kazakhstan and 1- EAPO for new samples of equipment and technical solutions have been filed and obtained;
- calculation methods and mathematical models of processes and technologies have been developed to solve the problems of energy saving and resource saving for specific industries;
- recommendations have been developed for the implementation of newly created methods, technical and technological solutions, and other research results in real sectors of the economy in the form of experimental industrial samples of equipment and design and technological documentation for them, methods and technical solutions for the modernization of existing equipment and technologies, etc.;
- digital doubles and digital models of technological equipment have been created, including a full cycle of CALS technologies for automation of design and design work from marketing to recycling;
- a sample of a new model of a nanocomposite material based on an amorphous matrix of hydrogenated amorphous silicon with an increase in the conductivity of the entire structure as a whole was obtained;
- methods have been developed to improve the stability of operation (resistance to moisture, light and heat), as well as to obtain multilayer structures based on metal oxides; the use of non-toxic and harmless compounds replacing lead; evaluation of the possibilities of creating tandem solar cells;

- antireflection coatings have been obtained to reduce reflection at the interface of two media;
- a photosensitive structure with a wide range of solar radiation absorption has been developed, using alloying with rare-earth elements of zinc oxide in zinc oxide/REE/silicon structures;
- highly efficient organic solar cells with a minimal shift in energy levels between donor and acceptor materials and a high fill factor were obtained. A unique combination of measurement methods and a diverse composition of semiconductor structures allows us to get a detailed idea of how the shift of energy levels affects the delicate balance of free carrier generation rates and suppressed Langevin recombination;
- The HIT technology has been upgraded to form a multilayer structure of antireflection coatings to increase the efficiency of solar cells in high-altitude terrain;
- the technology of obtaining heterojunction photocells at the AK-1000 installation has been worked out;
- a method for obtaining flow-through energy storage devices based on vanadium has been developed. A prototype of a vanadium redox battery was obtained.

- at least 5 (five) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in Scopus database of at least 50 (fifty),
- at least 5 (five) articles in journals recommended by CQAES.
- 2 monographs and 2 textbooks have been published.

4.2 The end result:

The results of the program should contribute to:

- implement the activities of the target program and contribute to the achievement of target indicators and indicators of the target program;
- contribute to increasing the intensity of industrialization and increasing the Index of economic complexity of Kazakhstan, increasing the share of high-tech (knowledge-intensive) services in GDP.

Expected scientific effect – obtaining new scientific knowledge and scientific directions, applied techniques and technologies in the field of energy efficiency and resource saving of energy-intensive technological processes and machine production.

Economic effect

The technical results of the program should demonstrate the capabilities, advantages and disadvantages of the heterojunction technology during its subsequent commercialization. The target consumers of the results obtained will be domestic companies, research institutes and government agencies specializing in the introduction and development of new alternative energy technologies.

Socio-economic effect - development of competitive advantages (favorable impact on the development of the industry of future application, expansion of existing and emergence of new markets, cost reduction and improvement of product quality, labor productivity growth, creation of reserves for the growth points of Industry 4.0.

Environmental effect: simultaneously with increasing energy efficiency, the tasks of environmental protection and reducing harmful emissions of production should be solved, including through the use of alternative fuels and energy sources; reducing energy consumption in production.

Target consumers of research results - enterprises of energy and mechanical engineering, as well as mining and oil and gas industry of the industry of Kazakhstan.

5. The maximum amount of the program is 400,000 thousand tenge, for 2022 – **70,000 thousand** tenge; for 2023 – **165,000 thousand** tenge; for 2024 – **165,000 thousand** tenge

Technical task No. 15
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program):

Energetics and mechanical engineering.

1.2. Name of the specialized direction of the program:

Alternative energy and technologies: renewable energy sources, nuclear and hydrogen energy, other energy

sources.

2. Goals and objectives of the program

2.1. The purpose of the program:

Development, creation and development of new innovative devices, materials and high-tech technologies to ensure highly efficient implementation and use of hydrogen energy in Kazakhstan.

2.2. To achieve this goal, the following tasks must be solved:

1) **Hydrogen production:**

- Development and creation of an innovative high-efficiency beta and steam conversion plant for the production of environmentally friendly ("green") hydrogen and alcohols from natural gas (methane) and water vapor, as the basis for the subsequent creation of a pilot industrial complex and scaling in Kazakhstan;
- Development of efficient one-dimensional and three-dimensional composite photocatalytic systems for hydrogen production by decomposition of aqueous mixtures;

2) **Transportation and storage of hydrogen:**

– Comprehensive materials science studies of materials intended for storage and transportation of hydrogen;

– Study of the mechanisms of hydrogen embrittlement and gas swelling in structural ceramic materials and fuel cells intended for storage and transportation of hydrogen.

– Development of technologies for creating metastable hydrides based on aluminum, in particular alan (AlH3) as a hydrogen storage;

3) **Conversion of hydrogen into electricity:**

– Study of the effect of He ion implantation on the structure and properties of solid oxide ion conductors based on barium cerates to create highly efficient electrochemical devices for the needs of hydrogen energy.

3. Which points of strategic and program documents are solved:

The implementation of the Program will make it possible to implement the tasks, achieve the goals and indicators defined in the following strategic and program documents:

- Point.71 NP for the implementation of the Address of the Head of State to the People of Kazakhstan dated September 1, 2021 "Making proposals for the development of nuclear and **hydrogen energy** in Kazakhstan, taking into account the development of engineering and the training of qualified personnel"

- Protocol instruction of the President of the Republic of Kazakhstan on the results of the meeting on the development of the electric power industry dated May 26, 2021: "item 4.3.2) by the end of 2021 to create **a Competence Center** to gain experience in the use of **high-tech innovations** in the energy sector";

- The order of the President of the Republic of Kazakhstan following the results of the 33rd Plenary Meeting of the Council of Foreign Investors dated June 10, 2021: "Item 7. ME RK, together with MEGNR and JSC "NC "Kazmunaygas", "To develop proposals for the **development of hydrogen energy** within the framework of the activities of the Competence Center in New Technologies being created by the end of 2021".

4. Expected results

4.1 Direct results:

- Development of a utility model and creation of an experimental demonstration stand by beta and steam conversion of methane (B&SC) based on the ILU-10 electron accelerator (at electron energy modes from 0.4 to 5.0 MeV in the presence of a 2.45 GHz microwave field), with a production capacity of 1.0 kg/hour of hydrogen and 9.0 kg of industrial alcohols (methanol), as the basis for the subsequent creation of a pilot industrial complex based on the electron accelerator ELV-8 (2.5 MeV), with a production capacity of 6 thousand tons per year of hydrogen and 100 thousand tons per year of methanol, with the prevailing process:$CH4+H2O+e \rightarrow CH3OH+H2$;
- Identification of optimal modes of physical impact on raw materials, with optimal energy efficiency, leading among all existing industrial methods of hydrogen production;
- Technology for creating metastable aluminum-based hydrides;
- One-dimensional and three-dimensional photocatalytic systems for hydrogen production by decomposition of aqueous mixtures;

- Proven methods of applying coatings that prevent the accumulation of hydrogen in materials intended for storage and transportation of hydrogen.
- New data and a model describing the mechanisms of hydrogen embrittlement and gas swelling in structural ceramic materials and fuel cells used for hydrogen storage and transportation.
- Experimental model of a solid-state hydrogen storage device on a tape carrier and conducting a study of its properties;
- Data on the effect of He ion implantation on the structure and properties of solid oxide ion conductors based on barium cerates for the creation of highly efficient electrochemical devices;
- Technical and methodological documentation on the use of hydrogen in the RK;
- monograph; 4 patent applications of the RK, 10 articles and (or) reviews in peer-reviewed scientific publications indexed in the Science Citation Index Expanded of the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 35 (thirty-five); 5 articles in scientific journals included in the CQAES lists.

4.2 The end result:

The implementation of the program will effectively solve the problem of carbon neutrality in the Republic of Kazakhstan by 2060 to reduce the carbon footprint.

The results obtained will influence the development of related sciences (nanotechnology, materials science, chemistry, physics) in the Republic of Kazakhstan and will become the basis for the creation of a platform for the development of new promising competitive, highly efficient technologies for the creation of new materials for hydrogen energy.

The developed methods will create a methodological basis for the development of technologies for safe storage and transportation of hydrogen in Kazakhstan.

Expected economic effect:

The results obtained during the implementation of the program should have a high commercial component and should have good prospects for implementation on world markets.

The developed technology for producing microcatalysts based on metal oxide compounds will allow in the future to create new types of catalysts for producing hydrogen that have no analogues in the world, which in turn can serve as a prerequisite for the development of the energy sector of the economy of the RK in the field of hydrogen technologies.

Expected environmental effect:

The ecological effect is the development of "green" technologies, in particular, in obtaining efficient and environmentally friendly fuel – hydrogen from renewable resources. It will also create conditions for the diversification of the energy industry through the introduction of alternative energy sources;

The development and use of hydrogen energy will make a great contribution to improving the environment in the Republic, and will allow the creation of new types of high-tech industries.

Expected social effect:

Social effect:

- increasing the number of jobs to 50, including young researchers (students, undergraduates, PhD doctoral students) and developers to the problem
- development of scientific, technical and intellectual potential of the country;
- increasing the quantity and quality of Kazakhstani publications in international rating publications in the field of renewable energy sources and materials science, on the basis of which PhD students will be issued;

Target consumers of the results obtained:

The target consumers of the results obtained are the energy sector of the economy of the RK in the field of development of hydrogen energy and solar technologies, research institutions and private companies in view of the possibility of using new developments in various fields, as well as further improvement of their characteristics.

The orientation of the created technologies for their subsequent use and application in Kazakhstan in such enterprises as: OJSC "Ulba Metallurgical Plant", corporation "Kazakhmys", "KazMunayGas", "Samruk-Energo", "ERG", etc. - ensures their prospects, as it will allow these enterprises to use new technologies for the development of alternative energy in the country.

5. The maximum amount of the program is 670,000 thousand tenge, including by year: for 2022 – **164,000** thousand tenge, for 2023 – **253,000 thousand** tenge, for 2024 – **253,000 thousand** tenge

Technical task No. 16
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program):

Information, communication and space technologies

1.2. Name of the specialized direction of the program:

High-performance computing technologies.
Geoinformation technologies and systems

2. Goals and objectives of the program

2.1. The purpose of the program:

Creation of a system for monitoring dams and other engineering structures in conditions of man-made and natural impacts using data mining

2.2. To achieve this goal, the following tasks must be solved:

- Development of a methodology for predicting the accident rate of dams and other engineering structures based on machine learning methods and technologies.
- Development of methodology and assessment of silting of reservoirs, channels and channels based on modern approaches of intellectual analysis and remote analysis data.
- Development of mathematical and information models based on machine learning algorithms for remote assessment of water flow and quality (virtual hydropost) and forecasting of water levels in rivers.
- Development and creation of interactive maps and web-based geoinformation services for monitoring the current and forecast state of hydraulic engineering facilities and water infrastructure of the Republic of Kazakhstan.
- Development of a set of scientifically based, management measures and recommendations to ensure efficient and trouble-free operation of dams and other engineering structures.
- Development of a pilot project of a web-based geoinformation service and interactive maps based on operational remote monitoring data using archival, field research and satellite (UAV) sensing based on geoinformation technologies.

3. Which points of strategic and program documents are solved:

1. Strategy “Kazakhstan-2050”: a new political course of the established state.

2. Resolution of the Government of the Republic of Kazakhstan dated May 25 , 2022 No. 336
On approval of the Concept of Science development of the Republic of Kazakhstan for 2022-2026

3. The Strategic Development Plan of the Republic of Kazakhstan until 2025, approved by the Decree of the President of the Republic of Kazakhstan dated February 15, 2018 No. 636, task “Development of the system of scientific research”.

Policy 6. “Green” economy and environmental protection”. Task 5. Improving the efficiency of use and protection of water resources.

4. Code of the Republic of Kazakhstan dated July 9, 2003 No. 481 “Water Code of the Republic of Kazakhstan”.

5. Government Resolution of June 29, 2020 “On approval of the State Program of Water Resources Management of the Republic of Kazakhstan for 2020 – 2030”.

6. Strategic Plan of the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan for 2020-2024.

4. Expected results

4.1 Direct results:

- Remote monitoring and analysis of the condition of natural water bodies and hydraulic infrastructure.
- Monitoring of the filling modes of reservoirs in the South of Kazakhstan; analysis of siltation of

reservoirs (Kapshagay rsvr. (Ile river), Shardarinsk rsvr. (Syrdarya river)).

- Development of interactive maps on the state of key hydrotechnical infrastructure facilities on the Ile River and the Syrdarya River.

- A set of scientifically-based, management measures and recommendations for optimization and trouble-free operation of hydraulic structures and infrastructure (Shardarinsk rsvr., Koksaray's counter-regulator).

- A complex of interactive maps based on operational remote monitoring data using archival, field research and satellite (UAV) sensing based on geoinformation technologies.

- To digitalize the process of collecting, storing and subsequent analysis of the condition of hydraulic structures.

- Water level and quality forecasting technology (virtual hydropost) based on modern machine learning approaches (Syrdarya river, Ile river).

- Methodology for assessing siltation of reservoirs, channels and channels using remote sensing data and modern approaches of intellectual analysis on the example of Kapshagai (Ile river) and Shardarinsk (Syrdarya River) rsvr. the channel of the Balkhash lake delta branch.

- Web-geoinformation service for monitoring and evaluating the current and forecast state of hydraulic structures of the Republic of Kazakhstan (Kapshagay (Ile river) rsvr, Shardarinsk (Syrdarya river) rsvr., Koksaray's counter-regulator).

- at least 3 (three) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty);

- at least 3 (three) articles or reviews in a peer-reviewed foreign or domestic publication recommended by CQAES;

- at least one monograph in a Kazakh or international publishing house.

4.2 The end result:

Creation of methods for remote monitoring, assessment of the condition and forecast of the stability of hydraulic engineering facilities and water infrastructure;

Digital representations and 3D modeling of key hydraulic engineering facilities and water infrastructure based on interactive maps and a web-based geoinformation service;

Recommendations and digital environment for ensuring the effective operation of hydraulic engineering facilities and infrastructure, environmental and industrial safety of key water bodies in Kazakhstan;

Improving efficiency and effectiveness in the field of planning and management of water resources of the Republic of Kazakhstan, through the use of modern monitoring tools and intelligent digital technologies, including geoinformation technologies and remote sensing data.

Development of competence in the field of digitalization of Kazakhstan in the field of monitoring of water and land resources using remote sensing of the earth and data mining.

Social effect of the program: development of means of public control and monitoring of the ecological state of the environment and water safety of hydraulic engineering facilities and water infrastructure on the territory of Kazakhstan.

5. The maximum amount of the program is 250,000 thousand tenge, including by year: for 2022 – **50,000** thousand tenge, for 2023 – **100,000** thousand tenge, for 2024 – **100,000** thousand tenge

Technical task No. 17
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program):

Information, communication and space technologies

1.2. Name of the specialized direction of the program:

Methods and systems of information security and data protection
Technologies and software-technical means of information protection.

2. Goals and objectives of the program

2.1. The purpose of the program: Development of methods, models and technologies to increase the level of cybersecurity of cellular communication networks in the Republic of Kazakhstan

2.2. To achieve this goal, the following tasks must be solved:

- Critical analysis of technological solutions in the field of cybersecurity of cellular networks
- Development of threat models of modern cellular networks
- Allocation and ranking of critical information infrastructure objects as part of cellular communication networks
- Development of new methods of cryptographic protection
- Improvement of authentication and authorization methods in cellular communication networks
- Development of software and hardware solutions for ensuring cybersecurity of cellular communication networks
- Development of methods for identification and response to cyber incidents in cellular communication networks
- Development of methods for detecting cyber attacks
- The use of artificial intelligence to ensure the cybersecurity of cellular communication networks

3. Which points of strategic and program documents are solved:

The program will allow to solve the following points and strategic and program documents:
1. Paragraphs 12, 17, 32, 33, 36 of the Action Plan for the implementation of the Cybersecurity Concept (Cybersecurity of Kazakhstan) until 2022, approved by
Resolution of the Government of the Republic of Kazakhstan dated October 28, 2017 No. 676
2. Direction 3. Implementation of the Digital Silk Road:
Task 1. Expanding the coverage of communication networks and ICT infrastructure;
Task 2. Ensuring information security in the field of ICT
The State program “Digital Kazakhstan”, approved by the Decree of the Government of the Republic of Kazakhstan dated December 12, 2017 No. 827.

4. Expected results

4.1 Direct results:

- new models, methods, methodologies, techniques that contribute to ensuring the cybersecurity of cellular communication networks;
- introduction of scientific developments and technologies into the activities of mobile operators of the Republic of Kazakhstan, special services, security services, manufacturers of software and hardware for cellular communication networks;
- patents of the Republic of Kazakhstan and other countries of the world;
- scientific and technical foundations for the creation of new types of software and hardware to ensure the cybersecurity of cellular communication networks;
- individual technical and technological solutions for the creation of new means of ensuring the cybersecurity of cellular networks;
- calculations and mathematical (software) models of cyber incidents and attacks in cellular networks,
- technical, methodological documentation for the cybersecurity industry of the information and communication infrastructure of the Republic of Kazakhstan;
- recommendations for the implementation of newly created (researched) methods, technical and technological solutions to ensure cybersecurity in cellular communication networks;
- at least 3 (three) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty);
- at least 5 (five) articles in journals recommended by CQAES.

4.2 The end result:

The results of the program should contribute to strengthening the intensity of industrialization and increasing the Index of economic complexity of Kazakhstan, increasing the share of high-tech, medium-high industries

and knowledge-intensive services.
Indicators of the impact on the economy (depending on the field of research):
economic effect, development of competitive advantages (favorable impact on the development of the industry of future application, expansion of existing and emergence of new markets for mobile operators, cost reduction and improvement of the quality of services of mobile operators, labor productivity growth in industries using cellular communication network services, creation of groundwork for the growth points of Industry 4.0, the Internet of Things using channels communications of cellular networks).
Environmental effect: increasing the energy efficiency of cellular communication networks and means of ensuring cybersecurity in them.
The social effect of the program should reflect the contribution of its results to improving the social environment and improving the quality of life of the population and be characterized by the following indicators: increasing the level of security of personal data of subscribers of cellular networks, ensuring the security of transactions using cellular networks.

5. The maximum amount of the program is 220,000 thousand tenge, including by year: for 2022 – **40,000** thousand tenge, for 2023 – **90,000** thousand tenge, for 2024 – **90,000** thousand tenge

Technical task No. 18
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program):
Information, telecommunication and space technologies
1.2. Name of the specialized direction of the program:
Space technologies.
Monitoring and forecasting of space and geodynamic processes, natural resources, remote sensing of the Earth

2. Goals and objectives of the program

2.1. The purpose of the program:

Creation of a system for joint ground-space research and forecasting of (ES) natural and man-made emergencies, which allows monitoring the condition of potentially dangerous objects affecting the intensively developing cross-border regions of the RK and the RF (the Caspian region and the Altai Mountains) in close to real time, promptly identify anomalous geodynamic manifestations, fires, flooding zones, oil spills , etc ., and the implementation of modeling and forecasting the dynamics of their development in order to minimize economic losses and develop recommendations for their prevention.

2.2. To achieve this goal, the following tasks must be solved:

In accordance with the decision of the Interstate Space Council of the CIS dated January 22-23, 2020 in Minsk, it is planned to further implement the Interstate Aerospace Monitoring System (IAMS) in 2022-2024 with the involvement of scientific organizations of the Republic of Kazakhstan, the Russian Federation and the Republic of Belarus to fulfill existing and develop new urgent tasks for space monitoring of transboundary regions of the Caspian Sea, the Caspian depressions and the Altai mountains to assess the danger and reduce the consequences of an emergency. Including:

– Development of a system for space monitoring and modeling of active forest and steppe fires, and assessment of burnt-out territories of cross-border regions of the RK and the RF;

– Development of new approaches and methods for processing big data (big data) remote sensing of pollution with modeling of oil products in the Caspian Sea, including on the basis of artificial neural networks

(Artificial neural networks).

– Development of a system for operational space monitoring and modeling of floods and floods in the transboundary river basins of the RK and the RF.

– Construction of a complex geodynamic model of the Earth's crust of the trans-boundary regions of the Altai Mountains using modern methods of computational geomechanics and empirical GPS data on the movements of the Earth's surface with the creation of 3D terrain models.

– Development of an expert system for space monitoring of fires (forest and steppe fires, burnt-out territories) and floods for automated assessment of the scale and extent of the emergency situation.

- Development of a methodology for analyzing the indirect effects of emergency prevention and response (minimizing casualties, budget expenditures, environmental effects, etc.) when using space assets.

3. Which points of strategic and program documents are solved:

The created space monitoring systems will significantly expand the market for space information. The results of the program, based on modern satellite data, including the EROS of the RK, will improve the quality and reliability of the results obtained. It will allow to evaluate the effectiveness of the implementation of the results of space activities and use the results in international projects. These works should contribute to the development of the sphere of training highly qualified personnel for the space industry of the RK, as well as the creation of new jobs.

In the course of the work, researchers will be able to interact with research centers in Russia on the implementation of the research topic. The IAMS program is included in the list of pilot interstate innovative projects of the Interstate Program of Innovative Cooperation of the CIS member states. In accordance with the decision of the CIS Interstate Space Council dated January 22-23, 2020 in Minsk, it was recommended to continue the creation of a Multi–purpose Aerospace system for predictive monitoring of natural and Man-made emergencies within the framework of the Interstate Program of Innovative Cooperation of the CIS member states for the period up to 2030.

The implementation of the program will make it possible to implement the tasks, achieve the goals and indicators defined in the following strategic and program documents:

Strategic and program documents of RK:

а) The Strategic Development Plan of the Republic of Kazakhstan until 2025, approved by the Decree of the President of the Republic of Kazakhstan dated February 15, 2018 No. 636, task “Development of the system of scientific research”.

б) The Law of the Republic of Kazakhstan “On Space Activities” (with amendments and additions as of 11.04.2019). Article 4. Directions of space activity: 3) remote sensing of the Earth from space; 7) development of the national space services market and expansion of space services in the world market; Article 14. Scientific research in the field of space activities.

в) Strategic Plan of the Ministry of Digital Development, Innovation and Aerospace Industry of the Republic of Kazakhstan for 2020-2024, approved by the Order of the Minister of Digital Development, Innovation and Aerospace Industry of the Republic of Kazakhstan dated January 16, 2020 No. 13/NK

4. Expected results

4.1 Direct results:

The results of the program should include:

– Automated system of space monitoring and modeling of active forest and steppe fires, and assessment of burnt-out territories of the cross-border regions of the RK and the RF;

– New approaches and methods of processing big data (big data) remote sensing with modeling of oil pollution in the Caspian Sea;

– Models of the passage of flood waters and floods using space sensing data and ground measurements, during which survey maps of the state of the water surface of the studied territory are formed with the allocation of flood zones and modeling of the development of the situation;

– Complex geodynamic model of the Earth's crust of the trans-boundary regions of the Altai Mountains using modern methods of computational geomechanics and empirical GPS data on the movements of the Earth's surface with the creation of 3D terrain models.

– Models of the spread of fires (forest and steppe fires, burnt-out territories) and floods for automated

assessment of the scale and extent of the emergency situation.

- Methodology for analyzing the indirect effects of ES prevention and response (minimizing casualties, budget expenditures, environmental effect, etc.) when using space assets.

The following modernized methods and techniques should be applied to solve the problems of space research of ES:

- a method of operational space sensing of fires, in the process of which maps of fire foci with reference to settlements are formed on the basis of night and day satellite images (6-8 times a day), mask maps and tables of values of areas burned out and affected by fires on the territory of the region, models of the spread of fires and their verification to the terrain and climatic conditions;

- GIS is a technology for assessing the risk of fires based on long-term remote sensing data, conducting a general analysis and testing the results of space monitoring of fires, identifying areas with a high degree of risk of fires.

- GIS technology for assessing the risk of flooding of the territory based on long-term results of space monitoring, 3D terrain models, construction of test maps of flood risk zones;

- a method for detecting oil spills in the Caspian Sea using radar and optical images and a model of the spread of oil spills and their verification to the terrain and climatic conditions;

a method for studying geodynamic processes using GPS data, processing by a specialized software package GAMIT\GLOBK;

- mathematical modeling of the geomechanical state of the upper part of the earth's crust using a complex of geological, geophysical, satellite data.

The results of R&D hould be used to solve problems:

- research of emergency situations, forecast and assessment of damage, the state of natural and man-made territorial complexes, environmental control of economic activity, agricultural production, cross-border threat to the protection of the population;

- seismology, geology, oil and mining industry, urban planning to assess and forecast the state of natural and economic systems, planning of hydraulic structures, industrial agglomerations and urbanized territories in order to ensure their safe development.

Publications:

- at least 3 (three) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty);
- at least 5 (five) articles in journals recommended by CQAES.
- at least 2 (two) security documents.

4.2 The end result:

The prospects of the presented research are due to the high demand for the developed systems in ensuring the daily economic and other activities of cross-border areas. The information obtained with the help of monitoring systems will make it possible to organize the operational provision of management bodies and emergencies with reliable information about the potential danger of occurrence, detection, development and assessment of potential damage in various emergency situations with the issuance of recommendations on the prediction of emergencies and ensuring the safety of transboundary areas.

Scientific and technical effect: The results of the scientific and technical program, in the form of a system of joint ground-space monitoring and forecasting of emergency situations (emergencies) developed using new approaches and methods of processing big data (big data) remote sensing for operational monitoring of emergencies based on artificial neural networks (Artificial neural networks), developed models that have no analogues in the CIS (in Kazakhstan), and will make a huge contribution to the development of the space and IT spheres of our country.

Economic effect: in economic terms, the results of the program will significantly improve the quality of information services for decision makers at various levels, increase the effectiveness of management decisions and, as a result, mitigate economic damage from man-made and geoecological disasters, forecasting natural and man-made emergencies.

Environmental effect: reliable assessment of the impact of environmental threats - environmental assessment

of the impact of oil and gas production activities on the biological resources of the territory of the Caspian region.

Social effect: preservation of life and health of people, minimization of victims through forecasting and early warning of natural and man-made emergencies, the results of the program should contribute to improving the social image of science in Kazakhstan; science and education will receive new research results, the assessment of the emergency state should contribute to the overall social benefit.

Target consumers of the results obtained: subordinate organizations of the Ministry of Emergency Situations of the RK and the Ministry of Ecology, Geology and Natural Resources of the RK, akimats, national companies, universities, research institutes, other departments and enterprises

The maximum amount of the program is 210,000 thousand tenge, including by year: for 2022 – **43,300 thousand** tenge,

for 2023 – **83,400 thousand** tenge 2024 – **83,300** thousand tenge

Technical task No. 19
for research work
within the framework of program-targeted financing

1. General information:

1.1. **The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program):**

Information, communication and space technologies;

1.2. Name of the specialized direction of the program:

Space technologies

Monitoring and forecasting of space and geodynamic processes, natural resources, remote sensing of the Earth

2. Goals and objectives of the program

2.1. The purpose of the program:

Regulatory, methodological and informational support for assessing the impact of rocket fuel on the environment in the territories affected by rocket and space activities, on the habitat and health of the population of adjacent territories

2.2. To achieve this goal, the following tasks must be solved:

– Development of methods for determining rocket fuel components and products of their transformation in environmental objects.

– – Development of methodological recommendations for assessing the damage to public health from the accidental falls of launch vehicles.

2.3. Scientific novelty and practical significance of the program

The planned studies are relevant for monitoring the content of rocket fuel components and products of its transformation in environmental objects, in order to ensure methodological and regulatory environmental safety of rocket and space activities..

Residents of the territories adjacent to the areas of rocket and space activity (in particular, Ulytau-Zhezkazgan region and Kyzylorda region) express extreme concern about the possibility of oncological diseases and other health disorders due to the impact of rocket fuel components and its derivatives through the food chain (soil - plants – animals – man). Informing the local population based on the results of the proposed studies will help reduce the socio-psychological stress in society associated with pollution of habitat objects.

The results of the research should make a significant contribution to the scientific and methodological support of research on the timely and most complete assessment of the environmental and sanitary-epidemiological situation in the territories adjacent to the objects of rocket and space activities.

3. Which points of strategic and program documents are solved:

– The State Program for the Development of Education and Science of the Republic of Kazakhstan for 2020-2025, approved by the Decree of the Government of the Republic of Kazakhstan dated December 27, 2019 No. 988;

– Strategic Development Plan of the Republic of Kazakhstan until 2025, approved by the Decree of the President of the Republic of Kazakhstan dated February 15, 2018 No. 636, task “Development of the system of scientific research”;

– Strategic Plan of the Ministry of Digital Development, Innovation and Aerospace Industry of the Republic of Kazakhstan for 2020-2024, approved by the Order of the Minister of Digital Development, Innovation and Aerospace Industry of the Republic of Kazakhstan dated January 16, 2020 No. 13/NK;

– The Law of the Republic of Kazakhstan "On Space Activities" (dated January 6, 2012, No. 528-IV (as amended on 11.04.2019) Article 14. Scientific research in the field of spece activities. The concept of further cooperation at “Baikonur” complex (approved by the Kazakh-Russian Intergovernmental Commission on the“Baikonur” complex, December 26, 2016).

The research results are of international importance, as they are a logically justified continuation of research on the problems of ensuring the environmental safety of rocket and space activities.

4. Expected results

4.1. Direct results:

- draft methodology for measuring asymmetric dimethylhydrazine (ADMG) and/or its transformation products in hair by investigating the optimal mode of ADMG detection, selecting optimal parameters for ADMG extraction, optimal calibration parameters, generating initial data for developing a draft methodology for performing ADMG measurements;
- draft methodological recommendations on the algorithm for assessing the damage to public health from the consequences of accidental falls of launch vehicles, taking into account the results of socio-hygienic and medical examinations in settlements adjacent to the areas of the emergency fall of the RKN.

According to the results of the implementation of the program, it should be published:

- at least 2 (two) articles and (or) reviews in peer-reviewed scientific publications indexed in the Science Citation Index Expanded of the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 35 (thirty-five) and at least 1 (one) patent included in the Derwent Innovations Index database (Web of Science, Clarivate Analytics);
- as well as at least 1 (one) article or review in a peer-reviewed foreign or domestic publication recommended by CQAES.

4.2. The end result:

The developed regulatory and methodological framework should increase the effectiveness of measures to ensure the environmental safety of rocket and space activities, monitoring the state of environmental objects, habitat and public health in territories affected by rocket and space activities, preventing and reducing the level of socio-psychological stress among the population of territories affected by rocket and space activities, thereby ensuring the most stable economic development in these regions and the development of the rocket and space industry in the Republic of Kazakhstan.

The results will contribute to the development of a regulatory and methodological framework for assessing the impact of rocket fuel on the environment of territories affected by rocket and space activities, on the habitat and health of the population of adjacent territories. Updating data on the results of environmental monitoring of rocket and space activities based on digital technologies will allow the Company to bring its activities to a higher level of regional and international exchange of scientific and technical information.

The implementation of scientific and applied developments planned within the framework of the proposed program will allow for a timely and most complete assessment of the environmental situation at the sites of the fall of spent parts of launch vehicles, the sanitary and epidemiological situation in adjacent settlements; increase the effectiveness of measures to ensure the environmental safety of rocket and space activities in Kazakhstan territories; and also to get a social effect, in terms of relieving social tension in the regions adjacent to the territories of the emergency fall of launch vehicles and to the areas of the regular and emergency fall of launch vehicles, which is equally important for the Republic of Kazakhstan and the Russian Federation - the tenant of the Baikonur cosmodrome.

Methodological recommendations for assessing the damage to public health from the consequences of launch vehicle accidents are intended for practical use in calculating payment rates for medical and social assistance to affected people.

The results of the study have social significance and are intended for free distribution among interested consumers (authorized bodies of the Republic of Kazakhstan related to monitoring the environmental

situation, health care, emergency response, in the field of space activities, as well as local executive bodies, the public), respectively, are not commercialized.

5. The maximum amount of the program is 153,300 thousand tenge, including for 2022 – **33,300 thousand** tenge; 2023 – **60,000 thousand** tenge; 2024 – **60,000 thousand** tenge.

Technical task No. 20
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program

Scientific research in the field of natural sciences

1.2. Name of the specialized direction of the program:

Fundamental research in the field of ecology and geography

2. Goals and objectives of the program

2.1. The purpose of the program:

To assess the current state, trends and prospects of glaciation changes in the transboundary basins of Kazakhstan and neighboring countries of Central Asia (Balkash-Alakol, Ertis, Syrdaria and Amu Darya).

2.2. To achieve this goal, the following tasks must be solved:

- to develop a theoretical justification of the strategy for assessing changes in the glacial systems of Central Asia over the past decades in conditions of a shortage of factual information; to create an information and analytical database:

- to develop principles and methods for assessing the state of glacial systems based on remote sensing data of test glacial basins of the rivers that make up the Syrdarya and Amu Darya;

– to organize monitoring of the dynamics of the cryosphere of the river flow formation zone of the region with a system of year-round glaciohydroclimatic observations on the basis of mountain scientific stations (hospitals) in the Northern Tien Shan, the most provided with the necessary factual information;

– create an information and analytical database for three blocks - meteorological characteristics, space monitoring of glaciers, river runoff.

– to compile new catalogues of glaciers based on remote sensing data of glacial basins of the Syrdarya River; to develop a methodology for assessing glacial runoff:

- to monitor the dynamics of the cryosphere of the region's river flow formation zone with a system of year-round glaciohydroclimatic observations based on mountain research stations (hospitals) in the Northern Tien Shan;

- to compile new catalogues of glaciers of test basins of the studied territory in the volume necessary for a reasonable assessment of changes in glaciers and glacial systems of the Syrdarya basin over the past 50-60 years;

- to develop a methodology for assessing glacial runoff based on data from monitoring the mass balance of control (test) glaciers;

- based on the results of a comparative analysis of the data of repeated catalogues of glaciers of the control basins of the rivers that make up the Syrdaria, to evaluate the parameters of trends in the area/volume of glaciers over the past 5-6 decades as the basis for correcting the data of previously compiled catalogs;

– to compile new catalogues of glaciers of test basins in the volume necessary for a reasonable assessment of changes in glaciers and glacial systems of the Amudarya River basin over the past 50-60 years; to assess trends and prospects for the development of glacial systems of the named transboundary Amudarya basin; to assess glacial runoff:

- to compile new catalogues of glaciers of test river basins-components of the Amu Darya River;

- perform a comparative analysis with an assessment of the parameters of trends in the area/volume of glaciers over the past 5-6 decades as the basis for correcting the data of previously compiled catalogs;

- to assess trends and prospects for the development of glacial systems of the named transboundary basins

and their impact on runoff and water resources;
- to ensure the implementation of the R&D under the Program and informing the scientific community, the public and decision-makers through publications in scientific journals, mass media, participation of performers in scientific seminars/ conferences.

3. Which points of strategic and program documents are solved:

1. "Strategy "Kazakhstan-2050", a new political course of the established state".
2. Decree of the President of the Republic of Kazakhstan dated May 30, 2013 No. 577 "On the Concept for the transition of the Republic of Kazakhstan to a "green economy".
3. The State Program "Digital Kazakhstan".
4. Decree of the President of the Republic of Kazakhstan dated February 15, 2018 No. 636. "On approval of the Strategic Development Plan of the Republic of Kazakhstan until 2025".
6. Law of the Republic of Kazakhstan dated January 6, 2012 No. 527-IV. "On the national security of the Republic of Kazakhstan".
7. "National project on water Resources management of Kazakhstan until 2025".
8. Strategic Plan of the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan for 2017-2021 dated 09/10/2019 No. 26.

4. Expected results

4.1 Direct results:

The results of the program should include:

- new knowledge about current and forecast changes in glacial systems of the studied transboundary basins and their impact on river flow and water resources in the context of water and food security problems in Kazakhstan and neighboring Central Asian countries;
- - introduction of scientific developments into the practice of planning the development of the water sector of the economy of the countries of the region;
-- recommendations for the implementation of the developed methods of operational monitoring of the state of glacial systems and correction of obviously questionable data from previously compiled catalogues of glaciers;
- recommendations on the methodology for assessing glacial runoff developed in the course of research;
- theoretical substantiation of the possibilities of assessing the meltwater of underground ice (buried glaciers, glaciers of stone glaciers, collapsing rock strata, permafrost) and their participation in the formation of river runoff;
- at least 7 (seven) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in Scopus database of at least 50 (fifty);
- - at least 10 (ten) articles in journals recommended by CQAES.

4.2 The end result:

- new catalogues of glaciers of the trans-boundary basins of Syrdaria (Central, Inner and Western Tien Shan) and Amu Darya (Pamir-Alai) in an amount sufficient for a confident assessment of the real losses of the area/volume of glaciers for the periods between the years of repeated cataloging of glaciers and the corresponding losses of glacial resources;
- organized system of year-round hydrometeorological and glacial-geocryological monitoring on the basis of the Center's mountain hospitals as a basis for assessing the reaction of the cryosphere (snow cover, glaciers, underground ice) of the runoff formation zone to climate change;
- results of quantitative assessment of the role of meltwater of underground ice in the formation of runoff (by the example of the control basin of the Ile Alatau).

The economic effect should be to optimize the interstate use of the flow of transboundary rivers in the region, operational and long-term planning of the water sector of the economy of the countries of the region.

Ecological effect.

The problems of ecological, as well as food security of Central Asian countries are functionally determined by the dynamics of river runoff during the growing season, which is determined by 30-40% by runoff from glaciers. If current trends continue, the vast majority of the glaciers of the river basins of the outer ridges of the mountainous countries of the region will disappear before the end of this century. river runoff during the

growing season will decrease critically, the peak of the flood will shift from July-August to April-May, and severe water shortage during the growing season in the countries of the region will become the norm. This is the reason for the increasingly alarming concern caused by the reduction of glacial resources of the mountain glacial basins of Central Asia and the world as a whole.

Social effect. The results of research on the proposed Program are the basis for the development of measures for the adaptation of the population and economy of the countries of the region to the likely climate–conditioned changes in water resources. The expected results of the assessment of the role of meltwater of underground ice in the formation of runoff can significantly reduce the "degree" of anxiety of expectations of a landslide reduction in runoff during the growing season, and, accordingly, the level of social tension in the Central Asian countries.

5. The maximum amount of the program is 800,000 thousand tenge, including by year:
for 2022 – **50,000 thousand** tenge, for 2023 – **400,000 thousand** tenge, for 2024 – **350,000 thousand** tenge

Technical task No. 21
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Scientific research in the field of natural sciences

1.2. Name of the specialized direction of the program:

Fundamental research in the field of ecology and geography

2. Goals and objectives of the program

2.1. The purpose of the program:

To assess the current state of terrestrial and aquatic ecosystems of the Kazakh part of the Irtysh river basin and develop an action plan for the conservation and sustainable use of biodiversity and minimizing damage to river and terrestrial ecosystems under climate change, transboundary use of water resources and industrial development of the region.

2.2. To achieve this goal, the following tasks must be solved:

– To analyze the hydrological regime of the river of the Irtysh basin in the conditions of climate change, transboundary use and forecast reduction of river flow.

– To characterize the forms of relief and soil cover for the classification of terrestrial ecosystems in the Irtysh basin.

– To determine the concentrations of pollutants in various components of the river ecosystem according to the selected model areas of the Irtysh basin.

– To characterize plant communities, with the allocation of indicator, rare and endangered plant species, microalgae to describe ecosystems.

– To assess the diversity and spatial distribution of fauna (rotifers, arachnids, crustaceans, insects, mollusks, fish, amphibians, reptiles, birds and mammals), including populations of hunting and commercial, economically valuable, rare and red-listed aquatic and terrestrial animal species.

– To study parasites of wild animals as potential pathogens of parasitic diseases of humans and domestic animals, taking into account the possibility of cross-border transfer of zoonotic infections.

– To carry out a comprehensive assessment of the degree of anthropogenic transformation of ecosystems based on chemical analysis data and indicator biological indicators.

– To carry out ecological mapping of abiotic and biological data and to assess the distribution of environmental loads in the Irtysh basin, to identify the main sources of its pollution.

– To identify the main threats to ecosystems and biodiversity and to make a forecast of changes in the conditions of different water availability of the Irtysh River basin.

– To develop an action plan to minimize the damage caused to river and terrestrial ecosystems as a result of anthropogenic impact and transboundary use of water resources of the Irtysh basin under conditions of climate change.

3. Which points of strategic and program documents are solved:

1. “Strategy “Kazakhstan-2050” – a new political course of the established state”;
2. “Action plan for the implementation of the Concept of conservation and Sustainable Use of Biodiversity of the Republic of Kazakhstan until 2030;
3. “Strategic Development Plan of the Republic of Kazakhstan until 2025”, in which, within the framework of Task 7. “Conservation of biological diversity”;
4. “The concept of transition of the Republic of Kazakhstan to sustainable development for 2007-2024”;
5. Law of the Republic of Kazakhstan dated July 9, 2004 N593-II “On protection, reproduction and use of wildlife”;
6. Resolution of the Government of the Republic of Kazakhstan dated January 5, 2005 No. 1 “On approval of the Rules of State accounting, cadastre and monitoring of wildlife in the Republic of Kazakhstan”;
7. “Convention on Biological Diversity” (Rio de Janeiro, 1992);
8. “Convention on the Conservation of Migratory Species of Wild Animals” (Bonn, 1983);
9. “Convention on the Protection of the World Cultural and Natural Heritage”;
10. “Convention on the Protection and Use of Transboundary Watercourses and International Lakes”;
11. “United Nations Convention to Combat Desertification”, RAMSAR - Convention on Wetlands of International Importance, Mainly as Habitats for Waterfowl.

4.2 The end result:

As a result of the implementation of the Program, studies should be carried out covering ecological, ecotoxicological, soil, botanical, zoological, parasitological directions, as well as a comprehensive assessment of the state of biological resources in the Irtysh basin under conditions of climate change, transboundary use of water resources and industrial development of the region. As a result of the implementation of the program, ecological mapping of chemical and indicator biological indicators should be obtained, allowing to describe the distribution and intensity of anthropogenic loads, identified the most transformed areas and potential causes of environmental problems in the Irtysh river basin. The data obtained should be used to develop scientifically sound measures to minimize damage to natural ecosystems as a basis for the conservation and sustainable use of biodiversity in the Irtysh river basin.

The program should contain recommendations for making appropriate decisions on the conservation and rational use of biological resources, the creation of a favorable ecological environment and the development of hunting, fishing and fisheries sectors of the economy of Kazakhstan.

Scientific data should be included in the reports of the Republic of Kazakhstan on the implementation of international conventions. The results of the program should serve as a scientific basis for the development of interstate agreements to minimize damage to the natural ecosystems of the Irtysh basin in the conditions of transboundary use of water resources.

Publications:

- at least 5 (five) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a percentile by CiteScore there are at least 50 (fifty) in the Scopus database;
- at least 5 (five) articles in journals recommended by CQAES.

The economic effect should consist in visualizing data based on ecological mapping and presenting the results in an integral form convenient for perception and assessment of the environmental situation within the entire Irtysh basin, taking into account the transboundary transfer of pollutants from China, Kazakhstan's contribution to the overall level of pollution of the river and further transfer of pollution to Russia. The results obtained and the form of their presentation should be the basis for monitoring in order to track the ecological state of the region and forecast its changes, to develop recommendations for the conservation of biodiversity and sustainable use of wildlife under modern environmental pressures. Assessment of the state of natural populations of rare and endangered, as well as hunting and commercial species should be the basis of the developed recommendations for specially protected natural territories, hunting farms, authorized bodies for the protection, use and reproduction of flora and fauna.

The social effect should be to improve the health of natural ecosystems and improve the quality of life of the population of the region. Understanding the parasitological situation should allow us to assess the risks of

infection of the local population and domestic animals. Dissemination of knowledge about ecosystems, biological diversity, promotion of environmental protection among the local population should increase the educational level and environmental awareness of the population.

Target consumers of the results obtained: Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan, Forestry and Wildlife Committee of the Ministry of Agriculture of the Republic of Kazakhstan, environmental organizations, specially protected natural territories, hunting farms, republican and regional authorized bodies for environmental control, international databases on flora and fauna, International Red List (IUCN), International Database on bird migrations, veterinary territorial departments, higher educational institutions.

5. The maximum amount of the program is 350,000 thousand tenge, including by year:
for 2022 – **70,000 thousand** tenge, for 2023 – **140,000 thousand** tenge, for 2024 – **140,000 thousand** tenge.

Technical task No. 22
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Scientific research in the field of natural sciences.

1.2. Name of the specialized direction of the program:

Fundamental and applied research in the field of biology.

2. Goals and objectives of the program

2.1. The purpose of the program:

Updating the Red Book of Animals of the Republic of Kazakhstan using international approaches to maintain the global red List of the International Union for Conservation of Nature (hereinafter – IUCN) and create a national electronic database on rare and endangered species of animals as a basis for their long-term monitoring.

2.2. To achieve this goal, the following tasks must be solved:

– To develop the structure of an electronic database on rare and endangered animals of the Republic of Kazakhstan using GIS technologies and filling the data bank with modern materials obtained during field work.

– To analyze and develop recommendations for improving the legislation of the Republic of Kazakhstan concerning the issues of maintaining the Red Book of the Republic of Kazakhstan, in order to bring together the regulatory framework for maintaining the national Red Book and the global Red List of animals.

– Based on the results of field research, to assess the current state of populations of species previously listed in the Red Book of Kazakhstan, with the development of recommendations for their conservation and the forecast of the development of such populations for the next 10 years.

– To carry out assessments of endemic, rare and endangered species of fauna of Kazakhstan using international criteria and categories of the IUCN Red List.

– To introduce the use of the latest cryobiological technologies for the ex situ conservation of rare and endangered animal species in order to preserve them for a long time and, if necessary, restore them in natural ecosystems.

