Research activities in Kazakhstan and Al-Farabi Kazakh National University (short review)

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**Priority scientific directions of Kazakhstan (2018-2022)**

<table>
<thead>
<tr>
<th>No.</th>
<th>Direction</th>
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<tbody>
<tr>
<td>1</td>
<td>Rational use of natural and water resources, geology, recycling, new materials and technologies, safe products and constructions</td>
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<tr>
<td>2</td>
<td>Power and mechanical engineering</td>
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<td>3</td>
<td>Informational, telecommunication and space technologies, scientific research in field of natural sciences</td>
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<td>4</td>
<td>Health and life sciences</td>
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<td>5</td>
<td>Scientific bases of “Mangilik el” (education in XXI century, fundamental and applied research in the field of social and humanitarian sciences)</td>
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<td>6</td>
<td>Stable development of agro-industrial complex and safety of agricultural production</td>
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<td>7</td>
<td>National security and defense</td>
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</table>
383 organizations with 22,985 staff members engaged in the field of scientific research in Kazakhstan.
Five national laboratories in Kazakhstan:

1. “National nanotechnology laboratory of open type”, Al-Farabi Kazakh National University, Almaty
2. JSC “Center of earth sciences, metallurgy and enrichment”, Almaty
3. “Kazakh national center of biotechnology”, Committee of science of the Ministry of Education and Science, Astana
4. National scientific laboratory of collective use of information and space technologies, Almaty
5. National scientific laboratory of collective use (nuclear technologies and technologies of renewable power), Ust-Kamenogorsk
**Fifteen laboratories of an engineering profile in Kazakhstan:**

<table>
<thead>
<tr>
<th>Laboratory of engineering profile on nanotechnologies and electronics, Al-Farabi KazNU, Almaty</th>
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<tbody>
<tr>
<td>Experimental laboratory of engineering profile – Complex development of resources of mineral raw materials, Karaganda</td>
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<tr>
<td>The laboratory of engineering profile on electronic microscopy and nanotechnology, Karaganda</td>
</tr>
<tr>
<td>Laboratory of engineering profile on a mining and metallurgical, oil and gas sector, Almaty</td>
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<tr>
<td>Laboratory of engineering profile “Physical and chemical methods and analysis”, Kyzylorda</td>
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<tr>
<td>Laboratory of engineering profile “Petrochemistry”, Atyrau</td>
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<tr>
<td>Research laboratory “Nano engineering methods of research”, Taraz</td>
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<tr>
<td>Experimental regional laboratory of engineering profile “Constructional and biochemical Materials”, Shymkent</td>
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<tr>
<td>Laboratory of engineering profile “Physical and chemical methods of research”, Karaganda</td>
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<td>------------------------------------------------------------------------------------------------</td>
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<tr>
<td>Regional experimental engineering laboratory of open type “IRGETAS”, Ust-Kamenogorsk</td>
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<tr>
<td>Experimental regional laboratory of engineering profile “Scientific center of radio ecological research”, Semei</td>
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<tr>
<td>Laboratory of engineering profile on biotechnology, Uralsk</td>
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<td>Laboratory of engineering profile, Astana</td>
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<tr>
<td>Laboratory of engineering profile NMR-spectroscopy, Kokshetau</td>
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<tr>
<td>Laboratory of engineering profile on nano-biotechnology and ecology, Almaty</td>
</tr>
</tbody>
</table>
Research activity funding

1. Basic funding
2. Grant funding
3. Program-targeted funding
Main Campus Area 75 hectare
Second Campus Area 25 hectare
VISION: to enter the Top 200 leading research universities in the world

MISSION: Generating the human capacity - highly qualified specialists competitive in the international labor market

«To 2020 .... at least 2 higher educational institutions will be awarded in the ranking of the world's best universities»

From the Message of President of Kazakhstan N. Nazarbayev

ABOUT THE UNIVERSITY:
• Faculties: 15
• Chairs: 65
• Research institutes: 25
• Laboratories of the National Level: 2
• Science and Technology Park

ACADEMIC PROFILE:
• More than 20 000 students
• Bachelor specialities: 86
• Master specialities: 118
• PhD programs: 79
Al-Farabi KazNU in TOP-250 (QS World University Rankings)
Al-Farabi Kazakh National University - the only university in the Republic of Kazakhstan, which has a unique scientific and innovative structure.