– To introduce a system of scientifically based monitoring of the state of populations of rare and endangered species of wild animals based on the use of modern techniques (satellite tagging, banding, camera traps, drones, etc.).

– To prepare and publish the updated “Red Book of the Republic of Kazakhstan (Volume 1, animals), as well as the creation of the information web portal “Red Book of the Republic of Kazakhstan (animals)” for public use.

3. Which points of strategic and program documents are solved:

1) Convention on Biological Diversity, the purpose of which is the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of benefits associated with the use of

genetic resources, including by providing the necessary access to genetic resources and the appropriate transfer of appropriate technologies, taking into account all rights to such resources and technologies.
2) Strategy "Kazakhstan-2050": A new political course, which talks about the proper management of natural resources and the most effective transformation of the country's natural resources into sustainable economic growth;
3) Resolution of the Government of the Republic of Kazakhstan dated January 5, 2005 No. 1 "On approval of the Rules of State accounting, cadastre and monitoring of wildlife in the Republic of Kazakhstan";
4) The State Program for the Development of Education and Science of the Republic of Kazakhstan for 2020 - 2025, approved by the Decree of the Government of the Republic of Kazakhstan dated December 27, 2019 No. 988
- Goal 2 "Increasing the contribution of science to the socio-economic development of the country"
- item 5.2.1. "Strengthen the intellectual potential of science"
- item 5.2.3. "To increase the effectiveness of scientific research and ensure integration into the world scientific space"
5) Strategic Development Plan of the Republic of Kazakhstan until 2025 No. 636 dated February 15, 2018
- Policy 6. "Green" economy and environmental protection
- Task 7 - Conservation of biological diversity – "within the framework of the national strategy for sustainable land management, work will continue on the implementation of strategic measures aimed at systematically solving the problem of land degradation and desertification"
6) "Development Strategy of the Republic of Kazakhstan until 2050 "Kazakhstan-2050" - a new political course of the established state"
- The sixth challenge is the exhaustion of natural resources; large–scale modernization of agriculture in the context of growing global demand for agricultural products)
7) Message of the President of the Republic of Kazakhstan – Leader of the Nation N.A. Nazarbayev to the people of Kazakhstan, December 2012
8) The address of the Head of State "The third modernization of Kazakhstan: global competitiveness" dated January 31, 2017
9) The concept of transition of the Republic of Kazakhstan to sustainable development for 2007-2024, approved by the Decree of the President of the Republic of Kazakhstan dated November 14, 2006 No. 216 (item 3.4 – sustainable economic progress; 3.5 – environmental sustainability);
10) Concept for the conservation and sustainable use of biological diversity of the Republic of Kazakhstan until 2030, 2015
- Priority 2. Goal 9. Conservation and restoration of agrobiodiversity
11) The State program "Digital Kazakhstan" (dated December 12, 2017 No. 827, as amended by the Decree of the Government of the Republic of Kazakhstan dated December 20, 2019 No. 949)

4. Expected results

4.1 Direct results:

- Unified structure of the electronic database on rare and endangered animals of the Republic of Kazakhstan using GIS technologies with a completed database of modern materials obtained during field work.
- Analysis and recommendations on improving the legislation of the Republic of Kazakhstan concerning the issues of maintaining the Red Book of the Republic of Kazakhstan, in order to bring together the regulatory framework for maintaining the national Red Book and the global Red List of animals.
- Based on the results of field research, the assessment of the current state of populations of at least 60 species previously included in the Red Book of Kazakhstan, the development of recommendations for their conservation and the forecast of population development for the next 10 years.
- Assessment of 230 endemic, rare and endangered species of fauna of Kazakhstan using international criteria and categories of the IUCN Red List.
- Introduction of the latest cryobiological technologies for ex situ conservation of 20 rare and endangered species of animals with the aim of their long-term conservation and, if necessary, restoration in natural ecosystems.
- Implementation of a system of scientifically based monitoring of the state of populations of rare and endangered 25 species of wild animals based on the use of modern techniques (satellite tagging, banding,

camera traps, drones, etc.).
- Preparation and publication of the “Red Book of the Republic of Kazakhstan (Volume 1, animals), as well as the creation of the information web portal “Red Book of the Republic of Kazakhstan (animals)” for public use.
- Publication of at least 5 articles and/or reviews in peer-reviewed scientific publications included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty);
at least 10 articles in peer-reviewed foreign and (or) domestic publications with a non-zero impact factor (recommended by CQAES).
- Submission of at least 3 patent applications;
- Training of at least 2 PhD doctors and 10 bachelors and masters.

4.2 The end result:
The implementation of the Program should ensure compliance with national legislation (the Law of the Republic of Kazakhstan on the Protection, Reproduction and Use of Wildlife, the Environmental Code of the Republic of Kazakhstan) and international obligations (the Convention on Biological Diversity) Kazakhstan, as well as to increase the scientific and technical potential of the state and its global image through the development of measures for the conservation of rare and endangered species of animals. The results obtained should contribute to the implementation of an effective state policy in the field of conservation of biological diversity and management of zoological resources. The result of the program should be the development of specific measures for the conservation of rare and endangered species of animals, which will give impetus to the development of domestic fundamental and applied zoology.
The scientific and practical result of the implementation of the program is to develop an effective knowledge-intensive way of managing (accounting and control) rare and endangered animal resources in the Republic of Kazakhstan, as well as integrating the country's environmental policy into international biodiversity conservation programs. The developed proposals for improving the legal regulation of the Red Book of the Republic of Kazakhstan should increase its effectiveness and remove many problems of its integration into the international global system for the conservation of rare and endangered species of wild animals. The scientific and practical results of the program should be used in courses of lectures and practical classes on zoology, taxonomy and systematics, paleozoology, zoogeography, ecology in universities of biological and ecological profiles.
The ecological effect should consist in the effective conservation of rare and endangered species of wild animals.
The social and economic effect should consist in the development of "digital Kazakhstan" and information technologies in facilitated public access to scientific zoological materials, as well as the formation and involvement of qualified domestic personnel in the knowledge-intensive process, in the growth of the educational level of the population, strengthening the personnel of educational and scientific organizations, improving the effectiveness of environmental protection measures, increasing the potential of science in Kazakhstan, strengthening the integration links between science and practice both within the country, so it is in the international arena, as well as raising the international image of Kazakhstan's science. The public availability of information on rare and endangered animals of Kazakhstan should allow to reduce the costs of measures for their conservation.

5. The maximum amount of the program is 350,000 thousand tenge, including by year:
for 2022 – **70,000 thousand** tenge, for 2023 – **140,000 thousand** tenge, for 2024 – **140,000 thousand** tenge.

Technical task No. 23
for research work
within the framework of program-targeted financing

1. General information:
1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Scientific research in the field of natural sciences

1.2. Name of the specialized direction of the program:

Fundamental and applied research in the field of chemistry

2. Goals and objectives of the program

2.1. The purpose of the program:

Development and testing of technologies of new functional materials using plasma chemical, mechanochemical and self–propagating high-temperature synthesis processes (hereinafter - SHS).

2.2. To achieve this goal, the following tasks must be solved:

- Development of mechanoactivated additives based on aluminum and its alloys for the production of new functional materials by methods of technological combustion;
- Development and testing of technologies for increasing the adhesion of bitumen to mineral materials using inorganic and organic additives;
- Development and testing of technologies for plasma chemical processing of industrial and household waste into multifunctional materials;
- Development of new composition catalytic systems for greenhouse gas utilization and synthesis gas production as a valuable end product.

3. Which points of strategic and program documents are solved:

1. The State Program of Industrial and Innovative development for 2020-2025 (Resolution of the Government of the Republic of Kazakhstan dated December 31, 2019 No. 1050): task “Increase in production volumes and expansion of the range of processed goods in demand in domestic and foreign markets”;

2. National project “Technological breakthrough through digitalization, science and innovation” (Resolution of the Government of the Republic of Kazakhstan dated October 12, 2021 No. 727): direction 9 “Increasing the contribution of science to the development of the country “Science – production – business”; paragraph 4.2.2 “Ensuring a competitive environment and the development of the industry by strengthening the participation of local companies”,

3. The new “Environmental Code of the Republic of Kazakhstan” (dated January 2, 2021 No. 400-VI ZRK): Article 324 “Energy waste disposal”, “Introduction of advanced technologies to reduce emissions into the environment”; Article 196, paragraph 12 “research on the search, scientific and technical justification and introduction of new environmentally efficient and resource-saving technologies”; Article 209 “Environmental requirements for the protection of atmospheric air during storage, neutralization, burial and incineration of waste”, paragraph 2 “Legal entities and individual entrepreneurs whose waste products are sources of atmospheric air pollution are obliged, in accordance with the environmental legislation of the Republic of Kazakhstan, to ensure timely removal of such waste to specialized places of their storage, neutralization, processing, disposal or disposal”.

4. Expected results.

4.1 Direct results:

As a result of the implementation of the program, the following should be obtained:

- development of mixed high-explosive substances based on powdered aluminum and its alloys, providing the necessary level of efficiency of explosives and rocket fuels;
- evaluation of the energy intensity of mixed solid fuel systems with modified powders based on aluminum and aluminum alloys, depending on the conditions of preparation of combustible mixtures;
- development and testing of technological principles for increasing the adhesion of bitumen using mechano-activated technogenic materials and organic synthesis products;
- determination of the influence of mechanical activated technogenic materials on the intensity of bitumen aging;
- installation of physical-mechanical and structural features that determine the nature of interaction at the interface of the bitumen−filler system phases in the presence of mechano-activated technogenic materials and organic additives;
- development and testing of plasma chemical methods for processing municipal and man-made waste into functional materials;
- development and testing of oxide catalytic systems based on metals of variable valence deposited on

carriers for the utilization of carbon dioxide and methane from greenhouse gases;

- establishing the relationship between the physico-chemical properties of catalysts and the degree of conversion of carbon dioxide and methane.

Publications:

- at least 7 (seven) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in Scopus database of at least 50 (fifty);

- at least 7 (seven) articles in publications recommended by CQAES.

- Obtaining at least 5 patents of the RK.

4.2 The end result:

Expanding the range of new industrial explosives for use in the mining and construction industries, which will increase the efficiency and safety of drilling and blasting operations.

Development of technology for obtaining powder materials from aluminum and its alloys with low cost, which will create prerequisites for increasing the range of new high-tech products with high added value.

Expansion of the nomenclature of modifying additives that improve the quality of road-building composites. The use of mechano-activated fly ash from the TPP and organic additives to obtain these additives contributes to solving an important environmental problem of recycling multi-tonnage waste from the heat and power sector, as well as the complete import substitution of adhesive additives to bitumen. The listed results should allow to increase the service life of roads with asphalt-bitumen coating, and thereby save budget funds allocated for the current and overhaul of the transport network of Kazakhstan.

Plasma chemical processing should allow municipal waste to be disposed of without their preliminary classification, with the production of new fillers for the construction industry (heat insulators, building mixes, mineral additives to road surfaces). It can be implemented through the creation of small enterprises for the production of export-oriented products in the settlements of the country with a wide geography. Reducing the amount of municipal waste due to their processing will reduce the negative impact on the environment by reducing the territories allocated for landfills.

Economic effect. The results of the Program should make it possible to create new high-tech industries in the Republic of Kazakhstan and contribute to increasing the country's Economic Complexity Index. Creation of prerequisites for the creation of at least four production facilities for the production of the following products with high added value: powder mixed high-explosive substances; adhesive additives in bitumen; acid– and heat-resistant functional materials based on plasma chemical waste processing; new oxide catalytic systems for the conversion of carbon dioxide and methane into a valuable commercial product - synthesis gas. These products have a high export potential.

Environmental effect. The implementation of the Program should create prerequisites for a sharp reduction in the volume of ash and slag waste, which currently occupies hundreds of millions of hectares of land, and poses a significant danger to human health and the environment in principle. The implementation of the Program will significantly reduce the amount of industrial and household waste, which will reduce their negative impact on the environment. The use of newly developed catalytic systems should reduce the amount of greenhouse gases in the country.

Social effect. Newly organized production facilities for the production of high-tech products should create at least 500-700 new jobs for highly qualified workers and engineers, with wages above the average level in the country. Reducing the negative impact of fly ash from TTP , industrial and household waste, as well as greenhouse gases on the environment should lead in the medium and long term to a reduction in the morbidity of the population and a reduction in the burden on the country's healthcare system.

5. The maximum amount of the program is 350,000 thousand tenge, including for 2022 – **70,000 thousand** tenge; for 2023 – **140,000 thousand** tenge; for 2024 – **140,000 thousand** tenge.

Technical task No. 24
for research work

within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Scientific research in the field of natural sciences.

1.2. Name of the specialized direction of the program:

Fundamental and applied research in mathematics and mechanics

2. Goals and objectives of the program

2.1. The purpose of the program:

Development of fundamental and applied methods for solving complex and/or unsolved problems of mechanics and robotics using modern machine learning approaches and artificial intelligence achievements (problems of mineral extraction, prediction of turbulent flows, design and control of robots and manipulators, studying the properties of new metals and alloys, etc.).

2.2. To achieve this goal, the following tasks must be solved:

1) development of deep learning methods for solving stochastic differential equations of hydromechanics (increase in oil production):

2) development of intelligent high-performance computational models for solving the problem of nonequilibrium filtration (composite model) with thermal and chemical reactions based on - Reduced-order modeling, Physics-informed neural networks, etc.

3) evelopment of intelligent high-performance computational models for analyzing and predicting the characteristics of oil and gas field development under conditions of uncertainty (based on) based on - Stochastic Galerkin method, probabilistic collocation method, frozen flow distribution method (FROST), Multilevel Monte Carlo method, etc.

4) development of a virtual prototype of an oil well (oil and gas field) within the framework of the Digital Twin concept

5) collection of experimental and/or generation of synthetic borehole data and rock data for the formation of an input layer for neural networks and the construction of pore networks of various rocks, based on the collected data;

6) development of an effective computational Physics-Informed Neural Networks model of the pore-scale transport phenomenon (Pore-Network Model+Deep Learning);

7) verification of the computational Physics-Informed Neural Networks model of the pore-scale transport phenomenon by comparing the results obtained with the results of direct modeling;

8) calculation of absolute and phase permeability, capillary pressure and diffusion coefficient of various new geological (hydrocarbon and uranium-bearing ore) rocks.

9) development of machine learning and intelligent analysis methods in problems of mechanics and control of machines and robots:

10) development of methods of multi-criteria synthesis and optimal design of mechanisms of machines and robots based on a combination of random and directed search methods, focused on the development of machine learning methods;

11) development of stochastic methods for diagnostics of mechanical and technological characteristics (energy intensity, material intensity, reliability, durability, safety, noiselessness, failure, risk assessment, etc.) of machine units and robotic systems;

12) development of deep learning methods for processing technical and technological data on the state of the mechanical system and their production;

13) development of machine learning methods for solving nonlinear stochastic problems in vibration protection systems;

14) development of experimental methods for intelligent analysis of hardness and VAT of materials used in machines and robotic systems;

analysis of strength characteristics of materials and prediction of elastic-plastic properties of solids based on machine learning and experimental data.

3. Which points of strategic and program documents are solved:

1) The Message of the President of the Republic of Kazakhstan dated January 10, 2018 “New development

opportunities in the conditions of the Fourth Industrial Revolution".
2) Message of the President of the RK K.K. K.K. Tokayev to the people of Kazakhstan dated September 1, 2020. Task **V. Affordable and high-quality education. Item 58** of the National Plan for the implementation of the Address of the President of the country K.Tokayeva to the people of Kazakhstan "Kazakhstan in a new reality: time for action" from September 1, 2020.
3) The State program of industrial and innovative development of the Republic of Kazakhstan for 2020-2025. The action plan for the implementation of the SPIID of the Republic of Kazakhstan for 2020 – 2025. Task 4. Technological development and digitalization

4. Expected results

4.1. Direct results:

4.1.1. New approaches (models, methods, algorithms, software modules) on the use of deep learning methods in modeling and solving problems of increasing oil production:

1) intelligent high-performance computational models for solving the problem of nonequilibrium filtration (composite model) with thermal and chemical reactions based on - Reduced-order modeling, Physics-informed neural networks, etc.

2) intelligent high-performance computational models for analyzing and predicting the characteristics of oil and gas field development under uncertainty (stochastic modeling) based on - Stochastic Galerkin method, probabilistic collocation method, frozen flow distribution method (FROST), Multilevel Monte Carlo method, etc.

3) a virtual prototype of an oil well (oil and gas field) within the framework of the Digital Twin concept

4.1.2 New approaches (models, methods, algorithms, software modules) on the use of deep learning methods in modeling and solving problems of hydromechanics:

4) generated synthetic borehole data and rock data to form an input layer for neural networks;

5) new computational Physics-Informed Neural Networks models of the pore-scale transport phenomenon (Pore-Network Model+Deep Learning) to study ways to increase the recovery rate of hydrocarbons and solid minerals;

6) more accurate calculations by the proposed method of residual saturation with rock fluids, absolute and phase permeability, capillary pressure and diffusion coefficient of new various geological (hydrocarbon and uranium-bearing ore) rocks;

7) recommendations on increasing the coefficient of extraction of hydrocarbons and solid minerals from the subsurface extracted by the borehole method.

4.1.3 New approaches (models, methods, algorithms, software modules) on the use of machine learning and intelligent analysis methods in modeling and solving problems of mechanics and control of machines and robots:

8) intelligent models of multi-criteria synthesis and optimal design of mechanisms of machines and robot manipulators based on a combination of random search and directional descent methods and genetic algorithms;

9) intelligent models of technical and technological diagnostics of mechanical and robotic systems based on stochastic analysis of factor systems;

10) intelligent models and a database of technical and technological characteristics of real machines and robots, taking into account their dynamic and mathematical models developed by methods of analytical and nonlinear mechanics;

11) intelligent systems and/or their components for robotization and control of technological processes of production, in particular, in the tasks of monitoring and non-destructive control of the state of equipment and environment in the processes of uranium extraction by the method of borehole leaching.

4.1.4 New approaches (models, methods, algorithms, software modules) on the use of deep learning methods in the analysis of strength characteristics of materials and prediction of elastic-plastic properties of solids, mechanical properties of solid materials:

12) intelligent models and a database of technical characteristics of vibration and seismic protection devices, taking into account their nonlinear stochastic models developed by analytical mechanics methods;

13) experimental method of intelligent analysis of the hardness of materials based on a high-precision digital hardness tester Tukon 1102;

14) experimental method of intelligent analysis of the stress-strain state of continuous materials based on the universal Instron 5982 breaking machine;

15) software for intelligent analysis of strength characteristics of materials and prediction of elastic-plastic properties of solids based on machine learning and experimental data.

4.1.5. New knowledge or solutions, the results of research, analysis, theoretical research, modeling, obtained in the course of scientific and (or) scientific and technical activities:

New knowledge consists in the development of the concept (methods) of machine learning to solve a class of unsolved or complex applied problems of mechanics, taking into account the methods and models of traditional numerical and analytical methods of mechanics. The new solution to the problem is connected with deep research of mechanical systems using modern methods of machine learning and data, using this knowledge to develop intelligent models. Research results: intelligent high-performance computational models of hydrodynamics of stochastic flows, borehole production of oil and solid minerals, solid materials from metals and alloys, methods of machine learning and intelligent analysis for the design of lever mechanisms of machines and robots. Results of the analysis: characteristics of oil and uranium deposits in Kazakhstan, schemes and functional capabilities of lever mechanisms for effective use in real robot designs, robot control systems for technological processes of uranium extraction by underground borehole leaching, technical characteristics of solid materials made of metals and alloys used in the industry of Kazakhstan.

Publications:

- at least 7 (seven) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in Scopus database of at least 50 (fifty);

- at least 7 (seven) articles in publications recommended by CQAES.

4.2 The end result:

New knowledge consists in solving a class of unsolved or complex problems of mechanics and robotics based on the development of machine learning and artificial intelligence with the application of methods and models of traditional numerical and analytical methods of mechanics.

The scientific effect of the program implementation should consist in the development of new research methods for practical problems of mineral extraction: interpretation of borehole data, modeling of nonequilibrium filtration, development of high-performance computational models and a virtual prototype of the well for the analysis and prediction of the characteristics of the development of mineral deposits; to solve stochastic problems of hydromechanics (problems of modeling turbulent flows and flows in porous media) and mechanics of solids (development of experimental methods and methods of intelligent analysis of hardness and VAT); for the design of complex mechanisms and manipulators and modern robots (optimization of the task of designing mechanisms and manipulators, intelligent models and technical diagnostics programs, control and navigation systems of mobile robots).

The economic effect should consist in the development of scientific and practical foundations and innovative approaches to the creation of new algorithms and machine learning software for solving problems of mechanics and robotics, which correspond to the demanded tasks of the country's manufacturing enterprises.

The results of the Program should contribute to the implementation of the objectives of the SPIID for 2020-2025, in particular, on technological development and digitalization of manufacturing industries, which is an important element of the Index of Economic Complexity of Kazakhstan. During the implementation of the Program, measures should be taken to develop technological development centers (technology/competence centers) on the terms of a targeted transfer for co-financing with multinational companies. Also, the results of the Program can be the foundation for the creation of an analytical platform for digital transformation in the field of mechanical engineering and mineral extraction.

The social effect should be to increase the efficiency of scientific research in the field of natural sciences, increase the scientific potential of Kazakhstan in the field of intelligent systems and new effective methods of studying the laws of nature, the integration of science and business by introducing new approaches into production to increase their productivity.

The social effect should also manifest itself in attracting and forming qualified domestic personnel in a

knowledge-intensive process.

Target consumers of the results obtained: Scientists in the field of mechanics, mechanical engineering and robotics, research organizations, CAD developers, higher educational institutions, knowledge-intensive enterprises in the field of automation, intelligent systems, robotics, research centers (laboratories) of industrial enterprises for the extraction of mineral raw materials, rock mining.

5. The maximum amount of the program is 250,000 thousand tenge, including by year:
for 2022 – **50,000 thousand** tenge, for 2023 – **100,000 thousand** tenge, for 2024 – **100,000 thousand** tenge

Technical task No. 25
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Scientific research in the field of natural sciences.

1.2. Name of the specialized direction of the program:

Scientific research in the field of biology.

2. Goals and objectives of the program

2.1. The purpose of the program:

Creation of competitive scientific products for the needs of healthcare and agriculture.

2.2. To achieve this goal, the following tasks must be solved:

– To create panels of markers for differentiation of the most important genetic groups of the causative agent of tuberculosis based on the molecular genetic characteristics of Kazakhstan drug-resistant strains of *Mycobacterium tuberculosis*;

– To identify circulating microRNAs with potential in the differential diagnosis of pulmonary tuberculosis and lung cancer;

– Develop a domestic test system for the diagnosis of COVID-19 based on enzyme immunoassay to protect public health;

– Molecular and genetic characteristics of strains of the causative agent of bacterial burn of fruit crops threatening wild plant species of Kazakhstan;

– To develop a biotechnology for obtaining plants resistant to the phytopathogenic oomycete *P. infestans*, based on the process of RNA interference;

– To develop highly effective systems for the diagnosis of phytopathogens of fruit and berry crops;

– To develop a diagnostic system for viroids affecting fruit trees cultivated on the territory of the RK;

– To assess the resistance to widespread phytopathogenic diseases of new promising biotechnological potato lines in the process of seed production.

3. Which points of strategic and program documents are solved:

1. The message of the Head of State K.-Zh. Tokayev to the people of Kazakhstan “Kazakhstan in a new reality: time for action” on September 1, 2020. Task VI. Development of the healthcare system. Task VII. Ecology and protection of biodiversity.
2. Strategic Development Plan of the Republic of Kazakhstan until 2025. National priority
2. An affordable and effective healthcare system. Task 2. Improving the availability and quality of medical services. Subtasks “Reorientation to prevention and management of diseases in the early stages” and “Management of major chronic and oncological diseases”. Task 2. Improving the availability and quality of medical services. Subtasks “Reorientation to prevention and management of diseases in the early stages” and “Management of major chronic and oncological diseases”.
3. Initiative 2.3. Priority "Creating the foundations for a new economy"; Initiative 2.18. Task "Development of the system of scientific research"; Policy 5. Ensuring a high quality of life; Reform 2. Technological renewal and digitalization.
4. Strategic Plan of the Ministry of Education and Science of the Republic of Kazakhstan for 2017-2021. The priority direction is “Increasing the contribution of science and the industrial needs of the country”.
5. The State program of healthcare development of the Republic of Kazakhstan “Densaulyk” for 2016-2020.

Direction 5.3 Quality assurance of medical services. Direction 5.7. Ensuring further development of healthcare infrastructure based on public-private partnership, innovations and modern information and communication

6. The State program for the development of the agro-industrial complex for 2017-2021.

7. The Law of the Republic of Kazakhstan "On Plant Protection" dated July 3, 2002 No. 331-II. 16). The Law of the Republic of Kazakhstan "On Plant Quarantine" dated February 11, 1999 No. 344-I (with amendments and additions dated 02/18/2002 No. 293-II).

8. Resolution of the Government of the Republic of Kazakhstan "On approval of the List of especially dangerous pests and diseases of agricultural plants" No. 1518 dated November 26, 2001.

9. The concept of transition of the Republic of Kazakhstan to sustainable development for 2007-2024. Decree of the President of the Republic of Kazakhstan dated November 14, 2006 No. 216.

4. Expected results

4.1 Direct results:

According to the results of the program implementation, there should be:

- the molecular genetic certification of Kazakhstani genotypes of drug-resistant *Mycobacterium tuberculosis* strains was carried out with the introduction of their genetic profile data into a replenished database;
- a panel of markers for differentiation of the most important genetic groups of the causative agent of tuberculosis based on the identified genetic features of the analyzed strains of *Mycobacterium tuberculosis* is proposed;
- circulating microRNAs with potential in the differential diagnosis of pulmonary tuberculosis and lung cancer have been identified;
- recombinant proteins of the delta variant of SARS-CoV-2 were obtained for the development of test systems;
- a highly specific test system for the serological diagnosis of COVID-19 has been developed;
- recommendations have been developed for the use of a test system for serological diagnostics with VID-19, including step-by-step instructions, recommended storage conditions and shelf life, and the results of validation of a set of reagents;
– extended monitoring of the zones of growth of endemic apple tree species and cultivated orchards for the presence and distribution of *Erwinia amylovora;* strains was carried out; strains in various geographical locations were identified;
- genetic profiles have been identified and the diversity and origin of bacterial burn pathogen strains in Kazakhstan have been established;
- transgenic tobacco and potato plants carrying a sequence inducing RNA interference in the phytopathogen were obtained;
- transgenic plants were obtained and tested for *P. infestans* infectability at the experimental site under conditions of a natural phytopathogenic background;
- the genetic diversity of viruses of fruit and berry crops has been studied;
- highly effective systems of diagnostics of phytopathogens of fruit and berry crops have been developed;
- the assessment of the phytosanitary status of dangerous viral diseases of fruit and berry crops of Kazakhstan was carried out;
- multiplex RT-PCR has been developed for simultaneous detection of six different viroids;
- multiprobes have been created for the detection of viroids by the method of nucleic acid hybridization;
- seed material was obtained from experimental potato lines obtained by system technology to assess their resistance to late blight in the field;
- planting of seed material and cultivation of plants of experimental potato lines was carried out;
- the results of the stability assessment were obtained and promising potato lines were selected;
- the seed material of promising potato lines has been propagated;
- at least 5 articles have been published in peer-reviewed scientific publications included in 1 (first) or 2 (second) or 3 (third) quartiles in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty), at least 10 articles (CQAES);
- submission of at least 1 patent application of the Republic of Kazakhstan;
- a highly specific test system for the serological diagnosis of COVID-19 has been developed;

- databases of genetic profiles of human pathogens have been updated;
- databases of genetic profiles of plant pathogens have been updated;
- laboratory regulations have been developed;
- the results are presented in the materials of international scientific conferences and congresses.

4.2 The end result:

The economic effect should consist in:

- replacement of imported test systems with domestic analogues in the market of Kazakhstan;
- development and implementation of innovative approaches to improve the quality of medical care for the population of the country;
- introduction into medical practice of domestic test systems for the diagnosis of socially significant human diseases (tuberculosis, lung cancer, COVID-19);
- the study of the phytosanitary status of fruit and berry plantations in Kazakhstan and analyzed the genetic diversity of pathogens of fruit and berry crops;
- in the introduction of new phytopathogen-resistant potato lines into production;

also, the developed technologies for the diagnosis of pathogens of fruit and berry crops (viruses, viroids, bacterial burn) should contribute to strengthening phytosanitary control, including the import and turnover of planting material of fruit crops.

The social effect should be:

- reducing the cost of medical services for the population in the diagnosis of lung diseases of various etiologies;
- availability of test systems aimed at diagnosing dangerous diseases of the respiratory system;
- providing agriculture with modern knowledge-intensive technologies and knowledge;
- increasing yields and reducing the cost of products will increase the level of consumption of vitamin-rich fruits and berries by the population.

5. The maximum amount of the program is 350,000 thousand tenge, including by year:
for 2022 – **70,000 thousand** tenge, for 2023 – **140,000 thousand** tenge, for 2024 – **140,000 thousand** tenge

Technical task No. 26
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Scientific research in the field of natural sciences.

1.2. Name of the specialized direction of the program:

Fundamental and applied research in the field of chemistry.

2. Goals and objectives of the program

2.1. The purpose of the program:

Complex processing of intermediates and man-made waste containing valuable components by the method of supercritical technologies (SCFT)

2.2. To achieve this goal, the following tasks must be solved:

- to develop and certify new methods of analysis of rare and rare earth metals and impurities in them in government agencies;
- to develop the scientific basis of technology for obtaining concentrates of rare earth metals;
- to develop technologies for the associated extraction of rare elements from the masterbatch solutions of the technological cycle of the mining enterprises of JSC “NAC “KazAtomProm”;
- to obtain individual metals from collective REM extracts isolated from man-made waste and natural raw materials by the SKFE method;
- develop technologies for obtaining especially pure Zn, Cu, In, Hg;
- to create a technology for producing precision titanium alloys of ultrafine-grained structure using rare and rare-earth metals;

– to develop a universal high-efficiency flow reactor with an original catalyst for the production of biodiesel.

3. Which points of strategic and program documents are solved:

1. Development strategies of the Republic of Kazakhstan until 2050: A new political course for the proper management of natural resources;
2. Address of the President of the Republic of Kazakhstan K. Tokayev to the people of Kazakhstan "Unity of the people and systemic reforms – a solid foundation for the prosperity of the country" (2021); Item 3. Quality education. Development of science;
3. The State program of industrial and innovative development for 2020-2025.

4. Expected results

4.1. Direct results:

Following the results of the program implementation, there should be:

- new methods of analysis of rare and rare earth metals and impurities in them have been developed and certified in state agencies;
- developed SCF technologies for complex processing of natural (Kundybai deposit) and man-made (phosphogypsum dumps of Kazphosphate LLP) raw materials with extraction of a number of rare and rare earth metals;
- a technology has been developed for the associated extraction of rare elements from the masterbatch solutions of the technological cycle of the mining enterprises of JSC "NAC "KazAtomProm";
- methods for obtaining especially pure Zn, Cu, In, Hg have been created;
- technologies for producing precision titanium alloys of ultrafine-grained structure using some rare and rare-earth metals have been developed;
- a universal high-efficiency flow reactor with an original catalyst for the production of biodiesel fuel has been developed;
- at least 5 (five) articles and (or) reviews have been published in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) or 3rd (third) quartiles in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty); as well as 5 (five) articles in publications recommended by CQAES;
- at least 3 applications for patents for utility models and (or) inventions have been filed.

.2 The end result:

- diversification of the economy in the regions, creation of industrial growth points, expansion of existing and emergence of new markets;
- cost reduction and product quality improvement;
- development and implementation of green technologies in production for complex extraction of useful components from natural raw materials of the RK;
- automation of technological processes;
- improvement of the ecological situation of the region and rational use of natural resources;
- solving the problems of waste disposal of mining enterprises with the production of export-oriented commercial products;
- creating jobs while implementing research results into production and improving infrastructure.

The target consumers of the results obtained - JSC "NAC "KazAtomProm", LLP "Kazphosphate", JSC "Kazzinc", group of companies "Kaz Minerals", etc. for pilot tests with a view to their further commercialization.

5. The maximum amount of the program is 500,000 thousand tenge, including by year:
for 2022 – **100,000 thousand** tenge, for 2023 – **200,000 thousand** tenge, for 2024 – **200,000 thousand** tenge

Technical task No. 27
for research work
within the framework of program-targeted financing

General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Scientific research in the field of natural sciences

1.2. Name of the specialized direction of the program:

Fundamental research in the field of biology

2. Goals and objectives of the program

2.1. . The purpose of the program:

To study and provide a functional annotation of various structural genetic variants based on the data of 500 complete genomes of Kazakhstanis obtained using high-performance sequencing technologies of the new (NGS) and third generation (TGS), and to create an integration reference base of genetic variants of the Kazakh population.

2.2. To achieve this goal, the following tasks must be solved:

- Align and map sequence data obtained using new generation sequencing technology (NGS) to the reference genome GRCh37/GRCh38/hg38/hg19 using bioinformatic methods;
- de novo assembly of complete genomes of Kazakhstanis based on sequence data obtained on the Oxford Nanopore platform using bioinformatic methods;
- Evaluate the quality of sequence data and the quality of mapping and assembly of complete genomes;
- To create a reference genome of an individual of the Kazakh population by integrating long (TGS, PromethION Oxford Nanopore), short (NGS, Illumina) and optical mapping (Bionano, Saphyr) sequencing data;
- To identify structural genetic variants in the complete genomes of Kazakhstanis obtained using new generation sequencing (NGS), third generation sequencing (TGS) and genotyping (GWAS) technologies;
- To give an annotation of genetic variants of complete genomes of Kazakhstanis and compare them with genome-wide population data;
- To create an integration database of genetic variants of Kazakhstanis obtained using new generation sequencing technologies (NGS), third generation (TGS) and genotyping data (GWAS).

3. Which points of strategic and program documents are solved:

1. Strategy “Kazakhstan-2050”
2. Strategic Development Plan of the Republic of Kazakhstan until 2025, approved by the Decree of the President of the Republic of Kazakhstan dated February 15, 2018 No. 636
3. Law of the Republic of Kazakhstan dated February 18, 2011 No. 407-IV “On Science”;
4. Code of the Republic of Kazakhstan dated July 7, 2020 No. 360-VI “On the health of the people and the healthcare system”
5. Message of the President of the Republic of Kazakhstan to the People of Kazakhstan dated September 1, 2021 Tasks II-III. Improving the efficiency of the healthcare system/Quality education.
6. Code of the Republic of Kazakhstan dated July 7, 2020 No. 360-VI “On the health of the people and the healthcare system”

4. Expected results

4.1 Direct results:

According to the results of the program , there should be:

- alignment and mapping of sequence data obtained using new generation sequencing technology (NGS) on the reference genome GRCh37/GRCh38/hg38/hg19 using bioinformatic methods was carried out;
- a *de novo* assembly of complete genomes of Kazakhstanis was carried out on the basis of sequence data obtained on the Oxford Nanopore platform using bioinformatic methods;
- the quality of sequence data and the quality of mapping and assembly of complete genomes were evaluated;
- A reference genome of an individual of the Kazakh population was created by integrating sequencing data of long (TGS, PromethION Oxford Nanopore), short (NGS, Illumina) readings and optical mapping data (Bionano, Saphyr);
- structural genetic variants have been identified in the complete genomes of Kazakhstanis obtained using new generation sequencing (NGS), third generation sequencing (TGS) and genotyping (GWAS) technologies;
- abstract of genetic variants of complete genomes of Kazakhstanis and comparison with genome-wide

population data are carried out;
- an integration database of genetic variants of Kazakhstanis obtained using new generation sequencing technologies (NGS), third generation (TGS) and genotyping data (GWAS) has been created;
- published at least 3 (three) articles or reviews in peer-reviewed scientific publications included in 1 (first), 2 (second) or 3 (third) quartiles in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty); at least 5 (five) articles or reviews in a peer-reviewed foreign or the domestic edition recommended by CQAES.

4.2 The end result:

As a result of the implementation of this Program, 500 complete genomes of Kazakhstanis should be analyzed based on data obtained using new generation (NGS) and third generation (TGS) sequencing technology; a reference genome of an individual of the Kazakh population should be created by integrating long (TGS, PromethION Oxford Nanopore), short (NGS, Illumina) sequencing data readings and optical mapping data (Bionano, Saphyr); An integration database of genetic variants of Kazakhstanis obtained using new generation sequencing technologies (NGS), third generation (TGS) and genotyping data (GWAS) has been created for use in further fundamental research by scientific organizations and centers, as well as biomedical practice. Identification of large genomic structural variants (large insertions/deletions, translocations, inversions) and new genome assemblies will create their own local reference base of genomic variants and significantly improve the position of Kazakhstan on the genomic map of world populations. The obtained data and information about the structure of genetic variants, the frequency of occurrence of alleles in the population should be the fundamental basis for the development of methodological approaches for early diagnosis, prediction and personalized treatment of individuals based on the genetic profile.

Economic effect. The results obtained during the implementation of the Program should provide scientific and practical significance not only on a national but also on an international scale, including through the development of modern diagnostic and test systems based on the use of genotyping and sequencing technologies.

The social effect consists in the awareness of the population about genetic risk factors and potential predispositions in Kazakhstan, the development of measures for early diagnosis and prediction of disorders and pathologies, the formation of information policy and the development of diagnostic genetic services for citizens of Kazakhstan, as well as improving the quality of life and increasing the level of social activity of citizens.

Target consumers of the results obtained: The Ministry of Health of the Republic of Kazakhstan, the Ministry of Education and Science, researchers, researchers in the field of human genomics and genetics, bioinformatics, medical researchers and practitioners, laboratory assistants, students, as well as those interested in genomic research and bioinformatic data analysis. Some of the results can be applied by clinicians and pharmaceutical companies in relation to the identification of new potential pharmacogenetic markers in the selection/development of drugs or their dosages during treatment. Some of the results are of great practical importance for medical geneticists, population biologists and geneticists in relation to comparing patients with genetic disorders, with an unclear phenotypic picture of the disease to assess risks and search for genotype-phenotype associations.

5. The maximum amount of the program is 250,000 thousand tenge, including by year:
for 2022 – **50,000 thousand** tenge, for 2023 – **100,000 thousand** tenge, for 2024 – **100,000 thousand** tenge

Technical task No. 28
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Scientific research in the field of natural sciences.

1.2. Name of the specialized direction of the program:

Fundamental and applied research in the field of biology

2. Goals and objectives of the program

2.1. The purpose of the program:

Creation of a biobank of biotechnologically significant industrial microorganisms for biosafety in the field of biotechnology, ecology, agriculture.

2.2. To achieve this goal, the following tasks must be solved:

- Creation of a biobank of industrial microorganisms by maintaining a database and standardized operational procedures.
- Assessment of biological risks of biobank management and biosafety procedures in accordance with regulatory legal acts of the Republic of Kazakhstan.
- Monitoring of specialized collections of industrial microorganisms on the territory of the Republic of Kazakhstan and integration into the database to ensure biological safety.
- Implementation of effective cybersecurity measures for electronic databases of industrially valuable microorganisms.
- Evaluation of the intellectual potential of industrially valuable microorganisms and development of highly effective biological products that are promising for commercial business structures.
- Creation and replenishment of the biobank with industrial strains of microorganisms with antimicrobial properties and producers for the conservation of biodiversity.

3. Which points of strategic and program documents are solved:

- Law of the Republic of Kazakhstan dated February 18, 2011 No. 407-IV "On Science", Article 27. "Program-targeted financing";
- On approval of the rules for the creation and operation of biobanks No. 21927 dated December 28, 2020;
- Development strategy of the Republic of Kazakhstan until 2050;
- The State program "Development of Education and science of the Republic of Kazakhstan for 2020 – 2025" approved by the Decree of the Government of the Republic of Kazakhstan dated December 27, 2019 No. 988.
- The State program "Digital Kazakhstan" approved by the Decree of the Government of the Republic of Kazakhstan dated December 12, 2017 No. 827. According to the target indicator of the program: Improvement in the ranking of the Global Competitiveness Index of the World Economic Forum on the indicator "Ability to innovate';
- Law of the Republic of Kazakhstan dated June 17, 2008 No. 43-IV "On ratification of the Cartagena Protocol on Biosafety to the Convention on Biological Diversity";
- The message of the President of the Republic of Kazakhstan K. Tokayev to the people of Kazakhstan "The unity of the people and systemic reforms are a solid foundation for the prosperity of the country". Section III. Quality education.

4. Expected results

4.1 Direct results:

- at least 5 (five) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in Scopus database of at least 50 (fifty);
- at least 5 (five) articles in journals recommended by CQAES.
- 5 applications for a Kazakh patent and 1 application for a Eurasian patent.

4.2 The end result:

- A biobank of industrial microorganisms should be created by maintaining a database and standardized operational procedures.
- An assessment of the biological risks of the biobank's management and biosafety procedures should be carried out in accordance with the regulatory legal acts of the Republic of Kazakhstan.
- Monitoring of specialized collections of industrial microorganisms on the territory of the Republic of Kazakhstan and integration into the database to ensure biological safety should be carried out.
- Effective cybersecurity measures for electronic databases of industrially valuable microorganisms should be implemented.
- An assessment of the intellectual potential of industrially valuable microorganisms should be carried out

and the development of highly effective biological products promising for commercial business structures should be started.

- The biobank should be created and replenished with industrial strains of microorganisms with antimicrobial properties and producers to preserve biodiversity.

5. The maximum amount of the program is 350,000 thousand tenge, including by year:

for 2022 – **70,000 thousand** tenge, for 2023 – **140,000 thousand** tenge, for 2024 – **140,000 thousand** tenge

Technical task No. 29
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Scientific research in the field of natural sciences

1.2. Name of the specialized direction of the program:

Fundamental and applied research in the field of chemistry

2. Goal and objectives of the program

2.1. The purpose of the program:

To develop scientific and technological bases for modifying epoxy nanocomposites with improved physicochemical (heat resistance, heat resistance and reduced flammability) and mechanical properties.

2.2. To achieve this goal, the following tasks must be solved:

– To investigate the structure, fractional composition, and specific surface area of nanodisperse fillers (aluminum nitride, tungsten disulfide and nanodiamonds).

– Treat nanofillers with a functionalizing agent (aminoacetic acid) in the quantities necessary for the preparation of composites for further research.

– To establish the presence of chemical interaction between the functional groups of aminoacetic acid with the functional groups of the epoxy oligomer and nanofillers.

– To study the effect of modified and unmodified nanofillers on the processes of structure formation of epoxy polymer.

– To investigate physical and mechanical properties (bending stress and flexural modulus [ISO 178:2010], tensile strength and modulus [ISO 527-2:2012], compressive strength [ISO 604:2002], impact strength [ISO 179-1:2010], Brinell hardness [ISO 2039-1:2001]) epoxy composites containing unmodified and modified nanofillers.

– To optimize the percentage of fillers (determination of the minimum content), providing the maximum effect of hardening.

– To investigate the effect of nanofillers on the physicochemical and thermophysical properties of epoxy composites (flammability, heat resistance (ISO 306:2004), heat resistance (GOST 29127-91), thermal conductivity coefficient and thermal resistance (ISO 22007-2:2015).

– To investigate the resistance of the developed epoxy nanocomposites to various aggressive environments.

– To conduct a comparative assessment of the operational properties of the developed epoxy composites with existing domestic and foreign analogues.

3. Which points of strategic and program documents are solved:

National project “Technological breakthrough through digitalization, science and innovation”.

4. Expected results

4.1 Direct results:

- creation of new polymer composite materials with improved physicochemical and mechanical properties using functionalized (aminoacetic acid) nanomaterials (aluminum nitride, tungsten disulfide and nanodiamonds) as a reinforcing material, ED-20 epoxy resin plasticized with trichloroethyl phosphate/trichloropropyl phosphate was used as a polymer matrix.

- to study the mechanisms of formation of bonds (chemical and/or physical) between the polymer matrix and reinforcing fillers (aluminum nitride, tungsten disulfide and nanodiamonds) and to establish the presence of chemical interaction between the functional groups of aminoacetic acid and epoxy oligomer and nanofillers.
- the efficiency of the functionalization of nanodisperse fillers, which ensures a decrease in their aggregation, polydispersity and uniformity of their distribution in the polymer matrix, as well as an increase in the specific surface area.
- investigation of the effect of the type of additive and the percentage of reinforcing additives on the strength of composites for rupture, bending, compression and Young's modules, thermal conductivity, heat and heat resistance.
- determination of the influence of nanofillers on the processes of structure formation and the structure of epoxy composites, which will allow directional control of the duration of gelation and curing processes.

- at least 5 (five) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in Scopus database of at least 50 (fifty);

- at least 5 (five) articles in journals recommended by CQAES.

4.2 The end result:

As a result of the program, deep fundamental knowledge should be obtained in the field of the influence of nature, morphology and surface treatment of nanofillers particles, as well as methods of physical modification that provide more effective interaction at the polymer matrix/nanofiller interface on the structure, physico-chemical and mechanical properties of epoxy composites.

The new tasks that are supposed to be solved within the framework of the Program should contribute to the study of the mechanisms of interaction between the components of the polymer matrix and nanofillers. The analysis and use of the experimental data obtained should allow achieving the maximum effect from the introduction of the studied fillers (aluminum nitride, tungsten disulfide and nanodiamonds), which will contribute to the production of polymer composite materials with high physicochemical, mechanical properties and reduced flammability.

5. The maximum amount of the program is 300,000 thousand tenge, including by year:
for 2022 – **50,000 thousand** tenge, for 2023 – **125,000 thousand** tenge, for 2024 – **125,000 thousand** tenge

Technical task No. 30
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Scientific research in the field of natural sciences.

1.2. Name of the specialized direction of the program:

Fundamental and applied research in physics and astronomy.

2. Goal and objectives of the program:

2.1. The purpose of the program:

Development of recommendations on the selection of optimal parameters of a thermonuclear target with the possibility of application for experiments in inertial fusion facilities and to create scientific foundations of modern plasma technologies for the synthesis of new functional composite materials and nanomaterials.

2.2. To achieve this goal, the following tasks must be solved:

- Calculation of thermodynamic and fundamental characteristics of quark-gluon and quantum plasmas;
- Development of new models of effective interaction potentials of fine particles in a complex plasma;
- Investigation of braking capacity and other dynamic characteristics of dense plasma in laboratory and astrophysical conditions;

- Analysis of transport and structural properties of low-temperature gas-discharge plasma;
- Determination of structural and dynamic characteristics of dust particles of complex plasma;
- Study of thermodynamic properties of dense high-temperature plasma;
- Analysis of electrical and optical properties of low-temperature plasma with nanoparticles obtained by plasma chemical deposition from the gas phase;
- Synthesis and preparation of functional composite nanomaterials in a plasma medium with specified properties;
- Synthesis of fullerenes in electric arc discharge plasma to create polymer coatings;
- Study of nonlinear electrical conductivity of plasma in nanoporous semiconductors;
- Investigation of the effect of dense plasma flow on the surface of materials using a set of experimental diagnostic methods taking into account the erosion of the first wall of thermonuclear reactors;
- Analysis of collision processes in a complex plasma with dust particles;
- Study of the problems of structure formation of plasma crystals with different types of symmetry based on the development of the method of using D-entropy;
- Investigation of heat and mass transfer processes of low-temperature pulverized coal plasma;
- Study of plasma activation of turbulent reacting flows in complex systems for solving applied problems of thermal power engineering and environmental problems.

3. Which points of strategic and program documents are solved:

1. Development strategy of the Republic of Kazakhstan until 2050;
2. Strategic Development Plan of the Republic of Kazakhstan until 2025;
3. Law of the Republic of Kazakhstan dated February 18, 2011 No. 407-IV “On Science”;
4 The concept of Kazakhstan's entry into the top 30 most developed countries in the world.
5. The message of the Head of State K.K. Tokayev to the people of Kazakhstan: The unity of the people and systemic reforms are a solid foundation for the prosperity of the country dated 01.09.2021.

4. Expected results

4.1 Direct results:

According to the results of the program , there should be:

- Data on the phase transition, microscopic and collective properties of quark-gluon quantum plasma;
- New models of effective interaction potentials of particles and micropotentials of complex plasma with fine particles of condensed matter, interaction of dust particles in complex plasma at different temperatures, effective potential of partially degenerate plasma with admixture of dispersed particles
- Characteristics of charged particle deceleration and dynamic properties of dense plasma in laboratory and astrophysical conditions, wave phenomena in charged particle systems;
- Electron capture cross sections by ion and calculation of the probability of ion recombination when passing through a low-temperature plasma, structural properties of a low-temperature plasma;
- Static and dynamic structural factors of the dust component of a complex plasma at different temperatures, calculation of the dispersion of dust-acoustic waves in a complex plasma;
- Microscopic, structural and thermodynamic properties of dense high-temperature plasma;
- Optical and structural properties of plasma with nanoparticles, new materials obtained using modern plasma technologies;
- The synthesis of composite nanomaterials with the specified properties, as well as the analysis of their surface and structural characteristics was carried out;
- The dependence of the refractive index and the band gap of polymer materials due to the concentration of fullerenes;
- Nonlinear electrical conductivity of plasma in nanoporous semiconductors;
- Analyses of physical processes occurring in pulsed discharges, a method for diagnosing pulsed plasma has been developed and its physical parameters, features of the formation of plasma clots and radiation destruction of materials have been determined;
- Characteristics of scattering processes in a complex plasma with dust particles;
- Studies of the problems of structure formation in open nonequilibrium dynamical systems based on D-entropy analysis;
- Computational experiments on the use of low-temperature pulverized coal plasma fuel;

- Recommendations on the application of the latest plasma technology of thermochemical preparation of pulverized coal plasma fuel for combustion in order to optimize the processes of burning low-grade Kazakh coal in the combustion chambers of domestic thermal power plants and reduce anthropogenic impact on the environment.

- at least 5 (five) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in Scopus database of at least 50 (fifty);

- at least 5 (five) articles in journals recommended by the CQAES.

- 4 applications for a patent of the RK have been filed.

4.2 The end result:

Scientific and technical effect:

The results of the scientific and technical program obtained on the basis of their own developments should contribute to the acquisition of new knowledge that should be applied to solve current problems in the field of plasma physics and plasma-like media. The results of the program should contribute to the creation of new research methods and effective plasma technologies, as well as their practical use for the synthesis of new functional materials, including nanomaterials. The results obtained should be discussed at scientific seminars of the group of authors of the program, as well as at prestigious international conferences in which the program performers will take part. Scientific business trips should help to improve the qualifications of young scientists participating in the program and expand their ties with well-known and young scientists from abroad.

The scientific effect of the program is to obtain new fundamental and applied knowledge in the field of plasma physics and plasma-like media, which will increase the competitiveness of domestic science, and will positively affect the integration of science and business

The scientific and scientific-technical activity of the program will be evaluated by publications written on the basis of the results obtained within the framework of this program. Participation in international conferences and seminars should be planned, which will give an opportunity to improve methods and gain new knowledge at various stages of the program implementation.

Economic effect: The economic effect will manifest itself in the use of the results obtained to solve urgent problems in the use of plasma and plasma-like media for the synthesis of new functional materials. The industrial interest and economic effect of the implementation of the program is that its results will affect the development of such fields of science and technology as thermonuclear energy, nuclear power, traditional thermal power, alternative energy, new generation rocket engines, space industry, plasma medicine, new materials, nano- and microelectronics, which will form the basis of high-tech productions of the future.

Environmental effect: The implementation of the program should contribute to the optimization of the processes of burning low-grade Kazakh coal in low-temperature dust-coal plasma in the combustion chamber of domestic thermal power plants and reduce the anthropogenic impact on the environment.

Social effect: The implementation of the program should contribute to the training of young highly qualified specialists.

Target consumers of the results obtained: Foreign and Kazakh universities, research institutes and research centers, representatives of small and medium-sized businesses, the energy industry.

5. The maximum amount of the program is 350,000 thousand tenge, including by year:
for 2022 – **70,000 thousand** tenge, for 2023 – **140,000 thousand** tenge, for 2024 – **140,000 thousand** tenge

Technical task No. 31
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program):

Scientific research in the field of natural sciences

1.2. Name of the specialized direction of the program:
Fundamental and applied research in the field of chemistry

2. Goals and objectives of the program

2.1. The purpose of the program

To create a physico-chemical basis for the production of domestic environmentally friendly synthetic inorganic, organic substances and complex polymer materials for industry, agriculture and medicine.

2.2. To achieve this goal, the following tasks must be solved:

- to investigate the theoretical foundations of the processes of obtaining mono- and polyphosphates, organo- and phytomineral complex materials, to study their compositions and properties, to determine the optimal conditions for obtaining;
- to develop an innovative technology for obtaining and conducting integrated and pilot-industrial tests of new compositions, to study their effectiveness in various industries (in water treatment, "green" chemistry) and to ensure food safety, to prepare practical recommendations for use;
- to carry out synthesis and research of physicochemical, electrochemical and physicomechanical properties of ion-exchange materials based on epoxy compounds and various polyamines;
- to study sorption and complexing properties of new ionites in comparison with industrial analogues;
- to create and test fundamentally new macromolecular sorbents of various nature for the subsequent creation of highly selective systems for the selective extraction of gold ions and related valuable components;
- to obtain heat-resistant polyamide composite materials with nanoscale montmorillonite additives;
- to create scientific bases of green synthetic adaptogens, immunomodulators, anti-infective, including antiviral drugs, tuberculostatics and to increase their effectiveness by immobilization on natural and/or synthetic polymers;
- synthesize petrochemical products: lower and higher olefins and new products based on them, with the processing of associated petroleum gas, base and residual petroleum raw materials;
- **to study the factors affecting the ecosystem and environmental components, to conduct physico-chemical studies of** industrial waste, and to develop a set of **preventive measures for environmental protection.**

3. Which points of strategic and program documents are solved:

1. Development Strategy of the Republic of Kazakhstan until 2050: A new political course for the proper management of natural resources;
2. Message of the President of the Republic of Kazakhstan K.K. Tokayev to the people of Kazakhstan dated September 1, 2020. Task VII: Ecology and protection of biodiversity. Instruction of the Head of State to the Government of the Republic of Kazakhstan on the approval of long-term plans for the conservation and rational use of biological diversity, landscaping of the country;
3. Message of the President of the Republic of Kazakhstan K.K. Tokayev to the people of Kazakhstan "Constructive public dialogue is the basis of stability and prosperity of Kazakhstan" (2019);
4. Environmental Code of the Republic of Kazakhstan (with amendments and additions as of 06/25/2020);
5. The State program of industrial and innovative development for 2020-2025.

4. Expected results:

4.1. Direct results:

According to the results of the program, there should be:

- the scientific basis for the production of mono- and polyphosphates, organo- and phytomineral complex materials has been established and a recommendation for the implementation of "Kazphosphate" LLP has been prepared;
- The optimal technological parameters for obtaining new compositions at enlarged and pilot plants have been determined, their effectiveness has been shown in experimental field and production demonstration conditions and a recommendation for implementation to the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan has been prepared;

- experimental fundamentals of the technology for extracting gold ions and related valuable components from industrial hydrometallurgy solutions using promising polymer sorbents of various nature and highly selective systems based on them have been developed and a recommendation for the implementation of

"Kazatomprom" JSC has been prepared;

- experimental bases for obtaining compositions based on the copolymer SP and 1,2 with additives of other polymers containing the nanoscale mineral montmorillonite have been developed and a recommendation for the implementation of JSC NC "KazMunayGas" has been prepared;

- The selective properties of synthesized composite materials with respect to ions of various metals from individual and multicomponent solutions have been studied and a recommendation for implementation to the Ministry of Industry and Infrastructure Development of the Republic of Kazakhstan has been prepared;

- The composition, structure and properties of synthesized ion-exchange materials have been studied by a complex of modern physico-chemical research methods and a recommendation for implementation to the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan has been prepared;

- New materials and life products have been studied by infrared spectrometry, mass spectrometry, gas chromatography, thermogravimetry, atomic absorption spectrometry and porosimetry, and a recommendation for implementation to the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan has been prepared;

- environmentally friendly, waste-free methods of synthesis of polyelectrolytes and ion-exchange membranes have been created and highly effective sorption and electromembrane technologies have been developed on their basis to solve a number of environmental problems and a recommendation has been prepared for implementation to the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan;

- scientific foundations have been created for the creation of green synthetic adaptogens, immunomodulators, anti-infective, including antiviral drugs, tuberculostatics and increasing their effectiveness by immobilization on natural and/or synthetic polymers and a recommendation has been prepared for the implementation of SC-PHARMACY;

- the regularities of the oil and gas-chemical processes of obtaining lower and higher olefins from light and heavy alkanes, the peculiarities of synthesis based on olefins have been studied and a recommendation for the implementation of JSC "NC "KazMunayGas" has been prepared;

- the technological basis for the creation of biologically active substances, complexes and materials for agricultural purposes has been developed and a recommendation for implementation to the Ministry of Agriculture of the Republic of Kazakhstan has been prepared;

- 3 applications for a utility model and 3 patents of the Republic of Kazakhstan have been issued.

- at least 5 (five) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a percentile by CiteScore there are at least 50 (fifty) in the Scopus database;

- - at least 5 (five) articles in journals recommended by the CQAES.

4.2 The end results:

As a result of the implementation of this Program, there should be

- the regularities of the formation of mono- and polyphosphates, organo-, phytomineral complex materials with a given composition and property are established;
- optimal technological parameters of production have been determined, initial data have been prepared for the creation of low-tonnage production and recommendations for the use of new compositions of multifunctional action, as a result of which a resource-saving technology for the production of materials should be developed;
- a method has been developed for the selective extraction of gold ions and related valuable components from industrial solutions of hydrometallurgy, as a result of which the amount of harmful toxic and environmentally hazardous waste will decrease;
- new safe and effective biologically active materials have been developed – adaptogens, immunomodulators, anti-infective, including antiviral drugs, tuberculostatics for crop production and medicine, which will lead to

a reduction in the import of materials;

- domestic environmentally friendly means of protecting crops and other plants have been developed, increasing productivity by 15-20%, which will increase the country's food security.

The economic effect is established by increasing the efficiency of mineral components by 22-25% and providing plants with additional nutrients – 30-35%, while reducing the rate of new compositions by 1.5-3 times to obtain high-quality crop yields. Reducing the rate of compositions will provide income by 40-60%, and by increasing crop yields – by 25-40%.

The ecological effect of the Program is determined by the accumulation of organic matter in the soil of 5-15 t/ ha and additional nutrients by 20-50%, reduction of nitrates by 15-20%, carbon dioxide emissions into the atmosphere - 15-20%, nitrogen oxides - 5-10%.

Social effect by increasing food security, creating additional jobs with the introduction of research results into production and improving infrastructure and creating additional jobs provided the results are implemented in the domestic production of precious metals.

5. The maximum amount of the program is 300,000 thousand tenge, including by year:
for 2022 – **60,000 thousand** tenge, for 2023 – **120,000 thousand** tenge, for 2024 – **120,000 thousand** tenge

Technical task No. 32
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program):

Scientific research in the field of natural sciences

1.2. Name of the specialized direction of the program:

Fundamental and applied research in the field of chemistry

2. Goals and objectives of the program

2.1. The purpose of the program:

Establishment of physico-chemical regularities and mechanism of interaction processes occurring in multicomponent metal-containing systems during the processing of low-quality mineral and man-made raw materials by floccular flotation, hydro- and pyrometallurgical methods. Obtaining new scientific knowledge to create the theoretical foundations of innovative, environmentally friendly technologies for the extraction of non-ferrous, rare, rare earth and precious metals from low-quality mineral raw materials and man-made waste, differing in their chemical and phase compositions from those studied earlier and not currently involved in processing.

2.2. To achieve this goal, the following tasks should be solved:

– to study the structure of multicomponent metal-containing systems and the mechanism of interaction processes occurring in multicomponent metal-containing systems during their processing:

- to investigate the regularities of the action of selective microheterogenic emulsion reagents to improve the flotation of ultrafine minerals;
- to study the physico-chemical laws of the process of dissolution of non-ferrous and precious metals from low-quality raw materials;
- to investigate the effect of organic polyatomic alcohols on the mechanism of dissolution of niobium from technogenic raw materials;
- to study the physico-chemical laws of sorption extraction of lithium from solutions containing impurity elements;
- to investigate the mechanism of hydrothermal activation of calcium oxide in the CaO-Al2O3-SiO2 system;
- thermodynamic studies of a double system of magnesium with an alloying metal – beryllium and the creation of a new special-purpose alloy based on the data obtained;
- thermodynamic calculation of the reaction interaction of titanium melt with refractory compounds;
- to investigate the structure and properties of calcium-phosphate compounds on titanium alloy VT1-0,

depending on their composition and synthesis conditions;
– to study the structure of multicomponent copper oxide systems.
– to investigate the physico-chemical patterns of interaction processes occurring in multicomponent metal-containing systems during the processing of low-quality mineral and man-made raw materials:
- to synthesize and study the colloidal-chemical properties of nano-activators and nano-depressors for the selective separation of collective concentrates into minerals of different names.;
- physico-chemical studies of the extraction of copper and gold from multicomponent leaching solutions;
- to investigate the influence of the nature of acid on the regularities of the leaching process of rare earth metals from mineral raw materials;
- to investigate the kinetic patterns of sorption extraction of lithium from lithium-containing solutions;
- to investigate the mechanism of hydrothermal activation of calcium oxide in the CaO-Na2O(K2O)-Al2O3-SiO2 system.
- thermodynamic studies of a double system of magnesium with an alloying metal – manganese and the creation of a new special-purpose alloy based on the data obtained;
- experimental determination of the characteristics of the development of reaction diffusion in the contact of titanium melt with refractory compounds;
- to study the influence of physico-chemical factors (pressure changes, potentials) on the properties and formation of the structure of a calcium phosphate compound under magnetron sputtering conditions;
– the influence of the composition of multicomponent copper oxide systems on their basic physical and chemical properties
– to create theoretical foundations for the development of innovative, environmentally friendly technologies for the extraction of non-ferrous, rare, rare earth and precious metals from various raw materials:
- to study the possibilities of enrichment of ultrafine valuable minerals using the method of floccular microflotation;
- development of the theoretical foundations of a selective method for the extraction of precious and non-ferrous metals from low-quality mineral raw materials;
- to investigate the solubility of alkali metals (lithium, rubidium, potassium) from natural and man-made raw materials;
- to study the characteristics of sorption equilibrium, thermodynamics of the process of lithium sorption from solutions;
- to investigate the mechanism of hydrothermal activation of magnesium oxide in the MgO-Na2O(K2O)-Al2O3-SiO2 system;
- thermodynamic studies of a double system of magnesium with an alloying metal – zirconium and the creation of a new special-purpose alloy based on the data obtained;
- evaluation of the parameters of wetting with titanium melts of refractory compounds;
- to investigate the mechanism of interaction and physico-chemical laws of plasmochemical synthesis of calcium phosphate compounds developing in contact with titanium base;
– to study the influence of the composition of multicomponent oxide systems on the forms of non-ferrous metals in them.

3. Which points of strategic and program documents are solved:
1. Strategy “Kazakhstan-2050”.
2. State program of industrial and innovative development of the Republic of Kazakhstan for 2020-2025: section 5. Main directions, ways to achieve the set goals, subsection 1.5. Development of technologies and innovations; 1.10. Development of manufacturing sectors; 1.9. Training of qualified personnel.
3. Strategic Development Plan of the Republic of Kazakhstan until 2025.
4. Message of the President of the Republic of Kazakhstan dated January 10, 2018 “New development opportunities in the context of the Fourth Industrial Revolution”.
5. Message of the President of the Republic of Kazakhstan dated October 5, 2018 “The growth of the well–being of Kazakhstanis: increasing incomes and quality of life”.
6. The Message of the President of the Republic of Kazakhstan dated September 1, 2021 “The unity of the people and systemic reforms are a solid foundation for the prosperity of the country”.
7. The Law “On commercialization of the results of scientific and (or) scientific and technical activities”.

8. Development strategy of the Republic of Kazakhstan until 2050: A new political course for the proper management of natural resources.

4. Expected results

4.1 Direct results:

According to the results of the program , there should be:

In the course of the work, new fundamental knowledge should be obtained on the kinetics and mechanism of interaction in multicomponent metal-containing systems and the structure of solid and liquid systems, which will become the basis for the creation of innovative technologies, in particular:

- new microheterogenic emulsion reagents have been obtained based on the study of their colloidal chemical properties with multifunctional properties;
- nanoactivators and nano-depressors were obtained for effective selection of collective concentrates for minerals of different names
- the method of follicular microflotation was used to capture ultrafine valuable minerals;
- the physicochemical characteristics of leaching products and the structure of productive solutions have been studied, kinetic patterns have been obtained and the mechanism of dissolution of metals from complex low-quality mineral raw materials has been studied, the composition of solutions and impurity components formed during leaching on metal extraction indicators has been studied;
- the mechanism of a new method of hydrothermal activation of alkali-earth metal oxides has been established, which makes it possible to determine the regularity of the interaction of elements of the multicomponent CaO(MgO)-Na2O(K2O)-Al2O3-SiO2 system with the extraction of Al2O3 into a solution and the production of a silicate product that does not contain alkali and aluminum;
- based on thermodynamic studies of magnesium dual systems with alloying metals, it is necessary to create new special-purpose alloys with increased strength characteristics by 2%;
- the physicochemical processes developing in plasma during reactive magnetron sputtering of a calcium target and their effect on the chemical and phase composition and structure of precipitated calcium phosphate coatings have been studied; based on these data, an effective method of coatings of a given composition and structure should be developed. The developed method will increase the deposition rate of calcium phosphate coatings by 2-5 times and reduce the cost by 40-50% compared to existing ones;
- new data on the influence of the composition of multicomponent copper-containing systems on their properties and the forms of non-ferrous metals in them have been obtained.

– 5 articles have been published in peer-reviewed scientific publications included in the 2 (second) or 3 (third) quartiles in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty), as well as at least 5 (five) articles or reviews in peer-reviewed foreign and/or domestic publications recommended by CQAES.

4.2 The end results:

The results of fundamental studies of the kinetics and mechanism of interaction in multicomponent metal-containing systems should become the physico-chemical foundations for the development of effective, environmentally friendly methods of floccular flotation, pyro- and hydrometallurgical schemes for processing low-quality mineral and man-made raw materials with the extraction of non-ferrous, rare and precious metals, which is relevant against the background of depletion of mineral reserves. In particular,:

- theoretical foundations of a new class of microheterogenic emulsion reagents have been created;
- theoretical data on the phase transformations of complex mineral formations have been obtained;
- phase diagrams are constructed and thermodynamic constants of formation and evaporation of magnesium-based alloys as modifying or alloying additives are determined.

Economic effect. The implementation of the program will significantly increase the industrial potential in the field of metallurgical production of precious and non-ferrous metals through the use of innovative technologies that increase productivity by 1.5-2%, which in turn will lead to economic growth of the company's assets by an average of 8-10%.

Environmental effect. The practical use of the obtained research results will allow to obtain a significant environmental effect, consisting in rational use of natural resources in the processing of copper-containing, gold-containing, aluminum, chrome, titanium and other difficult-to-open low-quality ores, man-

made waste and industrial products, while reducing the amount of waste products generated at chemical and metallurgical enterprises. In addition, the expansion of existing and the emergence of new markets is predicted due to the development of new technologies based on the fundamental data obtained.

Social effect. The expected scientific and socio-economic effect is due to the acquisition of new fundamental knowledge to create effective, environmentally friendly technical solutions, which in turn will give new jobs at chemical and metallurgical enterprises after the implementation of the results obtained.

The target consumers of the results obtained. Enterprises of the manufacturing and extractive industries of the Republic of Kazakhstan may be interested in the results of the program, which can act as consumers of the technologies being developed, in order to expand the range of products

5. The maximum amount of the program is 300,000 thousand tenge, including by year:
for 2022 – **60,000** thousand tenge, for 2023 – **120,000** thousand tenge, for 2024 – **120,000** thousand tenge

Technical task No. 33
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program):

Scientific research in the field of natural sciences

1.2. Name of the specialized direction of the program:

Fundamental research in the field of biology

2. Goals and objectives of the program

2.1. The purpose of the program:

Study of molecular genetic and cellular processes to increase disease resistance and crop productivity

2.2. To achieve this goal, the following tasks should be solved:

1. Genotyping of commercial and promising varieties of grain crops based on the use of modern and highly polymorphic DNA markers associated with disease resistance and productivity of grain crops.
2. Identification and introduction of new DNA markers of disease resistance and productivity of soft wheat for accelerated creation and seed production of competitive and highly productive varieties.
3. Study, development and implementation of biotechnology of accelerated microclonal reproduction and obtaining elite planting material of new non-traditional berry crops in Kazakhstan for introduction into nursery practice.
4. Development of highly efficient technology for obtaining seed potatoes and its introduction into seed production in Kazakhstan.
5. Development and implementation of molecular genetic systems for accelerated identification of quarantine pathogens and plant pests.

3. Which points of strategic and program documents are solved:

1) The message of the Head of State Kassym-Jomart Tokayev to the people of Kazakhstan “Unity of the people and systemic reforms - a solid foundation for the prosperity of the country”
dated September 1, 2021, question I. Economic development in the post-pandemic period (The main task of the agro-industrial complex is to fully provide the country with basic foodstuffs);
2) The message of the Head of State K. Tokayev to the people of Kazakhstan. “Kazakhstan in a new reality: time for action”, September 1, 2020 (The fourth point is Productivity growth, increasing complexity and technological efficiency of the economy. The sixth point is the "Greening" of the economy, environmental protection.
3) The message of the Head of State K. Tokayev to the people of Kazakhstan. September 2 , 2019 (The fifth point is a developed agro-industrial complex).
4) Address of the President of the Republic of Kazakhstan – Leader of the Nation N.A. Nazarbayev to the people of Kazakhstan, December 2012 “Development Strategy of the Republic of Kazakhstan until 2050 “Kazakhstan-2050” (the third challenge is the threat to global food security; the sixth challenge is the

exhaustion of natural resources; large-scale modernization of agriculture in the conditions of growing global demand for agricultural products);
5) The Strategic Development Plan of the Republic of Kazakhstan until 2025, approved by the Decree of the President of the Republic of Kazakhstan dated February 15, 2018 No. 636 (Policy 6. "Green" economy and environmental protection. Task 3. - Stimulating investments in "green" technologies. Task 7 - Conservation of biological diversity);
6) Forecast of socio-economic development of the Republic of Kazakhstan for 2020-2024 (2. Policy of development of economic sectors);
7) The concept for the Conservation and Sustainable Use of Biological Diversity of the Republic of Kazakhstan until 2030, 2015 (Priority 2. Goal 9. Conservation and restoration of agrobiodiversity);
8) The concept for the transition of the Republic of Kazakhstan to a "green" economy, approved by the Decree of the President of the Republic of Kazakhstan dated May 30, 2013 No. 577 (item 3.2. development of sustainable and high-performance agriculture);
9) The concept of transition of the Republic of Kazakhstan to sustainable development for 2007-2024, approved by Decree of the President of the Republic of Kazakhstan dated November 14, 2006 No. 216 (item 3.4 – sustainable economic progress; 3.5 – environmental sustainability);
10) Resolution of the Government of the Republic of Kazakhstan "On approval of the List of especially dangerous pests and diseases of agricultural plants" dated November 26, 2001 No. 1518.
11) Law of the Republic of Kazakhstan "On Plant Protection" dated July 3, 2002 No. 331-II.
12) Law of the Republic of Kazakhstan "On Plant quarantine" dated February 11, 1999 No. 344-I. (with amendments and additions dated 02/18/2002 No. 293-II).

4. Expected results

4.1 direct results:

As a result of the Program, new knowledge and solutions in the field of plant biotechnology should be obtained, as well as the following research results:
- - genotyping of varieties and promising lines of grain crops using highly polymorphic and informative types of DNA markers
- molecular genetic identification of genes of resistance to yellow and stem rust of wheat in promising lines and varieties of winter wheat at successive stages of breeding in nurseries SP-2, KP, PSI and KSI was carried out
- standards have been developed for DNA genotyping of grain crops of Kazakhstan to determine the originality and uniformity of new varieties of wheat and barley
- seeds of wheat varieties of reproductions of super elite and elite were obtained
biotechnology of accelerated *in vitro* reproduction of honeysuckle, blueberry and blackberry plants has been developed
- a clan collection of honeysuckle, blueberry and blackberry plants in *in vitro* culture has been created
- the technology of transferring plants from *in vitro* conditions to container culture and obtaining elite planting material has been developed
- optimization of the modes of growing explants of meristemic potato plants in the system of temporary immersion has been carried out.
- a protocol has been developed for the production of virus-free seed potatoes in the form of mother plants, their clones and microtubers for the subsequent production of potato mini-tubers.
- a highly efficient technology for obtaining seed potatoes (mother plants, their clones and microtubers) has been developed and its introduction into potato seed production
- the search and selection of species-specific genome sites of different strains of *Candidatus* Liberibacter solanacearum bacteria causing the potato chip zebra disease was carried out, and a test system for accelerated identification of the pathogen based on the isothermal amplification method was developed, as well as a portable module for annotation of diagnostic results was developed.
- a search for specific allelic variants of the genome sites of the Asian subspecies of the unpaired silkworm was carried out and a pest identification system based on PCR analysis or capillary sequencing was developed.
- A population analysis was carried out and ribotypes of the bacteria *Erwinia amylovora* circulating in the

country, which causes bacterial burn of fruit trees, were identified, and a highly sensitive pathogen detection system was developed.

Within the framework of the Program, highly sensitive molecular genetic systems for accelerated identification of quarantine pathogens and plant pests should be introduced into the laboratory of phytosanitary control, as well as high-quality planting and seed material of agricultural crops in the practice of nursery and seed production in the country. For international standardization of domestic varieties of grain crops and their introduction into production processes, an application for accreditation of laboratories in the field of genetic certification of commercial varieties and promising lines should be submitted, and recommendations for the introduction of informative DNA markers associated with resistance to fungal pathogens in the breeding process of grain crops should be developed.

Within the framework of the Program, innovative pathogen detection test systems should be developed together with portable devices for annotating the results in order to directly detect pathogens in fields and gardens.

- at least 5 (five) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a percentile by CiteScore there are at least 50 (fifty) in the Scopus database;
- at least 5 (five) articles in journals recommended by CQAES.
- Filing 2 patent applications and obtaining a utility model patent.

4.2 The end results:

As a result of the implementation of this Program, effective technologies should be developed and implemented to increase the yield and resistance of crops to dangerous diseases, which will make it possible to increase the competitiveness of the country's economy and make partial import substitution of agro-industrial complex goods to protect the food sector.

Scientific effect.

During the implementation of the Program, new scientific research results should be obtained in the field of diagnostics of phytopathogens, marker-mediated selection and certification of grain crops, cellular technologies for obtaining elite planting and seed material.

The development of new informative DNA markers for genotyping and analyzing the signs of productivity of grain crops, as well as the identification of resistance genes to dangerous pathogens, will qualitatively improve the process of targeted breeding and yield forecasting based on DNA technologies. The development of cellular technologies for obtaining elite planting and seed material will make it possible to identify and select up-to-date protocols of highly effective reproduction *in vitro* for each culture. As part of the development of quarantine pathogen identification systems, new regions of the *Candidatus* Liberibacter solanacearum and *Erwinia amylovora* genomes should be identified for their species-specific detection, new allelic variants in the genome of the Asian subspecies of the unpaired silkworm should also be identified in order to select SNP markers for its identification, which will significantly improve the quality of detection of quarantine plant objects. The developed specific markers for the identification of quarantine objects can also be used in genetic studies to type populations and identify distribution areas. Quarantine objects identified on the territory of the country should be typed with the entry of their genetic data into international genetic databases for a full analysis of the spread of pathogens and pests in the world in order to develop effective measures to combat them.

The results obtained should be of interest to the domestic and world scientific community and be an important basis for the introduction of high-tech technologies in the agro-industrial complex of the country. In addition, the results obtained should have high competitiveness at the global level and will contribute to the country's entry into the international market with new high-quality products.

The socio-economic effect of achieving the objectives can be significant (the formation of qualified personnel, the involvement of domestic personnel in a highly profitable, knowledge-intensive process, and ensuring sustainable development of agriculture, improving the image of science in Kazakhstan). The main result of the implementation of the Program will be providing the population with qualitatively new technologies, knowledge and products for the sustainable development of agriculture. The cultivation of disease-resistant varieties will increase the yield of plants and, accordingly, provide an economic effect. The

use of resistant varieties to pathogens can bring a profit equal to 20% of the cost of production and will prevent the annual expansion of acreage and irrigation costs. Annual crop yield losses from plant pathogens and pests are colossal and amount to billions of dollars annually. Timely detection of pathogens and pests with the help of developed detection systems will prevent their spread in the country and, accordingly, increase the yield of cultivated plants. The technology of production of domestic planting material will enrich the market of Kazakhstan with high-quality seedlings of honeysuckle, blueberries and blackberries, which will reduce import dependence in this industry, will lead to a decrease in the cost of berry products. The implementation of this program should contribute to improving the provision of valuable vitamin-bearing berry crops to the population of Kazakhstan, contributing to the country's food security. Highly efficient technology for obtaining virus-free potato planting material will allow large seed farms to produce virus-free planting material directly on farms, which will significantly increase the intensity of elite seed production, as well as improve the quality, reduce the cost of seed potatoes and reduce its import. As a result, productivity and labor productivity in seed and commodity farms of the country should be increased.

The problem of personnel preservation and training and the solution of problems of employment in research institutes, experimental stations, as well as in institutions of biological and biotechnological profile of the MES RK should also be solved. The implementation of the results obtained during the implementation of the Program will lead to an increase in the food security of the population and increase the biosafety of the Republic.

The target consumers of the results obtained are peasant and farm farms, nurseries, the Union of potato and vegetable growers, breeding centers of the MA of the RK, commercial biotechnological laboratories, laboratories of phytosanitary control, universities and research institutes of Kazakhstan.

The ecological effect of the program is that the cultivation of resistant forms of crops to biotic factors, as well as the prevention of the spread of pathogens and pests in gardens and fields by timely detection and removal of infected plants, will significantly reduce the use of fungicides, which will reduce environmental pollution with pesticides.

During the implementation of the program, bachelor's, master's and doctoral students should be trained in the specialties of agronomy, plant protection, biology and biotechnology together with the state universities of the MES RK and the MA of the RK.

5. The maximum amount of the program is 325,200 thousand tenge, including by year:
for 2022 – **75,200 thousand** tenge, for 2023 – **125,000 thousand** tenge, for 2024 – **125,000 thousand** tenge

Technical task No. 34
for research work
within the framework of program-targeted financing

1. General information

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program):

Life and Health Science

1.2. Name of the specialized direction of the program:

Innovative research in medicine and public health

2. Goals and objectives of the program

2.1.The purpose of the program:

Study of the role of genetic and environmental factors in the formation of suicidal behavior to improve the quality and life expectancy of the population based on the development of new approaches to predicting and preventing suicide

2.2. To achieve this goal, the following tasks should be solved:

–to develop scientific and methodological foundations for assessing the integrative model of the formation of suicidal behavior; to determine the determinants that play a role in various stages of the suicidal process:

- to develop scientific and methodological foundations (approaches, principles, methods) for assessing the neurobiological mechanisms of actualization of autoaggressive behavior;
- to develop scientific and methodological foundations (principles, methods) for assessing environmental mechanisms and psychological factors of suicidal behavior formation;
-to conduct research on social factors (including family ones) of the risk of suicidal behavior formation
- to develop criteria, indicators, evaluation indicators of the psychological health of suicides
- to conduct research on the psychological status of persons with incomplete suicide
-substantiate systems for predicting the risks of suicidal behavior based on family history and psychological indication;

— to study the neurobiological mechanisms of the formation of suicidal behavior based on genetic and epigenetic diagnostic criteria

- to conduct a study of the function and role of the serotonergic system in the formation of suicidal behavior
- to study the activity of the enzyme tryptophanhydroxylase (TG) in biological relatives of suicides and in persons with incomplete suicide
- to conduct a study of polymorphisms of genes or gene loci responsible for synthesis or related to proteins of the serotonergic system
- to conduct a study of the lipid profile in suicides
-to assess the role of cytokines in the formation of suicidality

– development of preventive measures and regulatory documents aimed at reducing the damage to public health due to suicide

-substantiation of a system for predicting the risks of suicidal behavior based on genetic, biochemical, psychological indications;
-development of modern methods of complex diagnostics and treatment of persons prone to suicide;
- development of preventive measures and regulatory documents aimed at reducing the damage to public health due to suicide;
- to conduct seminars, trainings together with psychologists in educational and rehabilitation institutions;
- create a comprehensive online questionnaire system to identify adherence to auto-aggressive behavior;
– evaluate the effectiveness of the developed recommendations and measures to prevent suicide

3. Which points of strategic and program documents are solved:

1. “Standard of organization of medical and social assistance in the field of mental health to the population of the Republic of Kazakhstan”. Order of the Minister of Health of the Republic of Kazakhstan dated November 30, 2020 No. KR DSM 224/2020
2. State program of healthcare development of the Republic of Kazakhstan for 2020 – 2025 dated December 26, 2019 No. 982
3. About some issues of providing medical and social assistance in the field of mental health. Order of the Minister of Health of the Republic of Kazakhstan dated November 25, 2020 No. KR DSM-203/2020.
4. Code of the Republic of Kazakhstan "On the Health of the People and the healthcare system" dated July 7, 2020 No. 360-VI (with amendments and additions as of 03.05.2022)
5. Strategic plan of the Republican Scientific and Practical Center of Mental Health for 2017-2021. Almaty 2017
6. Order of the Minister of Health of the Republic of Kazakhstan dated August 24, 2021 No. KR DSM-90 “On approval of the Rules for the provision of primary health care”

4. Expected results

4.1 Direct results:

According to the results of the program, the following should be studied:

- genetic, pathogenetic, metabolic mechanisms of the development of suicidal behavior
-new highly informative methods and markers of early diagnosis of the formation of suicidal behavior have been developed and put into practice

-theoretical and methodological bases for the study and assessment of the formation of suicidal behavior in various age categories of the population of Kazakhstan for recommendations to the MH of the RK for amendments to legislative documents
-methods of complex primary and secondary prevention have been developed and implemented
- methods of predictive and personalized correction of suicidal behavior of the studied contingent with the help of medications and non-medications have been introduced
- published at least 3 (three) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty);
- at least 3 (three) articles in journals recommended by CQAES;
- patents and applications have been issued for diagnostic markers and for the prevention of the formation of suicidal behavior,
- one monograph has been published.

4.2 The end results:
As a result of the implementation of this Program, early diagnostic criteria and mechanisms for the formation of suicidality should be developed, which will allow the introduction of systems of individual and long-term population prognosis of the risk of development, and prevention of suicidal behavior of the population of the RK
Economic effect. The scientifically-based measures for primary and secondary prevention of suicidal behavior obtained during the implementation of the Program should lead to an increase in the life expectancy of the population.
The social effect of using the obtained research results as the basis of predictive and personalized medicine should ensure improvements in the quality of life of the population and the social environment; increase the effectiveness of scientific and practical knowledge on suicide prevention (trainings, seminars).
The target consumers of the results obtained are medical organizations, health protection agencies, educational institutions, state republican, territorial administrative medical and social structures, public organizations on social problems, experts in the field of mental health.

5. The maximum amount of the program is 250,000 thousand tenge, including by year:
for 2022 – **50,000** thousand tenge, for 2023 – **100,000** thousand tenge, for 2024 – **100,000** thousand tenge

Technical task No. 35
for research work
within the framework of program-targeted financing

1. General information:
1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)
Life and Health Science
1.2. Name of the specialized direction of the program:
Innovative research in medicine and public health.

2. Goals and objectives of the program
2.1.The purpose of the program:
Introduction of innovative diagnostic methods, development of modern methods of treatment of drug-resistant forms of epilepsy, selection of effective methods of surgical treatment to improve the results of treatment and adaptation of patients in society.
2.2. To achieve this goal, the following tasks should be solved:
1. Improving the results of diagnosis, treatment and social adaptation of patients with drug-resistant forms of epilepsy through the development and implementation of a fundamentally new pathophysiologically sound system of pre-surgical diagnosis and rational tactics of surgical correction of the disease.
2. Study of the mechanisms of formation of the epileptic focus, epileptic system and neurological disorders by comparing the dynamics of data from electrophysiological, molecular genetic and pathomorphological,

clinical studies.
3. Study of the structure, severity and dynamics of the main cognitive disorders affecting the quality of life and social adaptation of patients with drug-resistant forms of epilepsy.
4. Development of algorithms for evaluating structural and functional neuroimaging data in order to develop a system for selecting patients with severe drug-resistant epilepsy for surgical and non-drug treatment methods.
5. Analysis of modern methods of pre-surgical preparation and organization of surgical treatment and comparison of their effectiveness. Selection and implementation of the optimal system in the daily practice of patient treatment.
6. Development of a digital database of clinical, genetic and neuroimaging data of patients.

3. Which points of strategic and program documents are solved:
Strategy 2050 the new political course of the established state
The third direction. New principles of social policy – social guarantees and personal responsibility.
Key priorities: to ensure the provision of high-quality and affordable medical services. To ensure the diagnosis and treatment of the widest possible range of diseases. “Preventive medicine should become the main tool in the prevention of diseases. To work out the issue of introducing new approaches to ensuring the health of our children. To cover all children under the age of 16 with the full range of medical care”.
Decree of the President of the Republic of Kazakhstan dated February 15, 2018 No. 636 “On approval of the National Development Plan of the Republic of Kazakhstan until 2025 and invalidation of certain decrees of the President of the Republic of Kazakhstan”
National Priority 2. Affordable and effective healthcare system
Fundamental changes for Kazakhstan by 2025:
“from the traditional healthcare system to patient-centered medicine focused on improving the health indicators of citizens”.
Task 1. Formation of a healthy lifestyle
“Measures will be taken to strengthen the health of children and adolescents, including disease prevention, assistance and full-fledged rehabilitation, taking into account the best international practices”.
The message of the Head of State Kassym-Jomart Tokayev to the people of Kazakhstan. September 1, 2020
V. Affordable and high-quality education
VI. Development of the healthcare system
IX. Digitalization is the basic element of all reforms
Message of the Head of State Kassym-Jomart Tokayev to the people of Kazakhstan on September 1, 2021
I. Economic development in the post-pandemic period
“Kazakhstan should become a central digital hub in a significant part of the Eurasian region”.
II. Improving the efficiency of the healthcare system

4. Expected results.
4.1 Direct results:
1. Introduction of a pathophysiologically based system of pre-surgical diagnosis and rational tactics of surgical correction of the disease;
2. Based on the multidisciplinary study of the mechanisms of formation of the epileptic focus, epileptic system and neurological disorders, a clinical protocol for the diagnosis of the disease should be developed.
3. Based on the analysis of cognitive abilities in patients with epilepsy affecting the quality of life and social adaptation, recommendations should be proposed for the adaptation of people suffering from epilepsy in society.
4. Based on the data of functional and structural imaging, the selection of patients for surgical treatment of epilepsy and alternative methods of treatment for intractable forms of epilepsy should be standardized;
5. New clinical protocols of preparation for surgery should be developed and effective methods of surgical treatment should be developed;
6. Digital database of clinical, genetic and neuroimaging data of patients for the development of research work in epileptology.
7. Must be published:
- at least 3 (three) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction

of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty);
- at least 3 (three) articles in journals recommended by CQAES.

4.2 The end result:
Socio-economic effect:
Social effect:
1. Reduction of disability;
2. Improving the quality of life of patients suffering from epilepsy;
3. Reduction of mortality of patients with epilepsy.
Economic effect:
An increase in the percentage of the working population of the Republic of Kazakhstan, through the adaptation of patients, reducing disability, improving the quality of life of people suffering from epilepsy.

5. The maximum amount of the program is 500,000 thousand tenge, including by year:
for 2022 – **100,000** thousand tenge, for 2023 – **200,000** thousand tenge, for 2024 – **200,000** thousand tenge

Technical task No. 36
for research work
within the framework of program-targeted financing

1. General information:
1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)
Life and Health Science
1.2. Name of the specialized direction of the program:
Innovative research in medicine and public health.

2. Goals and objectives of the program
2.1.The purpose of the program:
Development and implementation of innovative technologies for normothermal preservation and transportation of a donor organ and a virtual reality system for prolonging human life.
2.2. To achieve this goal, the following tasks must be solved:
1) Development and study of the safety of a system for normothermal preservation and long-term transportation of a donor organ at the preclinical stage.
2) Creation of a virtual reality program to improve the educational process of specialists

3. Which points of strategic and program documents are solved:
1. Target indicators of the State Healthcare Development Program of the Republic of Kazakhstan for 2020 – 2025:
- an increase in the life expectancy of citizens up to 75 years;
- reduction of the risk of premature mortality from 30 to 70 years from cardiovascular diseases
2. Item 5.5 Improving the provision of medical care of the State Program for the Development of healthcare of the Republic of Kazakhstan for 2020 – 2025:
- Measures to combat the main diseases that lead to mortality – these are diseases of the circulatory system (strokes, heart attacks and others), respiratory diseases, oncological diseases, injuries, child and maternal health, neurological diseases, and in other clinical services – includes: transfer and introduction of new and innovative technologies for diagnosis and treatment diseases within the framework of public and private initiatives;

4. Expected results
4.1 Direct results:
According to the results of the program , there should be:
– development of innovative technology in the form of a unique system for normothermal preservation and long-term transportation of a donor organ outside the body.
– introduction into production of a system for normothermal preservation and long-term transportation of a donor organ.

– filing an application for a patent for a unique development in the form of a system for normothermal preservation and long-term transportation of a donor organ
– the virtual reality system created should allow to improve the process of studying topographic and pathological anatomy in the field of cardiac surgery and cardiology.
– the resulting computer anatomical model of the human heart should allow to avoid undesirable phenomena up to 75% during surgical interventions.
– improvement of the current educational process for training young specialists in cardiology and cardiac surgery, which should reduce the risks of postoperative complications by 30%
– at least 3 (three) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty);
- at least 3 (three) articles in journals recommended by CQAES;

4.2 The end result:

As a result of the implementation of this Program, innovative technologies should be developed that will make a significant contribution to the development of the health care system in Kazakhstan, namely transplantation, cardiac surgery and cardiology in Kazakhstan.

Economic effect. The scientifically-based research data obtained during the implementation of the Program should be the basis for a clinical study with a developed system for normothermal preservation and long-term transportation of a donor organ outside the body. The development of this device and its introduction into clinical practice should reduce the cost of organ transplantation surgery.

The use of virtual reality technology as a preoperative preparation will prevent possible risks that may arise during the operation, thereby increasing its safety. Therefore, taking into account the results, it is proposed to use it also as an additional educational tool along with basic training.

Social effect. Innovative technologies developed in Kazakhstan for the first time should be used in cardiology and cardiac surgery, created by a domestic manufacturer, which will bring the country to a new technological level. The results should lead to modernization and an increase in the share of innovative technologies in the healthcare system. The introduction of virtual technology will provide accessible tools for medical professionals and supplement training programs with interactive visual content, which will increase the effectiveness of training and reduce the number of medical errors. Thus, the quality of medical care should improve and mortality from cardiovascular diseases should decrease.

The target consumers of the results obtained are medical specialists and organizations engaged in organ transplantation. Young specialists in cardiology and cardiac surgery undergoing training.