Research is carried out in accordance with the priorities of the Republic of Kazakhstan and world trends in science and technology.
Faculties

- Mechanics and Mathematics
- Physics and Technology
- Chemistry and Chemical Technology
- Biology and Biotechnology
- Geography and Nature Management
- History, Archeology and Ethnology
- Philology, Literary Studies and World Languages
- Journalism
- Philosophy and Political Science
- High School of Economics and Business
- Law
- International Relations
- Oriental Studies
- Pre-College Education
- High School of Public Health (established in 2016)
<table>
<thead>
<tr>
<th>Socio-humanitarian institutes and centers</th>
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<tbody>
<tr>
<td>Abay Research Institute</td>
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<tr>
<td>Institute of State and Law</td>
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<tr>
<td>Confucius Institute</td>
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<tr>
<td>Institute of Security and Cooperation Problems</td>
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<tr>
<td>International Institute of Kipchak Studies</td>
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<tr>
<td>Orazbayev Center for Archaeology and Ethnology</td>
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<tr>
<td>NATO Information and Resource Centre</td>
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<tr>
<td>Center for Sociological Research and Social Engineering</td>
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<tr>
<td>Versatile scientific and innovative center of the educational services &quot;GLOSS&quot;</td>
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<tr>
<td>Research and Innovation Center for Educational Studies</td>
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<tr>
<td>Research and Educational Center for German Studies</td>
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<tr>
<td>Training and Research Center Ancient Turkic scripts</td>
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<tr>
<td>Center for Environmental Safety and Natural Resources</td>
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<tr>
<td>Turan-Iran</td>
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<tr>
<td>Research Centre for Korean Studies</td>
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<tr>
<td>Center for Arabic Studies</td>
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<tr>
<td>Research Institute of Archaeology and Ethnology</td>
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<tr>
<td>Center for Psychological Technology and Innovation</td>
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<tr>
<td>Center for Economic Research</td>
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<tr>
<td>Center for Legal support of innovation development of RK</td>
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<td>The European Information Centre</td>
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<tr>
<td>Center of problems of fight against crime</td>
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<tr>
<td>Resource Center for American and Democratic Studies</td>
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<tr>
<td>Republican Center «Al-Farabi»</td>
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<tr>
<td>Center for Religious Research and Expertise</td>
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<tr>
<td>Center of Ethnopedagogics and Ethnic Psychology</td>
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<tr>
<td>O.Suleimenov Scientific and Research linguistic center</td>
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<tr>
<td>Scientific-educational and cultural center of TURKSOY</td>
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Former research institutes of Academy of Sciences (Gylym Ordasy) integrated with Al-Farabi KazNU

- Institute of Mathematics and Mathematical Modeling
- Institute of Information and Computer Technologies
- Institute of Economics
- C.Valikhanov Institute of History and Ethnology
- M.Auezov Institute of Literature and Art
- R.Suleimenov Institute of Oriental Studies
- A.Baitursynov Institute of Linguistics
- U.Dzholdasbekov Institute of Mechanics and Engineering
- Institute of Philosophy, Political Science and Religious Studies
- A.Margulan Institute of Archaeology
Research-Innovation Way ("Pipe")

Researches
- State authorities of Kazakhstan, Development institutions, National and international funds
- Scientific institutes and centers
  - Fundamental
  - Applied

Innovations
- Business angels
- Venture capital, Development institutions, Enterprises
- Technopark, Center for engineering and commercialization, research teams Design Center, factories, SMEs
- Design, Patenting
- Engineering
- Technical designing

Production
- National companies, Business, Second level banks
- Enterprises production sphere, stock exchanges, SMEs
- Distribution
- Production
- Market

Idea

- Publications with IF, h-index
- Protective documents
- Prototype
- Production of prototype
- Creation of start-up companies
- License agreements, technology transfer
- Production output
- Small scale, serial production
Research-educational and innovation cluster