5. The maximum amount of the program is 500,000 thousand tenge, including by year:
for 2022 – **100,000** thousand tenge, for 2023 – **200,000** thousand tenge, for 2024 – **200,000** thousand tenge

Technical task No. 37
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Life and Health Science

1.2. Name of the specialized direction of the program:

Development of domestic pharmaceutical science, industrial and environmental biotechnology.

2. Goals and objectives of the program

2.1.The purpose of the program:

Development of new approaches to the organization and conduct of clinical trials of medicines and medical devices in the Republic of Kazakhstan. Creation of a unified system for coordinating clinical trials in the Republic of Kazakhstan

2.2. To achieve this goal, the following tasks must be solved:

- Development of recommendations for the creation of an effective biomedical infrastructure in

Kazakhstan (biobanks, biocollections, preclinical research centers, bioinformatics, strategic biomedical technologies, biosafety, etc.)

• analysis of the current situation of the biomedical research market in the Republic of Kazakhstan;

• analysis of regulatory legal acts regulating the conduct of biomedical research in the Republic of Kazakhstan;

• analysis of international experience of centralized
coordination of clinical trials;

• development of scientific and methodological foundations for the creation of an effective biomedical infrastructure in Kazakhstan (biobanks, biocollections, preclinical research centers, bioinformatics, strategic biomedical technologies, biosafety, etc.).

- Creation of a multi-level system of coordination of clinical trials on the territory of the Republic of Kazakhstan and modernization of clinical bases based on world standards

• launch of the national Register of Biomedical Research, providing access (in Open Access format) to all health research conducted on the territory of the Republic of Kazakhstan;

• Increasing the scientific potential of researchers on good clinical practice (GCP) and on the standards of good Laboratory Practice (GLP);

• organization of clinical trials of medicines in accordance with the requirements of "Good Clinical Practice (GCP)" and the Standard of Good Laboratory Practice (GLP);

• analysis and coordination of the activities of clinical bases in accordance with ISO14155:2014 recommendations of the Board of the Eurasian Economic Commission No. 17 dated September 4, 2017, regulatory legal acts of the Eurasian Economic Union in the field of circulation of medical devices, as well as in accordance with international standards ratified by the Republic of Kazakhstan;

• Implementation of international cooperation in the field of "Good Clinical Practice (GCP)".

- Creation of a national digital platform for conducting clinical trials

• To analyze the current situation on the availability of information on ongoing research in the Republic of Kazakhstan;

• development of a digital platform layout (portal) for applying for clinical trials with automation of interaction with expert bodies and the MH of the RK;

• development of instructions for maintaining a digital platform.

- Development of mechanisms for the selection and transfer of the results of domestic fundamental research, moving to the stage of applied work to obtain prototypes of innovative products, as well as technologies for their creation

• to analyze the international experience of transferring the results of fundamental scientific research into applied scientific research;

• develop and create a database of domestic fundamental research;

• develop criteria and indicators of the cost effectiveness of scientific research at all stages of the innovation cycle;

• to assess the cost effectiveness of scientific research at all stages of the innovation cycle;

• evaluate the effectiveness of the results of fundamental research;

• analyze information about the amount of funds received from the sale of high-tech innovative products;

• to develop a mechanism for selecting and transmitting the results of domestic fundamental research, moving to the stage of applied work to obtain prototypes of innovative products, as well as technologies for their creation.

- Development and implementation of special programs for teaching postgraduate students technological methods of scientific biomedical research, methods of processing scientific information, etc.

• To analyze educational programs of postgraduate level of education for the presence of topics, disciplines on methods of scientific biomedical research;

• conduct a survey of postgraduate students to identify the potential of researchers on good practices;

• develop special training programs for students on the basics of implementing best international practices for researchers;

• to make recommendations on the inclusion of issues of proper planning and conducting research, research methodology, ethics of scientific research and statistical processing of scientific information in the

curriculum of postgraduate students.

- - Development of a system for selecting promising and priority areas, evaluating the quality and effectiveness of clinical trials
- analysis of the system for selecting promising and priority areas of scientific research, determining the quality and relevance of research results and their demand for the development of medical science and implementation in practical healthcare;
- development of a system for selecting promising and priority areas of clinical research,
- **development of a scale for assessing the quality and effectiveness of clinical trials.**

- Development and implementation of innovative clinical research designs adapted to local specifics.

- analysis of international experience in conducting clinical trials of medicines and medical devices, principles and approaches to use in modern Kazakhstan conditions;
- development of a digital platform for conducting clinical trials.

3. Which points of strategic and program documents are solved:

1. Strategy "Kazakhstan-2050", a new political course of the established state" Address of the President of the Republic of Kazakhstan - Leader of the Nation N.A. Nazarbayev to the people of Kazakhstan, Astana, December 14, 2012.
2. Code of the Republic of Kazakhstan dated July 7, 2020 No. 360-VI ZRK "On the health of the people and the healthcare system. Article 227 Biomedical research.
3. Resolution of the Government of the Republic of Kazakhstan dated May 25, 2022 No. 336 "On approval of the Concept of Development of Science of the Republic of Kazakhstan for 2022-2026".
4. State Program of healthcare development for 2020-2025 (until October 2021).
5. The national project "High-quality and affordable healthcare for every citizen "Healthy Nation" (from October 2021).
6. Order of the Minister of Health of the Republic of Kazakhstan dated December 11, 2020 No. KR DSM-248/2020.On approval of the rules for conducting clinical trials of medicines and medical devices, clinical and laboratory tests of medical devices for diagnostics outside a living organism (in vitro) and requirements for clinical databases and the provision of public services for the issuance of permits for conducting clinical trials and (or) testing of pharmacological and medicinal products, medical devices.
7. Order of the Minister of Health of the Republic of Kazakhstan dated December 21, 2020 No. KR DSM-310/2020 "On approval of the rules for conducting biomedical research and requirements for research centers.
8. 8. Roadmap of the project "Development of the biomedical research market, including international and multicenter research".

4. Expected results

4.1 Direct results:

- a coordination center for clinical research has been established;
- training programs have been developed for the development of scientific and human potential in the field of medical science;
- simplified licensing procedures for clinical trials;
- * the legal framework for conducting clinical trials has been improved;
- published at least 3 (three) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty);
- * at least 3 (three) articles in journals recommended by CQAES;

4.2 The end result:

- changes in legislative and regulatory acts regulating the conduct of biomedical and clinical research;
- the developed digital platform for conducting clinical trials will ensure the improvement of regulatory mechanisms and the development of infrastructure for biomedical research;
- development of innovative innovation centers in the field of development of medicines and medical devices, including research and educational base;

- increased investment in clinical research, scientific development and technological innovation;
- unified coordination of the activities of clinical research centers, centralized training of medical personnel in the field of clinical research and implementation of international cooperation in the field of CI, contributes to the development of high-tech developments in the domestic pharmaceutical industry and the development of Kazakh medical science.

5. The maximum amount of the program is 300,000 thousand tenge, including by year:
for 2022 – **65,000 thousand** tenge, for 2023 – **115,000 thousand** tenge, for 2024 - **120,000 thousand** tenge

Technical task No. 38
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Life and Health Science

1.2. Name of the specialized direction of the program:

Innovative biological research to increase the productivity and sustainability of plant varieties and animal breeds in agriculture

2. Goals and objectives of the program

2.1.The purpose of the program:

To create highly productive varieties and lines of agricultural crops based on innovative biotechnologies

2.2. To achieve this goal, the following tasks must be solved:

1. Creation of promising wheat lines resistant to brown rust based on the introduction of Marker Assisted Pyramiding technology into the breeding process.
2. Creation of a highly productive variety of spring barley based on combinations of classical and molecular breeding methods.
3. Creation of a variety of spring rapeseed for cultivation in the northern regions of Kazakhstan on the basis of mutagenesis, remote hybridization and haploid biotechnology.
4. Creation of rice varieties with colored pericarp, resistant to pyriculariasis, based on biotechnologies for rice-growing regions of Kazakhstan.
5. Obtaining high-yielding tomato lines resistant to biotic and abiotic stress by genomic editing of promising varieties.
6. Creation of a highly productive grape variety of the table direction based on in vitro biotechnologies and molecular labeling.

3. Which points of strategic and program documents are solved:

1) The message of the Head of State Kassym-Jomart Tokayev to the people of Kazakhstan. President of the Republic of Kazakhstan "New Kazakhstan: the path of renewal and modernization", March 16, 2022 (10. On priority anti-crisis measures).

2) Message of the Head of State Kassym-Jomart Tokayev to the people of Kazakhstan "Kazakhstan in a new reality: time for action", September 1, 2020 (II Economic development in new realities, VII Ecology and protection of biodiversity);

3) The message of the Head of State Kassym-Jomart Tokayev to the people of Kazakhstan. September 2, 2019 (The fifth point is a developed agro-industrial complex);

4) Address of the President of the Republic of Kazakhstan – Leader of the Nation N.A. Nazarbayev to the people of Kazakhstan, December 2012 "Development Strategy of the Republic of Kazakhstan until 2050 "Kazakhstan-2050" (the third challenge is the threat to global food security; the sixth challenge is the exhaustion of natural resources; large-scale modernization of agriculture in the conditions of growing global demand for agricultural products)

5) The National Development Plan of the Republic of Kazakhstan until 2025, approved by Decree of the President of the Republic of Kazakhstan dated February 15, 2018 No. 636 (as amended by Decree of the President of the Republic of Kazakhstan dated 02/26/2021 No. 521) (National priority 7. Strengthening

national security; National priority 8. Building a diversified and innovative economy. Task 5. Reforming the agro-industrial sector to adapt to new conditions);
6) Strategic plan of the Ministry of Education and Science of the Republic of Kazakhstan for 2020-2024 (strategic direction 4. Development of science);

4. Expected results

4.1 Direct results:

According to the results of the program , there should be:

1. – A new strategy of pyramiding genes of resistance to brown rust *Marker-Assisted Pyramiding* has been developed to identify wheat genotypes containing several *Lr* genes of pyramidal resistance determining resistance to different races of the pathogen *P. recondita (Prt).*

2. The DNA technology *Marker-Assisted Pyramiding* has been developed to identify and create new forms and elite wheat lines with increased and stable expression of brown rust resistance of *Puccinia recondita f.sp. tritici (Prt),* high productivity, adapted to various conditions of Kazakhstan.

3. Promising wheat lines protected by effective disease resistance Lr genes have been created. Recommendations on the practical application of the MarkerAssisted Gene Pyramiding technology in genetics, phytopathology and plant breeding have been prepared.

4. Older generation barley hybrids were selected using informative DNA markers.

5. Selected promising lines of spring barley were evaluated for drought resistance and resistance to rust diseases.

6. Promising barley lines were evaluated according to the complex of yield and quality components.

7. A highly productive variety of spring barley has been created using marker-mediated selection technology.

8. A variety of spring rapeseed has been created for cultivation in the northern regions of Kazakhstan on the basis of mutagenesis, remote hybridization and haploid biotechnology.

9. The first domestic long-grain rice variety with colored pericarp (red rice) has been transferred to the State variety testing.

1.A universal genetic system has been developed for genomic editing of dicotyledonous plants by the CRISPR-Cas9 method.

2. A molecular genetic study of the country's tomato gene pool was carried out and promising varieties with the potential for resistance to dangerous phytopathogens, drought and salinization were selected for targeted genome editing.

3. High-yielding tomato lines with prolonged resistance to dangerous fungal pathogens and increased drought resistance potential were obtained.

4. Genetic passports have been formed for the obtained high-yielding tomato lines resistant to fungal pathogens

5. The agronomic evaluation of the obtained tomato lines was carried out.

6. A comprehensive assessment of promising grape hybrids on economically valuable traits in the field and on resistance to dangerous fungal diseases using molecular markers was carried out.

In vitro biotechnology has been developed for mass-clonal reproduction and preservation of selected promising grape hybrids.

1.Genetic passports of 10 Kazakhstani grape varieties and hybrids have been created.

2. A new highly productive grape variety of the table direction has been transferred to the State variety testing.

- published at least 3 (three) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty);
- at least 3 (three) articles in journals recommended by CQAES;
- 1 patent was obtained and 2 patent applications were made to the Kazakhstan Patent Office.

4.2 The end result:

The scientific effect of the implementation of the Program.

Molecular genetic studies of cultivated plants should reveal new loci, alleles, as well as genotypes to improve existing and create new varieties.

The development of informative DNA markers of agricultural crops should accelerate and improve the breeding methodology in the country.

The identification of new combinations of genes of susceptibility and resistance in tomatoes to biotic and abiotic stress will make it possible to better understand the mechanisms of immunity and stress resistance of plants. The global expansion of the genetic data of germplasm of any agricultural crops, including tomatoes, reveals new genetic resources for maintaining biodiversity, as well as for breeding. A universal system of genomic editing of dicotyledonous plants should be developed, which will allow studying the function of genes and regulatory RNAs, transiently expressing introgress genes and studying their effect on the plant, developing green "biofactories" for heterologous proteins, modifying the genomes of agricultural crops to increase their productivity.

As a result of the implementation of the program, a new Kazakh highly productive grape variety of the table direction should be created, characterized by genes of resistance to dangerous fungal diseases (mildew, powdery mildew) based on molecular labeling.

Social and economic effect.

Creation of 4 new highly productive varieties of agricultural crops (barley, rapeseed, rice, grapes), allocation of promising lines of grain, vegetable, berry and oilseed crops (at least 50). The resulting productive and sustainable varieties will increase yields, and accordingly the quantity and quality of the harvested crop and prevent the annual expansion of acreage and irrigation costs. The promising lines created will significantly accelerate the breeding process by including them in breeding programs for breeding new varieties.

The use of sustainable and productive varieties will bring a profit equal to about 20% of the cost of production. The results of the work will increase crop yields by 25-30%, limit the use of pesticides, and ensure environmental safety.

Highly productive varieties of agricultural crops will reduce the dependence of the agricultural sector of the country on imported seed and planting material, as well as on crop products. The introduction of new technologies in the agricultural complex will allow the country to enter the international market with new high-quality products, with high competitiveness indicators.

The created highly productive grape variety will reduce import dependence, enrich the market of Kazakhstan with a valuable food product, which will favorably affect the improvement of the country's food security.

Target consumers:

The target consumers of the results obtained are: research institutes, universities, breeding, seed and nursery centers, peasant and farm farms, commercial biotechnological laboratories.

5. The maximum amount of the program is 300,000 thousand tenge, including by year:

for 2022 – **65,000** thousand tenge, for 2023 – **115,000** thousand tenge, for 2024 – **120,000** thousand tenge

Technical task No. 39
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Life and Health Science

1.2. Name of the specialized direction of the program:

Innovative research in medicine and public health.

2. Goals and objectives of the program

2.1.The purpose of the program:

Creation of an integrated interdepartmental model of timely response to man-made, natural and humanitarian emergencies to prevent risks and reduce losses in the field of public health.

2.2. To achieve this goal, the following tasks must be solved:

– To study the international and domestic experience of the organization and mechanisms of interdepartmental interaction in responding to emergencies, pandemics, disasters with an assessment of resource provision and to develop an algorithm for interdepartmental interaction in the Republic of Kazakhstan:

- To evaluate the experience of Kazakhstan and other countries on the organization and mechanisms of interdepartmental interaction in responding to emergencies, pandemics, disasters at the interdepartmental and intersectoral levels with an analysis of the regulatory framework.

- To assess the resource provision of the Republic of Kazakhstan in case of man-made, natural and humanitarian emergencies (human, financial, economic, material and technical) to save lives and preserve the health of the population.

- To develop a plan and algorithm of interdepartmental interaction for medical and sanitary provision of the population in emergency situations of man-made, natural and humanitarian character.

– To develop and implement monitoring systems for interdepartmental interaction with the development of a training program for specialists and the public to prevent and reduce human and material losses in the Republic of Kazakhstan

- To introduce a system for monitoring interdepartmental interaction of tasks to save lives and preserve public health in emergency situations of man-made, natural and humanitarian character

- Develop training programs for specialists and the public to prevent and reduce human and material losses

– To develop a forecasting system and a software module of intelligent analysis for effective management of interdepartmental interaction in case of man-made, natural and humanitarian emergencies

- Develop a system for predicting potential risks and outcomes of man-made, natural and humanitarian emergencies based on mathematical and computer modeling

-Development of a software module of intelligent analysis for effective management of interdepartmental interaction in case of man-made, natural and humanitarian emergencies.

3. Strategic and program documents reflecting the objectives of the program:

1. The State Program “Digital Kazakhstan” dated December 12, 2017 No. 827.

2. Decree of the President of the Republic of Kazakhstan dated February 15, 2018 No. 636. “On approval of the Strategic Development Plan of the Republic of Kazakhstan until 2025”.

3. On the approval of the national project "Quality and affordable healthcare for every citizen “Healthy Nation” Resolution of the Government of the Republic of Kazakhstan dated October 12, 2021 No. 725.

4. Expected results

4.1 Direct results:

The program results should include:

- the experience of Kazakhstan and foreign countries on interdepartmental interaction has been studied, and a responsibility matrix has been developed, and proposals for their improvement should be given based on the study of the NLA

-an assessment of resource provision (human, financial and economic) was carried out with proposals for improving standards and equipment timesheets

-identified potential development risks and prevention measures (development of a system for predicting risks and outcomes of man-made, natural and humanitarian emergencies based on mathematical and computer modeling, developed training programs for specialists and the public to prevent and reduce human and material losses)

- studied the NLA and made proposals to improve interdepartmental interaction in man-made, natural emergencies and of a humanitarian nature

- methodological manuals and algorithms of actions in case of man-made, natural and humanitarian emergencies for public health have been developed

- developed and tested educational emergency response programs for specialists of different profiles

- proposals are given for the organization of an examination of the preparedness of health facilities for emergencies, accreditation and certification of experts, granting the functions of the organization to carry out

this type of activity

- published at least 3 (three) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty);

- at least 3 (three) articles in journals recommended by CQAES;

4.2 The end result:

As a result of the implementation, a software module for intelligent analysis and monitoring of the effectiveness of managing interaction processes in man-made, natural and humanitarian emergencies should be developed to minimize damage and losses from their occurrence and preserve the life and health of the population of the Republic of Kazakhstan

Economic effect. The scientifically-based approaches obtained during the implementation of the Program will help in solving the issues of logistical and financial support for the elimination of consequences, preventing direct material, financial, technical losses, and most importantly human losses. The economic effect consists in adequate resource availability and readiness of all structural divisions of the departments of the Republic of Kazakhstan for man-made, natural and humanitarian emergencies.

Social effect. Prevention of human losses in man-made, natural and humanitarian emergencies, with the help of a set of measures aimed at identifying potential risks, improving interdepartmental interaction, developing algorithms for emergency response, training the population to respond to emergencies, ensuring the readiness of health facilities that will allow for a social effect. Reduction of anxiety and fear of harm to the population of the country.

The target consumers of the results obtained are state bodies; Kazakhstani scientific organizations dealing with the problems of responding to man–made, natural and humanitarian emergencies, medical organizations; universities; state republican and territorial management structures; project organizations in the field of developing integrated plans for the socio-economic development of Kazakhstan; public organizations, experts in the field of health, environmental protection and ecology.

5. The maximum amount of the program is 300,000 thousand tenge, including by year:
for 2022 – **65,000** thousand tenge, for 2023 – **115,000** thousand tenge, for 2024 – **120,000** thousand tenge

Technical task No. 40
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Life and Health Science.

1.2. Name of the specialized direction of the program:

Innovative biological research to increase the productivity and sustainability of plant varieties and animal breeds in agriculture

2. Goals and objectives of the program

2.1.The purpose of the program:

Development of microbial preparations and their use to protect fruit crops from the causative agent of bacterial burn.

2.2. To achieve this goal, the following tasks must be solved:

2.2.1 *Using phytopathological and molecular genetic methods of analysis to conduct monitoring studies and identify the area of bacterial burn spread among fruit crops of Kazakhstan, in order to establish the extent of disease progression and phytosanitary condition of fruit crops.*

- To conduct route surveys of garden biocenoses in the southern and south-eastern regions of Kazakhstan for infection with the causative agent of bacterial burn

- To take into account the prevalence and development of the disease depending on the zone of growth, varietal characteristics of plants and weather conditions.
- Collect biological materials to identify and identify the causative agent of bacterial burn and isolate new strains of antagonistic microorganisms.

2.2.2 *Development of 2 (two) biologics based on antagonist microorganisms and their effective use against bacterial burn of fruit crops.*

- To screen microorganisms from laboratory collections and newly isolated isolates from the phyllosphere of garden cenoses with inhibitory activity against the causative agent of bacterial burn.
- To carry out molecular genetic confirmation of a strain of a microorganism that has activity against the causative agent of bacterial burn.
- Using methods of high-performance liquid, gas chromatography and mass spectrometry, to determine the component composition of biologically active substances produced by selected strains of microorganisms and to identify substances that have a bactericidal effect against the causative agent of bacterial burn
- Using methods of high-performance liquid, gas chromatography and mass spectrometry, to determine the component composition of biologically active substances produced by selected strains of microorganisms and to identify substances that have a bactericidal effect against the causative agent of bacterial burn
- Obtain experimental samples of 2 (two) biological products and select optimal cultivation conditions.
- To select effective doses and develop schemes for the use of prototypes of 2 (two) biological products.

– To study the possibility of using antagonist microbes together with various chemical and biological preparations in laboratory and field conditions.

- To evaluate the biological effectiveness against the causative agent of bacterial burn in different climatic zones of fruit crops.
- To develop scientific and technical documentation for the production of experimental industrial samples 2 (two) biopreparations based on antagonist microorganisms

2.2.3 *Conducting studies on the phytotoxicity of* 2 (two) *developed biological products on fruit crops in laboratory and production conditions*.

- To study the effect of 2 (two) developed domestic biological products on morpho-physiological, histological and biochemical parameters of apple and pear micro-shoots in vitro (transpiration intensity, photosynthesis, activity of proline and antioxidant enzymes, hormonal status).

2.2.4 *To develop a comprehensive integrated system of protection of the garden from bacterial burn, including quarantine and sanitary-preventive measures, mechanical, agrotechnical, chemical and biological methods of protection*

– To test various schemes of protective measures with the inclusion of 2 (two) domestic biological products based on antagonist microbes adapted to the soil and climatic conditions of the south and south-east of the republic. Select the most effective options, develop and issue guidelines.

3. Which points of strategic and program documents are solved:

- Message of the Head of State Kassym-Jomart Tokayev to the people of Kazakhstan dated September 1, 2021.
- The concept of transition of the Republic of Kazakhstan to sustainable development for 2007-2024, approved by the Decree of the President of the Republic of Kazakhstan dated November 14, 2006 No. 216.
- The Law “On Plant Quarantine” dated February 11, 1999.
- The State program for the development of education and science in the Republic of Kazakhstan for 2020-2025 - The Strategic Development Plan of the Republic of Kazakhstan until 2025, item 2. Competitiveness of economic sectors - ensuring food security of the country and the growth of export-oriented environmentally friendly products, increasing resource efficiency.

4. Expected results

4.1 Direct results:

- route surveys of garden biocenoses of the southern and south-eastern regions of Kazakhstan were carried out for infection with the causative agent of bacterial burn.

– the prevalence and development of the disease were taken into account depending on the zone of growth, varietal characteristics of plants and weather conditions

– biological material was collected for the isolation and identification of the causative agent of bacterial burn

and new strains of antagonistic microorganisms.
– screening of microorganisms from the laboratory collection and newly isolated isolates from the phyllosphere of garden biocenoses with inhibitory activity against the causative agent of bacterial burn was carried out.
- a molecular genetic analysis of a strain with activity against the causative agent of bacterial burn (16S RNA, genome-wide sequencing) was carried out.
- By methods of high-performance liquid chromatography and mass spectrometry, the component composition of biologically active substances of selected strains of microorganisms should be determined and substances with a bactericidal effect against the causative agent of bacterial burn should be identified.
– experimental samples of 2 (two) biological products were obtained and optimal cultivation conditions were selected.
– effective doses have been selected and schemes for the use of prototypes of 2 (two) biological products have been developed.
– the possibility of using antagonist microbes together with various chemical and biological preparations in laboratory and field conditions has been studied.
- an assessment of the biological effectiveness of 2 (two) developed drugs against the causative agent of bacterial burn in different climatic zones of fruit crops was carried out.
– scientific and technical documentation has been developed for the production of experimental industrial samples of 2 (two) biological products based on antagonist microorganisms
– the effect of 2 (two) biological preparations on morpho-physiological, histological and biochemical parameters of apple and pear micro-shoots *in vitro* (transpiration intensity, photosynthesis, activity of proline and antioxidant enzymes, hormonal status) was studied.
- tests of various schemes of protective measures were carried out with the inclusion of 2 (two) domestic biological products based on antagonist microbes adapted to the soil and climatic conditions of the south and south-east of the republic. The most effective options should be selected, as a result of which methodological recommendations should be developed and issued.
According to the results of the Program**:**
- at least 3 (three) have been published articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty), and an implementation certificate was received indicating the achieved economic effect, the implementation mechanism with a transcript of the work carried out, or recommendations for implementation, or an application for a commercialization project was submitted (preferably).
- at least 5 (five) articles in journals recommended by CQAES;
- submitted at least 2 (two) applications for patents to the Kazakhstan patent office;
- practical recommendations have been developed on an integrated system for protecting gardens from bacterial burns with the inclusion of prototypes of domestic biological products based on native microorganisms;

4.2 The end result:

The data obtained will supplement national and global information systems on the effectiveness of domestic drugs in the fight against bacterial burn. The expected results of the program should be competitive in relation to the research conducted in the Republic of Kazakhstan and in the world.
The target consumers of the results obtained are: the Ministry of Agriculture of the Republic of Kazakhstan, large agro-industrial associations, peasant farms, homesteads and suburban areas.
The economic effect of the implementation of the program should be associated with a reduction in indirect and direct crop losses and deforestation of orchards, as well as with the development of the domestic market of biological products and a decrease in import dependence on the foreign market of drugs. The implementation of the program should allow the development of effective microbial plant protection products from bacterial burn adapted to the natural and climatic conditions of Kazakhstan. The use of biological products should optimize the phytosanitary condition of agrocenoses, reduce the pesticide load on fruit products, and significantly increase the yield of agricultural fruit crops. Rational use of natural resources, their reproduction while improving the quality and quantity of crop products are an integral part of national

policy, the basis of sustainable economic development of the country.

Social effect. The developed biological products for the protection of fruit crops from bacterial burns should be used in the production of environmentally friendly biological products, which implies the use of only organic and biological plant protection products. This, in turn, should become one of the directions of diversification of agricultural organic production and increase the competitiveness of domestic agricultural producers in the global market. The introduction into practice of the programs developed during the implementation of the Program should expand the range of domestic biological products and should contribute to the development of the domestic microbiological industry. Sustainable production of high-quality agricultural products is one of the international priorities.

5. The maximum amount of the program is 670,000 thousand tenge, including by year:
for 2022 – **130,000** thousand tenge, for 2023 – **280,000** thousand tenge, for 2024 – **260,000** thousand tenge

Technical task No. 41
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Life and Health Science

1.2. Name of the specialized direction of the program:

Innovative research in medicine and public health

2. Goals and objectives of the program

2.1.The purpose of the program:

To develop cellular, genomic and proteomic technologies for the diagnosis, treatment and prevention of oncological and cardiovascular diseases

2.2. To achieve this goal, the following tasks must be solved:

1. To develop recommendations for the pre-symptomatic diagnosis of stroke based on the sequencing of a new generation. To develop a protocol for the diagnosis of somatic mutations that contribute to the formation of arteriovenous malformations. To develop a proteomic method for determining stroke biomarkers based on mass spectrometry.
2. To develop cellular technologies for the treatment of ischemic stroke and lower limb ischemia using preconditioned MSCs.
3. Develop recommendations for evaluating the effectiveness of immunotherapy in the treatment of bladder cancer (PD-1/PDL-1 inhibitors). To develop recommendations for determining the sensitivity of lung cancer and skin melanoma to immunotherapy based on the expression of the PD-L1 ligand and PD-1 receptor. To determine the activity of the recombinant peptide PD-1 in enhancing anti-cancer immunity.
4. To develop a protocol for immunohistochemical diagnosis of breast cancer based on monoclonal antibodies to the Her-2/neu cancer marker protein. To develop a test system for early diagnosis of lung cancer based on the DNA methylation profile.
5. To develop a method for assessing the individual sensitivity of cancer cells of patients to chemotherapy drugs using a 3D tumor model. To develop a protocol for studying the miRNA expression profile in breast cancer patients receiving chemotherapy. To determine the prognostic and predictive role of microsatellite instability in oncology in the Kazakh population.
6. To develop a technology for obtaining a dendritic vaccine for the treatment of breast cancer. To create a modified CD-19 CAR receptor for the technology of chimeric antigenic T-lymphocyte receptor used for the treatment of B-cell lymphomas and leukemias.
7. To study natural polyphenols and synthetic heterocycles with hemorheological activity that have the ability to reduce the risk of cardiovascular pathology in experimental atherosclerosis in rats and

doxorubicin cardiotoxicity.

3. Which points of strategic and program documents are solved:

- Address of the President of the Republic of Belarus dated January 10, 2018 “New development opportunities in the context of the Fourth Industrial Revolution”, in terms of the development of personalized medicine;
- Development Strategy “Kazakhstan-2050” Address of the President of the Republic of Kazakhstan - Leader of the Nation N. A. Nazarbayev to the people of Kazakhstan. III. Strategy “Kazakhstan-2050” 4. The health of the nation is the basis of our successful future;
- The State program of Healthcare development for 2020-2025. Resolution of the Government of the Republic of Kazakhstan "On approval of the State Program for the Development of Healthcare of the Republic of Kazakhstan for 2020 - 2025" dated December 26, 2019 No. 982 (Target indicators: in 2025: reducing the risk of premature mortality from 30 to 70 years from **cardiovascular, oncological**, chronic respiratory diseases and diabetes to 15.43%).

4. Expected results

4.1 Direct results:

According to the results of the Program implementation, the following results should be obtained:

1. Recommendations for the pre-symptomatic diagnosis of stroke based on the sequencing of a new generation have been developed. A protocol for the diagnosis of somatic mutations contributing to the formation of arteriovenous malformations has been developed. A proteomic method for determining stroke biomarkers based on mass spectrometry has been developed.

2. Cellular technologies have been developed for the treatment of ischemic stroke and lower limb ischemia using preconditioned MSCs.

3. Recommendations have been developed to evaluate the effectiveness of immunotherapy in the treatment of bladder cancer (PD-1/PDL-1 inhibitors). Recommendations have been developed to determine the sensitivity of lung cancer and skin melanoma to immunotherapy based on the expression of the PD-L1 ligand and the PD-1 receptor. The activity of the recombinant peptide PD-1 in enhancing anti-cancer immunity was determined.

4. A protocol for immunohistochemical diagnosis of breast cancer based on monoclonal antibodies to the Her-2/neu cancer marker protein has been developed. A test system has been developed for the early diagnosis of lung cancer based on the DNA methylation profile.

5. A method has been developed for assessing the individual sensitivity of cancer cells of patients to chemotherapy drugs using a 3D tumor model. A protocol has been developed to study the miRNA expression profile in breast cancer patients receiving chemotherapy. The prognostic and predictive role of microsatellite instability in oncology in the Kazakh population has been determined.

6. The technology of obtaining a dendritic vaccine for the treatment of breast cancer has been developed. A modified CD-19 CAR receptor was created and tested for the technology of chimeric antigenic T-lymphocyte receptor used for the treatment of B-cell lymphomas and leukemias.

7. Natural polyphenols and synthetic heterocycles with hemorheological activity have been studied, which have the ability to reduce the risk of cardiovascular pathology in experimental atherosclerosis in rats and doxorubicin cardiotoxicity.

8. Publications:

- at least 3 (three) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty);
- at least 3 (three) articles in journals recommended by CQAES
- at least 1 (one) act of implementation,
- 3 applications for obtaining security documents.

The proposed comprehensive study should make it possible to individualize treatment in patients with the studied nosologies. The end result of the research should be developed programs for early diagnosis and screening of cardiovascular and oncological diseases, as well as personalized therapy protocols based on

genomics, proteomics and cellular technologies.

4.2 The end result:

The results obtained within the framework of the program should have great scientific and practical significance not only on a national but also on an international scale. The socio-economic effect lies in the development of high-precision methods for the diagnosis of cardiovascular and oncological diseases.

The obtained research results should provide new information about the therapeutic effectiveness of cellular, molecular genetic methods in cardiovascular and oncological diseases and will allow the development of new approaches and technologies for early diagnosis and treatment of socially significant diseases. The results obtained under the program should have a high socio-economic effect associated with an increase in the level of medical services provided, an improvement in the quality of life of patients and a reduction in the cost of treatment and patient care. The implementation of the program will make it possible to develop and scientifically substantiate personalized approaches in the treatment of oncological and cardiovascular diseases.

5. The maximum amount of the program is 530,000 thousand tenge, including by year:

for 2022 – **125,000** thousand tenge, for 2023 – **200,000** thousand tenge, for 2024 – **205,000** thousand tenge

Technical task No. 42
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Life and Health Science

1.2. Name of the specialized direction of the program

Innovative research in medicine and public health

2. Goals and objectives of the program

2.1.The purpose of the program:

Development of innovative technologies that increase the effectiveness of diagnosis and treatment of background and precancerous diseases of the cervix associated with human papillomavirus (HPV).

2.2. To achieve this goal, the following tasks must be solved:

- Evaluation of the effectiveness and safety of the applied methods of treatment of background and precancerous diseases of the cervix associated with the human papillomavirus.
- Development of an improved, effective and safe method for the treatment of background and precancerous diseases of the cervix associated with human papillomavirus using laser technologies with photosensitization (photodynamic therapy – PDT).
- Development of a method of fluorescent diagnostics using a photosensitizer for background and precancerous diseases of the cervix associated with human papillomavirus
- Development of a method for assessing the "burnout" of a photosensitizer during local photodynamic therapy.
- Development and implementation of an optimal blood photomodification program for complete eradication of HPV.
- Development and implementation of an algorithm for the management of women with cervical diseases associated with human papillomavirus.

3. Which points of strategic and program documents are solved:

The State program of healthcare development of the Republic of Kazakhstan for 2020-2025. (Target indicators: in 2025: reduction of the risk of premature mortality from 30 to 70 years from cardiovascular, **oncological**, chronic respiratory diseases and diabetes to 15.43%).

The main directions of the Program:

5.4 Development of human capital, modernization of education, science.

5.5 Improving the provision of medical care
5.8 Improving the investment climate in the medical industry
Message of the Head of State Kassym-Jomart Tokayev to the People of Kazakhstan dated September 1, 2020
II Improving the efficiency of the health system
III Quality education
VI. Development of the healthcare system
Development Strategy "Kazakhstan-2050"
4. The health of the nation is the basis of our successful future

4. Expected results
4.1 Direct results:
According to the results of the Program, the following results should be obtained:
- data from a comprehensive study of the prevalence of background and precancerous cervical diseases associated with HPV;
- new approaches to the treatment of background and precancerous cervical diseases associated with HPV in comparison with the treatment methods used;
- effective comprehensive technology for the diagnosis and treatment of background and precancerous diseases of the cervix associated with HPV;
- a strategy of medical care based on prognostic methods of treatment in the long term for background and precancerous diseases of the cervix associated with HPV;
- improving public awareness of risk factors for the development and treatment methods of background and precancerous cervical diseases associated with HPV;
- at least 3 (three) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty);
- at least 3 (three) articles in journals recommended by CQAES;
- revision of clinical protocols for diagnosis and treatment, methodological recommendations;
- reports of research results at international scientific forums;
- monograph;
- a patent for an invention.

Scientific effect:
- based on new scientific multifactorial data, an effective integrated technology of local and systemic PDT for the diagnosis and treatment of background and precancerous diseases of the cervix associated with HPV;
- the results of the study influencing the further development of research initiatives aimed at the management of viral diseases that cause background and precancerous diseases
Economic effect:
- reducing the burden on budget funds allocated within the Guaranteed volume of free medical care for the treatment of cervical cancer by at least 5%.
Social effect:
- reducing the risk of developing background and precancerous diseases of the cervix by at least 10%;
- reducing the incidence of cervical cancer in the medium term by at least 5%;
- increasing the duration and improving the quality of life of women of reproductive age, reducing disability, increasing the level of social activity of patients;
- increasing the scientific potential of Kazakhstan;
- formation and involvement of qualified domestic personnel in the knowledge-intensive process..
Target consumers of the results obtained:
- The Ministry of Health of the RK, the Ministry of Labor and Social Protection of the Republic of Kazakhstan, the female population of the Republic of Kazakhstan.

5. The maximum amount of the program is 400,150 thousand tenge, including by year:
for 2022 – **50,150** thousand tenge, for 2023 – **175,000** thousand tenge, for 2024 – **175,000** thousand tenge

Technical task No. 43
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Research in the field of education and science

1.2. Name of the specialized direction of the program:

Fundamental, applied, interdisciplinary research of problems of education, science, culture and sports in the XXI century:

Research in the field of physical culture and sports

2. Goals and objectives of the program

2.1.The purpose of the program:

Based on a comprehensive analysis of genetic and physiological characteristics, to develop methods and recommendations for improving physical capabilities, endurance and adaptive reserves of the body.

2.2. To achieve this goal, the following tasks must be solved:

- Analysis of individual genetic characteristics of athletes, amateurs and children based on genome-wide SNP genotyping and DNA methylation profile.
- Development of methods to increase adaptive reserves and physical endurance of athletes of various sports based on the use of hypoxytherapy and specialized food products.
- - Evaluation of the effectiveness and safety of methods for increasing adaptive reserves (hypoxia of quantum therapy) *in vitro*.
- Development of technology for targeted production of natural antioxidants to create new phytopreparations for the rehabilitation of high-level athletes.

3. Which points of strategic and program documents are solved:

The concept of the development of physical culture and sports until 2025 (from 11.10.2016).

General vision of the development of physical culture and sports of the Republic of Kazakhstan until 2025 A characteristic feature of the state policy of Kazakhstan in the field of sports and physical culture is traditionally the implementation of a balanced approach to the development of mass sports and sports of higher achievements.

Key problems of the industry: 4) lack of a coordinated strategy for conducting scientific research in the field of sports and physical culture, including sociological surveys of the population

- As a priority organizational measure, it is also necessary to develop a clear system of requirements for the work of children's and youth sports schools and specialized children's and youth schools of the Olympic reserve, which will be based on the principles of long-term sports selection of gifted young athletes, taking into account the model characteristics of physical and technical fitness, physical development and health assessment.
- 3. Further development of high-performance sports, the system of training the sports reserve, staffing of the industry and the formation of modern scientific potential of the industry.

The sport of the highest achievements is a powerful incentive for the development of the sports industry, which in the future will become one of the factors of the socio-economic development of the country. Qualitative improvement of scientific, methodological and medical support of athletes is required.

In recent years, competition in the international sports arena has significantly increased, in this regard, it is necessary to create and develop our own scientific base to ensure the effectiveness of high-performance sports and mass sports. To this end, it is necessary to develop a scientific approach to the development of the sports industry and expand the scope of applied research.

National sports in Kazakhstan are an integral part of sports and physical education, a factor in attracting

young people and strengthening the health of the population through the education of national patriotism and respect for national history and traditions. Over the period of Kazakhstan's independence, more than 20 national sports have been actively developed. National sports have been actively developed. Conditions are being created for holding national equestrian competitions at a high organizational level. *Message of the Head of State Kassym-Jomart Tokayev to the people of Kazakhstan dated September 1, 2021*:

"The key to health is physical culture. It is necessary to create all conditions for mass and children's sports".

"Priority should be given to mass sports, physical education and, of course, children. Modern realities can be so dangerous for children that their energy and curiosity need to be directed in the right direction. After all, children are the future of our state", he warned.

-*The State program of healthcare development of the Republic of Kazakhstan for 2020-2025.* Target indicators of the program*:*

- an increase in the life expectancy of citizens up to 75 years;
- reducing the risk of premature mortality from 30 to 70 years of age from cardiovascular diseases.

Action plan for the implementation of the Program:

1. Development of the biomedical research market, including conducting international and multicenter research.
2. Training of qualified scientific and medical personnel in personalized medicine (bioinformatics, medical genetics, pharmacogenetics, etc.), in master's, doctoral, postdoctoral programs.
3. Creation of a biobank for conducting clinical research in the field of personalized medicine with a database of big data.

- *Strategy "Kazakhstan-2050"*

- The strategy "Kazakhstan-2050" sets an important task for the development of physical education and sports. 4.5. Development of physical education and sports. "Physical culture and sports should become a special concern of the state. It is a healthy lifestyle that is the key to a healthy nation. However, there are not enough sports facilities, sports equipment and equipment available to everyone in the country. In this regard, the Government and local authorities need to take measures to develop physical culture, mass sports and the construction of physical culture and recreation facilities according to standard projects".

- *The Comprehensive Plan for the development of the pharmaceutical and medical Industry for* 2020-2025, according to which the Head of Government instructed to expand state support measures for domestic pharmaceutical production, especially in terms of stimulating clinical and preclinical trials.

State Program for the development of Education and Science of the Republic of Kazakhstan for 2020 - 2025:

- Goal 2 "Increasing the contribution of science to the socio-economic development of the country", paragraph 5.2.1. "Strengthen the intellectual potential of science", paragraph 5.2.3. "To increase the effectiveness of scientific research and ensure integration into the world scientific space"
- Quality education

"In general, Kazakhstan's education and science face a large–scale, urgent task - not just to keep up with new trends, but to be one step ahead, generate trends".

4. Expected results

4.1 Direct results:

- Target groups of athletes, sports enthusiasts and children should be formed to assess individual genetic characteristics and sports capabilities.
- Conducting full-genome microchip genotyping and studying the methylation profile for the main genes responsible for athletic qualities (strength, endurance, speed, power, body recovery, etc.).
- Based on the analysis of world data on associative research (GWAS), existing databases of Kazakhstanis, as well as new data obtained, the genetic features of the Kazakh population that determine sports opportunities and risks should be identified. Based on these data, promising sports for development in the Republic should be recommended.
- Genetic passports necessary for participation in high-level international competitions should be developed for athletes. Recommendations on individual and safe training regimen and nutrition are given, the risk of developing occupational diseases of athletes is assessed.
- For sports fans, fitness training regimens and diet features should be recommended.
- Recommendations should be given for children on choosing the most promising sports direction.

- Evaluation of the effectiveness and safety of hypoxic training and quantum therapy in model experiments on laboratory animals and at the cellular level in athletes.
- An integral assessment of the effect of using hypoxytherapy with specialized food products to improve the quality of training and optimize the training process in order to achieve high results at competitions is given
- To improve and increase the effectiveness of the training process, a mathematical model of remote monitoring of the main physiological parameters of a person in hypoxic conditions should be developed.
- For the rehabilitation of athletes of different levels of training after physical exertion, a technology for the targeted production of natural antioxidants and phytopreparations should be developed, pharmacological screening of extracts of biologically active substances should be carried out.

4.2 The end result:

Scientific and technical effect:

The results of the scientific and technical program obtained on the basis of wide-genome associative studies, supplemented by an analysis of physiological indicators and clinical examinations should allow us to develop practical recommendations (5): 1) on choosing a sports direction for children in which the highest results should be achieved, 2) on the prevention of diseases associated with physical activity, 3) on individual and safe training regimen, 4) personalized rational nutrition, 5) effective maintenance of weight and muscle mass.

Highly qualified athletes should be issued genetic passports developed on the basis of individual characteristics of the genome, reflecting such physical capabilities as strength, endurance, power, speed, features of metabolism and recovery of the body, as well as the risks of professional sports diseases. The data obtained should allow not only to evaluate individual sports capabilities, but also to predict the risk of possible injuries, the development of occupational diseases as a result of increased physical activity, and to prevent rare cases of sudden death during sports events.

Studies on large cohorts of athletes, amateurs and children should allow us to detect selective signs and new genetic/epigenetic variants that explain the natural predisposition of Kazakhstanis to certain sports in which the highest result is possible.

The proposal of complex methods for assessing the physiological state of the body (2) during hypoxic and physical exertion. To stimulate the reserve capabilities of the body, optimal regimes (at least 2) of combining training with the intake of specialized nutrition, taking into account antioxidant and immunostimulating effects, should be proposed.

Determination of the ranges of norms of individual and intra-group indicators of adaptive capabilities, endurance, performance, individual risks of stress resistance in different groups of athletes were identified.

Development of technologies (1) aimed at obtaining natural antioxidants and phytopreparations for the rehabilitation of athletes of different levels of training after physical exertion.

The results of the program should be published:

- at least 3 (three) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty);
- at least 3 (three) articles in journals recommended by CQAES;

Target consumers of the results obtained:

Sports federations and associations, Olympic reserve schools, children's and youth sports schools, sports dispensaries, fitness and wellness centers, highly qualified athletes (candidates for masters of sports, masters of sports, masters of international class, honored masters of sports), sports and fitness enthusiasts, children and their parents.

Economic effect:

As a result of the implementation of the program, data should be obtained to determine the sports that have the greatest potential for development in Kazakhstan, which will contribute to a more efficient allocation of budget funds.

Offer recommendations for solving practical health and sports problems related to the rehabilitation of athletes after heavy physical exertion.

The developed recommendations should allow interested structures to effectively select candidates for the preparation of the country's Olympic reserve, promote the development of professional, amateur and children's sports.

The social effect of the Program should be:
- Promotion of a healthy lifestyle of the population.
- Improving the potential of health, prolonging active longevity, preserving youth and public health.
- Development of nationally oriented sports.
- Targeted training of athletes.
- Improving the individual health culture of athletes.
- Development of rehabilitation programs to restore the body and increase the reserve potential of athletes.
- Sports career guidance for children

5. The maximum amount of the program is 900,000 thousand tenge, including by year:
for 2022 – **100,000** thousand tenge, for 2023 – **400,000** thousand tenge, for 2024 – **400,000** thousand tenge

Technical task No. 44
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Research in the field of education and science

1.2. Name of the specialized direction of the program:

Fundamental, applied, interdisciplinary research of problems of education, science, culture and sports in the XXI century:

Current problems in the field of education and linguistics

2. Goals and objectives of the program

2.1.The purpose of the program:

To develop scientific, theoretical and methodological support for the joint work of the school, family and the public on the prevention of bullying and cyberbullying.