Research-educational cluster

- Cluster of Life, Medicine, Biotechnology and Natural Sciences
- Cluster of Chemical Engineering Sciences
- Cluster of Physical Engineering Sciences, Nanotechnologies and Material Technologies
- Cluster of Mathematics and Computing Sciences, Information and Space Technologies
- Cluster of Social and Humanity Sciences and Technologies
- Cluster of Engineering and High Technologies (established in 2016)

IT-TECHNOPARK

Innovation cluster

- Business Incubation Center
  - Business incubator;
  - Consulting;
  - Technology Transfer and Licensing;
  - Commercialization Office.
- Scientific Technology Park
  - Center of High Technologies;
  - Experimental-Design Center.
- Center for engineering and commercialization
- Industrial Center
- Office of venture capital
  - NATD;
  - Development Institutes;
  - Banks of the second level.
- High School of Innovative Technologies and Industrial Engineering

Publications Patents

Start-ups Spin-offs

Limited-edition Production
High Technology Companies
Creation of «Mini-EXPO» city for implementation of innovation projects on «Green Energy», and training of specialists of a new formation on the basis of modern technologies and high-technology engineering, with using alternative energy technologies: wind, solar, hydro, geothermal and biogas.
In 2016 the scientists of the University implemented **533 projects** including:

- **247 projects** of grant funding of Ministry of Education and Science of the Republic of Kazakhstan on ASE RSI of Al-Farabi KazNU;
- **7 projects** of program-targeted funding of Ministry of Education and Science of the Republic of Kazakhstan on DRIA of Al-Farabi KazNU;
- **2 projects** of the JSC «National Agency for Technological Development»;
- **89 research works** within the framework of business agreements with organizations and enterprises;
- **188 grants** of international funds and organizations.
The State program of industrial and innovative development of Kazakhstan for 2015-2019 is developed in accordance with the long-term priorities of the Strategy «Kazakhstan-2050»

**Goal**
- Stimulation of diversification and improvement of competitiveness of the manufacturing industry

**Tasks**
- advanced development of the manufacturing industry;
- improvement of efficiency and increasing the added value in the priority sectors;
- expansion of markets for non-primary goods;
- increase of productive employment;
- giving a new level of manufacturability to priority sectors of industry and providing a basis for development of future sectors through the formation of innovation clusters;
- stimulation of entrepreneurship and development of small and medium-sized businesses in the manufacturing industry.
### Directions of SPIID-II:

- **Oil and gas complex**
- **Metallurgical complex**
- **Chemical Industry**
- **Food industry**
- **“Green” Energy**
- **ICT / Space technologies**

### Educational Programs:

- **petrochemistry**
- **Materials science and technology of new materials, Nanotechnologies**
- **Chemistry and technology of rare and rare earth metals**
- **Genetic engineering, Food and Biological Safety,**
- **Nuclear power, Alternative energy and energy saving technologies, Geo energy**
- **Automation and robotics, space technologies, Innovation management, innovative entrepreneurship**
The best projects of Student business incubators in 2016

«CANSAT - the first step to the spacecraft»

«Integrated technology of co-cultivation of valuable fish and plant species»

«Creation of new energy-saving window/screen systems»

«Yukilim»

«GeoMap»

«Electronic map of Turkic-speaking peoples»

«Gas leak detector»
Student Start-up companies

«Biohumus»

«Zhana urpak»

«Mediaschool «Ecosystems protection»

«RobiGroup»

«JELLY»

«Young Labor»
Membership in international organizations

- QS World University Rankings (2016) 236
- QS Emerging Europe and Central Asia Ranking (2015) 21

Institutions:
- Eurasian Association of Universities
- Eurasia-Pacific Uninet
- European Society for Engineering Education
- IAESTE
- Consortium of the University of Shanghai Cooperation Organization
- The Silk-road Universities Network
- Universities Alliance of the New Silk Road
- COMSATS
- IUCCE
- Clinton Global Initiative University Network
- United Nations Academic Impact
- MDP Global Classroom
- IREG Observatory
- Magna Charta Universitatum
- Eurasian Association of Universities
- Consortium of CIS Network Open University
- European Association of Universities
- Turcic inter-university association
- The Silk-road Universities Network
- Universities Alliance of the New Silk Road
International recognition of Al-Farabi KazNU