2.2. To achieve this goal, the following tasks must be solved:

– to develop scientific and methodological foundations for the organization, management and assessment of the state of educational work on the prevention of bullying and cyberbullying in general education organizations; to create an information and analytical database:

– to develop scientific and methodological foundations (approaches, principles, methods), regulatory and information support for the organization, management, evaluation of preventive measures of bullying and cyberbullying among students;

– to determine the essence, types, main parameters of risk assessment and causes of bullying and cyberbullying;

- to determine the socio-psychological characteristics of bullying and cyberbullying participants;

– to develop criteria, indicators, evaluation indicators of the organization and management of the system of educational work on the prevention of bullying and cyberbullying;

– to diagnose the state of educational work on the prevention of bullying and cyberbullying in general education organizations: observation, questionnaires, interviews, conversations, sociometry, referentometry, etc.;

– to conduct monitoring observations on the development of bullying and cyberbullying processes in general education organizations;

– to develop and create an information and analytical database on three blocks - socio–pedagogical, psychological and methodological, which will be in demand for managerial decision-making;

– develop and create a model of a free atmosphere from bullying, including cyberbullying.

– to conduct experimental work on the organization and management of information technology and educational work on the prevention of bullying and cyberbullying in educational organizations:

– to develop the content of informational and educational work on the prevention of bullying and cyberbullying among students: watching videos and analysis, debates, discussions, trainings, excursions,

hikes, debates, contests;
- to develop the content of information and methodological work on the prevention of bullying and cyberbullying for parents;
- to develop the content of information and methodological work on the prevention of bullying and cyberbullying for teachers, social educators, psychologists and members of the public.
– develop a strategy for a school free of bullying and cyberbullying in general education organizations.
– compile and develop a dictionary of terms on bullying and cyberbullying for parents, teachers, social educators, psychologists and all interested parties;
– develop and create a database on technologies that prevent the risks of bullying and cyberbullying and methods for solving bullying and cyberbullying situations;
– develop a set of scientifically based requirements, guidelines and measures to prevent bullying and cyberbullying;
– evaluate the effectiveness of the developed guidelines and measures to prevent bullying and cyberbullying;
– to conduct seminars, trainings in educational organizations on measures to prevent bullying and cyberbullying.

3. Which points of strategic and program documents are solved:
1. The Law of the Republic of Kazakhstan "On Education" dated July 27, 2007 No. 319-III.
2. "Strategy "Kazakhstan-2050", a new political course of the established state" Address of the President of the Republic of Kazakhstan – Leader of the Nation N.A. Nazarbayev to the people of Kazakhstan, Nur-Sultan, December 14, 2012.
3. Decree of the President of the Republic of Kazakhstan dated May 30, 2013 No. 577 "On the Concept for the transition of the Republic of Kazakhstan to a "green economy".
4. **The State Program "Digital Kazakhstan" dated** December 12, 2017 No. 827.
5. Decree of the President of the Republic of Kazakhstan dated February 15, 2018 No. 636. "On approval of the Strategic Development Plan of the Republic of Kazakhstan until 2025".
6. Law of the Republic of Kazakhstan dated January 6, 2012 No. 527-IV. "On the national security of the Republic of Kazakhstan".
7. The program "Mangilik el". – Astana, 2014 from January 17.
8. Message of the Head of State Kassym-Jomart Tokayev to the people of Kazakhstan: New Kazakhstan: The path of renewal and modernization. – Nur-Sultan, 2022 from March 16

4. Expected results
4.1 Direct results:
According to the results of the program , there should be:
– theoretical and methodological developments, criteria, indicators, evaluation indicators of the state of the educational system for the prevention of bullying and cyberbullying;

– scientific and applied justification of the Strategy of a school free from bullying and cyberbullying;

– development of a scientifically based model, methodological recommendations, technology for the prevention of bullying and cyberbullying;

– implementation of a model and technology for the organization and management of information and educational work, allowing to reduce the risks of bullying and cyberbullying;

– theoretical, methodological and methodological bases for the study and evaluation of bullying and cyberbullying prevention.
– publication of 3 (three) articles in peer-reviewed scientific publications included in 2 (second) or 3 (third) quartiles in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty), 3 (three) articles in CQAES and collections of international conferences and journals of the near and far abroad.

4.2 The end result:
As a result of the implementation of this Program, a Strategy, model, technologies, methodological recommendations for the prevention of bullying and cyberbullying, the development and creation of a scientific, theoretical and methodological base for the administration, school teachers, social educators,

psychologists, parents should be developed.

Economic effect. The scientifically-based Strategy, model, technologies, methodological recommendations for the prevention of bullying and cyberbullying and methods for solving the risks of bullying and cyberbullying obtained during the implementation of the Program should ensure high efficiency of the organization and management of educational work of educational organizations.

Social effect. The development and testing of systems of measures for a free atmosphere from bullying, including cyberbullying, will cause waves and changes in many areas of our lives, first of all, it should contribute to diversity and inclusiveness in society, the achievement of the Sustainable Development Goals (SDGs) The UN, aimed at eliminating violence, combating inequality and injustice, as well as protecting the planet and ensuring peace and prosperity for the entire population, reducing suicides, especially in adolescence, will increase the number of social services, including, the number of schools for families and children capable of improving their quality of life and well-being, the emergence of innovative educational programs, diagnostic methods and social support for children and the professionalization of specialists. An effective system of measures for a free atmosphere from bullying, including cyberbullying, is impossible without the effectiveness of many other aspects of society, such as education, justice, healthcare, social services, which will require social innovations from the practice that seek to meet social needs better than existing solutions. These innovations will help solve the problem of social injustice and at the same time achieve many of the 17 SDGs. and all this can lead to greater and better social changes. The pedagogical effect is to improve the relationship between students of different age groups and all participants in the educational process: teachers, parents and students, reducing anxiety, fears, offenses, hooliganism and crimes, increasing psychological comfort for favorable socialization, self-development and self-realization of students.

The target consumers of the results obtained are state bodies, education departments, Kazakhstani scientific organizations, educational organizations, public organizations, etc., universities, institutes of advanced training, educational centers, family institute, teaching staff, experts in the field of education.

5. The maximum amount of the program is 250,000 thousand tenge, including by year:

for 2022 – **50,000** thousand tenge, for 2023 – **100,000** thousand tenge, for 2024 – **100,000** thousand tenge

Technical task No. 45
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Research in the field of education and science

1.2. The name of the specialized direction of the program:

Fundamental, applied, interdisciplinary research of problems of education, science, culture and sports in the XXI century:

Current problems in the field of education and linguistics

2. Goals and objectives of the program

2.1.The purpose of the program:

Conducting a comprehensive study aimed at improving the competitiveness of universities in Kazakhstan through reengineering of the national system of quality assurance of higher education as a catalyst for improving the quality of human capital in the context of the implementation of the concept of continuing education

2.2. To achieve this goal, the following tasks must be solved:

- identify and cluster factors that have a direct and indirect impact on the quality of higher education;
- to develop a concept of quality assurance of higher education based on the analysis of domestic and foreign systems of quality assurance of higher education;
- to conduct a cohort study of the current level of quality of the higher education system based on clustered factors of influence;
- to develop an improved national model of the quality assurance system of higher education, with a

description of its characteristics as components of the expected level of quality of higher education;
- to test the national model of the quality assurance system of higher education with the correlation between the expected and current levels of quality of higher education in Kazakhstan;
- to develop methodological and regulatory documentation of the constructs of the national system of quality assurance of higher education for the implementation of research results at the national and institutional levels;
- to modernize the Register of educational programs of higher and postgraduate education as one of the key factors in ensuring the quality of higher education;
- to develop a methodological concept for embedding an applied bachelor's degree in the higher education system based on a competence-based approach and orientation to learning outcomes;
- to develop a model for the development of applied bachelor's degree based on the approaches of the European Higher Education Area;
- to develop a technology for integrating an applied bachelor's degree as a short cycle into the higher education system;
- to develop normative and methodological support for the system of post-secondary education as part of the higher education system, including the organization of the educational process, the development of educational programs of applied bachelor's degree, etc.;
- to test experimentally the model of development of applied bachelor's degree and the technology of its integration as a short cycle in the system of higher education

3. Which points of strategic and program documents are solved:

- National Development Plan of the Republic of Kazakhstan until 2025 (*Approved by Decree of the President of the Republic of Kazakhstan dated February 26, 2021 No. 521*): National priority 3. Quality education; Task 2. Creating favorable conditions and environment for learning; Task 3. Improving the quality of education
- The national project “Quality Education “Educated Nation” *(approved by the Decree of the Government of the Republic of Kazakhstan dated October 12, 2021 No. 726)*

Strategic indicator 3. The number of universities in Kazakhstan marked in the QS-WUR rating, TOP 200

- The concept of lifelong learning (continuing education)

4. Expected results

4.1 Direct results:

According to the results of the study , the following should be obtained:
- the factors that have a direct and indirect impact on the quality of higher education are scientifically substantiated and clustered;
- methodological foundations of quality assurance of higher education have been developed based on the analysis of domestic and foreign systems of quality assurance of higher education;
- the methodology of cohort research in determining the current level of quality of the higher education system has been developed and introduced into the methodology of scientific and pedagogical research;
- a modernized national model of the higher education quality assurance system has been theoretically substantiated, developed and experimentally tested and implemented at the country and institutional levels;
- the Register of educational programs of higher and postgraduate education has been modernized;
- a methodological concept of the implementation of the applied bachelor's degree in the higher education system based on a competence-based approach and orientation to learning outcomes has been developed;
- a model of applied bachelor's degree development based on the approaches of the European Higher Education Area has been developed and tested;
- the technology of integration of the applied bachelor's degree as a short cycle into the higher education system has been developed and tested;
- developed and implemented regulatory and methodological support for the system of post-secondary education as part of the higher education system, including the organization of the educational process, the development of educational programs of applied bachelor's degree;
- 4 (four) articles have been published in peer-reviewed scientific publications included in the first three quartiles (Q1, Q2, Q3) of the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty);

- 4 (four) articles have been published in journals included in the List of scientific publications recommended by CQAES MES RK;
- publication of a monograph.

4.2 The end result:

Scientific and technical effect:

The results of the Program should contribute to the implementation of: - Task 2 "Creating favorable conditions and an environment for learning" and task 3 "Improving the quality of education" of the National priority 3 "Quality education" of the National Development Plan of the Republic of Kazakhstan until 2025
- strategic indicators of the National Project "Quality Education "Educated Nation"
- objectives of the Concept of lifelong learning (continuing education)

Scientific effect:

The quality and quantity of scientific publications must meet the requirements of the competition documentation of targeted scientific and technical programs for PTF.

The results of scientific research published in rating domestic publications and foreign journals (Web of Science/ Scopus) contribute to the improvement of the scientific status of scientists. Within the framework of the Program, young specialists (PhD, masters and bachelors) should be trained.

The economic effect of the program should be to attract foreign students to study at universities in Kazakhstan.

The social effect of the program should be:
- improving the competitiveness of Kazakhstani universities at the regional and international level;
- meeting the needs of the labor market for highly qualified specialists;
- a positive impact on the development of the economy through the attraction of foreign students and the opening of jobs by graduates of higher and postgraduate education programs;
- improving the efficiency of scientific research through ensuring the quality of doctoral programs;
- meeting the needs of the labor market for qualified mid-level specialists with instrumental knowledge;
- reducing the deficit of insufficiency of professional competencies "at a rapid pace";
- reducing the unemployment rate among young people on the basis of accelerated vocational training.

Main consumers/users of the program results:
- Ministry of Education and Science of the Republic of Kazakhstan;
- higher educational institutions of the Republic of Kazakhstan, regardless of departmental subordination and form of ownership;
- independent quality assurance agencies;
- researchers are specialists in the field of pedagogy and education management.

5. The maximum amount of the program is 450,000 thousand tenge, including by year:
for 2022 - **50,000 thousand** tenge; for 2023 – **200,000 thousand** tenge; for 2024 – **200,000 thousand** tenge.

Technical task No. 46
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Research in the field of education and science

1.2. The name of the specialized direction of the program:

Fundamental, applied, interdisciplinary studies of the problems of education, science, culture and sports in the XXI century:

The study of current problems in the field of education and linguistics

2. Goals and objectives of the program

2.1. The purpose of the program:

In accordance with modern trends in the development of inclusive education in the Republic of Kazakhstan, to develop directions, content, methods, technologies and educational and methodological support for the

modernized process of training special teachers at the university with their reorientation to future work in inclusive organizations

2.2. To achieve this goal, the following tasks must be solved:

1. Analysis of the provision of inclusive organizations of preschool and secondary education with specialists in special pedagogy.
2. Defining the requirements of inclusive organizations for the training of special teachers.
3. Study of the current state of readiness of special teachers to work in inclusive education.
4. Study of foreign experience of training of special teachers.
5. Analysis of the inclusive-oriented component in educational programs implemented by Kazakh universities in special pedagogy in various areas (specializations).
6. Development of scientific foundations for improving inclusive-oriented training of special teachers at the university.
7. Theoretical substantiation and development of a model of a specialist in special pedagogy with a description of inclusively oriented competencies.
8. Theoretical substantiation of the development of content and technology of inclusive-oriented training of special teachers at the university.
9. Development of educational and methodological support for the modernized process of training special teachers at the university with its reorientation to future work in inclusive organizations.
10. Formation of proposals and recommendations for the modernization of the process of training special teachers at the university with its reorientation to future work in inclusive organizations.

3. Which points of strategic and program documents are solved:

1 The UN Sustainable Development Goals (SDGs), which Kazakhstan joined in September 2015: 4 The goal is to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

2 The UN Convention on the Rights of Persons with Disabilities, ratified by the Republic of Kazakhstan on February 20, 2015, Article 24, paragraphs 3 and 4: taking appropriate measures to recruit teachers who speak sign language and/or Braille; using suitable reinforcing and alternative methods, methods and formats of communication, teaching methods and materials to support disabled people, obtaining the necessary support for disabled people within the general education system to facilitate their effective learning.

3. Strategy "Kazakhstan-2050": a new political course of the established state", strategic direction: development of human capital. The task of the formation of the Kazakh people as a highly educated nation in order to become a competitive developed country. Knowledge and professional skills should become "key landmarks of the modern system of education, training and retraining of personnel"

4conception of lifelong learning (continuing education), approved by the Decree of the Government of the Republic of Kazakhstan dated July 8, 2021 No. 471:Professional staff is considered as the key to the successful operation of the organization; maintaining the compliance of the professional level of employees with dynamically increasing qualification requirements becomes one of the tasks of the employer.

5. The concept of social development of the Republic of Kazakhstan until 2030, approved by the Decree of the Government of the Republic of Kazakhstan dated April 24, 2014 No. 396, priorities: 1. Development of education as a platform for the prosperity of society; 4. Inclusive society by creating favorable conditions for all vulnerable groups.

6. The State Program for the development of Education and Science of the Republic of Kazakhstan for 2020 - 2025, approved. Resolution of the Government of the Republic of Kazakhstan dated December 27, 2019 No. 988, section 3: "the shortage of specialists for psychological and pedagogical support of children in an inclusive environment, which is 64%." Priorities; section 5.Development of the personnel potential of the education and science system.

7. Program article of the First President of Kazakhstan N.A. Nazarbayev "Social modernization of Kazakhstan: twenty steps to a society of universal labor": the need to give impetus to all work on the creation of a national qualifications system, which will be a "road map" or "professional elevator" for each type of professional activity.

8. Address of the Head of State Kassym-Jomartokayev to the people of Kazakhstan "Unity of the people and systemic reforms - a solid foundation for the prosperity of the country" (September 1, 2021): Priority IV.Quality education. The task of the relevant ministry is to ensure the improvement of the quality of higher

education. Universities are obliged to be responsible for the proper training of personnel.

4. Expected results

4.1 Direct results:

1. 1. New solutions to modernize the process of traditional training of special teachers at the university with a reorientation to future work in inclusive organizations.

2. Sociological research to determine the requirements of inclusive organizations for the training of special teachers.

3. Analysis of the provision of inclusive organizations of preschool and secondary education with specialists in special pedagogy.

4. Analysis of the current state of readiness of special teachers to work in inclusive education.

5. Analysis of foreign experience in training special teachers.

6. Definition of modern requirements for inclusive-oriented training of special teachers at the university.

7. Analysis of educational programs implemented by Kazakhstani specialists in special pedagogy in various areas (specializations) of inclusive-oriented training of specialists.

8. A model of a specialist in special pedagogy with a description of inclusive-oriented competencies.

9. Scientific foundations for the development of the content and technology of inclusive-oriented training of special teachers at the university.

10. Development of the draft of the previously missing normative document “Cards of the profession “Special teacher” as an appendix to the professional standard “Teacher”.

11. Educational and methodological support of the modernized process of training special teachers at the university with its reorientation to future work in inclusive organizations (monographs and textbooks).

12. Methods of advanced training of university teaching staff on the implementation of the model of inclusive-oriented training of special teachers.

13. Dissemination of the results of the work among potential users, the community of scientists and the general public should be carried out at advanced training courses, participation with reports and publications at seminars and conferences, etc.

14. Obtaining author's certificates for the developed educational and methodological materials.

15. Publication of at least 2 (two) articles and (or) reviews in peer-reviewed scientific publications included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor and (or) indexed in the Arts and Humanities Citation Index of the Web of Science database, and (or) having a percentile by CiteScore there are at least 35 (thirty-five) in the Scopus database.

16. Publication of at least 10 articles in peer-reviewed foreign and (or) domestic publications with a non-zero impact factor (recommended by CQAES).

17. Conducting round tables (webinars).

4.2 The end result:

The results of the program should contribute to the implementation of strategic documents of Kazakhstan on the modernization of higher and postgraduate education.

Inclusive-oriented training of specialists in special pedagogy in higher education institutions should enable organizations of preschool and secondary education to develop work on the education and upbringing of persons with special educational needs, increase the efficiency of the work of special teachers on the organization of psychological and pedagogical support of children with special educational needs, and, thereby, should allow to achieve the intended goals for the implementation of the policy of inclusive education.

The training of special teachers to work in inclusive education should contribute to the solution of an important social task – the creation of a pedagogical environment adapted to the educational needs of any child, the consolidation of a social community, the organization of a multidisciplinary team of specialists in psychological and pedagogical support of children with special educational needs and the creation of resource centers with the participation of special teachers as a methodological resource for inclusive practice.

In the course of the research, modular educational programs in the direction of “Special Pedagogy” for universities, training, retraining, advanced training of teaching staff, resource support for the preparation

of special teachers for inclusive education should be developed and tested. The developed organizational, educational and program-methodical materials, structure, content, methods and technologies of inclusive-oriented training of special teachers can be effectively applied in the system of university and postgraduate training, as well as for retraining and advanced training of special teachers. Modernization of the content and methods of training, retraining, advanced training of special teachers will increase the effectiveness of their work in inclusive education by forming their readiness for interdisciplinary interaction and coordination of psychological and pedagogical support of a child with special educational needs, the use of skills for the development and implementation of an individual educational program, counseling teachers and parents, thereby increasing the effectiveness of the inclusion of children with special educational needs in the educational process and increasing the effectiveness of inclusive education.

5. The maximum amount of the program is 250,000 thousand tenge, including by year:
2022 – **50,000 thousand** tenge; 2023 – **100,000 thousand** tenge; 2024 – **100,000 thousand** tenge.

Technical task No. 47
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Sustainable development of the agro-industrial complex and safety of agricultural products.

1.2. The name of the specialized direction of the program:

Processing and storage of agricultural products and raw materials.

2. Goals and objectives of the program

2.1. The purpose of the program:

Complex waste-free processing of agricultural raw materials of animal and vegetable origin

2.2. To achieve this goal, the following tasks must be solved:

- Development of technologies for the collection, primary processing and storage of agricultural products: meat, milk, offal, intestinal and fatty raw materials for the development of the domestic market of food products of the Republic of Kazakhstan with the possibility of exporting products to the world market;
- Research of qualitative indicators and food safety of agricultural raw materials of animal and vegetable origin for the production of new environmentally friendly food and natural dietary products of high quality without dyes and preservatives;
- Development of technology for processing secondary raw materials of slaughter of farm animals directly at the slaughter sites;
- Development of technology for cutting animal carcasses, packing cuts for convenience of cooling and further transportation for processing;
- Development of technology of new affordable meat, meat-growing and dairy environmentally friendly food products from local raw materials, in order to reduce the growth of morbidity, strengthen human health, increase social and professional activity of the population;
- Development of a comprehensive technology for processing secondary dairy raw materials (whey and buttermilk) with the development of innovative food products of increased biological value in accordance with the principles of food combinatorics and nutritionology;
- Development of the formulation and technology of whole-meat and ham meat products using methods of mechanical processing and biologically active preparations (brines, emulsions and a complex of components of substances);
-Study of structural-mechanical, biochemical and physico-chemical parameters of raw meat with initial low quality indicators (beef, horse meat, camel meat);
- Development of technology for the rational use of secondary meat and dairy raw materials for the production of new therapeutic and preventive nutrition products with increased biological value, created on the basis of natural food raw materials, enriched with vitamins, trace elements, and especially natural additives based on vegetable raw materials, without the use of synthetic food additives.

-Substantiation of the choice of microbiological consortium (autoprobiotics, heteroprobiotics, complex probiotics), which can be used in the development of new domestic dairy products;
- Development of a recipe for natural canned vegetables based on corn varieties grown in the regions of the Republic of Kazakhstan;
- Development of technology for the rational use of corn for the production of new canned products.

3. Which points of strategic and program documents are solved:

National project for the development of the agro-industrial complex of the Republic of Kazakhstan for 2021-2025:

Task 2. Provision of basic food products of domestic production

Indicator 1. Provision of food products (including socially significant ones) at the level of 80%.

Message of the Head of State dated March 16, 2022

- item 1. Ensuring food security of the country

-Law of the Republic of Kazakhstan dated February 18, 2011 No. 407-IV "On Science";

-The State Program for the Development of Education and Science of the Republic of Kazakhstan for 2020 - 2025 (3.1 The implementation of the objectives of the Program solves the issues specified in Increasing the contribution of science to the socio-economic development of the country, 5.2.1. "Strengthen the intellectual potential of science" and 5.2.3. "Increase the effectiveness of scientific research and ensure integration into the world scientific space").

The State program of industrial and innovative development of the Republic of Kazakhstan for 2020-2025. Action plan for the implementation of the SPIID of the Republic of Kazakhstan for 2020 – 2025. Task 4

4. Expected results

4.1 Direct results:

As a result of the implementation of the program , the following should be obtained:
- development of new technologies for waste-free processing of farm animal slaughter products;
- expansion of the production of therapeutic and preventive and dietary food products by 5% for the development of the domestic market of food products of the republic.
- development of a system for collecting and primary processing on–site agricultural raw materials - meat, milk, offal, intestinal raw materials, etc.;
- theoretical and practical substantiation of a complex technology for processing secondary dairy raw materials (whey, buttermilk) with the development of innovative food products of increased biological value in accordance with the principles of food combinatorics and nutritionology;
- determination of technological parameters that increase the quality of meat raw materials with initial low quality indicators (beef, horse meat, camel meat)when using intensive processing methods;
- theoretical and experimental substantiation of the selection and composition of biologically active preparations (brines, emulsions and complex components of substances), including multicomponent brines, natural functional plant ingredients that positively affect the quality of meat raw materials.
- theoretical and experimental substantiation of the selection and composition of microbiological consortium (autoprobiotics, heteroprobiotics, complex probiotics) that positively affect the quality indicators of dairy products;
-development of recipes and technology of canned corn and vegetable mixtures based on corn;
- development of technology and 3 formulations of new dietary products based on natural protein enriched with corrective additives based on studies of physico-chemical parameters of prescription components, analysis of organoleptic parameters and nutritional value.
- at least 3 (three) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction

of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty).
- at least 5 (five) articles in journals recommended by CQAES.
- obtaining 3 patents for a utility model of the Republic of Kazakhstan.

4.2 The end result:

The end result:

The results of the scientific program should contribute to deeper waste-free processing of agricultural products of animal husbandry and crop production. The developed technologies should allow for a more rational use of significant resources of secondary raw materials of animal slaughter for the production of full-fledged food products. Secondary products of animal slaughter at a cost lower than the main raw material – meat by 30-50%, this should make it possible to obtain meat products with low cost, but with high nutritional value and therapeutic and preventive properties.

Rational use of secondary meat and milk processing resources should also have an environmental effect, i.e. reduction and recycling of waste, environmental protection by reducing pollutants from production.

The production of organic products in crop production, the rational use of plant proteins and biologically active preparations based on them should create the technology of new food products of the therapeutic and preventive direction. Improving the structure of nutrition and increasing the nutritional and biological value of basic foodstuffs should ultimately lead to an improvement in the health of the population, an increase in the average life expectancy of the population and an increase in the welfare of the people.

5. The maximum amount of the program is 250,000 thousand tenge, including for 2022 - **50,000 thousand** tenge, for 2023 – **100,000 thousand** tenge, for 2024 – **100,000 thousand** tenge.

Technical task No. 48
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Research in the field of social sciences and humanities

1.2. The name of the specialized direction of the program:

Actual problems of social modernization: demography, migration, quality of human resources, quality of life and social inequality, problems of employment and unemployment, scientific organization, rationing and labor safety

2. Goals and objectives of the program

2.1. The purpose of the program:

A comprehensive interdisciplinary study of the problems of child autism in the Republic of Kazakhstan and the development of recommendations that have theoretical and practical significance for the implementation of psychological, medical and social assistance and the integration of children into the social and educational environment

2.2. To achieve this goal, the following tasks must be solved:

– conducting a sociological study of the causes, risk factors, problems of child autism in the Republic of Kazakhstan and assessing the state policy towards children with disabilities:

- analysis and evaluation of specific problems of children with autism requiring resolution;
- - analysis of the formation of an individual rehabilitation program for the development of a child with childhood autism;
- analysis of the current model of comprehensive support for a child with autism spectrum disorder in an educational complex;
-analysis of the role of comprehensive psychological and pedagogical support and special assistance to children with autism in the consistent development of a more complex and dynamic educational environment;
--study of recommendations, rehabilitation programs and technologies of various national and foreign experts (psychiatrists, neuropsychologists and rehabilitologists) in the field of development of compensatory abilities of

children with autism;
- study, amendments and/or additions to the current legislation through the preparation of proposals to improve the system of social support for children with autism and their families at a comprehensive level.
– organization of medical, social and pedagogical support in the field of integrated technology and culture of support and assistance to children and teachers in solving problems of development, education, upbringing, socialization, formation of a tolerant attitude towards children with autism:
– organization of social and pedagogical support aimed at mastering, transferring and consolidating vital skills and abilities of children with autism;
- development of a complex of rehabilitation measures aimed at overcoming problems and difficulties in the development of speech and communication;
– drug correction with individual selection of drugs in the presence of indications in order to improve social adaptation and reduce disability of children;
-preparation of a rehabilitation program of an interdisciplinary and complex nature and psychological support for a family with a child with ASD;
-creation of organizational and pedagogical conditions for the education and upbringing of children with autism spectrum disorders (ASD).
– development of proposals and implementation of social programs to improve the provision of legal, organizational, psychological, pedagogical, medical and other assistance to children with special needs, disabled children, children with autism and their families:

- creation of resource and information and consulting centers on the rights, employment and social adaptation of people with autism;

- promotion of systemic reforms in the Republic of Kazakhstan to improve the lives of people with autism;

- development of recommendations and guidelines for improving the living conditions of children and adults with neuropsychic diagnoses – autism, Down syndrome, cerebral palsy, etc. with the involvement of domestic and foreign experts in the industry.

3. Which points of strategic and program documents are solved:
1. The Constitution of the Republic of Kazakhstan (with amendments and additions as of 08.06.2022). Article 12, paragraph 2. Human rights and freedoms belong to everyone from birth, are recognized as absolute and inalienable, determine the content and application of laws and other regulatory legal acts.
Article 14, paragraph 2. No one may be subjected to any discrimination based on origin, social, official and property status, gender, race, nationality, language, attitude to religion, beliefs, place of residence or any other circumstances.
2. Message "Strategy "Kazakhstan-2050": A new political course of the established state" (Astana, December 14, 2012): The industry has an important task set by the Strategy "Kazakhstan-2050" to provide every citizen with high–quality medical care as part of the implementation of priority 3. New principles of social policy - social guarantees and personal responsibility. – Principle 4, 4.1 key priorities in the field of health. And also according to the Strategy "Kazakhstan-2050", it is necessary to achieve the quality and safety of medical care by standardizing all production processes in medical organizations. It is required to develop and improve clinical protocols, standards of specialized services based on the introduction of the most effective and modern technologies and achievements of medical science.
3. Message "New development opportunities in the context of the Fourth Industrial Revolution" dated January 10, 2018. The seventh task. Human capital is the basis of modernization. A new quality of education.
4. Decree of the President of the Republic of Kazakhstan dated February 15, 2018 No. 636 "On approval of the Strategic Development Plan of the Republic of Kazakhstan until 2025 and invalidation of certain Decrees of the President of the Republic of Kazakhstan" (as amended on 09/10/2019): Reform 1. New human capital, Priority "Education as the basis of economic growth"; Reform 2. Technological renewal and digitalization, The task "Development of the system of scientific research"; Reform 4. A rule-of-law state without corruption, Priority "Improving legislation and ensuring conditions for compliance with laws", Task "Improving mechanisms for protecting human rights and freedoms and property rights".

5. Resolution of the Government of the Republic of Kazakhstan dated December 27, 2019 No. 988 “On approval of the State Program for the Development of Education and Science of the Republic of Kazakhstan for 2020 – 2025”: Goal 1. To increase the global competitiveness of Kazakhstan's education and science, education and training of the individual on the basis of universal values.
6. Law of the Republic of Kazakhstan dated July 27, 2007 No. 319-III “On Education” (with amendments and additions as of 03.05.2022). Article 14, p 1-1. The State creates conditions for persons (children) with special educational needs for their self-improvement, lifelong learning at all levels education, free development of their abilities, including the right to choose the form of education within the limits provided by the education system, taking into account their individual development characteristics.
7 Roadmap for improving the provision of comprehensive assistance to children with disabilities in the Republic of Kazakhstan for 2021-2023 Decree of the Prime Minister of the Republic of Kazakhstan dated August 17, 2020 No. 2020
8. Law of the Republic of Kazakhstan dated August 8, 2002 No. 345-II “On the rights of the child in the Republic of Kazakhstan” (with amendments and additions as of 07.07.2020).
9. Code of the Republic of Kazakhstan dated July 7, 2020 No. 360-VI “On the health of the people and the healthcare system”.
10. Message of the President of the Republic of Kazakhstan to the People of Kazakhstan dated September 1, 2020. Task VI. Development of the healthcare system.
11. Law of the Republic of Kazakhstan On Social and medical-pedagogical correctional support for children with Disabilities dated July 11, 2002 N 343.
12. Law of the Republic of Kazakhstan dated April 13, 2005 N 39 “On Social protection of disabled people in the Republic of Kazakhstan”.

4. Expected results

4.1 Direct results:

1. development of recommendations and guidelines for creating living conditions for children with special developmental needs;
2. development and implementation of a rehabilitation program for children with psychosocial disabilities;
3. improvement of approaches and introduction of new technologies in this direction in accordance with international standards;
4. introduction of screening methods, training of specialists, including primary health care and increasing the availability of psychological, medical and social care;
5. improvement of the organization of assistance aimed at socialization and education, empowerment of children with autism;
6. organization of continuous step-by-step psychological and pedagogical support of the child and his family;
7. organizing and conducting an information campaign to educate the population, form a tolerant attitude towards children with special developmental needs;
8. preparation of proposals for improving legislation concerning children with special developmental needs;
9. social adaptation and rehabilitation of children with autism, improving the quality of life of their parents and loved ones;
10. Conducting a national study on the situation of children with autism in Kazakhstan (a sociological study);

Publications based on the results of scientific research:

- Publication of the 1st monograph and 3 manuals, 5 recommendations;
- Development of 2 information web-systems;
- 4 copyright certificates for intellectual property;
- at least 3 (three) articles and (or) reviews in peer-reviewed scientific publications included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor and (or) indexed in the Arts and Humanities Citation Index of the Web of Science database, and (or) having a percentile by CiteScore there are at least 35 (thirty-five) in the Scopus database;
- 10 articles in scientific journals included in the CQAES list.

4.2 The end result:

Scientific effect: should consist in improving the organization of assistance aimed at socialization and education, empowering children with disabilities and supporting their families to accelerate the cycle time

from diagnosis to improvement of symptoms, in creating an information channel to help improve the quality of life of children suffering from various ailments and improve the quality of life of their loved ones.
Early diagnosis and intervention, the study of the unique needs of each child and the necessary psychological, medical and social support for children and their families can significantly improve the symptoms of some diseases and even reduce them to "no".
Socio-economic effect: The program should be aimed at improving the competence of parents in the upbringing and development of children with ASD and other mental disorders. Mastering the necessary knowledge by parents for conflict-free communication with children, continuing rehabilitation at home should improve the quality of life of children of the target group, their maximum socialization and allow them to correct socially unacceptable behaviors; contribute to the formation of communication skills.
Target consumers of the results obtained:
Children and adults with autism are their parents and loved ones. Society. Regional NGOs and public associations working on the topic of children with disabilities.
Representatives of correctional offices; teachers and specialists (working with autistic and disabled children), Public Association of Parents of Children with Autism.

5. The maximum amount of the program is 250,000 thousand tenge, including: for 2022 – **50,000 thousand** tenge, for 2023 – **100,000** thousand tenge; for 2024 – **100,000** thousand tenge.

Technical task No. 49
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Research in the field of social sciences and humanities

1.2. Name of the specialized direction of the program:

Structural and technological modernization and sustainable spatial development of the economy and society

2. Goals and objectives of the program

2.1. The purpose of the program:

A comprehensive study of the remaining potential of single-industry towns, the development of a strategy for the revival of single-industry towns, their social, economic, technological, environmental modernization in the conditions of the creation of a New Kazakhstan and the justification of the mechanisms of its implementation.

2.2. To achieve this goal, the following tasks must be solved:

– Research of theoretical and methodological foundations of the development of single-industry towns and assessment of their potential:

- research of conceptual approaches to the revival of single-industry towns;
- research of approaches and methods to assess the development potentials of single-industry towns and the features of regional specialization and economic profile of single-industry towns of Kazakhstan

- Analysis and evaluation of economic, entrepreneurial, social, demographic, labor, environmental, technological, infrastructural, intellectual, etc. potentials for the development of single-industry towns in Kazakhstan:

- research and assessment of poverty, the level and quality of life of the population of single-industry towns;
- assessment of the state of city-forming enterprises that provide employment in single-industry towns;
- analysis of key trends and identification of the specifics of the formation and development of employment and the labor market in single-industry towns of industrial and raw materials type;
- analysis and assessment of demographic trends and conditions of demographic stability of single-

industry towns;

- assessment of entrepreneurial, environmental, technological, infrastructural and intellectual development potentials of single-industry towns in Kazakhstan

– Substantiation of promising directions and mechanisms for the formation of an effective territorial structure of their economy, focused on improving the welfare of the population, and mechanisms for the implementation of social, economic, technological, environmental modernization of single-industry towns in the conditions of the creation of a New Kazakhstan:

- development and modeling of forecast scenarios for changes in the structure of the economy of single-industry towns, research of prerequisites and potential opportunities for diversification and growth of competitiveness of the economy of single-industry towns, development of strategic priorities and mechanisms to stimulate their implementation;
- development of financial mechanisms for the implementation of the Strategy for the Revival of single-industry towns;
- development of a Strategy for the revival and modernization of single-industry towns of New Kazakhstan for single-industry towns of industrial and raw materials type

3. Which points of strategic and program documents are solved:

- Strategy “Kazakhstan-2050”;
- The State program of Regional Development for 2020 - 2025 (Tasks: 3. Development of single-industry towns with a population of more than 50 thousand people that are not part of functional urban areas; 4. Development of border mono- and small towns with adjacent territories);
- National project “Strong regions - the driver of the country's development”;
- National project “Quality and affordable healthcare for every citizen “Healthy Nation”;
- National project “Quality Education “Educated Nation”;
- National project “Technological Breakthrough through digitalization, science and innovation”;
- Address of the Head of State to the People of Kazakhstan dated September 1, 2021 “Unity of the people and systemic reforms are a solid foundation for the prosperity of the country”;
- Address of the Head of State to the People of Kazakhstan dated September 1, 2020 “Kazakhstan in a new reality: time for action”;
- Speech by the Head of State in November 2021 at a meeting on the development of single-industry towns in Ekibastuz

4. Expected results

4.1 Direct results:

According to the results of the program , the following should be obtained:

- New knowledge about conceptual approaches and strategies for the development of single-industry towns;
- Methodology for assessing the potential (economic, entrepreneurial, social, demographic, labor, environmental, technological, infrastructural, etc.) of the development of single-industry towns and corresponding calculations;
- Methodology for assessing the specialization and economic profile of single-industry towns in Kazakhstan and corresponding calculations;
- New knowledge about the typology of single-industry towns, a risk map of sustainable development of single-industry towns;
- Methodology for assessing demographic trends and conditions of demographic stability of single-industry towns and corresponding calculations;
- Identification and evaluation of key trends and specifics of the formation of the labor market and the development of employment in single-industry towns of industrial and raw materials type;
- Methodology for assessing poverty, the level and quality of life of the population of single-industry towns, and corresponding calculations;
- Methodology for assessing the state of city-forming enterprises that provide employment in single-

industry towns, and corresponding calculations;
- Forecast scenarios of changes in the structure of the economy of single-industry towns;
- New knowledge about the prerequisites and potential opportunities for diversification and growth of competitiveness of the economy of single-industry towns;
- Evidence-based recommendations on the development of strategic priorities and mechanisms to stimulate their implementation;
- Scientifically-based recommendations on the development of promising directions and mechanisms for the formation of an effective territorial structure of their economy, focused on improving the welfare of the population, and mechanisms for the implementation of social, economic, technological, environmental modernization in the conditions of the creation of a New Kazakhstan;
- Scientifically-based recommendations on the formation of financial mechanisms for the implementation of the Strategy for the Revival of single-industry towns;
- Strategy of revival and modernization of single-industry towns of New Kazakhstan for single-industry towns of industrial and raw materials type.
- at least 3 articles and reviews in peer-reviewed scientific publications Web of Science (Q1, Q2, Q3) or publications in the Citescore database in the Scopus database (Q1, Q2, Q3), including at least 3 with a percentile of 35 and above;
- at least 10 articles in peer-reviewed foreign or domestic publications with a non-zero impact factor (recommended by CQAES MES RK);
- scientific reports;
- copyright certificates

4.2 The end result:

As a result of the implementation of this Program, new knowledge, methods, forecast scenarios, recommendations for the revival of single-industry towns, their social, economic, technological, environmental modernization in the conditions of the creation of a New Kazakhstan and justification of the mechanisms for its implementation should be developed.

Economic effect. The results of the program should contribute to the implementation of economic, entrepreneurial, demographic, labor, environmental, technological, infrastructural, etc. development potentials of single-industry towns due to recommendations and developed mechanisms for the implementation of the strategy of revival and modernization of single-industry towns of New Kazakhstan.

Environmental effect. The use of the obtained research results should ensure the implementation of recommendations for the sustainable development of single-industry towns.

The social effect of the program should be ensured through the developed recommendations to improve the demographic situation, increase the welfare of the population of single-industry towns, reduce poverty and improve the standard and quality of life, proposals to improve the educational level of the population and increase its competencies, the formation of a stable labor market taking into account the emergence of new professions and competencies.

The target consumers of the results obtained are the Economic Security Council of the Republic of Kazakhstan, the Administration of the President of the Republic of Kazakhstan, the Parliament of the Republic of Kazakhstan, central and local executive state bodies, the Chamber of Entrepreneurs "Atameken", the Entrepreneurship Development Fund "Damu"

5. The maximum amount of the program is 300,000 thousand tenge, including by year: for 2022 – **60,000** thousand tenge, for 2023 – **120,000** thousand tenge, for 2024 – **120**,**000** thousand tenge.

Technical task No. 50
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Research in the field of social sciences and humanities

1.2. Name of the specialized direction of the program:
Actual problems of social modernization: demography, migration, quality of human resources, quality of life and social inequality, problems of employment and unemployment, scientific organization, rationing and labor safety

2. Goals and objectives of the program
2.1. The purpose of the program:

To develop a program for the resettlement of Kandas and internally displaced persons (migrants) and to determine the level of their integration and adaptation in Kazakh society

2.2. To achieve this goal, the following tasks must be solved:
- to conduct a comparative analysis of international and Kazakh experience on ethnic repatriation and internal migration policy;
- to determine the role of population migration in the demographic development of Kazakhstan;
- to determine the main features, intensity and direction of ethnic migration in Kazakhstan;
- to determine the degree of settlement, the level of adaptation and integration among immigrants and ethnic repatriates in the regions of Kazakhstan;
- to identify problematic issues in integration and adaptation among ethnic repatriates in Kazakhstan by the length of stay in Kazakhstan and the countries of departure and among internally displaced persons;
- to assess the risks and threats of the level of adaptation and integration in the places of settlement of external and internal migrants for the migration security of the country and on its basis to develop a program for the resettlement of ethnic repatriates and internally displaced persons of the country;
- to investigate the causes of internal migration of ethnic repatriates after moving to their historical homeland based on a sociological survey (at least 6000 respondents);
- to determine the social and economic effect of the resettlement of ethnic repatriates (Kandas) and internally displaced persons;
- to identify the influence of socio-economic, political and other factors on ethnic migration processes;
- to determine the factors of intercultural relations between ethnic repatriates and the local population (ethnic groups that make up more than 1% of the total population, and ethnic groups living compactly) in all regions of Kazakhstan;
- to develop methodological approaches/recommendations for the intercultural interaction of ethnic repatriates and the local population;
- to make recommendations on solving problems in the integration of repatriates and the search for new methods for managing cultural diversity and resources brought by the immigration of ethnic repatriates in the regions of Kazakhstan for CSOs and LEB

3. Which points of strategic and program documents are solved:

- Strategy “Kazakhstan-2050”, where the global demographic imbalance is indicated among the ten global challenges of the XXI century;

- National Development Plan of the Republic of Kazakhstan until 2025. National priority 10. Balanced territorial development. Task 1. Territorial integrity and spatial development of the country.

- The concept of migration policy for 2022-2026;

- National project “Strong regions - the driver of the country's development” for 2021-2025. Direction I. Equal access to basic services;

- The Message of the President of the Republic of Kazakhstan “Unity of the people and systemic reforms are a solid foundation for the prosperity of the country”. Item VII. Consolidation as the main factor of further progress;

- The Doctrine of National Unity, which proclaims the following principles of National Unity of Kazakhstan:

I. “One Country — One Destiny”; II. “Different Origins — Equal Opportunities”; III. “Development of the National Spirit”;

- The concept of development of the Assembly of People of Kazakhstan (until 2025), where one of the tasks is the introduction of new formats of interaction between the state and ethno-cultural and other public associations to strengthen social harmony and national unity

4. Expected results

4.1 Direct results:

1. formation of new conceptual knowledge about the level of study of migration processes and the relationship of migration processes and the development of interculturalism among the ethnic groups of Kazakhstan;
2. determination of the main features, intensity and direction of ethnic migration in Kazakhstan and their role in the demographic development of Kazakhstan;
3. determination of the level of adaptation and integration of migrants in the regions of Kazakhstan and the degree of settlement among migrants and ethnic repatriates in the regions of Kazakhstan;
4. assessment of risks and threats to adaptation and integration in the places of settlement of external and internal migrants for the migration security of the country;
5. Development of a resettlement program for ethnic repatriates and internally displaced persons of Kazakhstan;
6. determination of the social and economic effect of the resettlement of ethnic repatriates (Kandas) and internally displaced persons;
7. formation of an algorithm and mechanisms for the speedy adaptation of migrants in their places of residence, taking into account the development of interculturalism;
8. Making recommendations to solve problems in the integration of returnees and the search for new methods to manage cultural diversity and resources brought by the immigration of ethnic returnees in the regions of Kazakhstan for CSOs and LEB.

Implementation of research results:

• 2 monographs;
• two methodological manuals;
• at least 4 articles in peer-reviewed foreign scientific publications indexed in the Web of Science databases (with a non-zero impact factor) or included in the Social Science Citation Index or Arts and Humanities Citation Index, and (or) having a CiteScore percentile in the Scopus database of at least 35;
• * at least 15 articles in journals included in the list of CQAES of the MES RK

4.2 The end result:

Scientific and technical effect: the implementation of the program should contribute to the effective implementation of intellectual, analytical and methodological support for the development and successful implementation of policies in the field of interethnic relations and population migration in the Republic of Kazakhstan, taking into account regional peculiarities, which should have economic, scientific, methodological and political effects.

Scientific and methodological effect: comprehensive knowledge of modern global challenges in the development of population migration, the development of interculturalism and interethnic relations of ethnic groups. Comprehensive diagnostics of the scale and intensity of migration processes in the country.

Socio-economic effect: the acquired knowledge should contribute to the development within the relevant structures (ministries, departments, akimats) of effective measures to raise the standard of living, social mobility, income, employment, and the potential of promising areas of economic development. Recommendations for improving the policy in the field of population migration and interethnic relations.

Political effect: The knowledge gained within the relevant structures (Senate and Majilis of the Republic of Kazakhstan, ministries, departments, akimats, public councils) should contribute to the improvement of migration legislation, existing regulatory documents in accordance with the Sustainable Development Goals; the development of effective measures to maintain political stability, conduct political modernization, and improve the efficiency of public administration.

Target consumers of the results obtained:

the Administration of the President of the Republic of Kazakhstan, central state bodies, local executive

authorities, civil society.
5. The maximum amount of the program is 250,000 thousand tenge, including by year: for **2022** – **50, 000 thousand** tenge, for **2023** – **100,000 thousand** tenge, for **2024** – **100,000 thousand** tenge

Technical task No. 51
for research work
within the framework of program-targeted financing

General information: **1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)** Research in the field of social sciences and humanities **1.2. The name of the specialized direction of the program:** Actual problems of social modernization: demography, migration, quality of human resources, quality of life and social inequality, problems of employment and unemployment, scientific organization, rationing and labor safety
2. Goals and objectives of the program **2.1. The purpose of the program:** Improving the mechanism of targeted social assistance to socially vulnerable segments of the population in the Republic of Kazakhstan on the basis of a proactive approach.
2.2. To achieve this goal, the following tasks must be solved: - theoretical and methodological review and analysis of the mechanism of targeted social assistance to the population and the application of a proactive approach to the provision of public social services; - comparative analysis of the mechanism of targeted social assistance to the population operating in Kazakhstan with the identification of the premises for the introduction of a proactive approach; - conducting an international review of the application of proactive mechanisms of targeted social assistance to the population on the example of the experience of developed countries; - identification of the characteristic features of a proactive approach to providing targeted social assistance to socially vulnerable segments of the population and practical application conditions that ensure the effectiveness of public services; - development of a theoretical model of proactive targeted social assistance to socially vulnerable segments of the population; - preparation of recommendations on the implementation of a proactive mechanism of targeted social assistance to socially vulnerable segments of the population in Kazakhstan. During the implementation of the program, it is necessary to develop a training module, a curriculum and materials on the use of a proactive mechanism for targeted social assistance to socially vulnerable segments of the population in Kazakhstan; to hold a round table with the participation of at least 10 representatives of interested state bodies and other persons, with a presentation and discussion of prepared materials on the results of the tasks set in Nur-Sultan
3. Which points of strategic and program documents are solved: - The strategy "Kazakhstan-2050", according to priority direction 3. New principles of social policy – social guarantees and personal responsibility, provides that the state should provide social support only to those groups that need it; - The National Development Plan of the Republic of Kazakhstan until 2025, task 2 ensuring social well-being within the framework of the Program, measures should be worked out to transition from the declarative form of providing social services to the revealing one in order to expand the coverage of services for people in difficult life situations; - The state program "Digital Kazakhstan", digital transformation leads to the emergence of new business models, including the so-called proactive data-based service
4. Expected results **4.1 Direct results: According to the results of the program , the following should be obtained:** – **at least 3 (three) scientific developments** in the social sphere, including a theoretical model of proactive

targeted social assistance to socially vulnerable segments of the population of Kazakhstan; criteria for the allocation of categories of population to provide targeted social assistance to the population and the use of a proactive approach; recommendations for the introduction of a proactive mechanism of targeted social assistance to socially vulnerable segments of the population in Kazakhstan;

– **at least 3 (three) published scientific publications** in peer-reviewed foreign scientific publications indexed in the Web of Science or Scopus databases with a non-zero impact factor, as well as at least 10 (ten) publications in peer-reviewed foreign and/or domestic scientific publications with a non-zero impact factor. Each article should contain information about the identification registration number and the name of the program under which it is funded, indicating the program-targeted funding as a source.;

– **at least 2 (two) published review scientific papers** published for the introduction of a proactive mechanism of targeted social assistance to socially vulnerable segments of the population of Kazakhstan in the form of monographs, books and (or) chapters in books of foreign and (or) Kazakh publishers;

– **at least 2 (two) security documents** in the field of intellectual property in the form of certificates of copyright registration (scientific work) or registration in the State Register of the Results of Scientific and (or) scientific and technical activities or other security documents;

– **at least 3 (three) scientific documents** in the form of a report on the results of research activities, the conclusion of the state scientific and technical expertise;

– **at least 2 (two) acts of implementation** of scientific results at the national level;

– **at least 10 (ten) reports** on the dissemination of scientific knowledge and results among potential users, the community of scientists and the general public

4.2 The end result:

The results of scientific research on the implementation of the Program should increase the level of social well-being of socially vulnerable segments of the population of Kazakhstan by introducing amendments and additions to the legislative framework and regulatory legal acts regulating the sphere of social protection. Scientific developments should become the basis for improving the state policy in the field of providing social benefits to the population in accordance with modern conditions in the field of providing social assistance to the population.

Economic effect. The scientific results should ensure a wider coverage of low-income citizens, reduce barriers and increase the availability of targeted social assistance to the population through the use of a proactive approach to providing targeted social assistance to socially vulnerable segments of the population of Kazakhstan, which ultimately will ensure high efficiency of financing social protection expenditures and reduce poverty in Kazakhstan.

Environmental effect. Scientific results should ensure the creation of conditions for balanced growth and social well-being of the population in accordance with the principles of the green economy in Kazakhstan.

Social effect. Scientific results have a great social demand, socio-economic interest and should have a positive impact on the development of social relations between the state and citizens in the field of social support of the population. The program should offer a proactive mechanism of targeted social assistance to socially vulnerable groups, link it with the state digital platform. Therefore, its results will have a positive impact on the growth of the share of public services received electronically from the total volume of public services and, in general, will lead to an increase in social protection of socially vulnerable segments of the population in Kazakhstan, a decrease in social tension in society.

The target consumers of the results obtained are state central and local executive bodies, Kazakhstani scientific organizations dealing with the problems of social protection and social security of the population of the Republic of Kazakhstan, universities, project organizations in the field of developing integrated plans for the socio-economic development of Kazakhstan, public organizations, international public organizations, experts in the field of finance of the social sphere of the Republic of Kazakhstan

5. The maximum amount of the program is 170,000 thousand tenge, including: 2022 – **30,000 thousand** tenge; 2023 – **70,000 thousand** tenge; 2024 – **70,000 thousand** tenge

Technical task No. 52

for research work
within the framework of program-targeted financing

1. General information:

1.1 The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Research in the field of social sciences and humanities

1.2 The name of the specialized direction of the program: Fundamental, applied interdisciplinary research in the field of social sciences

2. Goals and objectives of the program

2.1. The purpose of the program:

Development of a model and scientific and methodological justification of the processes of development of public service in the Republic of Kazakhstan on the principles of a hearing, effective, accountable, professional and pragmatic state

2.2 To achieve this goal, the following tasks must be solved:

- to identify the goals, functions, factors and prospects of public service reform in the process of building a New Kazakhstan;
- to develop a methodology for identifying and comparing the number of functions of state bodies, the number of their staff and the level of remuneration;
- collect and analyze data on the development of the civil service using primary and secondary sources in the light of the tasks being implemented;
- interpret the results obtained to determine trends in the construction of a new model of public service;
- to identify trends and problems of public service reform in the Republic of Kazakhstan;
- to analyze the processes of reforming the civil service of Kazakhstan using the tools of applied sociological analysis;
- analyze the effectiveness of social control in the public service system;
- to determine the institutions and forms of social control of society over the implementation of state policy;
- analyze the social status of a civil servant in the New Kazakhstan;
- develop standards for the assessment of knowledge and skills necessary for the performance of official duties, depending on the field and type of professional service activity;
- conducting training seminars to build up the necessary competencies of stakeholders to build a New Kazakhstan;
- experimental verification of the effectiveness of the results of the study

3. Which points of strategic and program documents are solved:

- "National Development Plan of the Republic of Kazakhstan until 2025" Decree of the President of the Republic of Kazakhstan dated February 15, 2018 No. 636;
- "On National priorities of the Republic of Kazakhstan until 2025" Decree of the President of the Republic of Kazakhstan dated February 26, 2021 No. 520;
- "On approval of the Concept of Public Administration development in the Republic of Kazakhstan until 2030" Decree of the President of the Republic of Kazakhstan dated February 26, 2021 No. 522;
- speech of the Head of State at the meeting of the Majilis of the Parliament of the Republic of Kazakhstan "Lessons of "tragic January": unity of society – guarantee of independence" dated January 11, 2022;
- Decree of the President of the Republic of Kazakhstan dated April 13, 2022 No. 872 "On measures to de-bureaucratization of the state apparatus"

4. Expected results

4.1 Direct results:

- development and testing of a methodology for identifying and comparing the number of functions of state bodies, the number of their staff and the level of remuneration;
- conducting a qualitative analysis of the development processes of the civil service of Kazakhstan (sociological survey);
- development and testing of a model for the development of the civil service of New Kazakhstan;

- - development of proposals on measuring the effectiveness of the development of the civil service of the Republic of Kazakhstan;
- development of a standard for the assessment of knowledge and skills necessary for the performance of official duties, depending on the field and type of professional service activity;
- the effectiveness of social control in the public service system in order to comply with the principles of a hearing, effective, accountable, professional and pragmatic state;
- development of criteria for assessing the social status of a civil servant in the New Kazakhstan;
- development of proposals to change the business processes of the provision of public services in order to move from a "bureaucratic" model of the relationship between the state and society to a proactive, service-oriented and responsive to the needs of citizens form of management;
- development of practical recommendations to ensure transparency of the activities of state bodies.

Implementation of research results:

– one monograph; two textbooks; two methodological manuals; one textbook on the development of public service for undergraduates and doctoral students; at least 7 articles in peer-reviewed foreign scientific publications indexed in Web of Science databases (with a non-zero impact factor) or included in the Social Science Citation Index or Arts and Humanities database Citation Index, and (or) having a CiteScore percentile in the Scopus database of at least 35; at least 15 articles in journals included in the list of CQAES of the Ministry of Education and Science of the Republic of Kazakhstan; scientific reports, recommendations for state bodies of the Republic of Kazakhstan, methods.

4.2 The end result:

The implementation of the program should contribute to:

– solving the tasks of de-bureaucratization of the state apparatus, announced in the Decree of the President of the Republic of Kazakhstan dated April 13, 2022 No. 872;
– improving the efficiency of the state apparatus, meeting the principles of the “Hearing State”;
– making a scientific contribution to the implementation of research in the field of public service.

Expected scientific result:

– methodological and expert support of the process of development of the civil service of New Kazakhstan;
– publication of methodological recommendations for improving the efficiency of government agencies.

Socio-economic effect:

- mechanisms of “entry”, “passage” and “exit” from public service should be developed;
- administrative procedures should be simplified, including by reducing the number of documents required for their execution;
- the processes of transition of the state to digital tools of interaction should be activated.

The developed conceptual model of the development of the civil service of the New Kazakhstan, the developed criteria for the social status of a civil servant, the developed mechanisms of “entry”, “passage” and “exit” from the civil service, as well as training seminars, methods of modeling and testing the effectiveness of research results should contribute to improving the efficiency of the civil service of the New Kazakhstan.

Target consumers of the results obtained:

the Administration of the President of the Republic of Kazakhstan, the Agency of the Republic of Kazakhstan for Civil Service Affairs, the expert community, central state and local executive authorities, civil society

5. The maximum amount of the program is 250,000 thousand tenge, including: 2022 – **50,000 thousand** tenge; 2023 – **100,000 thousand** tenge; 2024 – **100,000 thousand** tenge

Technical task No. 53
for research work
within the framework of program-targeted financing

1. General information:

1.1 The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Research in the field of social sciences and humanities

Specialized scientific direction:

Fundamental, applied, interdisciplinary research in the field of humanities:

New humanitarian education. Synergetic and philosophical research in the humanities. Humanitarian informatics

2. Goals and objectives of the program

2.1. The purpose of the program: to develop a culturally representative sub-corpus of an encyclopedic nature, defining the culture and worldview of the Kazakh people, and a subcorpus of advertising texts in the state language, regulating industrial relations based on business communication in Kazakh society

2.2. To achieve this goal, the following tasks must be solved:

In accordance with the purpose of the program, it is planned to solve scientific-theoretical and scientific-practical tasks in 3 blocks:

Block 1. Development of a culturally representative subcorpus:

- collection and disclosure of cultural semantics of ethno-cultural units containing cultural and cognitive information in the semantic composition of the Kazakh language; representative linguistic and cultural information of an encyclopedic nature;
- creation of an illustrative database of ethnocultural units (images, audio, videos, hyperlinks), providing them with multimedia support;
- creation of a database of texts of cultural and cognitive content with a large use of ethno-cultural units.

Block 2. Subcorpus of advertising texts as a linguistic base of copywriting in the state language:

- collecting an extensive database of advertising texts;
- classification of advertising texts depending on the objects requiring advertising (products, goods, organizations, etc.);
- creation of a model in accordance with the types of advertising texts;
- development of meta tags, markup, search engines for advertising texts.

Block 3. IT development

- creation of a database of texts containing voluminous, cultural and cultural information;
- development of a lexicographic database of culture.

3. Which points of strategic and program documents are solved:

The results of the program will provide linguistic support to projects and subprograms for the development and functioning of the state language implemented within the framework of the national project "Technological breakthrough through digitalization, science and innovation" Resolution of the Government of the Republic of Kazakhstan dated October 12, 2021 No. 727 on the implementation of language policy in the Republic of Kazakhstan for 2020-2025, the Development Strategy of the Republic of Kazakhstan until 2050, Program article of the First President of the Republic of Kazakhstan N. Nazarbayev's "A look into the future: modernization of public consciousness", the Messages of the President of the Republic of Kazakhstan to the people of Kazakhstan "Constructive public dialogue is the basis of stability and prosperity of Kazakhstan" (2019), "Kazakhstan in a new reality: time for action" (2020), the program article of the Head of State "Independence is most expensive" dated January 5, 2021 year, "Improving the global competitiveness of Kazakhstan's education and science" (19.12.2019)

4. Expected results

4.1 Direct results:

According to the results of the program , there should be:

- ethnocultural units containing cultural and cognitive information in the semantic composition of the Kazakh language have been accumulated and their cultural semantics revealed; representative linguistic and cultural information of an encyclopedic nature has been given; illustrative databases of ethnocultural units (images, audio, videos, hyperlinks) have been created, multimedia support has been provided; databases of texts consisting of at least 1 million words of cultural-cognitive content, in which ethnocultural units are used a lot; collection of a voluminous database of advertising texts; offer types of strategies/tactics in

accordance with the national consciousness of advertising texts; publication of the collection “markers” in advertising texts; the necessary “advertising model” has been created for objects requiring advertising; development of norms for writing advertising texts, normative instructions on dictionaries, cliches, regular use, corresponding translations have been developed.

Following the results of the implementation of the scientific and (or) scientific and technical program, the following minimum number of publications should be published:

- at least 2 (two) articles and (or) reviews in peer-reviewed scientific publications included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor and (or) indexed in the Arts and Humanities Citation Index of the Web of Science database, and (or) having a percentile by CiteScore there are at least 35 (thirty-five) in the Scopus database;
- at least 10 (ten) articles and (or) reviews in peer-reviewed foreign and (or) domestic publications (recommended by CQAES).

4.2 The end result:

Expected social and economic impact

The development and creation of NCL should effectively solve the following practical tasks:

1) to catalyze the process of teaching the state language, which is important for the consolidation of Kazakh society, its spiritual security and the formation of national identity;

2) should contribute to the competent and effective development of Kazakh advertising, the results can be commercialized, in demand in the economic sector;

3) to increase the quality of linguistic research several times, significantly simplify the procedure for processing language material and raise the level of reliability and objectivity of the results of scientific research on Kazakh linguistics, comparative linguistics, which is especially important for strengthening the scientific and theoretical base of the state language;

4) creation of prerequisites for studying the issues of national history, literature, culture and other sciences in close integration with the language, which will open up a lot of new, previously unexplored knowledge about the Kazakh ethno-linguistic community and its representatives and many others.;

5) raising the level of knowledge of Kazakhstani citizens and all those interested in Kazakh as a national and state language, thereby strengthening the prestige of the language in Kazakhstan and the world cultural space.

Economic efficiency. The developments obtained as a result of the implementation of the program and the scientific conclusions reached should increase the economic efficiency of all types of production, government agencies and business structures where the state language is used. Due to the large number of potential consumers of the research results, it is assumed that the results obtained should have a great impact on the development of science and should have a high socio-economic effect.

Main consumers /users of the program results:

Potential consumers of the results of the program can be teachers of the Kazakh language (kindergarten teachers, school teachers, course teachers), teachers of the Kazakh language (teachers teaching Kazakh as a second language in secondary and higher educational institutions, teachers teaching Kazakh linguistics, preparing philologists, linguists), editors (editors and proofreaders of newspapers, magazines websites, portals, periodicals and electronic media), specialists and scientists in the field of language policy, linguists, sociologists, IT specialists, undergraduates and doctoral students, politicians and journalists, the general public consuming Kazakh as a national and state language, as well as all government employees.

The subcorpus of advertising texts should contribute to the knowledge of regulatory models for the compilation and presentation of advertising texts to owners of small and large businesses, employees of production and retail facilities, advertising agencies

5. The maximum amount of the program is 350,000 thousand tenge, including by year: 2022 – **50,000 thousand** tenge, 2023 – **150,000 thousand** tenge, 2024 – **150,000 thousand** tenge

Technical task No. 54
for research work

within the framework of program-targeted financing

1. General information:

1.1 The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Research in the field of social sciences and humanities.

1.2. Name of the specialized direction of the program:

Fundamental, applied, interdisciplinary research in the field of humanities.
Historical and cultural heritage and spiritual values of Kazakhstan

2. Goals and objectives of the program

2.1. The purpose of the program: A comprehensive study of the nature of historical and cultural processes that took place on the territory of Kazakhstan at the end of the I millennium BC - the first half of the I millennium AD. Theoretical modeling of cultural transformations in the context of studying the problems of intercultural contacts. Formation of a holistic picture of national history in the Hunno-Sarmatian era

2.1.1. To achieve this goal, the following tasks must be solved:

- historiographical analysis of cultural and chronological concepts of the development of the population of Kazakhstan in the Hunno-Sarmatian period;
- Collection and systematization of data on all available archaeological collections of the Hunno-Sarmatian era in museums and scientific centers of Kazakhstan and adjacent territories. Systematic analysis of archaeological materials in comparison with other sources;
- search, identification and mapping of late Sarmatian, Xianbi, Wusun and Kangyu monuments;
- identification of the most promising areas for archaeological work;
- organization and conduct of field archaeological work in the regions of Kazakhstan;
- determination of common features and differences of historical and cultural complexes of the Central Asian Huns and nomads of the Hunno-Sarmatian period of the Ural-Kazakh steppes;
- analysis, interpretation of the semantic content of decorative and applied art and identification of patterns of development of systems of spiritual and ideological values of the late Sarmatians, Xianbis, Wusuns, Kangyu;
- generalization of new archaeological materials, visual, museum and written sources on the complex of weapons of the late Sarmatians, Xianbis, Wusuns, Kangyu;
- systematization, chronological and stylistic analysis of fine art monuments of the Hunno-Sarmatian era;
- substantiation of the chronology of monuments of individual historical and cultural areas based on the methods of radioisotope dating and comparative typological method;
- substantiation of the ethnocultural belonging of monuments in separate historical and cultural areas based on the analysis of material culture;
- reconstruction of socio-cultural processes and their dependence on changes in the natural environment;
- reconstruction of the architecture of ancient funeral and memorial complexes;
- reconstruction of the main elements of religious and mythological representations and spiritual culture of the population of the Hunno-Sarmatian period of the Ural-Kazakh steppes;
- development of classification and typology of various categories of inventory

3. Which points of strategic and program documents are solved:

1. Law of the Republic of Kazakhstan dated February 18, 2011 No. 407-IV “On Science”;
2. The Law of the Republic of Kazakhstan “On the Protection and Use of Historical and Cultural Heritage” dated December 26, 2019 No. 288-VI ZRK;
3. The national project “Technological breakthrough through digitalization, science and innovation” approved by the Decree of the Government of the Republic of Kazakhstan on October 12, 2021 No. 727. Direction VIII. Improving the competitiveness of the scientific ecosystem
4. Strategic Development Plan of the Republic of Kazakhstan until 2025 (National priority 3. Quality education. Task 6. Increasing the global competitiveness of Kazakh science and increasing its contribution to the socio-economic development of the country);

5. Article of the President of the Republic of Kazakhstan K.K. Tokayev “Independence first of all” dated January 6, 2021

4. Expected results

4.1 Direct results:

According to the results of the program , the following should be obtained:

collection and systematization of all available material on the archaeology of the late Sarmatians, Xianbis, Wusuns, Kangyu and other population groups; development of methods for the search and identification of archaeological sites of the Hunno-Sarmatian era; generalization of research materials from previous years, comparative work with data obtained during current research; obtaining new source data on cultures of the transitional stage from late Hunnic time to the ancient Turkic period; identification of the features of evolution and trends in the development of the community of archaeological monuments of the Hunno-Sarmatian era; introduction of decorative and applied art objects from new monuments of the late Sarmatians, Xianbis, Usuns and Kangyu in full scientific circulation; determination of the influence of the producing economy on the socio-economic and cultural development of the late Sarmatians, Xianbis, Usuns and Kangyu; reconstruction of paleoclimate and ways of life support of the ancient population of Kazakhstan in the Hunno-Sarmatian era; reconstruction of worldview fundamentals of the ancient population of Kazakhstan in the Hunno-Sarmatian era; creation of sections of the exposition in the regional historical and local history museums of Kazakhstan on the basis of the complex of archaeological finds of the late Sarmatians, Xianbis, Usuns and Kangyu; characterization of the methods of use of military equipment and functional features of the use of weapons and their effectiveness in military conditions; obtaining materials on the art of the ancient population, characterizing the level of material culture; work on the creation of geoinformation databases on new monuments of the Hunno-Sarmatian era of Kazakhstan; The reference monuments of the Hunno-Sarmatian era were included in the tourist routes of the regions of Kazakhstan; the results of research were introduced into scientific circulation through the media.

Following the results of the implementation of the scientific and (or) scientific and technical program, the following minimum number of publications should be published:

- at least 2 (two) articles and (or) reviews in peer-reviewed scientific publications included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor and (or) indexed in the Arts and Humanities Citation Index of the Web of Science database, and (or) having a percentile by CiteScore there are at least 35 (thirty-five) in the Scopus database;
- at least 10 (ten) articles and (or) reviews in peer-reviewed foreign and (or) domestic publications (recommended by CQAES).
- issue of 2 monographs; 1 scientific conference, 2 round tables, 3 seminars, interviews in the media

4.2 The end result:

The proposed program should solve a number of important tasks of both fundamental and applied nature and is conditioned by the general need to study the archeology and ancient history of Kazakhstan. The results of the program should fill in the existing gaps, make it possible to systematize the available information about the population of the Hunno-Sarmatian time of Kazakhstan. The enterprise is an attempt to trace the continuity of development between the population from the Hunnic era to the early Middle Ages, the chronology of the period is determined. As a result, the foundations should be laid for the subsequent systematic study of the origins of the ancient Turkic cultural complex.

The scientific effect is the beginning of a comprehensive and systematic study of the little-studied monuments of the Hunno-Sarmatian era of Kazakhstan, which will make it possible to fill in the existing gaps in National history. The results of the study will provide new data to solve problems related to the mechanisms and timing of the spread of the tradition of mobile cattle breeding and the stages of its transformation. On the basis of natural science methods, an attempt should be made to trace the degree of continuity of ancient and early medieval ethnic groups, as well as the modern Kazakh population. In addition, the solution of the tasks set will attract specialists in the field of interdisciplinary research, including from abroad, which will strengthen the mechanisms of international cooperation.

Economic effect Creation of a map with localization of monuments of important historical and cultural significance and work has been carried out with local authorities to preserve them. This should allow in the future to use archaeological sites in the field of tourism, for the development of open-air sightseeing routes,

as well as regional thematic tours. As a result of research under the program, unique archaeological reconstructions and original artifacts should replenish the museum funds and expositions of the Republic of Kazakhstan, which will also increase tourist interest in the historical past of our country.

The social significance of the program is associated with the popularization of the historical and cultural heritage of the country, which is largely associated with the promotion and popularization of the national heritage. The latter circumstance will allow the young generation to form such important qualities as historical self-awareness and patriotism. In addition, the transfer of unique knowledge about the centuries-old history of the country to the general public through the preparation of popular scientific works will favorably affect the growth of interest in national history.

The target consumers of the results obtained are university students majoring in history, archaeology, anthropology and ethnography, as well as art history and religious studies.

The results of the study are intended for scientists dealing with issues of ethno-cultural interaction in the steppe zone, worldview, cults, rituals of ancient societies of Eurasia. The obtained new data of the research program can be used for the development of educational programs in general education and special educational institutions, as well as in the writing of generalizing works.

5. The maximum amount of the program is 450,000 thousand tenge for 3 years including: for 2022 – **50,000 thousand** tenge, for 2023 – **200,000 thousand** tenge, for 2024 – **200,000 thousand** tenge

Technical task No. 55
for research work
within the framework of program-targeted financing

1. General information:

1.1 The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Research in the field of social sciences and humanities.

1.2. The name of the specialized direction for the scientific, scientific and technical program (hereinafter referred to as the program)**:**

Fundamental, applied, interdisciplinary research in the field of humanities

2. Goals and objectives of the program

2.1. The purpose of the program:

Reconstruction of the historical environment and determination of the continuity of cultural and historical processes in Northern Kazakhstan from the stone age to the Late Middle Ages, designation of the archaeological sites of the steppe and forest-steppe zone in the cultural heritage system of Central Eurasia, creation of a methodological basis for the preservation, use and popularization of the cultural heritage of the steppe and forest-steppe

2.1.1. To achieve this goal, the following tasks should be solved: development of issues of historiography and history of research of monuments of the Stone and Bronze Age, the Early Iron Age and the medieval population of Northern Kazakhstan, taking into account existing regional cultural and chronological schemes; compilation of an electronic database of archaeological monuments from the Stone age to the Middle Ages on the territory of the Kazakh Tributary, the Ishim plain and the Pavlodar Irtysh region; a comprehensive study of the problems of settlement of steppe and forest-steppe territories in the upper reaches of the Tobol, Ishim plain and Pavlodar Irtysh region in the stone age. Consideration of migration issues; determination of the features of material culture, areas, chronology of Mesolithic and Neolithic complexes. Search and study of stratified sites; systematization of materials from the Eneolithic era of the Tobolo-Irtysh interfluve, including the territory of the Turgai trough. Determination of the chronology of the Eneolithic of the region, formulation of the problem of early Eneolithic isolation; identification and study of problematic areas of archeology of the Eneolithic-early Bronze Age of the region (there are chronological gaps – early Eneolithic (first half of the IV millennium BC), early Bronze Age (III millennium BC). Determination of the features of material culture, areas and chronology. Search and study of stratified sites. Systematization of sources by epoch.); identification and study of the Sintashta and Petrovsky monuments in Northern Kazakhstan, identification of the specifics of

archaeological cultures and local variants in the upper reaches of the Tobol; interdisciplinary study of mining and metallurgy of copper ore resources of the Kokshetau Mining and Metallurgical Center (GMC) in the paleometallic era (study of the patterns of GMC locations in the region, features of mining and metallurgy, etc., study of metallurgists' settlements in complex with mining facilities). Study of ways of distribution of raw materials for metallurgy of copper and bronze; performing magnetometric and georadar surveys of settlements, necropolises, mining objects of different eras within Northern Kazakhstan; a comprehensive study of the monuments of rock art of the region, which includes documenting rock art and their systematization, the study of nearby settlements and necropolises, identifying the features of the geomorphological location of these monuments; interdisciplinary studies of the early nomadic cultural horizon and theoretical modeling of ethnosociocultural processes on the territory of Northern Kazakhstan in the I millennium BC in the context of studying the problems of intercultural contacts; the study of funeral and memorial rites of the population of the early Iron Age of Northern Kazakhstan. Identification of structural features of ground-based and inter-grave structures in the context of the dynamics of changes in the funeral and memorial rites of the ancient population of the studied regions in time and space; study of supporting monuments of the Early Iron Age on the territory of Northern Kazakhstan: mapping, geomagnetic research, study of ground-based and non-burial structures; laboratory and scientific-analytical processing of materials obtained during field work; the study of settlement sites near the studied necropolises; identification of the features of the process of formation of the anthropological composition and origin of the population of Northern Kazakhstan in the Bronze Age and early Iron Age; the study of issues of material culture and the study of the nature of historical and cultural processes that took place at the end of the I millennium BC - the first half of the I millennium AD, as well as the definition of the features of the formation of inclusive paintings of Northern Kazakhstan in the Hunno-Sarmatian period; study of the Turkic cultural complex, determination of the place and role of the early Turks in the history of the steppe states of medieval Eurasia, based on the materials of archaeological monuments of the ancient Turkic period of Northern Kazakhstan; determination of the features of material culture, ethno- and cultural genesis on the territory of Northern Kazakhstan during the formation and development of the Ulug Ulus (Golden Horde); archaeological research of monuments of statehood and state centers of the Kazakh khanates on the territory of Northern Kazakhstan; determination of the settlement system of Kazakh clans and tribes of Northern Kazakhstan based on the analysis of the data obtained on funerary and cult-architectural monuments of the population and archival information of the region; routes of nomads; theoretical reconstruction of cultural and historical processes in Northern Kazakhstan in the context of the development of adjacent regions/ steppe and forest-steppe zone of Eurasia; determination of the features of the archaeological heritage of Northern Kazakhstan. Development of a methodological basis for the preservation, use and popularization of the historical and cultural heritage of Northern Kazakhstan. Development of mechanisms for the introduction of the archaeological heritage of Northern Kazakhstan into the tourist infrastructure of Central Eurasia

3. Which points of strategic and program documents are solved:

1. Law of the Republic of Kazakhstan dated February 18, 2011 No. 407-IV “On Science”;
2. The Law of the Republic of Kazakhstan “On the Protection and Use of Historical and Cultural Heritage” dated December 26, 2019 No. 288-VI ZRK;
3. The national project “Technological breakthrough through digitalization, science and innovation” was approved by the Decree of the Government of the Republic of Kazakhstan on October 12, 2021 No. 727. Direction VIII. Improving the competitiveness of the scientific ecosystem;
4. Strategic Development Plan of the Republic of Kazakhstan until 2025 (National priority 3. Quality education. Task 6. Increasing the global competitiveness of Kazakh science and increasing its contribution to the socio-economic development of the country);
5. The comprehensive plan of socio-economic development of the North Kazakhstan region for 2021-2025 was approved by the Decree of the Government of the Republic of Kazakhstan No. 562 on September 12, 2018. Sections: Tourism and Sports, Education, Culture;
6. Article of the President of the Republic of Kazakhstan K. K. Tokayev “Independence first of all” dated January 6, 2021

4. Expected results

4.1 Direct results:

Should be implemented as a result of the implementation of the program:

the introduction into scientific circulation of the results of complex studies used in the implementation of state policy, the publication of textbooks and the creation of museum expositions, as well as to summarize information on the material culture of Northern Kazakhstan from the Stone Age to the Middle Ages; the definition of the chronological framework of the Eneolithic period, identified gaps that do not have archaeological content, the scheme of population development is presented, the features are characterized farms of the Eneolithic era of the region; analysis of the features and degree of continuity of ancient ethnic groups and the modern Kazakh population; determination of the ratio of cultural formations of the Eneolithic and Bronze Age on the territory of Northern Kazakhstan, the specifics of the social structure, funeral rite and clothing complex, place among the synchronous archaeological complexes of Northern Asia; justification of the allocation of an independent Kokshetau mining and metallurgical center of the Bronze Age. The aspects of functioning and determining the place of the Kokshetau and Bayanaul mining and metallurgical center in the structure of the Eurasian metallurgical province are considered; obtaining new materials on architecture, funeral rite, art and artistic culture, worldview and religious beliefs, horse equipment, weapons and military affairs of the ancient nomads of Northern Kazakhstan; studying the settlement monuments of the early nomads of the region, determining the features of topography, organization of housing and industrial space in settlements; compilation of an electronic data bank on monuments of archeology, architecture and objects of ethnoarchaeology of Northern Kazakhstan; publication of a complete Set of archaeological monuments, objects of architecture and ethnoarchaeology of the North Kazakhstan region;

Following the results of the implementation of the scientific and (or) scientific and technical program, the following minimum number of publications should be published:

- at least 2 (two) articles and (or) reviews in peer-reviewed scientific publications included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor and (or) indexed in the Arts and Humanities Citation Index of the Web of Science database, and (or) having a percentile by CiteScore there are at least 35 (thirty-five) in the Scopus database;
- at least 10 (ten) articles and (or) reviews in peer-reviewed foreign and (or) domestic publications (recommended by CQAES).
- development of methodological recommendations for the preservation, use and popularization of the historical and cultural heritage of Northern Kazakhstan for specialized organizations; development of mechanisms for the introduction of the archaeological heritage of Northern Kazakhstan into the tourist infrastructure of Kazakhstan and Central Eurasia.

4.2 The end result:

The scientific effect should consist in: scientific support of state policy in the field of ancient and medieval history of Northern Kazakhstan and the creation of a system of effective integrated national and regional programs for the study, protection and use of national heritage. New sources on the material culture of the Eneolithic and the Bronze Age should be identified, as well as the features of the evolution and trends in the general development of the culture of the oldest tribes of Northern Kazakhstan, the influence of the producing economy on the socio-economic and cultural development of ancient tribes should be determined. In addition, the architectural appearance of the dwellings of ancient settlements of Northern Kazakhstan should be reconstructed, materials on art and artistic culture should be obtained, as well as data characterizing the level of material culture and economic activity of the population of Northern Kazakhstan in the era of early and medieval nomads and Modern times, new data on the history of animal husbandry and ancient technologies of processing wood, bone, horns, metal, wool, etc. materials, as well as new data on the habitat, diet and others, including biomedical ones based on the results of anthropochemical studies

Economic effect: The connection between the process of development of the national economy and the revival of traditional culture should be revealed. The revival of a rich culture, the best traditions of the ethnic group, providing a beneficial effect on the further sustainable growth of the national economy.

Social effect of the program: Scientific research results and materials should be used both for the development of educational programs in general education and special educational institutions, and for the

popularization and promotion of national heritage and cultural heritage in museums of the country.
Target consumers of the results obtained: The direct target consumer of the program results is the scientific community, the indirect consumer is the educational, museum and tourism sector. Dissemination of the results of the work among potential users, the community of scientists and the general public is possible through the mass media, including the World Wide Web, as well as by traditional means, through the publication of articles and monographs

5. The maximum amount of the program is 450,000 thousand tenge, including: for 2022 – **50,000 thousand** tenge, for 2023– **200,000 thousand** tenge, for 2024 – **200,000 thousand** tenge

Technical task No. 56
for research work
within the framework of program-targeted financing

1. General information:

1.1 The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Research in the field of social sciences and humanities

1.2. Name of the specialized direction of the program:

Fundamental, applied, interdisciplinary research in the field of social sciences:
Current issues of social sciences, legal and interdisciplinary research

2. Goals and objectives of the program

2.1. The purpose of the program:

Study of the influence of social networks (social media) on the current political situation in Central Asia using causal mechanisms

2.2. To achieve this goal, the following tasks must be solved:

1. Conducting a meta-analysis of economic, political science and sociological literature studying the effects of the Internet and/or social networks on political behavior.
2. Conducting a comparative political science study on at least three Central Asian countries.
3. Mapping of the Central Asian region by the degree of penetration of the broadband Internet and the spread of various social networks/media.
4. Organizing and conducting a series of opinion polls to determine media consumption and political attitudes in at least five countries. Taking into account the problem of socially expected responses, surveys should use techniques such as a list experiment (item count technique), or randomized response technique, or ballot box method, or other techniques that perform a similar task.
5. Forming a database based on sociological surveys and cartographic data; reassembling data in such a way as to create conditions for the use of causal mechanisms (matching, or difference-in-difference, or regression discontinuity, or instrumental variable, or (quasi)experiment).
6. Identification and analysis of the interrelationships between social networks/media and voting attitudes in the cross-country context based on the available database. It is necessary at least to determine the dependence using regression, ideally to identify a causal relationship using one of the listed causal mechanisms.
7. Identification and analysis of the interrelationships between social networks/media and dissidence, critical attitude to power in the cross-country context based on the available database. It is necessary at least to determine the dependence using regression, ideally to identify a causal relationship using one of the listed causal mechanisms.
8. Identification and analysis of the interrelationships between social networks/media and participation in protests, strikes or other active forms of political resistance in the cross-country context based on the available database. It is necessary at least to determine the dependence using regression, ideally to identify a causal relationship using one of the listed causal mechanisms.
9. Identification and analysis of the interrelationships between social networks/media and political polarization in the cross-country context based on the available database. It is necessary at least to determine the dependence using regression, ideally to identify a causal relationship using one of the listed

causal mechanisms.
10. Determination and analysis of the effect of fake news on political behavior in the cross-country context based on the available database.
11. Development of a website on which the mapping of the region on the penetration of the broadband Internet and the prevalence of social networks, a database, as well as the main publications on the results of the project should be presented

3. Which points of strategic and program documents are solved:
Development strategy of "Kazakhstan-2050";
Strategic Development Plan of the Republic of Kazakhstan until 2025;
The Law of the Republic of Kazakhstan "On National Security of the Republic of Kazakhstan"

4. Expected results
4.1 Direct results:
- creation of an interactive map of the Central Asia and Transcaucasia region according to the degree of broadband Internet penetration and the prevalence/popularity of social networks (social media), as well as various attitudes to media consumption and political behavior;
- creation of a database based on a series of sociological surveys in at least five countries of Central Asia and/or Transcaucasia;
- preparation of a monograph in three languages;
- creation of a website with a database and main results.
Following the results of the implementation of the scientific and (or) scientific and technical program, the following minimum number of publications should be published:
- at least 2 (two) articles and (or) reviews in peer-reviewed scientific publications included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor and (or) indexed in the Arts and Humanities Citation Index of the Web of Science database, and (or) having a percentile by CiteScore there are at least 35 (thirty-five) in the Scopus database;
- at least 10 (ten) articles and (or) reviews in peer-reviewed foreign and (or) domestic publications (recommended by CQAES).

4.2 The end result:
The scientific effect should be:
- development/deepening of academic knowledge about the effect of the Internet and social networks on political behavior in the cross-country context; improving the quality of opinion polls through the use of modern data collection techniques to overcome the problem of socially approved responses; improving the quality of political analysis through the use of modern data analysis tools, including methods to identify cause-and-effect relationships; creating a database data that can then be used by other scientists to conduct their own research.
Economic effect:
- a clear understanding of the effect of social media on political behavior and an accurate description of the mechanism of this impact should allow to smooth out and resolve conflicts without bringing them to the acute phase of street protests (strikes) and, thus, reduce economic costs; understanding the nature of fake news will smooth out the negative effect and potential economic losses associated with their impact; the formation of a positive image of Kazakhstan's social science in Central Asia and Transcaucasia should also contribute to the growth of collaborations, as well as the appeal to Kazakh scientists for consulting services (taking into account the current political situation, now is an excellent opportunity to oust Russian experts from this market).
Social effect. Preventing the potential destructive impact of fake news, reducing conflict tensions associated with political polarization, smoothing out the potential negative effects of the polarization of society. All this should contribute to the formation of a healthier and more harmonious society. Comparative analysis of the effect of social media in different countries will allow us to better understand its features and develop more adequate measures to counteract negative consequences.

5**. The maximum amount of the program is 150,000 thousand** tenge, including by year: 2022 – **30,000 thousand** tenge; 2023 **– 60,000 thousand** tenge; 2024 – **60,000 thousand** tenge

Technical task No. 57
for research work
within the framework of program-targeted financing

1. General information:

1.1 The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

"Research in the field of social sciences and humanities"

1.2. Name of the specialized direction of the program:

Fundamental, applied, interdisciplinary research in the field of humanities:
The study of humanitarian aspects and the formation of an ideological platform for the sustainable development of Kazakh society

2. Goals and objectives of the program

Conducting a comprehensive study of the scientific, political and creative heritage of "Alash" figures as representatives of the national intellectual elite in the context of the historical continuity of their liberal democratic ideas in the modern state-building of Kazakhstan, developing recommendations for their practical application in the socio-political life of the country in the processes of modernization of public consciousness and spiritual revival of Kazakh society.

2.2. To achieve this goal, the following tasks must be solved:

- comprehensive study of the scientific, political and creative heritage of the intelligentsia "Alash", brought up on the advanced ideas of European democratic thought and absorbed the experience of the struggle of previous generations, identification and classification of their main socio-political and legal ideas, determination of their influence on political and state activities;
- identification and analysis of available primary sources (archival, library, handwritten materials) on the methods of struggle for the restoration of national statehood in Central Asia and the Volga region on the example of the national-territorial autonomies of Ukraine, Alash, Turkestan, Bashkiria, Siberia, etc. in the period 1917-1920;
- on the basis of primary sources from the archives of Paris, Geneva, Warsaw, Kiev, Moscow, Riga, to establish the reasons for the recognition of the Alash Horde, the Bashkir government and the Turkestan Mukhtariate of Soviet power in 1919-1920, to scientifically substantiate the choice of the leaders of the "Alash" a new, nonviolent strategy of struggle for liberation from the colonization of Soviet power;
- clarification of the circumstances of M. Shokaya's emigration as a prominent representative of the movement, the Alash Party and a member (commissioner) of the Alash Orda Government, based on his writings, articles, notes, speeches, correspondence, as well as new archival primary sources, to analyze M. Shokaya's ideological connection with the leaders of Alash;
- based on the study of the heritage of the leaders of "Alash" (A. Bukeikhan, M. Shokai, H. Dosmukhameduly, A. Baitursynuly, S. Kozhenuly, T. Ryskululy, etc.) to reveal the essence of the national policy of the Soviet government in Kazakhstan and Turkestan in 1920-1925, to conduct research work in domestic and foreign archives – Russia, Uzbekistan, Kyrgyzstan, Turkmenistan and Tajikistan;
- based on the works of "Alash" figures (A.Bukeikhan, A.Baitursynuly, M. Shokai, S. Khodzhanov, T. Ryskulov, etc.) to analyze and highlight each of the stages of the establishment of Soviet power and its dictatorship in Kazakhstan and Central Asia, its struggle with class enemies ("bourgeois nationalists", "counterrevolutionaries", "bai-feudal lords", etc.);
- on the basis of primary sources, as well as the works of "Alash" figures (M. Shokai, S. Khodzhanov) to highlight the true goals and objectives of the policy of the Soviet government on the "national demarcation" of Kazakhstan and Central Asia in 1924-1930;
- to objectively highlight the activities of the leaders of "Alash", as convinced supporters of the ideas of democracy, democratic values, parliamentarism, scientifically and argumentatively proved the incompatibility of traditional Kazakh culture and being with Soviet ideology and the system of power;
- to assess the role of the Alash movement in the state and national construction of independent Kazakhstan, to substantiate the possibility of implementing the ideology and experience of the political and state activities of the Government of the Alash Horde in the daily practice of state and legal

construction of modern Kazakhstan

3. Which points of strategic and program documents are solved:

- Law of the Republic of Kazakhstan dated February 18, 2011 No. 407-IV “on science”;
- Development strategy of the Republic of Kazakhstan until 2050;
- Address of the head of state to the people of Kazakhstan “constructive public dialogue – the basis of stability and prosperity of Kazakhstan” from September 2, 2019;
- Program article Tokayeva K. K. “independence is more important than anything else”

4. Expected results

4.1 Direct results:

According to the results of the program, a comprehensive study of the heritage of “Alash” figures as representatives of the national intellectual elite should be conducted in the context of the historical continuity of their liberal democratic ideas in the modern state-building of Kazakhstan, recommendations for their practical application in the socio-political life of the country, in the processes of modernization of public consciousness and spiritual revival of Kazakh society.

A scientific justification should be prepared for the need to apply the values and principles of social liberalism, democratic, legal, secular, social state, ideas of the system of public administration and self-government, institutions of the presidency, parliamentarism, economic, social and political modernization of society, perceived and promoted by the figures of “Alash” in the political life and state-building of modern Kazakhstan.

Based on the results of the study, specific proposals should be prepared and submitted in the form of analytical notes to the Presidential Administration and the Parliament of the Republic of Kazakhstan justifying the application of Alash state ideas in the modern state construction of Kazakhstan.

According to the results of the research, a collective monograph should be published, as well as a collection of rare archival documents and materials on the topic of the scientific program, it is necessary to consider the possibility of preparing other types of scientific and methodological publications: albums, textbooks, textbooks, etc., materials in the media.

Following the results of the implementation of the scientific and (or) scientific and technical program, the following minimum number of publications should be published:

- at least 2 (two) articles and (or) reviews in peer-reviewed scientific publications included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor and (or) indexed in the Arts and Humanities Citation Index of the Web of Science database, and (or) having a percentile by CiteScore there are at least 35 (thirty-five) in the Scopus database;
- at least 10 (ten) articles and (or) reviews in peer-reviewed foreign and (or) domestic publications (recommended by CQAES).

4.2 The end result:

Expected social and economic impact

Research should make a significant contribution to the development of historical, humanitarian and legal studies, as well as social and humanitarian thought in general, should be interdisciplinary in nature. The results of research in the field of national historical personalism should be considered in the context of the processes of transformation and modernization of the state and society. The results of the program should contribute to the formation of the national state idea, to the development of social and humanitarian research.

Economic effect: The results of the program should have an impact on the development of humanitarian knowledge and ideas, should provide a powerful impetus for the further development of society and the state. The research should contribute to the development of new conceptual solutions and approaches to the assessment of the past and present, critical analysis and rethinking of the scientific heritage in the field of historical knowledge.

Social effect of the program: The research results should influence the processes of modernization of public consciousness, the formation of historical consciousness of Kazakhstani citizens. The results of the study will arouse a new interest of the citizens of Kazakhstan in their historical past.