Global Hub for Sustainable Development of the Program “Academic Impact” of the United Nations

Regional Hub for Sustainable Development within the framework of the UNESCO Program – UNITWIN

KazNU is the only university in Central Asia acceded to:

- **World University Consortium (WUC)** (2014)
- **Network of universities of Clinton Global Initiative – Clinton Global Initiative University (CGI U)** (2015)
- **COMSATS organization, uniting 24 universities of the world** (2014)
- **Alliance of universities of Silk Road countries (Silk-road Universities Network) and its Board of Directors** (2015)
- **World Academy of Art and Science (WAAS) Rector G. Mutanov was elected as a member of WAAS**

In the framework of the VII Astana Economic Forum on May 21-22, 2014, **III Asian Universities Forum** was held on the basis of the Al-Farabi Kazakh National University.
International funds and organizations financing university projects

- TEMPUS: 19%
- USA Department of Energy: 4%
- Jawaharlal Nehru Institute: 7%
- International Council for the Distribution of the Chinese Language: 10%
- Fulbright: 4%
- "Newton-Al-Farabi": 13%
- TURKSOY: 2%
- Institute of National Remembrance (Poland): 8%
- Japan Foundation: 4%
- Erasmus Mundus, Erasmus+: 14%
- UNESCO: 11%
- NATO: 2%
- UNHCR: 2%
Partner universities by countries

- CIS: 38%
- South Korea: 15%
- China: 7%
- Turkey: 7%
- Japan: 5%
- USA: 4%
- Germany: 4%
- Great Britain: 4%
- Poland: 3%
- Spain: 3%
- France: 3%
- Hungary: 3%
- India: 2%
- Italy: 2%
- Spain: 3%
- Turkey: 7%
- China: 7%
IT TechnoPark of the University Alliance
"NEW SILK ROAD" on the "Silicon Valley" model

Center of Supercomputing and Cloud Computing of Al-Farabi KazNU

The project of supply and installation of a supercomputer
Center of Supercomputing and Cloud Computing of Al-Farabi KazNU

«Silk Way» Fund, Ministry of commerce of PRC

60 teraflops CPU

20 Teraflops GPU

20 Teraflops Cloud

10 Teraflops MIC

Areas:
• Ecological problems;
• Problems of oil and gas industry;
• The objectives of bioinformatics;
• E-campus;
• Nanotechnology;
• Seismic and exploration tasks;
• Economic and social forecasting;
• Health and others.

13 teraflops Virtual Desktop for E-campus

7 teraflops Cloud computing
Commercialization of scientific and innovation projects:

World Bank

Grants for commercialization of scientific and innovation projects by “Fund of science”

Scientific and innovation projects funding program (Ministry of health, Ministry of agriculture, etc.)
Interaction with Industrial Companies through Autonomous Cluster Fund (ACF)

1% of the total gross income of mineral developers

Subsoil users

ACF
AUTONOMOUS CLUSTER FUND

Subsoil users

R & D
As a result, our university gets ...

- **End of 2015**: 10 Start-ups
- **2016**: 20 Start-ups
- **2017**: 45 Start-ups
- **2018**: 75 Start-ups
Funding of building within the framework of state-private partnerships

- Innovation Cluster – 10 bn tenge (54 mln USD).
- Housings of Research Institutes – 7 billion tenge (37 mln USD).
- Medical and Biological Cluster – 500 million $
- Dormitory for 1500 people – 27 mln USD.
Goals of Al-Farabi KazNU until 2020

- Enter the top 200 leading research universities in the world
- Transformation of the classical national university into the world-class research university
- To increase quantity of publications in rating journals with impact-factor to 3000
- To increase volume of revenues from commercialization of scientific developments
- To achieve 98% employment of graduates
- To increase share of accredited educational programs to 100%
Thank you for your attention!