Target consumers of the results obtained: scientists, the general public, authorized state bodies for the implementation of the internal policy of the state, scientific and educational institutions, public

development institutions and non-governmental organizations

5. The maximum amount of the program is 300,000 thousand tenge, including: 2022 – **60,000 thousand** tenge; 2023 – **120,000 thousand** tenge; 2024 – **120,000 thousand** tenge

Technical task No. 58
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Research in the field of social sciences and humanities

Specialized scientific direction:

Fundamental, applied, interdisciplinary research in the humanities:

A new humanitarian Education. Synergetic and philosophical research in the humanities. Humanitarian informatics

2. **Goals and objectives of the program**

2.1. **The purpose of the program:** development of built-in linguistic modules and modern IT solutions necessary for open-source projects on automatic recognition of the Kazakh text.

2.2. **To achieve this goal, the following tasks must be solved:**

Block 1. Linguistic support for automatic recognition of Kazakh text (hereinafter – ARKT):

- development of the linguistic module of the ARKT based on the inventory and systematization of knowledge in lexicology, grammar, phonetics and phonology;
- development of the linguistic module of the ARKT based on the inventory and systematization of knowledge on terminology and onomastics;
- development of the linguistic module of ARKT based on inventory and systematization of knowledge on graphics, spelling and punctuation.

Block 2. Educational subcorpus of the National Kazakh Language Corpus as a linguistic base of the ARKT:

- collection of an extensive and versatile text base of the Educational subcorpus of the National Corpus of the Kazakh language (the volume of the text base: 3 million word usage);
- development of semantic markup with a removed homonymy and its computer program;
- creation of a multi-sided search system of the Educational subcorpus of the National Corpus of the Kazakh language according to metatextual and linguistic parameters.

Block 3. IT development on ARKT:

- creation of the Optical Character Recognition program – optical character recognition (hereinafter referred to as OCR):

1) creation of a massive database of texts with images in the Kazakh language: 5 million handwritten and printed cards with contexts from various styles and genres of book speech, books, newspapers, etc.;
2) creation of a CNN model (Convolutional Neural Network – artificial neural networks capable of analyzing images into layers by creating virtual neural connections in computer computing facilities);
3) combining the CNN model and the text base, releasing a beta version with the output of exemplary examples, developing a letter recognition matrix and determining the recognition accuracy;
4) improving recognition accuracy, expanding the database with additional text, learning to recognize in the context of a sentence and full text, then large-volume texts.

- development of electronic dictionaries and thesauruses:

1) development of a web version of dictionaries;
2) development of dictionary extensions for browsers;
3) definition of versions for epub, mobi, fb2 formats.

- - development of a reader-converter for converting e-books in the Kazakh language:

1) conversion of e-books in the Kazakh language in epub format in various graphic designs;
2) ensuring the binding of various dictionaries to the reader-converter.

3. **Which points of strategic and program documents are solved**:

The results of the program will provide linguistic support to projects and subprograms for the development and functioning of the state language implemented within the framework of the State Program “Digital Kazakhstan”, approved by the Decree of the Government of the Republic of Kazakhstan dated December 12, 2017 No. 827, on the implementation of the language policy in the Republic of Kazakhstan for 2020-2025, the Development Strategy of the Republic of Kazakhstan until 2050, the Program Article of the First President Of the Republic of Kazakhstan N. Nazarbayev's “A look into the future: modernization of public consciousness”, the Messages of the President of the Republic of Kazakhstan Kassym-Jomart Tokayev to the people of Kazakhstan “Constructive public dialogue is the basis of stability and prosperity of Kazakhstan” (2019), “Kazakhstan in a new reality: time for action” (2020), the program article of the Head of State “Independence is most precious” dated January 5, 2021.

4. Expected results

4.1 Direct results:

According to the results of the program , the following should be obtained:

linguistic modules for the ARKT and 1 instruction for their implementation in the IT project on the LFS have been developed; 1 representative and representative text base of the Educational Subcorpus of the National Corpus of the Kazakh Language has been collected (the volume of the text base: 3 million word uses); 1 semi-automatic computer program for recognizing homonyms in texts entered into the Educational subcorpus has been created; a modern multi-sided search engine has been created. the system of the educational subcorpus of the National Corpus of the Kazakh language according to metatextual and linguistic parameters; created 1 massive electronic database of Kazakh texts for the LFS program, consisting of 5 million handwritten and printed cards with contexts from various styles and genres of speech, books, newspapers; developed 1 LFS program for Kazakh texts in various graphic designs; developed 1 web version of the electronic database of dictionaries, consisting of their various lexicographic types; developed 1 dictionary extension program for browsers; developed 1 reader-converter with reference to various dictionaries for converting e-books in the Kazakh language in epub format in various graphic designs; published 2 scientific and collective monograph, 2 articles in international scientific journals, 5 articles in domestic scientific journals, 3 articles or reviews in a peer-reviewed scientific publication, indexed and (or) having at least 25 (twenty-five) percentiles on CiteScore in the Web of Science database, 7 articles or reviews in scientific journals from the CQAES list;

- information support: 2 scientific and practical conferences, 3 round tables; 6 scientific and production seminars, 7 interviews in the media and on TV

4.2 The end result:

Expected social and economic impact**.**

The scientific program should be aimed at developing linguistic support for specific IT solutions and IT projects that turn the physical forms of text information sources into a digital document that allows the user to change, edit word processors or spreadsheet programs, search in texts using conventional editors. Thus, the developments obtained as a result of the project should facilitate the process of working with written Kazakh texts not only for individual users, but also for entire offices, make their work more efficient, save production time, improve management and reduce paperwork several times. As well as the implementation of IT projects in the open-source format gives everyone the opportunity to freely use the developments obtained within the framework of this scientific program. This should contribute to the development of other IT solutions and is a prerequisite for increasing the level of digitalization of the Kazakh language and its connection with new technologies.

The above-mentioned facts characterize the practical significance of the program, which also has theoretical significance for subsequent research in the field of computational linguistics, since over the past twenty years there has been a revolution in linguistics of big data, big numbers, which has changed not only the scientists' understanding of language, but also the methodology for describing linguistic phenomena. Thus, the results of this study will expand the scientific, theoretical and factual base of Kazakh linguistics, will become a foundation for discoveries and developments related to the linguistic foundations of new information and communication technologies.

Economic efficiency. The developments obtained as a result of the implementation of the program

and the scientific conclusions reached should increase the economic efficiency of all types of production, government agencies and business structures where the state language is used. Due to the large number of potential consumers of research results, the results obtained should have a great impact on the development of science and should have a high socio-economic effect.

Main consumers /users of the program results:

Potential consumers of the results of the program are teachers of the Kazakh language (kindergarten teachers, school teachers, course teachers), teachers of the Kazakh language (teachers teaching Kazakh as a second language in secondary and higher educational institutions, teachers teaching Kazakh linguistics, preparing philologists, linguists), editors (editors and proofreaders of newspapers, magazines, websites, portals, periodicals and electronic media), specialists and scientists in the field of language policy, linguists, sociologists, IT specialists, undergraduates and doctoral students, politicians and journalists, the general public consuming Kazakh as a national and state language, as well as all government employees

5. **The maximum amount of the program is 300,000 thousand** tenge, including by year: 2022 – **50,000 thousand** tenge, 2023 – **125,000 thousand** tenge, 2024 – **125,000 thousand** tenge.

Technical task No. 59
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Research in the field of social sciences and humanities.

1.2. Name of the specialized direction of the program:

Fundamental, applied, interdisciplinary research in the field of humanities: Spiritual Modernization and the Seven Facets of the Great Steppe.

Historical and cultural heritage and spiritual values of Kazakhstan.

Commonality of history and culture, literature and language, traditions and values

2. Goals and objectives of the program

2.1. **The purpose of the program:** A comprehensive study of the role of artistic culture in the preservation, development and cultivation of progressive values of humanity in the context of the processes of spiritual modernization and globalization

2.2. To achieve this goal, the following tasks must be solved:

- To study the issues of spiritual transit and continuity of values in Kazakh folklore, literature and art;
- to scientifically substantiate the role of spiritual culture in generating new value orientations of a modernizing society;
- to identify and introduce into scientific and pedagogical circulation the regularities of the development of the system of values of steppe culture;
- to identify the features of national values in the context of cultural globalization;
- to investigate the processes of transformation of public consciousness and predict potential cultural trends that make fundamental changes in the intellectual development of the nation;
- to form a new fundamental knowledge about artistic processes aimed at strengthening the spiritual and moral potential of the country

3. Which points of strategic and program documents are solved:

- Program article of the First President of the Republic of Kazakhstan “A look into the future: modernization of public consciousness”: formation of new humanitarian knowledge within the

framework of spiritual modernization.
-Message of the President of the Republic of Kazakhstan
to the People of Kazakhstan dated 01.09.2020 “Kazakhstan in a new reality: time for action”: formation of a new paradigm for the development of the people; improving the quality of the nation.

- Article of the President of the Republic of Kazakhstan “Tauelsizdik barinen kymbat”, 05.01.2021: modernization of the results of fundamental research; popularization of the heritage of Alash figures and children's fiction;

- Speech of the President of the Republic of Kazakhstan at the informal summit of the Cooperation Council of Turkic-speaking States (31.03.2021): Modernization of the Turkic civilization;

- Strategic Development Plan of the Republic of Kazakhstan until 2025: development of the system of scientific research, gradual transition of applied scientific research to English, modernization of public consciousness, access to the best world knowledge, digitalization of the education and science system;

- Message of the President of the Republic of Kazakhstan to the people of Kazakhstan dated 01.09.2021: “Unity of the people and systemic reforms are a solid foundation for the prosperity of the country”: development of science; strengthening of value orientations, formation of a clear image of the future; development of a culture of civilized dialogue and mutual respect; strengthening of national identity; effective use of the historical heritage and cultural potential of the country; promotion of a new culture and its talented representatives; to instill universal values in young people

4. Expected results

4.1 Direct results:

According to the results of the program , the following should be obtained:
new knowledge about the role of artistic culture in the preservation, development and promotion of progressive values of humanity; recommendations for the introduction of value systems of steppe culture in the fields of culture, upbringing, education, informatization have been developed; new scientific data on forecasting potential cultural trends affecting the transformation of public consciousness have been obtained;
Published:
at least 2 (two) articles and (or) reviews in peer-reviewed scientific publications included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor and (or) indexed in the Arts and Humanities Citation Index of the Web of Science database, and (or) having a percentile by CiteScore there are at least 35 (thirty-five) in the Scopus database;
- at least 10 (ten) articles and (or) reviews in peer-reviewed foreign and (or) domestic publications (recommended by CQAES).
5 collective monographs devoted to the study of artistic processes aimed at strengthening the spiritual and moral potential of the country have been published:
1) “Folklore and public consciousness” (20 pp.l.);
2) “The role and place of literary, linguistic and cultural monuments of the Mamluks-Kipchaks in modern Kazakh spirituality” (20 p.l.);
3) “National and universal in the works of Abai Kunanbayev: spiritual transit in time and space” (20 p.l.);
4) “The study of M.O. Auezov's creativity in the context of the dialogue of cultures” (20 p.l.);
5) “The latest Kazakh literature (creative achievements of young talents)”;

4.2 The end result:

The results of the target program should contribute to the development of public consciousness, the strengthening of national identity and the harmonious development of unity and harmony as the main values of the state as a whole.
Economic effect: Expanding the circle of potential consumers in Kazakhstan and abroad, the quality of scientific products should be improved.
The social effect of the program can be assessed:

- the impact of the results on the modernization of public consciousness, strengthening the position of the national literary and art history science in the international community, strengthening the status of the humanities in the system of sciences and the life of society as a whole, in-depth study of the issues of spiritual transit and continuity of values in the aspect of literary, art criticism analyses. Scientific articles should contribute to the promotion of scientific results among scientists, teachers and students. Collective monographs and academic publications should be used in the educational and pedagogical process, as well as in the study of literary studies, art history, cultural studies, philosophy, Oriental studies, sociology

5. The maximum amount of the program is 280,000 thousand tenge; for 2022 – **80,000 thousand** tenge, for 2023 – **100,000 thousand** tenge, for 2024 – **100,000 thousand** tenge

Technical task No. 60
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Research in the field of social sciences and humanities

1.2. Name of the specialized direction of the program:

Fundamental, applied, interdisciplinary research in the field of social sciences.

2. Goals and objectives of the program

2.1. The purpose of the program:

A comprehensive study of socio-cultural, political, ideological prerequisites, factors and conditions, the development of theoretical and methodological approaches and the development of practice-oriented recommendations for the development of an intellectual nation in the conditions of modernization

2.2. To achieve this goal, the following tasks must be solved

- multidisciplinary analysis of the prerequisites and conditions for the formation of an intellectual nation in a modernizing society;
- development of theoretical, methodological, scientific and practical foundations of the process of intellectualization of society;
- determination of the fundamental foundations of the process of formation of an intellectual nation in the conditions of transformation of public consciousness;
- disclosure of the role of socio-cultural and political values and ideals of the population of modern Kazakhstan in the process of forming an intellectual nation;
- sociological monitoring of the state, specifics, trends of the worldview mentality of Kazakhstanis and factors of influence;
- identification of problem areas and risks of loss of the level and quality of intellectual potential, creativity, adaptability of Kazakhstan's mentality in a situation of increasing global risks of instability;
- development of practice-oriented recommendations for the development of an intellectual nation in the conditions of modernization

3. Which points of strategic and program documents are solved:

Address of the President of the Republic of Kazakhstan to the People of Kazakhstan dated 01.09. 2021 “Unity of the people and systemic reforms – a solid foundation for the prosperity of the country”;

2) Strategy “Kazakhstan – 2050”: a new political course of the established state. 7. New Kazakhstan patriotism is the basis for the success of our multinational and multi–confessional society;

3) The State program “Digital Kazakhstan”. Resolution of the Government of the Republic of Kazakhstan dated December 12, 2017 No. 827. The 4th direction “Development of human capital” is a direction of transformation covering the creation of a so-called creative society to ensure the transition to new realities – the knowledge economy;

4) Nazarbayev N.A. Seven facets of the Great Steppe. November 21, 2018.

5) Digitalization of the economy of Kazakhstan. Speech by the President of the Republic of Kazakhstan K.Zh. Tokayev on June 8, 2019

4. Expected results

4.1 Direct results:

- substantiation of the concept of national intelligence, definition of the essence and features of the intellectual nation, identification of the parameters of digital reality and its functioning in the Kazakh context, proof of the primacy of spirituality over intelligence;
- identification of the semantic content, role and significance of the Turkic and Kazakh intellectual traditions in the formation of the intellectual Kazakh nation;
- concentration and conceptualization of the modern theoretical and methodological content of the philosophy of intelligence in the Kazakh research basis for the study of the intellectual nation and the new digital reality, identification of the mechanism of applicability of the world philosophical experience to the realities of Kazakhstan;
- disclosure of the current state of the intellectual sphere of Kazakh society and digital reality in Kazakhstan, their features and prospects for development;
- identification of the nature and state of the intellectual and technological reality of modern Kazakh society based on the public opinion of Kazakhstanis and its description with an analysis of prospects, risks and new opportunities for intellectualization of the nation in the light of its spiritual renewal;
- development of a new concept of modernization processes in the field of science and education in the Republic of Kazakhstan; formulation of a new strategic goal of education and science reforms aimed at creating a society based on knowledge and high technologies capable of providing citizens with self-sustaining development and chances for self-realization;
- identification of priorities of the new scientific and educational policy of the Republic of Kazakhstan, arising from the tasks of building an intellectual nation and aimed at the accelerated development of a new scientific and intellectual potential and the implementation of its results in the field of services and production, culture and everyday life;
- development of competence criteria necessary for the formation of the nation's competitiveness in the context of globalization, subordination to the tasks of scientific and technological development, training of new intellectual personnel on the basis of modern education using the latest information and educational technologies;
- development of algorithms for the transition to a knowledge society in Kazakhstan based on the formation of an intellectual nation as a foundation for future economic growth and a tool for solving social and cultural problems;
- new knowledge and solutions in the creation of the philosophical and ideological foundation and theoretical and methodological base of the Kazakh discourse aimed at solving the problems of reproduction of the intellectual nation and modernization of the public mentality;
- new content of modernization processes in Kazakhstan, updated ideological content of transformation of social mentality and its constitutive factors, obtained on the basis of socio-philosophical, political science, religious studies, sociological dimensions;
- determination of prerequisites, conditions, principles, mechanisms, indicators and criteria of the process of intellectualization of society, factor analysis of the risks of reducing intellectual culture and modernization potential, theoretical reconstruction of the process of intellectualization;
- implementation of scientific publications: monographs, articles, analytical, scientific and practical recommendations for executive bodies aimed at supporting the ideological support of the internal policy of the Republic of Kazakhstan, contributing to the tasks of intellectualization and modernization of public mentality;
- publications of at least three scientific articles in journals in the Web of Science and/or Scopus databases;
- development of scientific and practical recommendations to the subjects of social management on the application of algorithms for influencing the public mentality in the fields of education, mass media, education, science, the Internet;
- introduction of scientific developments into the educational process carried out within the framework of educational strategies and programs for training undergraduates and doctoral students in the specialties “Philosophy”, “Political Science”, “Psychology”, Religious Studies”, etc.
- at least 2 (two) articles and (or) reviews in peer-reviewed scientific publications included in the 1st

(first), 2nd (second) and (or) 3rd (third) quartile by impact factor and (or) indexed in the Arts and Humanities Citation Index of the Web of Science database, and (or) having a percentile by CiteScore there are at least 35 (thirty-five) in the Scopus database;
- at least 10 (ten) articles and (or) reviews in peer-reviewed foreign and (or) domestic publications (recommended by CQAES).

4.2 The end result:

- implementation of the educational strategy for the formation of a highly intelligent nation in Kazakhstan, as well as the formation of a spiritual and moral personality;
- solving the ideological task of creating a creative society where the knowledge economy works;
- development of socio-humanitarian knowledge and its influence on the formation of productive intellectual human capital capable of responding to the challenges of the time;
- ideological strengthening of the intensity of modernization of the public consciousness of the Kazakh society, the growth of the knowledge intensity of Kazakh research and their competitiveness in the international space of modern research on the problems of the intellectual nation
- disclosure of the value potential of the intellectualization process in the context of scientific and technological progress and the transition to universal digitalization;
- determination of the importance of scientific knowledge (natural, socio-humanitarian and technical) in the formation of human capital, worldview and scientific picture of the world;
- comprehensive multidisciplinary substantiation of the intellectual nation paradigm, disclosure of its content and value content in the post-crisis period;
- realization of the effectiveness of the tasks of developing an intellectual and competitive nation;
- qualitative development of human potential with universally valid goals, values and norms of spiritual and cultural development;
- disclosure of the fundamental and everyday meaning of the instrumental values of knowledge and intelligence in a situation of global uncertainty and new existential challenges;
- the development of socio-humanitarian knowledge and its impact on the formation of productive human capital capable of responding to the challenges of the time;
- the use of innovative technologies to influence the intellectual culture of society, taking into account a variety of social strata.

Ecological effect: The implementation of scientific research of a new paradigm of national intelligence in the world of digital technologies with the justification of the priority of moral and spiritual principles in the intellectual development of man and society should contribute to strengthening the idea of human ecology in the public consciousness of Kazakhstan as one of the most important ideas of our time.

The social effect of the research should contribute to the scientific support and support of the implementation of modernization tasks aimed at solving breakthrough areas of development of Kazakh society, first of all, the modernization of Kazakh education that meets the new realities of the digital world and is based on the constant of the viability of society - strengthening the spiritual foundation of an increasingly intellectualizing Kazakh nation. The main socio-economic effect of the practical implementation of the results of the program should be to improve the quality and efficiency of managing the processes of development and retention of intellectual culture as a strategic resource for the development of modern society.

The target consumers of the research are the scientific and pedagogical community, administrative bodies of the ideological process in Kazakhstan at various levels, public organizations and art unions. In addition, the target consumers of scientific results will be institutions of political and administrative management, the education system, the scientific and expert community, public organizations, political parties, and civil society.

The results of the research should be used in writing scientific papers, textbooks and teaching aids, implemented in educational programs and courses of higher educational institutions and colleges of the country. The practical significance of the research is that it will bring certainty to the implementation of the strategy of transition to modern models of sustainable and dynamic development, taking into account the studied state and capabilities of society

5. The maximum amount of the program is 250,000 thousand tenge, including: 2022 – **50,000**

thousand tenge; 2023 – **100,000 thousand** tenge; 2024 – **100,000 thousand** tenge

Technical task No. 61
for research work
within the framework of program-targeted financing

1. General information: **1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)** Research in the field of social sciences and humanities. **1.2. Name of the specialized direction of the program:** Fundamental, applied, interdisciplinary research in the field of humanities. Commonality of history and culture, literature and language, traditions and values
2. . Goals and objectives of the program **2.1. The purpose of the program:** Determination of continuity and transformation in the traditions and culture of post-Golden Horde societies, based on a comparative study of epigraphic monuments of Kazakhstan (architectural styles, stone-cutting art, symbols, calligraphy, the content of inscriptions, vocabulary, social titles in the texts of inscriptions, etc.);
2.2. To achieve this goal, the following tasks must be solved: 1. Conduct field research, collect and process data of epigraphic monuments in all regions of Kazakhstan; 2. Comparative study of epigraphic monuments of Kazakhstan with monuments of neighboring states. 3. Study of the cultural heritage of the post-Golden Horde peoples on the basis of original materials of epigraphy, architecture, vocabulary of memorial monuments; 4. Establishment of forms of sustainable cultural traditions; 5. To trace the transformation processes in the historical development of the regions under consideration
3. Which points of strategic and program documents are solved: 1. The Law of the Republic of Kazakhstan “On Science”; 2. The Law of the Republic of Kazakhstan “On the protection and use of historical and cultural heritage” ; 3. The national project “Technological breakthrough through digitalization, science and innovation”, approved by the Decree of the Government of the Republic of Kazakhstan on October 12, 2021 No. 727. Direction VIII. Improving the competitiveness of the scientific ecosystem; 4. Article of the President of the Republic of Kazakhstan K. K. Tokayev “Independence first of all” dated January 6, 2021; 5. Program article of the First President of the Republic of Kazakhstan N. Nazarbayev “Seven facets of the Great Steppe”
4. Expected results **4.1 Direct results:** - the results of the study should trace the stable processes in the formation and development of the traditions of post-Golden Horde societies, study transformational changes under the influence of historical, social, cultural, linguistic and other factors; - establishment of stable forms of cultural traditions and the results of the transformations that have taken place; - comparative studies should establish what is common and special in West Kazakhstan monuments, the main features of the local school of stone-cutting art, the identification of regional centers for the

manufacture of kulpytas, the design of monuments, the compilation of dedicatory texts, the existence of cult and memorial complexes;
- mapping pilgrimage routes to cult-memorial complexes, communications between cultural and shopping centers of the past, collecting written and oral traditions around the sacred world of these cult-memorial centers;
- the results of the program should be applied in regional centers for the development of the infrastructure of international and local tourism;
- publication of 3 articles in peer-reviewed scientific publications included in the 1st (first), 2nd (second) or 3rd (third) quartile, Social Science CitationIndex or Arts and Humanities Citation Index of the Web of Science database, and (or) having a CiteScore percentile in the Scopus database of at least 35 (thirty-five);
- publication of 6 articles and (or) reviews in peer-reviewed foreign and (or) domestic publications (recommended by CQAES);
- obtaining copyright certificates on the object of intellectual property for published works based on the results of the study

4.2 The end result:

The data of epigraphic monuments are new, reliable historical sources, provide materials not only of historical significance, but also on linguistics, the social life of the people, diplomatic and cultural relations with neighboring administrative entities.

Inscriptions on kulpytas serve as an addition, and sometimes the only reliable source for clarifying and restoring the biographies of historical figures. Consequently, the newly discovered information in this direction is important both for historians and for ethnologists, religious scholars and specialists of a broader profile.

The restoration of the value of necropolises as monuments of historical and cultural significance, national heritage should also contribute to their preservation - repair, restoration, protection from vandalism and, finally, museification. Purposeful activities aimed at fostering patriotism, respect for historical and cultural heritage, as well as interest in the native land will become more effective when it is based on the “material” of necropolises, local archives and shrines, which are essentially potential open-air museums and priceless historical monuments, places of direct contact of modern man, especially young people with the past of his homeland

5. The maximum amount of the program is 250,000 thousand tenge, including: for 2022 – **50,000 thousand** tenge; for 2023 - **100,000 thousand** tenge; for 2024 - **100,000 thousand** tenge

Technical task No. 62
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Research in the field of social sciences and humanities

1.2. Name of the specialized direction of the program:

Research of actual problems of modern international relations, global, regional and cross-border geopolitical, geo-economic, geospatial processes, sociology, sociolinguistics, ethnology, ethnolinguistics, ethnopolitics, conflictology, humanitarian geography, interethnic relations and ethno-confessional relations

2. Goal and objectives of the program:

2.1. The purpose of the program is to develop a mechanism for deepening the economic integration of Central Asian countries to position the region as a major player in the world market, assess the competitive position of Kazakhstan and determine the country's sustainable development goals to achieve a leading role in the region within the framework of global trends of our time.

To achieve this goal, the following tasks must be solved:

- comparative analysis of the global competitiveness of the economies of Central Asian countries; getting an idea of the place of states in the competition for world markets, identifying the ability of countries and its institutions to ensure sustainable growth rates;
- analysis of the state, trends, internal contradictions and external factors of the development of the economies of states; identification of strengths and weaknesses of the economies, identification of points of contact for the cooperation of countries;
- study of the integration potential of Kazakhstan and Kyrgyzstan within the EAEU, the possibility of Tajikistan, Turkmenistan and Uzbekistan joining this union;
- institutional aspects of deepening cooperation between the Central Asian countries in the field of capital markets, labor, goods and services. Research of development institutions of countries: assessment of the degree of state and market regulation of economies, ease of doing business, use of absolute and comparative advantages;
- study of the state of cross-border trade and logistics; assessment of the possibility of optimizing trade and transport routes and building the Concept of a logistics hub within the framework of the Great Silk Road;
- analysis of the industrial potential of the countries, identification of the industries most suitable for the creation of innovative integrated structures within the Central Asian region in the form of completed repartitions in order to increase gross value added;
- research of the market conditions of agricultural products of the countries; conducting marketing research of the agricultural market; selection of an assortment of agricultural products, options for processing them into a finished product in order to create a production chain within the framework of cooperation of entrepreneurs of Central Asian countries;
- analysis of the financial system (including the stock market) of countries; justification of effective interaction of states in the field of finance; search for ways of regional cooperation on the basis of the Astana International Financial Center (AIFC) to attract investment in each country and the Central Asian region as a whole; study of prospects for the integration of individual sectors of the financial market of the region into the global the global capital market (in particular the stock market).
- review of water and energy problems in the Central Asian region; study of experts' opinions on ways to solve water problems in the region from the point of view of global climate change and land desertification; accumulation of existing points of view on the problem and an attempt to define the outline of the Water and Energy Consortium. Development of mechanisms for improving cooperation in the field of transboundary water resources and the environment;
- analysis of social indicators of countries' development (standard of living, income, social assistance, state participation in solving social problems, etc.); issuing recommendations on leveling the level of socio-economic development of the population of Central Asian states, identifying areas of assistance by organizing consultations and exchanging experience between countries;
- international legal regulation of the spheres of economic interaction of the Central Asian countries. Study of the international experience of economic integration of the EU countries, the Asia-Pacific Region, NAFTA; identification of factors determining the success of economic integration; preparation of a report on the experience of integration of avant-garde countries and the possibility of its use;
- formulation of the most important parameters characterizing Kazakhstan's leadership in the region, determination of the parameters of sustainable development, achievement of competitive advantages by the country through the diffusion of innovations, the transition of the main sectors of the economy to a new technological order;
- definition of the Vision, Strategy and Mechanism of economic interaction of the Central Asian countries; justification of the need for regional unity of states to gain competitive advantages in the world market and increase the investment attractiveness of the integrated economic space;
- development of mechanisms to strengthen cooperation in the region, recommendations to increase the resilience of economies to regional vulnerabilities, formulation of proposals to strengthen the financial markets of countries for national capital to enter the global market as a representative of a single major financial player in the region;
- development of recommendations on the economic integration of Central Asian countries, the entry of new countries into the EAEU (Uzbekistan, Turkmenistan, Tajikistan);

- analysis and forecast of prospects for deepening economic cooperation between the Central Asian countries and the Russian Federation, development of proposals for establishing higher-level cooperation.
- analysis of the current state of cooperation between the Central Asian countries and the People's Republic of China, forecast of prospects for expanding economic ties within the framework of the Great Silk Road;
- establishing closer ties with the CIS countries Azerbaijan, Georgia, Turkey, Iran, Afghanistan, Pakistan, drafting proposals for the creation of free trade zones with these countries;
- development of organizational and legal forms of economic cooperation between the Central Asian countries, drawing up a possible scenario for the development of cooperation between states in the medium term

3. **Which points of strategic and program documents are decided by the program**:

The scientific novelty of the research is justified by the fact that the Program was created in the context of the goals and objectives set in the Development Strategy of the Republic of Kazakhstan until 2050;

The implementation of the Program will make it possible to implement the tasks, achieve the goals and indicators defined in the following strategic and program documents:

1. Declaration on Eurasian Economic Integration. Decision of the Interstate Council of the Eurasian Economic Community No. 97. 2 of October 19, 2011

.The EAEU Treaty of May 29, 2014;

3. Memorandum on deepening cooperation between the EEC and the CIS Executive Committee dated November 27, 2018;

4. Memorandum of Understanding between the EEC and ASEAN in the field of economic cooperation dated November 14, 2018;

4. Message of the President of the Republic of Kazakhstan K. Tokayev to the people of Kazakhstan "Constructive public dialogue is the basis of stability and prosperity of Kazakhstan" (2019);

10. Message of the President of the Republic of Kazakhstan K. Tokayev to the people of Kazakhstan "Kazakhstan in a new reality: time for action" (2020)

4. Expected results:

4.1 Direct results:

- publication of 5 articles in publications recommended by CQAES
- publication of 6 articles in journals indexed by the RSCI
- publication of 6 articles or reviews in peer-reviewed scientific publications indexed in the Social Science Citation Index, Arts and Humanities Citation Index or RSCI of the Web of Science database or having a CiteScore percentile of the Scopus database of at least 35
- preparation for the publication of 5 monographs;
- receipt of 4 documents - Certificates of copyright for the object of intellectual property entered in the State register of the Republic of Kazakhstan.

Development of documentation on the study of the potential of economic cooperation of the Central Asian countries and the mechanism of integration interaction, preparation of documentation on the results of research for the transfer of developments to the authorities, specialists and scientists of the Central Asian countries, creation of a web page on the website of organizations; data on the members of the research group; links to relevant profiles; a list of publications and author's certificates, the creation of a website for external users from different countries covering the most relevant topics relevant to the content of this project (in Kazakh, Russian and English).

Development of an innovative training course based on research results (10 video lectures and 10 video seminars) with subsequent placement on the university portal and YouTube (in Kazakh, Russian and English), holding 1 thematic scientific conference, participation in various conferences, holding round tables, scientific seminars for bachelors, masters and doctoral students, preparation programs for TV, interviews in newspapers, the release of information leaflets, the transfer of these materials to colleagues from Central Asian countries, the EAEU and the CIS, seminars, meetings with scientists, specialists of Central Asian countries, participation in conferences in these countries with presentation of research results.

Scientific effect: Substantiation of the expediency of regional cooperation of the Central Asian countries to obtain competitive advantages and increase investment attractiveness.

Economic effect. The adoption of new models of economic growth of countries will lead to a radical restructuring of the structure of economies, new sources of income will appear, which are seen in the development of the manufacturing sector of industry (connected with regional production chains), agriculture, "green" energy, etc. At the same time, the Central Asian states are invited to improve the investment climate and create a diversified private sector. Economic development should cover not only the capitals, but also remote corners of the countries.

Economic effect: Conclusions, provisions and materials of the program should be useful for the development of national economies of countries and the region as a whole. The results of the study are applicable to cooperation organizations in Central Asia, the Eurasian Economic Commission in the structure of the EAEU. The states will get an idea of the competition for world markets, learn their capabilities to ensure sustainable growth rates. The strengths and weaknesses of the economies should be shown, the points of contact for cooperation between the countries should be identified.

Establishing effective cooperation between states in the field of finance, searching for ways of regional cooperation on the basis of the Astana International Financial Center (AIFC) to attract investment to each country. Identification of factors determining the success of economic integration, development of recommendations for the entry of new countries into the EAEU, the creation of free trade zones, and other options for cooperation. Implementation of the Scenario for the development of cooperation between states in the medium term.

Social effect: Based on the analysis of the standard of living, income, social assistance, state participation in solving social problems, recommendations should be issued to equalize the level of socio-economic development of the population of Central Asian states, identify areas of assistance through the organization of consultations and exchange of experience between countries.

Target consumers of the results obtained: research results should be available to scientists, specialists of Central Asian countries, will receive coverage in newspapers, magazines, broadcast on TV, published monographs, articles, electronic databases on the program should be presented on the website. The research material should be in demand and useful for teachers, students, undergraduates and doctoral students, research institute employees, specialists engaged in the field of scientific knowledge under consideration.

5. The maximum amount of the program is 200,000 thousand tenge, including by year: for 2022– **30,000 thousand** tenge, for 2023 – **85,000 thousand** tenge, for 2024 – **85,000 thousand** tenge,

Technical task No. 63
for research work
within the framework of program-targeted financing

1. General information:

Research in the field of social sciences and humanities.

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Fundamental, applied, interdisciplinary research in the field of humanities

The study of humanitarian aspects and the formation of an ideological platform for the sustainable development of Kazakh society.

2. Goals and objectives of the program:

2.1. The purpose of the program:

Development of scientific and methodological foundation of nation-building taking into account modern conditions, trends and possible development models, formation of conceptual and terminological apparatus, development of projection/evaluation models of national development for Kazakhstan, including an intercultural, inclusive society

2.2. To achieve this goal, the following tasks must be solved:
- to conduct a theoretical and methodological analysis of international and domestic experience in nation-building in multi-ethnic societies;
- to conduct a comprehensive analysis of modern conditions, trends of nation-building;
- to analyze the legal, social, educational, cultural features of the integration of a multiethnic community into a single nation;
- develop projection/evaluation models for the development of a multiethnic society;
- to assess the role of ethnic identity in nation-building in polyethnic and mono-ethnic regions of Kazakhstan formation of conceptual and terminological foundations of nation-building;
- to determine the role and forms of nationalism (civil or state and ethnic nationalism) in the nation-building of Kazakhstan, taking into account the new geopolitical realities;
- to develop scientifically based and practical recommendations for the formation of an intercultural and inclusive nation;
– to develop a domestic conceptual and terminological apparatus (glossary) in the field of nation-building.

3. Which points of strategic and program documents are decided by the program:
1. "Strategy "Kazakhstan-2050" Item 7. New Kazakhstan patriotism is the basis for the success of our multinational and multi–confessional society;
2. The Doctrine of National Unity, which proclaims the following principles of National Unity of Kazakhstan:
I. "One Country — One Destiny"
Ii. "Different Origins — Equal Opportunities"
Iii. "Development of the National Spirit"
3. The concept of development of the Assembly of People of Kazakhstan (until 2025), where one of the tasks is the introduction of new formats of interaction between the state and ethno-cultural and other public associations to strengthen social harmony and national unity;
4. Message of the President of the Republic of Kazakhstan "UNITY OF THE PEOPLE AND SYSTEMIC REFORMS – A SOLID FOUNDATION FOR THE PROSPERITY OF THE COUNTRY" Item VII. Consolidation as the main factor of further progress;
5. Message of the President of the Republic of Kazakhstan dated March 16, 2022 "NEW KAZAKHSTAN: THE PATH OF RENEWAL AND MODERNIZATION", where it is noted that in the New Kazakhstan we must always follow the principle of "different views, but one nation";
6. Implementation of the measures indicated by the Head of State at the XXXI session of the Assembly of People of Kazakhstan "Unity of the people — the basis of a renewed Kazakhstan".

4.1. Direct results:
- Development of projection/evaluation models for the development of a multiethnic society;
- Development of a domestic conceptual and terminological apparatus in the field of nation-building;
- Development of scientifically based and practical recommendations for the formation of an intercultural and inclusive nation;

The implementation of research results should be:
- 2 monographs have been published;
- 1 glossary on terminology has been published;
- 3 (three) articles have been published in peer-reviewed scientific publications included in the 1st (first), 2nd (second) or 3rd (third) quartile, Social Science CitationIndex or Arts and Humanities Citation Index of the WebofScience database, and (or) having a CiteScore percentile in the Scopus database of at least 35 (thirty-five);
- 6 articles and (or) reviews have been published in peer-reviewed foreign and (or) domestic publications (recommended by CQAES).

4.2 The end result:
Scientific and technical effect: The implementation of the program should contribute to the effective

implementation of intellectual, analytical and methodological support for the development and successful implementation of state policy in the field of nation-building;
Scientific and methodological effect: The formation of a conceptual and terminological apparatus in the field of nation-building;
Socio-economic effect: The acquired knowledge should contribute to the development of an intercultural, inclusive society;
Political effect: The knowledge gained within the relevant structures (Senate and Majilis of the Republic of Kazakhstan, ministries, departments, akimats, public councils) should contribute to: the formation of the foundations of nation-building, taking into account modern conditions, trends and projection/evaluation models of development.
Target consumers of the results obtained:
the Administration of the President of the Republic of Kazakhstan, the Ministry of Education and Science of the Republic of Kazakhstan, the Ministry of Education and Science of the Republic of Kazakhstan, local executive authorities, civil society.

5. The maximum amount of the program is 250,000 thousand tenge, including:
for 2022 – **50,000 thousand** tenge, 2023 – **100,000 thousand** tenge, for 2024 – **100,000 thousand** tenge

Technical task No. 64
for research work
within the framework of program-targeted financing

1. General information:
1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)
Research in the field of social sciences and humanities
1.2. Name of the specialized direction of the program:
Fundamental, applied, interdisciplinary research in the field of social sciences:
Actual problems of social modernization: demography, migration, quality of human resources, quality of life and social inequality, problems of employment and unemployment, scientific organization, rationing and labor safety.

2. Goals and objectives of the program:
2.1. The purpose of the program:
A comprehensive study of regional differentiation of the level of socio-cultural and economic indicators and the development of an effective model of the potential of regional development of Kazakhstan.

2.2. To achieve this goal, the following tasks must be solved:
- comprehensive analysis of the real foundations of the formation of the socio-cultural and economic environment in the regions over the past 25 years;
- comparative analysis of the level of regional differences at the regional, district, urban and rural levels;
- expert and selective sociological research on rating regional problems and conditions for overcoming them in the socio-cultural and economic environment;
- identification of a complex of issues of territorial development in the context of border regions;
- definition of a complex of issues of territorial development in the context of the so-called "problem" regions;
- disclosure of the factors of priority development of the regions of compact residence of ethnic minorities and unpromising rural settlements;
- development of priority measures to improve the efficiency of regional economic development institutions;
- development and implementation of a block of recommendations and proposals for republican and regional government bodies on the modernization of the socio-cultural and economic environment to overcome unjustified territorial differentiation in the level of its development;
- preparation of a roadmap to overcome regional imbalances in the socio-cultural and economic development of territories;

- development of comprehensive recommendations for restarting regional development institutions

3. Which points of strategic and program documents are solved:

- Strategic article of the President of the Republic of Kazakhstan K.K. Tokayev "Tauelsizdik barinen kymbat";
- Strategic Development Plan of the Republic of Kazakhstan until 2025. Decree of the President of the Republic of Kazakhstan No. 636 dated February 15 , 2018;
- National project "Ulttyk rukhani zhangyru";
- Address of the President of the Republic of Kazakhstan to the People of Kazakhstan "Unity of the people and systemic reforms are a solid foundation for the prosperity of the country";

Message of the President of the Republic of Kazakhstan to the people of Kazakhstan "New Kazakhstan: The path of renewal and modernization;

- Message of the President of the Republic of Kazakhstan to the People of Kazakhstan "Constructive public dialogue is the basis of stability and prosperity of Kazakhstan";
- Resolution of the Government of the Republic of Kazakhstan dated December 27, 2019 No. 990 "On approval of the State Program for the Development of Regions for 2020 – 2025".

4. Expected results:

4.1 direct results:

Following the results of the implementation of the scientific and (or) scientific and technical program, the following minimum number of publications should be published.

- at least 2 (two) articles and (or) reviews in peer-reviewed scientific publications included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile by impact factor and (or) indexed in the Arts and Humanities Citation Index of the Web of Science database, and (or) having a percentile by CiteScore there are at least 35 (thirty-five) in the Scopus database;
- at least 10 (ten) articles and (or) reviews in peer-reviewed foreign and (or) domestic publications (recommended by CQAES).

The implementation of the program should contribute to the alignment of priorities and the pace of modernization of the economic and social spheres in the context of regions.

This will ensure the full implementation of the strategic initiatives of the Head of State related to the intensification of the development of border areas, regions with a high index of problems and compactness of ethnic minorities.

High-status national institutions and organizations should be integrated into the regions, and a higher level of connectivity of regional and republican development programs should be achieved.

The target consumers of the results of the program are both republican and regional government bodies.

A model of a new regional policy in Kazakhstan should be tested in the pilot project.

The economic effect should be expressed in the growth of the dynamics of the target indicators of regional development and the sustainable transit of structural and technological transformations.

The social effect should be expressed in overcoming socio-economic imbalances in the level and quality of life of the population of the regions.

5. The maximum amount of the program – **250,000 thousand** tenge, including by year: for 2022 – **50,000 thousand** tenge, for 2023 – **100,000 thousand** tenge, for 2024 – **100,000 thousand** tenge

Technical task No. 65
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

Research in the field of social sciences and humanities

1.2. Name of the specialized direction of the program:

Fundamental, applied, interdisciplinary research in the field of humanities

2. Goals and objectives of the program:

2.1. The purpose of the program:
Introduction into scientific circulation of new Arabic, Mongolian, Persian, Chinese and Turkic sources on the ethnopolitical history of the Uluses of Chagatai, Haidu and Mogulistan in the XIII-XV centuries.

2.2. To achieve this goal, the following tasks must be solved:
– to create a database of Arabic, Mongolian, Persian, Chinese and Turkic sources on the ethnopolitical history of the Uluses of Chagatai, Haidu and Mogulistan in the XIII-XV centuries.
- to single out separately both the already translated sources and the sources on the history of the Uluses of Chagatai, Haidu and Moghulistan, which need to be translated and introduced into scientific circulation.
- to create a historiographical database of scientific articles, monographs, collections of extracts from sources and dissertations on the history of the Uluses of Chagatai, Haidu and Mogulistan in the XIII-XV centuries.
- to determine the range of sources for Arabic, Mongolian, Persian, Chinese and Turkic sources on the ethnopolitical history of the Uluses of Chagatai, Haidu and Moghulistan for translation and introduction into scientific circulation.
- to form a list of khans, oglans, emirs and other personalities from the history of the Uluses of Chagatai, Haidu and Mogulistan for the subsequent creation of the encyclopedia “Elite of the uluses of Chagatai, Haidu and Mogulistan”.
- 16 video lectures on the history of the uluses of Chagatai, Haidu and Mogulistan.
- Translation of Arabic, Mongolian, Persian, Chinese and Turkic primary sources on the history of the Uluses of Chagatai, Haidu and Mogulistan.
- writing and publishing the encyclopedia “Elite of the uluses of Chagatai, Haidu and Mogulistan”.
- writing and publishing a collective monograph “Ethnopolitical history of the Chagatai and Haidu ulus”.
- writing and publishing a collective monograph Ethnopolitical history of Moghulistan.
- determination of the tribal composition of the uluses of Chagatai, Haidu and Mogulistan.
- 8 video lectures on the history of the uluses of Chagatai, Haidu and Mogulistan.
- a course of lectures on the history of the ulus of Chagatai, Haidu and Mogulistan.
- publication of a collection of translations of Arabic, Mongolian, Persian, Chinese and Turkic primary sources on the history of the Uluses of Chagatai, Haidu and Mogulistan
- conference on the results of the implementation of the program with a presentation of the published publications.

3. Which points of strategic and program documents are solved:
1. “Strategy “Kazakhstan-2050”, a new political course of the established state” Address of the President of the Republic of Kazakhstan – Leader of the Nation N.A. Nazarbayev to the people of Kazakhstan, Astana, December 14, 2012.
2. Decree of the President of the Republic of Kazakhstan dated February 15, 2018 No. 636. “On approval of the Strategic Development Plan of the Republic of Kazakhstan until 2025”.
3. Program article by Kassym-Jomart Kemelevich Tokayev “Tauelsizdik barinen kymbat”. https://egemen.kz/article/260146-tauelsizdik-barinen-qymbat
4. Law of the Republic of Kazakhstan dated February 18, 2011 No. 407-IV “On Science”;
5. The message of the Head of State Kassym-Jomart Tokayev to the people of Kazakhstan “Constructive public dialogue is the basis of stability and prosperity of Kazakhstan” dated September 2, 2019. http://www.akorda.kz/ru/addresses/addresses_of_president/poslanie-glavy-gosudarstva-kasym-zhomarta-tokaeva-narodu-kazahstana
6. The concept of science development of the Republic of Kazakhstan for 2022-2026.

4. Expected results
4.1 Direct results:
According to the results of the program:
- collections of translations of Arabic, Mongolian, Persian, Chinese and Turkic primary sources on the history of the Chagatai, Haidu and Mogulistan uluses in Kazakh and Russian should be published.
- the encyclopedia “Elite of the uluses of Chagatai, Haidu and Mogulistan” has been published in Kazakh and Russian.

- a collective monograph “Ethnopolitical history of the Chagatai and Haidu ulus” has been published in Kazakh and Russian.
- a collective monograph “Ethnopolitical history of Mogulistan” has been published in Kazakh and Russian.
- 16 video lectures on the history of the uluses of Chagatai, Haidu and Mogulistan have been prepared.
- a course of lectures on the history of the ulus of Chagatai, Haidu and Mogulistan has been published.
– 3 articles have been published in peer-reviewed scientific publications included in 2 (second) or 3 (third) quartiles in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 50 (fifty).
- at least 10 (ten) articles and (or) reviews in peer-reviewed foreign and (or) domestic publications (recommended by CQAES).

4.2 The end result:

The growth of scientific knowledge concerning the medieval history of Kazakhstan in general, and the history of the uluses of Chagatai, Haidu and Mogulistan in particular. Collections of translations of primary sources on the history of these medieval states on the territory of Kazakhstan, as well as scientific articles and collective monographs on the history of these states should be published. Due to the identification of new scientific facts, there will be an increase in the symbolic capital of Kazakhstan. In general, the implementation of the program should strengthen the historical science of Kazakhstan by increasing new scientific knowledge.

Economic effect. The scientific results obtained during the implementation of the Program should contribute to the growth of Kazakhstan's human capital by increasing the level of education in such unexplored parts of Kazakhstan's history. Also, the revealed historical facts should contribute to the growth of the historical tourism industry of Kazakhstan, since many historical settlements with high tourist potential, as well as having sacred significance for Kazakhstan (Turkestan, Sairam, Otrar, Sauran, Taraz, etc.), were part of the ulus of Chagatai, Haidu and Mogulistan

Social effect. Improvement of the social sphere and consolidation of society due to the growth of national consciousness and the increase of the symbolic capital of the history of Kazakhstan. The target consumers of the results obtained are government agencies, Kazakhstani scientific organizations dealing with the problems of the history of Kazakhstan, as well as the problems of the formation of historical memory, analytical centers, public organizations, experts in the field of history, museum workers, university teachers and school teachers on world history and the history of Kazakhstan

5. The maximum amount of the program is 360,000 thousand tenge, including by year:for 2022– **60,000** thousand tenge, for 2023 – **150,000** thousand tenge, for 2024 – **150,000** thousand tenge.

Technical task No. 66
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter – the program)

Research in the field of social sciences and humanities.

1.2. Name of the specialized direction of the program:

Fundamental, applied, interdisciplinary research in the field of humanities:
Spiritual Modernization and the Seven Facets of the Great Steppe
Historical and cultural heritage and spiritual values of Kazakhstan.

2. Goals and objectives of the program

2.1. Purpose of the program:

Comprehensive, interdisciplinary (historical, archaeological-ethnographic, museum-monument studies, socio-ethnological) scientific study of the history and culture of the south-eastern and eastern regions of Kazakhstan (Shu-Ili area, Tarbagatai and Alakol basin regions).

2.2. To achieve this goal, the following tasks must be solved:

- Identification of the specifics of the evolution and transformation of monuments of the Stone Age and early metal on the territory of Zhetysu and the study of the features of the economic and cultural type;
- Carrying out a complex of natural science research in order to determine the chronology of monuments and recreate the life support system, cultural affiliation and reconstruction of the types of economic activity of the ancient population of the region;
- Mapping and description of modern and paleogeographic features of the studied areas as the main reference point for the interpretation of elements of the natural and cultural landscape;
- Classification of archaeological, ethnographic monuments and natural and cultural landscape ecosystems of the studied regions;
- Field studies of the supporting archaeological sites of ancient and medieval nomads in the foothills of Tarbagatai and Northeastern Zhetysu, as well as characteristics of the funeral rite of the population of these regions in aspects of continuity and transformation: geographical location, topography and principles of formation of necropolises, grave pits and inter-grave structures, sacrificial complexes in burials, etc.;
- Conducting targeted comprehensive field research on the Aktobe settlement (Balasagun) and in the medieval settlements of Zhaypak and Kapal;
- New rock art complexes in the foothills of Tarbagatai and the Chu-Ili Mountains (Akberli, Maraldy, Ushbulak, Sampyr, Mailin, etc.): characteristics, typology and classification of motifs, images and plots;
- On the basis of archaeological data, written sources, information of oral folk art, linguistics data, to conduct a comparative analysis of the origin and formation of the Early Turkic tribes that inhabited the Kazakh steppes in the Early Middle Ages on the territory of the studied region;
- Through ethnic reconstructions to determine the stages of the formation of the ethno-cultural area of interactions, ethnic contacts, historical causes and ways of migration processes of Turkic tribes as an important factor in the ethnogenesis of Kazakhs;
- To conduct an analysis in the context of the study of the processes of ethnogenesis of the Kazakh people through the tamgas, urans of the Kazakh tribes inhabiting the territory of the studied region;
- Research of written, archaeological, ethnographic sources, archival materials and museum artifacts on the history of the designated regions, allowing an objective assessment of the historical and ethno-cultural continuity of the pro-Turkic, Turkic tribes and the Kazakh people;
- Comprehensive study and research of the issues of onomastics and toponymy of the specified territory in order to return the historical names;
- A complete ethnographic description, identification of the semantic meaning and culturogenetic roots of the traditional beliefs of the Kazakhs in the customs and rituals of the family cycle;
- Ethnographic description, semantic analysis and identification of historical and cultural roots of Kazakh beliefs associated with the cult of ancestors and memorial customs;
- Description, disclosure of the internal content, genetic roots of the traditional beliefs of the Kazakhs associated with cattle farming;
- Study, analysis, identification of cultural and genetic roots of superstitious rituals and customs of Kazakhs related to agriculture;
- Determination of the number of Kazakh tribes and clans, seasonal pastures, migration directions in terms of localization of ethnic territory and comparative analysis of ethnic processes.
- Determination of the time of migration to seasonal camps, features of the organization of nomadic camps and the development of nomadic routes, the names of stops and watering places on the way of nomads;
- Research within the framework of studying the problems of ethnogenesis of the tradition of compiling pedigrees of Kazakh tribes of the studied region;
- study and determination of regional features of the traditional material and spiritual culture of the Kazakhs;
- Socio-ethnological research and analysis of historical demography, ethnodemography, migration, ethnolinguistic, ethno-confessional situation of the population of the studied territory;
- Socio-ethnological research and study of the process of migration, adaptation, economic activity of the Kandas compatriots in the studied territory;
- study of the problems of civic and ethnic unity, interethnic relations.

3. Which points of strategic and program documents are solved:

The Law of the Republic of Kazakhstan "On the protection and use of objects of historical and cultural heritage" dated December 26, 2019 N 288-VI ZRK.
Law of the Republic of Kazakhstan "On Culture" dated December 15, 2006 N 207;
Law of the Republic of Kazakhstan "On Science" dated February 18, 2011 N 407-IV;
"Strategy "Kazakhstan-2050": a new political course of the established state" Address of the President of the Republic of Kazakhstan-Leader of the Nation N.A.Nazarbayev to the people of Kazakhstan, Astana, December 14, 2012;
Program article of the First President of the Republic of Kazakhstan N.A. Nazarbayev "A look into the future: modernization of public consciousness" dated April 12, 2017;
Program article of the First President of the Republic of Kazakhstan N.A. Nazarbayev "Seven facets of the Great Steppe", published on November 21, 2018;
Message of the President of the Republic of Kazakhstan K.K.Tokayev to the people of Kazakhstan "Kazakhstan in the new reality: Time for action" from September 1, 2020;
Message of the President of the Republic of Kazakhstan K.K.Tokayev to the people of Kazakhstan "Unity of the people and systemic reforms – a solid foundation for the prosperity of the country" dated September 1, 2021.

4. Expected results

4.1 Direct results:

- Comprehensive field research on archaeological monuments of antiquity and the Middle Ages in the foothills of Tarbagatai and the Chu-Ili Mountains, as well as on medieval monuments of Aktobe (Balasagun), Zhaypak, Kapal;
- New materials on rock art complexes of the studied regions;
- methodological recommendations and instructions for conducting field expeditions (archaeological, ethnographic, historical, museum);
- Replenishment of funds and museum expositions with artifacts found as a result of scientific research;
- New data on the ethnography of the Zhetysu Kazakhs;
- new materials and recommendations on ethnic unity, interethnic relations
- publications of 3 scientific monographs (one on archaeology, one on ethnography and one on history), also 2 album books and 2 textbooks;
- published 3 (three) articles in peer-reviewed scientific publications included in the 1st (first), 2nd (second) or 3rd (third) quartile, Social Science CitationIndex or Arts and Humanities Citation Index of the WebofScience database, and (or) having a CiteScore percentile in the Scopus database of at least 35 (thirty-five);
- 6 articles and (or) reviews have been published in peer-reviewed foreign and (or) domestic publications (recommended by CQAES).
- obtaining copyright certificates on the object of intellectual property for published works based on the results of the study;

4.2 The end result:

Implementation of scientific systematization of historical and cultural heritage monuments of the south-eastern and eastern regions of Kazakhstan, introduction into scientific circulation of new archaeological, ethnographic data concerning the history of the region. Replenishment of regional and regional museums with new artifacts. Scientific developments and recommendations on issues of ethnic identity and interethnic relations

The target subjects are educational institutions, universities, research institutes, regional cultural departments and Committees for the Protection of historical and Cultural Monuments, the Assembly of Peoples of Kazakhstan.

5. The maximum amount of the program is 200,000 thousand tenge, including for 2022 – **50,000 thousand tenge**, for 2023 – **75,000 thousand tenge**, for 2024 – **75,000 thousand tenge.**

Technical task No. 67
for research work

within the framework of program-targeted financing

1. General information:

1.1. Name of the specialized direction for the scientific, scientific and technical program (hereinafter referred to as the program):

Research in the field of social sciences and humanities

Fundamental, applied, interdisciplinary research in the field of humanities.

2. Goals and objectives of the program

2.1. Purpose of the program:

The study of the history and culture of Kazakhstan and Central Asia, the objective writing of generalizing scientific papers based on new archival materials (written Eastern and Western European sources, archival documents and visual artifacts), still unknown and stored in foreign archival collections, libraries and museums.

To achieve this goal, the following tasks must be solved:

- Historiographical and archeographic research of documents and artifacts related to the history and culture of Central Asia and Kazakhstan through archaeological expeditions to foreign archives and libraries of Switzerland, Uzbekistan, Tajikistan, Korea, Armenia, Germany, Denmark, Sweden (2023), Vatican, Georgia, Taipei, Japan, Iran (2024).
- Expansion of Kazakhstan's source database of digitized copies of archival documents, written sources and visual artifacts on the history and culture of Kazakhstan and Central Asia.
- Wide popularization of the results of the scientific project through the publication of generalizing scientific papers, speeches at international conferences, in the media, organization and holding of thematic exhibitions of copies of written sources, archival documents and visual artifacts identified in foreign funds.
- Advanced training of archeographers in the history and culture of Kazakhstan and Central Asia.

3. Which points of strategic and program documents are solved:

1. Message of the President of the Republic of Kazakhstan dated December 14, 2012 “Strategy "Kazakhstan-2050”: a new political course of the established state”: direction - 6 “Consistent and predictable foreign policy – promotion of national interests and strengthening of regional and global security", priority "To intensify international cooperation in cultural, humanitarian, scientific and educational and other related areas”;
2. Decree of the President of the Republic of Kazakhstan dated March 6, 2020 No. 280 “On the Concept of Foreign Policy of the Republic of Kazakhstan for 2020-2030”: paragraphs 3.1 “Strengthening constructive and equal cooperation in the field of protection of human rights and freedoms, development of civil society, taking into account the peculiarities of historical development and cultural values of the states of the world" and 3.7 “expansion of international cooperation on bilateral and multilateral level in the field of education, science, culture, sports and youth policy” key priorities of the Foreign Policy Concept of the Republic of Kazakhstan for 2020-2030;
3. Resolution of the Government of the Republic of Kazakhstan dated May 25, 2022 No. 336 “On approval of the Concept of Science development of the Republic of Kazakhstan for 2022-2026”: direction 5.4. “Coordination of scientific and technological development”, item 59 “Conducting analytical and foresight research on planning and forecasting of scientific and technological development of industries”;
4. Resolution of the Government of the Republic of Kazakhstan dated December 20, 2019 No. 953 “On approval of the Comprehensive Action Plan for the implementation of the Archive-2025 project for 2020-2025”: item 6 “Archeographic works in foreign archives and funds on the history and culture of the Great Steppe (identification, analysis, digitization)”;
5. Order of the Prime Minister No. 167-r dated October 6, 2021 “On approval of the Roadmap for the transition of the Rukhani Zhangyru program for the period of national modernization for 2022-2024”: item 45 “Organization of events for archaeological works in foreign archives and funds on the history and culture of the Great Steppe (identification, analysis, digitalization)”.

4. Expected results.

4.1 Direct results:

- preparation and conduct of archaeological expeditions to foreign archives and libraries of Switzerland,

Uzbekistan, Tajikistan, Korea, Armenia, Germany, Denmark, Sweden (2023), Vatican, Georgia, Taipei, Japan, Iran (2024)

- identification and acquisition of copies of written sources, archival documents and artifacts on history and culture Kazakhstan and Central Asia;

systematization, cataloging, digitization and analysis of identified materials during foreign archaeological expeditions;

- replenishment of the Kazakh source database (National Archive, etc.) with digitized copies of archival documents, written sources and visual artifacts on the history and culture of Kazakhstan and Central Asia, which are of great importance for an objective study of the history of the Kazakh statehood;
- historiographical, archeographic and interdisciplinary research of archival documents and artifacts related to the history and culture of Kazakhstan and Central Asia.
- publication of 3 (three) articles in peer-reviewed scientific publications included in the 1st (first), 2nd (second) or 3rd (third) quartile, Social Science CitationIndex or Arts and Humanities Citation Index of the WebofScience database, and (or) having a CiteScore percentile in the Scopus database of at least 35 (thirty-five);
- publication of 6 articles and (or) reviews in peer-reviewed foreign and (or) domestic publications (recommended by CQAES).

4.2 The end result:

- new information revealed from Eastern and Western European written sources, archival documents and visual artifacts on the history and culture of Kazakhstan and Central Asia are the basis of the worldview of the Kazakh people, allowing to identify the historical continuity, place and role of Kazakhstan in the world community.
- a systematic analysis, an interdisciplinary approach and the introduction into scientific circulation of the first discovered materials on the history and culture of Kazakhstan and Central Asia, will lead to the development of new conceptual solutions, innovative methodologies in understanding the historical and cultural heritage of Kazakhstan.
- the data obtained will reveal new promising research paths for the development of history, Oriental studies and cultural studies, in general, social studies.
- the revealed materials will eliminate gaps and restore historical dignity, develop new thinking on the study of the ethnogenesis and ethnic history of the Kazakh people, Kazakh statehood, the common history, culture and intellectual heritage of Kazakhstan and Central Asia, and will give an opportunity to re-evaluate historical perspectives and strengthen the interaction of eastern and Western cultures.

Scientific effect: improving the image and competitiveness of Kazakh science; the possibility of using the results of the research to develop research and analytical projects on the interaction of nomadic and sedentary cultures, ecology and environment of Kazakhstan and Central Asia, the common history and culture of Kazakhstan and Central Asia, the development of dialogue and international relations in the Central Asian region, and more broadly, in Eurasia; development of programs of higher educational institutions, general education schools; introduction of new materials to the academic seven-volume edition "History of Kazakhstan", as well as the development of long-term recommendations for the implementation of state policy in the educational, scientific and cultural spheres; implementation of practical requests of relevant ministries and departments.

Socio-economic effect: The work on this project and the publication of its results should introduce new information into the educational and educational process, should promote popularization and ensure the formation of historical self–awareness of the population, strengthen the unity of the people - the basis of the new Kazakhstan patriotism.

The target consumers of the results obtained are: Scientists and research organizations of legal, pedagogical, social and humanitarian profile, state institutions and state bodies, the population of urban and rural areas.

5. The maximum amount of the program is 260,000 thousand tenge, including for 2022 – **20,000 thousand tenge**, for 2023 – **120,000 thousand tenge**, for 2024 – **120,000 thousand tenge**.

Technical task No. 68
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter referred to as the program)

National Security and Defense

1.2. Name of the specialized direction of the program:

Ensuring information security.

2. Goals and objectives of the program

2.1. The purpose of the program:

Creation of a military multifunctional educational platform (hereinafter referred to as VMP) based on advanced technologies, taking into account information security and processing of information constituting state secrets.

2.2. To achieve this goal, the following tasks must be solved:

– creation of a software and hardware complex within the framework of the development of a VMOP based on the departmental data transmission network of the Armed Forces, with the possibility of further integration with other information systems of the Armed Forces of the Republic of Kazakhstan (including in a protected version);

– development of a VMOP, taking into account the availability of modules for loading, unloading, exchange of materials, output of processed, including classified information in the form of reporting, digital data, analytics with elements of artificial intelligence, in accordance with the requirements for information security imposed by current legislation;

– development of all necessary technical and methodological documentation within the framework of the creation of the VMOP, in order to automate, collect, process and store a large amount of official information, limited distribution of military educational institutions;

– creation of a storage base with the presence of a system of duplication of information on backup storage devices with subsequent restoration, taking into account the requirements for the protection of state secrets;

– introduction of new digital technologies in order to create a unified information space for military education, improve the quality, control and monitoring of the educational process, output of processed information, in strict accordance with the information security requirements imposed by the current legislation;

– installation of VMOS, testing in the pilot version.

3. Which points of strategic and program documents are decided by:

Implementation:

- the second priority policy of the Strategic Plan 2025 “Technological renewal and digitalization”;
- “National security Strategies” ensuring combat and mobilization readiness of the Armed Forces of the Republic of Kazakhstan;
- subparagraph 11) of paragraph 3.4. of the Military Doctrine of the Republic of Kazakhstan “Development of the military organization of the state, modernization of the system of military education and training, development of military science taking into account international best practices”;
- Item 1 of the National Action Plan for the implementation of the Address of the Head of State to the People of Kazakhstan “New development opportunities in the conditions of the Fourth Industrial Revolution”;
- the state program “Digital Kazakhstan”.

4. Expected results

4.1 Direct results:

- implementation of new solutions and innovative approaches to the organization of the educational process as part of the modernization of the military education system, which allows for management in an

automated, digital and highly organized format in real time with ensuring the safety and security of data of the Armed Forces of the Republic of Kazakhstan;

- introduction of modern safe, domestic, innovative developments and technologies that meet security requirements, models for digitalization and automation, collection, processing and storage of a large amount of information;
- new science-based technological solutions for the use of server equipment and data processing and storage facilities necessary for the creation of the complex;
- creation on the scientific basis of the VMOP, improving the quality, control and monitoring of the educational process, output of processed information in the form of reporting data, based on the developed requirements according to the terms of reference (development and design of databases, development of the client part of the software (front-end development); parameters with elements of artificial intelligence in terms of analytics.
- recommendations on the transformation of the staff structure of the Armed Forces based on the application of new skills and competencies in the field of digitalization;
- development of the necessary regulatory and technical documentation for the operation of the VMOP, filing a patent application, certification at a high level of trust;

- at least 5 (five) articles in journals recommended by CQAES.

4.2 The end result:

- the creation of a VMOP should contribute to improving the quality of military personnel training, strengthening digital culture, improving the quality, control and monitoring of the educational process in a secure execution, integration into automated systems of the Armed Forces of the Republic of Kazakhstan;
- the introduction of innovative technologies in the educational process of military universities, which should contribute to improving the combat readiness of the Armed Forces;
- exclusion of corruption risks in the educational process;
- The IOC should contribute to strengthening the country's defense capability, comply with the provisions of the Military Doctrine, the Second priority Policy of the Strategic Plan 2025 "Technological Renewal and Digitalization", "National Security Strategy";
- the results of the creation of the complex will make it possible to develop a platform used in the organization of the educational process of military educational institutions, as well as used in the troops during training to improve combat readiness, conduct retraining and advanced training courses, as well as exchange of experience.

The economic effect of the implementation of this scientific technical task is due to the development of the military IT sphere, the expansion of existing and the emergence of new requirements for military education; a multiple reduction in the cost of training compared to the existing one; an increase in the ratio of indicators: efficiency / cost, due to time savings, the exclusion of paper document management.

The ecological effect is due to the absence of harmful emissions; the use of environmentally friendly materials in the production; reduction of energy consumption; assistance in the development of a “green economy”.

The social effect of the program is expressed in the creation of new jobs in the field of IT, the growth of scientific potential, will allow the introduction of scientific and technical achievements in the educational process, which contributes to the introduction of innovative views on science and the educational process, as well as in strengthening the combat capability of the Armed Forces.

5. The maximum amount of the program is 346,690 thousand tenge, including: for 2022 - **81,690 thousand** tenge, for 2023 – **140,000** thousand tenge, for 2024 – **125,000** thousand tenge.

Technical task No. 69
for research work
within the framework of program-targeted financing

1. General information:

National security and defense

1.2. Name of the specialized direction of the program:

Development of the military-industrial complex, weapons and military equipment, military space technologies

2. Goals and objectives of the program

2.1. Creation of a prototype of a combat strike unmanned aerial vehicle (hereinafter - CSUAV) based on advanced technologies, taking into account the provision of target designation in the conditions of counteraction of enemy electronic means.

2.2. To achieve this goal, the following tasks must be solved:

– creation of a software and hardware module for the protection of communication and control channels within the framework of the development of a CSUAV based on the departmental data transmission network of the Armed Forces, with the possibility of further integration with other information systems of the Armed Forces of the Republic of Kazakhstan (including in a protected version);

– calculation and design of a CSUAV airframe with high flight performance and maneuverability;

- calculation and manufacture of a mortar-type CSUAV launcher;

- development of a software and hardware complex for controlling the equipment of the CSUAV payload (optical and thermal imaging cameras) with elements of artificial intelligence to perform the functions of homing and self-destruction;

- software development for the built-in flight simulator;

- diagnostics of radio modules of the CSUAV equipment for electromagnetic compatibility;

– development of all necessary technical and design documentation within the framework of the creation of the CSUAV;

– creation of a prototype of a drone, taking into account the provision of low cost and high efficiency in defeating important (dangerous) enemy targets.

3. Which points of strategic and program documents are decided by:

Implementation:

- the second priority policy of the Strategic Plan - 2025 “Technological renewal and digitalization”;

- “National security strategies”: provision of new models of weapons and military equipment of the Armed Forces of the Republic of Kazakhstan;

- subparagraph 11) of paragraph 3.4. of the Military Doctrine of the Republic of Kazakhstan “Development of the military organization of the state, development of military science taking into account international best practices”;

- Item 1 of the National Action Plan for the implementation of the Address of the Head of State to the People of Kazakhstan “New development opportunities in the conditions of the Fourth Industrial Revolution”;

- the state program “Digital Kazakhstan”.

4. Expected results

4.1 Direct results:

- implementation of new solutions and innovative approaches to the creation of new models of weapons and military equipment, allowing to increase the combat potential of the Armed Forces of the Republic of Kazakhstan (hereinafter – the Armed Forces of the Republic of Kazakhstan);

- organization of the scientific and production process within the framework of rearmament and digitalization of the Armed Forces of the Republic of Kazakhstan, which allows for the management of combat assets in an automated, digital and highly organized format in real time with information security;

- patentability and patent purity of the CSUAV based on the results of patent research;

- development of algorithms and methods for the implementation of individual technical and technological solutions in the production process for the creation of a CSUAV;

- new science-based technological solutions for the development of software and hardware control modules and data transmission protection;

- obtaining a mathematical model of a CSUAV glider;

- development of the necessary regulatory and technical documentation for the operation of the CSUAV;

- creation of a prototype of a drone on a scientific basis, based on the developed requirements of the terms of reference (development and design of a glider, development of a hardware and software module

with elements of artificial intelligence);

- recommendations on the use of CSUAV based on the application of new skills and competencies in the field of digitalization of the Armed Forces of the Republic of Kazakhstan;

- - at least 5 (five) articles in journals recommended by CQAES;

- obtaining at least 2 certificates (copyrights) for intellectual property objects.

4.2 The end result:

- the creation of new products should contribute to the development of scientific and innovative base, the creation of high-performance jobs, economic diversification aimed at achieving target indicators and the implementation of national priorities and the National Development Plan of the country until 2025 in order to ensure sustainable economic growth;

- CSUAV contributes to strengthening the country's defense capability and increasing the combat potential of the Armed Forces, which corresponds to the provisions of the Military Doctrine, the Second priority Policy of the Strategic Plan 2025 “Technological Renewal and Digitalization”, “National Security Strategy”;

- the results of the scientific program should make it possible to make a technological breakthrough through digitalization, science and innovation, to develop a new type of weapon.

The economic effect of the implementation of this scientific technical task is due to the development of the military IT sphere, the expansion of existing and the emergence of new requirements for weapons and military equipment; a multiple reduction in the cost of ammunition and explosives compared to existing; an increase in the ratio of indicators: efficiency / cost.

The ecological effect is due to a reduction in the amount of harmful emissions and damage to the environment in comparison with the use of conventional means of destruction; environmentally friendly production and reduction of its energy consumption.

The social effect of the program should be expressed in the creation of new jobs in the field of high technologies, the growth of scientific potential and educational level of specialists, the introduction of scientific and technological achievements in industry, which will contribute to the introduction of innovative views on the development of creative industries.

5. The maximum amount of the program - 345,000 thousand tenge, including 2022 – **70,000 thousand** tenge; 2023 – **140,000 thousand** tenge; 2024 – **135,000 thousand** tenge.

Technical task No. 70
for research work
within the framework of program-targeted financing

1. General information:

1.1. The name of the priority for the scientific, scientific and technical program (hereinafter - the program)

National security and defense

1.2 The name of the specialized direction of the program:

Development of the military-industrial complex, weapons and military equipment, military space technologies.

2. Purpose and objectives of the program

2.1. Purpose of the program:

Systematic research, scientific justification and development of a system (complex) of operational control of the situation to establish the location and movement of firing points (means) with the possibility of determining the types of weapons used, in order to ensure national security and increase the country's defense capability.

2.2 To achieve this goal, the following tasks must be solved:

- to explore foreign and domestic experience in the development and practice of the use of sonometric systems in the interests of national security.

- to carry out scientific and technical substantiation of the main tactical and technical characteristics of a new type of sonometric complex for operational control of the situation.

- to develop hardware and software parts of the sonometric complex of operational control of the situation.

- to develop a program and methodology for testing the created sample of the sonometric complex of operational control of the situation.

- to carry out field tests of the created sample of the sonometric complex of operational control of the situation and a set of statistical data.

- to create a scientific laboratory for experimental research in the field of sound measurement;
- to develop methodological recommendations and determine the order of application of the created sample of the sonometric complex of operational control of the situation.

3. Which points of strategic and program documents are solved:

1. Strategy “Kazakhstan -2050”: A new political course of the established state. Item 5 Further strengthening of statehood and development of Kazakhstan's democracy. “... It is necessary to carry out a large-scale reform of the Border Service. The task is to radically increase the efficiency of its activities, modernize the material and technical base”. Item 6. Consistent and predictable foreign policy – promotion of national interests and strengthening of regional and global security”.... Kazakhstan should strengthen its defense capability and military doctrine, participate in various mechanisms of defensive deterrence.

" 2. Message of the President of the Republic of Kazakhstan to the People of Kazakhstan dated September 1, 2020. Task I. A new model of public administration. “... In a rapidly changing world, the speed of decision-making becomes a threat to national security”.Task II Economic development in the new realities. “... The most important task facing Kazakhstan is the full disclosure of its industrial potential”.

3. Message of the President of the Republic of Kazakhstan to the People of Kazakhstan dated September 1, 2021. The unity of the people and systemic reforms are a solid foundation for the prosperity of the country. 1 issue “Economic development in the post-pandemic period", "... Strengthening defense capability, increasing the responsiveness to threats should also become priorities of national importance… We must prepare for external shocks and the worst-case scenario...”.

4. Strategic Development Plan of the Republic of Kazakhstan until 2025. Stimulating investments in applied research and innovations aimed at the development, transfer and adaptation of technologies will make the process of technological renewal continuous. The task of “Stimulating innovation”. For the long-term development of technologies, it is necessary that Kazakhstani companies not only import new solutions and specialists from abroad, but also create their own technological developments, including those aimed at adapting solutions popular in the world to the peculiarities of the country's market. The task “Development of the system of scientific research”.
5. The State Program for the development of education and science of the Republic of Kazakhstan for 2020 – 2025. Goal 2 “Increasing the contribution of science to the socio-economic development of the country”, item 5.2.3. To increase the effectiveness of scientific research and ensure integration into the world scientific space.

4. Expected results:

4.1 Direct results:

- Tactical and technical task for the creation of a new prototype of the sonometric complex for operational control of the situation.

- Hardware and software parts of the sonometric complex of operational control of the situation.

- The program and test procedure of the created sample of the sonometric complex of operational control of the situation.

- The test report of the created sample of the sonometric complex of operational control of the situation.

- A patent for an industrial design.

- A scientific laboratory for collective use for testing weapons and experimental research in the field of sound measurement.

- Methodological recommendations and determination of the order of application of the created sample of the sonometric complex of operational control of the situation.
- at least 5 (five) articles in journals recommended by CQAES;

4.2 The end result:

Scientific and technical effect:

The results of the scientific and technical program should be aimed at creating effective domestic technical means capable of determining the location and movement of firing points and determining the types of weapons used.

The results of the program should contribute to increasing the scientific and technical potential of domestic developers and manufacturers.

A new type of sonometric complex for operational control of the situation with export potential should appear.

The scientific effect should be expressed in: the creation and practical approbation of a prototype system (complex) of operational control of the situation to establish the location and movement of firing points (means) with the possibility of determining the types of weapons used, in order to ensure national security and increase the country's defense capability, the creation of a scientific laboratory for conducting experimental research in the field of sonometry.

The economic effect should be expressed in: reducing the cost of a serial product, operating costs and reducing the recovery time of products (in case of their failure), operational improvement of tactical and technical characteristics during the life cycle of products, the possibility of integrating the product with other types of weapons, the development of domestic scientific and production potential, the possibility of obtaining income from exports.

The ecological effect should be expressed in: providing an environmentally significant potential from the use of the developed sound-measuring complex in the fight against poachers.

The social effect should be expressed in: improving the efficiency of resolving border incidents, conducting anti-terrorist operations, countering other forms of armed destruction, creating high-tech jobs, and developing enterprises of the domestic military-industrial complex.

The target consumers of the results obtained are: the Border Service of the National Security Committee of the Republic of Kazakhstan; military scientists; special units of the power structures of the Republic of Kazakhstan; the Committee of Forestry and Wildlife of the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan; military (special) educational institutions.

5. The maximum amount of the program is 350,000 thousand tenge, including in 2022 – **56,700 thousand tenge**, in 2023 – **136,700 thousand** tenge, in 2024 – **156,600 thousand** tenge.

Appendix 3
to the Competition documentation
for program-targeted financing
for scientific, scientific and technical
programs for 2022-2024

Contract no.___

for program-targeted financing

Nur-Sultan c. **from "___" _____ 20___**

State Institution "Science Committee of the Ministry of Education and Science of the Republic of Kazakhstan", hereinafter referred to as the Customer, represented by _____, acting on the basis of the Regulations on the Science Committee approved by the Executive Secretary's Order No. 169-K dated July 10, 2019 and the order of the Minister of Education and Science of the Republic of Kazakhstan dated December 25, 2019 No. 169-zhk, on the one hand, *and (for physical persons persons Full name / for legal entities. legal name of the organization),* hereinafter referred to as the Executor, in the person *(only for legal entities, the position of the head of the full name)*, acting on the basis of *(for individuals.persons identity card /for legal entities legal document),* issued/approved *(for individualspersons by whom and from what date issued "___" _____ year/for legal entities from "___" _____ year no.__),* on the other hand, hereinafter jointly referred to as the Parties, on the basis of the Budget Code of the Republic of Kazakhstan dated December 4, 2008, the Law of the Republic of Kazakhstan dated February 18, 2011 "On Science", Resolution of the Government of the Republic of Kazakhstan dated May 25, 2011 No. 575 "On approval of the Rules of basic, grant, program-targeted financing of scientific and (or) scientific and technical activities", Resolution of the Government of the Republic of Kazakhstan dated May 16, 2011 No. 519 "On National Scientific Councils", Order _____ from _____ 201___ year No. ___ "On approval of the competition documentation for program-targeted financing for scientific and (or) scientific and technical programs for 2022-2024", order(s) of the Chairman of the Science Committee of the Ministry of Education and Science *(from ___ _____ 20___ year no. ___ on 8 priorities* ***(select the necessary priority(s)*** "On approval of the decision of the National Scientific Council on the program-target financing of scientific research for 2022-2024", decisions of the National Scientific Councils on program-targeted financing according to the priority *"The implemented priority is indicated" (protocol from "___"_____ 2020 year no.__)*, have concluded this agreement (hereinafter referred to as the Agreement) on the following:

1. 1. Subject of the contract

1.1 1.1 The Customer entrusts, and the Contractor assumes obligations, to perform scientific research(s), within the framework of the state order for the implementation of scientific and (or) scientific and technical programs under the budget program 217 "Development of Science", subprogram 101 "Program-targeted financing of subjects of scientific and (or) scientific and technical activities at the expense of the republican budget", specifics 156 "Payment for consulting services and research" for the total amount of _____ (amount in words) for the entire duration of the program, broken down by year:

within the amounts of financing for 2022 - in the amount of _____ (amount in words);

within the amounts of financing for 2023 - in the amount of _____ (amount in words);

within the amounts of financing for 2024 - in the amount of _____ (amount in words), by priority: (specify name) and by subject(s): 1) IRN "_____" (specify the program topics of the appropriate priority by organizations).

1.2 The content and deadlines for the implementation of the main stages of the implementation of the scientific and (or) scientific and technical program for program-targeted financing are determined by the work schedule according to the Contractor's competition application for program-targeted financing.

1.3 The documents listed below and the conditions stipulated in them form this Agreement and are an integral part of it:

1) This Agreement;

2) Calendar Plan (Appendix(s) 1.1-1. _);

3) Report on the use of allocated funds (Appendix(s) 2.1- 2. _).

2. Characteristics of scientific and technical products

2.1 The characteristics of scientific and technical products by qualification criteria and economic indicators are indicated in paragraph 2 of the calendar plan(s), according to Annexes 1.1-1 ... (*depending on the number of topics*) (for example, 5 topics for the organization will be 1.1-1.5, 20 topics - 1.1-1.20)

3. Total amount of the contract and payment terms

3.1 The total amount of the Contract is _____ tenge (the amount in words), (of which ____ tenge is 10% of individual income tax for individuals) for the entire duration of the program, broken down by year:

within the amount of financing for 2022 - in the amount of _____ (amount in words), (of which _____ tenge (amount in words) 10% of individual income tax for individuals);

within the amount of financing for 2023 - in the amount of _____ (amount in words), (of which _____ tenge (amount in words) 10% individual income tax for individuals);

within the amount of financing for 2024 - in the amount of _____ (amount in words), (of which _____ tenge (amount in words) 10% of individual income tax for individuals) including the cost of all costs associated with the performance of work, taking into account all taxes and other mandatory payments to the budget, in accordance with the legislation of the Republic of Kazakhstan.

3.2 The Contractor's works are paid by the Customer in the following order: The Customer makes an advance payment of 50% of the amount of financing for the corresponding year, within 10 (ten) working days from the date of registration of this Agreement with the Treasury authorities.

Subsequent payment is made with a proportional deduction of the previously paid advance, according to the payment financing plan after the Contractor provides and the Parties subsequently sign the act of work performed.

The final payment by the Customer under the Contract at the end of the relevant financial year (first year, second year of the program implementation (interim)) is carried out according to the payment financing plan after the Contractor provides: a report on scientific and (or) scientific and technical activities, a positive decision(s) of the National Scientific Councils, a report on the use of the allocated funds (Appendix 2.1-2._ to the Contract), and the subsequent signing by the Parties of the act of work performed, in accordance with the requirements established by law.

The final payment by the Customer under the Contract at the end of the relevant financial year (the third year of the program (final)) is carried out according to the payment financing plan after the Contractor provides: a report on scientific and (or) scientific and technical activities, the conclusion of the state scientific and technical expertise, a positive decision(s) of the National Scientific councils, a report on the use of allocated funds (Appendix 2.1-2._ to the Contract), and the subsequent signing by the Parties of the act of work performed, in accordance with the requirements, established by the current legislation. The IPN is transferred to the State Revenue Administration for the Esil district of the State Revenue Department for the city of Nur-Sultan BIN BIK.

3.3 Source of funding: The Republican budget.

3.4 The Contractor is obliged to ensure proper accounting and analysis of the actual cost of the work performed in the context of its stages, in accordance with the procedure established by law.

3.5 In accordance with subparagraph 40) of Article 394 of the Code of the Republic of Kazakhstan dated December 25, 2017 “On taxes and other mandatory payments to the budget (Tax Code)”, the Contractor is exempt from value added tax.

4. The order of delivery and acceptance of works

4.1 The Executors submit to the Customer an interim report on scientific and (or) scientific and technical activities (the first year (with the exception of the program with a period of implementation of 1 (one year)), the second year of the program (with the exception of the program with a period of implementation of 2 (two years)) no later than November 15 of the current reporting year according to GOST 7.32-2017. Final reports on scientific and (or) scientific and technical activities - no later than November 1 of the current reporting year.

4.2 The Contractor submits to the Customer an interim report on the use of allocated funds for program-targeted financing (the first year (with the exception of the program with a period of implementation of 1 (one year), the second year of the program (with the exception of programs with a period of implementation of 2 (two years)) (Appendix 2.1-2._ to the Contract), the act completed works and the decision of the National Scientific Council no later than December 10 of the current reporting year.

The Contractor submits to the Customer a final report on the use of allocated funds for program-targeted financing (in the first year - for programs with a implementation period of 1 (one year), in the second year – with a implementation period of 2 (two years), in the third year - with a implementation period of 3 (three years) (Appendix 2.1-2._ to the Contract), the act of work performed, the conclusion of the State Scientific and Technical Expertise and the decision of the National Scientific Council no later than December 10 of the current reporting year.

The contractor ensures the reliability and legality of the information reflected in the report on the use of allocated funds for program-targeted financing.

4.3 When publishing scientific work, research results (*articles, reviews, security documents, including patents, monographs, materials of conferences, forums and symposiums, textbooks, etc.)* received during and (or) after the completion of the program, the authors must necessarily refer to the received targeted funding indicating the IRN of the program and the source of funding (Science Committee of the Ministry of Education and Science of the Republic of Kazakhstan).

4.4 If, in the process of implementing a scientific and (or) scientific and technical program for program-targeted financing, it turns out that it is inevitable to obtain a negative result or the inexpediency of further implementation of a scientific and (or) scientific and technical program, the Contractor is obliged to suspend them by notifying the Customer within five days after the suspension of work.

In this case, the parties are obliged to consider the feasibility and directions of continuing the scientific and (or) scientific and technical program by obtaining the decision(s) of the National Scientific Council(s).

4.5 Equipment, devices and (or) inventory purchased by state organizations within the framework of the program are fixed on their balance sheet.

5. Responsibility of the parties

5.1 In case of non-fulfillment of the obligations stipulated by the Agreement, the parties are liable on the terms and in accordance with the procedure established by law.

5.2 In case of non-fulfillment of the scientific and (or) scientific and technical program within the time specified in Annex(s) 1.1-1_ of this Agreement and paragraph 4.1 of the Agreement, the Contractor pays to the income of the relevant budget a penalty in the amount of 0.03% of the amount of the corresponding current year of the scientific and (or) scientific and technical program for each overdue calendar day.

In case of non-fulfillment and improper performance of the works provided for in the work schedule (Appendix 1.1-1._) of this Agreement, the Contractor pays to the income of the relevant budget a penalty in the amount of 0.05% of the amount of the corresponding current year of the scientific and (or) scientific and technical program for each overdue calendar day.

To deduct the amount of the penalty, the Contractor and the Customer conclude an additional agreement to the Contract, except in cases of payment of the penalty by the Contractor to the revenue of the republican budget and submission of supporting documents.

5.3 In case of non-fulfillment and improper fulfillment by the Contractor of works on scientific and (or) scientific and technical programs, the Customer has the right to terminate their financing at any stage of implementation, based on the decision of the National Scientific Council.

5.4 The funds of program-targeted financing are distributed by the scientific director of the program appointed by the applicant for the direct management of scientific and (or) scientific and technical programs, according to the application for program-targeted financing.

5.5 The funds of program-targeted financing are allocated for expenses directly related to the implementation of a scientific and (or) scientific and technical program, in accordance with the requirements established by law.

5.6 In case of inefficient and unjustified use of funds of program-targeted financing, the Contractor is liable in accordance with the procedure established by law.

6. Other conditions

6.1. Monitoring of the progress of the implementation of the scientific and (or) scientific and technical program and their effectiveness, including on-site visits, as well as monitoring of the effectiveness of the scientific and (or) scientific and technical program is carried out in accordance with the current legislation.

6.2. In case of amendments to the Law of the Republic of Kazakhstan "On the Republican Budget for 2022-2024", regarding the reduction of funds for the corresponding financial year allocated for the implementation of scientific and (or) scientific and technical programs, the Customer, based on the decision of the National Scientific Council, has the right to make appropriate changes to paragraph 3.1. of the Contract, the calendar plan (appendix 1.1-1._ of the Agreement).

6.3. The Agreement enters into force and becomes binding for the Parties from the moment of its registration with the territorial bodies of the Treasury of the Ministry of Finance of the Republic of Kazakhstan and is valid for "___" ___ 20___ years.

6.4. Scientific, scientific and technical programs and reports (interim and final) according to their implementation, they are subject to mandatory state registration by the Contractor at the National Center for State Scientific and Technical Expertise (hereinafter referred to as the Center) in accordance with the procedure established by law, in accordance with the Rules of State Registration of Scientific, Scientific and Technical Projects and Programs funded from the state budget and the report on their implementation, approved by the order of the Minister of Education and Science of March 31 2015 No. 149 .

6.5. The Contractor is responsible for all claims of third parties.

6.6. The Agreement is drawn up in two copies, one copy for each of the parties having the same legal force.

6.7. All amendments and additions to this Agreement are made out by additional agreements and signed by the first heads of the Parties.

7. Legal addresses of the parties

(it cannot be placed on a separate page)

Customer:	**Contractor:**
SI "Committee of Science of the Ministry of Education and Science of the Republic of Kazakhstan"	Legal name of the organization
Nur-Sultan c., Mangilik El Avenue, 8	Legal address
BIN 061 140 007 608	Region, city, street, house
BIC KK MF KZ 2A	BIN XXX XXX XXX …
IIC KZ92 0701 01KS N000 0000	BIC XX XX XX
Kbe 11	IIC XXXX XXXX XXXX …
	Kbe XXX
RSU "Treasury Committee	BANK without branch and city
	Tel. Required (contractor's number)
Ministry of Finance of the Republic of Kazakhstan"	**Position (without organization)**
	_____ Surname. acting
	Seal here
Chairman	(note - sign with a blue ballpoint pen, the seal is clear)
_____	
Seal here	

(DETAILS WITH SIGNATURES CANNOT BE PLACED ON A SEPARATE PAGE)

Annex 1
to this Agreement
No._____ from "_____"_____ 2022

CALENDAR PLAN

Under contract no._____ from _____20__ year

1. THE NAME OF THE CONTRACTOR (legal or physical. face)

1.1 By priority: _____ Fill in.
1.2 By sub - priority:_____ Fill in.
1.3 On the topic of the program: №____ "_____" Fill in.
1.4 The total amount of the program XXXXXX (digital value of the program amount) (in words) tenge, including by year, for the performance of work according to paragraph 3:
- for 2022 - in the amount of XXXXXX (amount in words) tenge;
- for 2023 - in the amount of XXXXXX (amount in words) tenge;
- for 2024 - in the amount of XXXXXX (amount in words) tenge.

2. Characteristics of scientific and technical products by qualification criteria and economic indicators

2.1 Direction of work: Fill in.
2.2 Scope of application: Fill in.
2.3 The end result:
- for 2022: Fill in;
- for 2023: Fill in;
- for 2024: Fill in.

2.4 Patentability: Fill in.
2.5 Scientific and technical level (novelty): Fill in.
2.6 The use of scientific and technical products is carried out: Fill in
2.7 Type of use of the result of scientific and (or) scientific and technical activity: Fill in.

3. Name of works, terms of their implementation and results

The cipher of the task, stage	The name of the work under the Contract and the main stages of its implementation*	Implementation date*		Expected result*
		beginning	ending	

Note: * - the works, deadlines and their results for 2022-2023 are indicated for each year, according to the calendar plan of the competition application.

From the Customer:
Chairman
SI "Committee of Science of the Ministry of Education and Science of the RK"

_____ FULL NAME
_____
Seal here

From the Contractor:
POSITION "Name of the organization"

_____ FULL NAME of the first head
Seal here
organization

Familiarized with:
Scientific Director of the program

_____ Full name
(signature)

(Signatures cannot be placed on a separate page)
(Make a calendar plan separately for each topic of the program)

Appendix 2

to this agreement
No._____ from "_____"_____ 2022

REPORT ON THE USE OF ALLOCATED FUNDS FOR PROGRAM-TARGETED FINANCING

No. in sequence	Name of the cost item	The amount planned according to the estimate	The amount actually spent	Cost savings	Name of supporting documents	Note
1	2	3	4	5	6	7
1	Remuneration of labor					
2	Business trips					
3	Other services and works					
4	Purchase of materials					
5	Purchase of equipment and/or software (for legal entities)					
6	Scientific and organizational support					
7	Rental of premises					
8	Equipment and machinery rental					
9	Operating costs of equipment and equipment used for the implementation of research					
10	Taxes and other mandatory payments to the budget					
	TOTAL	Total	Total	Total		

Note:
1) the report for each program and program is filled in separately;
2) the contractor is responsible for the accuracy of the information provided in accordance with the procedure established by law.

Head of the organization _____ _____

(signature)
Seal here FULL NAME (if available)

Head of the scientific program_____ _____
(signature) full name (if available)

Accountant-economist _____ _____
(signature) FULL NAME (if available)