S&T Policy Mix Peer Review for Kazakhstan

Final Report

International team of independent experts:

Manfred Horvat, AT (Team leader)
Jean-Luc Clement, FR
Margit Harjung, AT
Kirsten Kienzler, DE
Zygmunt Krasinski, PL
Vardan Sahakian, AM
Michael Schlicht, DE

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Table of contents

List of abbreviations 4

1. Introduction: Background and approach of the exercise 6
2. The science, research, technological development and innovation (RTDI) policy system in Kazakhstan 7
3. Investment in and funding of RTDI 18
4. Universities, research institutes and the National Academy of Sciences 23
   4.1. Introduction 23
   4.2. Universities 25
   4.3. Research institutes 32
   4.4. The National Academy of Sciences 35
5. The business sector and RDTI 36
6. Science-business cooperation 40
   6.1. General issues 40
   6.2. Innovation infrastructures 43
   6.3. Intellectual property 46
7. Human resources for RTDI 47
8. International cooperation 50
   8.1. General issues 50
   8.2. Commonwealth of Independent States (CIS) 51
   8.3. European Union (EU) and participation in FP7, perspectives for HORIZON 2020 51
9. Summary of main comments and recommendations 54
10. Acknowledgements 60
References 60

ANNEXES
1. The international peer review team 65
2. The main steps of the peer review exercise 66
3. Visiting agenda of international team of peer reviewers, Astana and Almaty, 11-17 March 2012 68
4. List of Participants, Dissemination meeting at the Ministry of Industry and New Technologies, 27 June 2012, Astana, Kazakhstan 74
5. State of the Nation addresses of President Nursultan Nazarbayev 2004 – 2012 76
6. Result of the NIF foresight exercise: Priority Areas and Critical Technologies 77
7. Country Report prepared by InExCB-KZ 80
### List of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIS</td>
<td>Commonwealth of Independent States</td>
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<td>CTP</td>
<td>Council for Technology Policy</td>
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<td>DAAD</td>
<td>Deutscher Akademischer Austauschdienst – German Academic Exchange Service</td>
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<tr>
<td>EBRD</td>
<td>European Bank for Reconstruction and Development</td>
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<td>EECA</td>
<td>Eastern Europe and Central Asia</td>
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<td>EHEA</td>
<td>European Higher Education Area</td>
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<td>ERA</td>
<td>European Research Area</td>
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<td>ERI</td>
<td>Economic Research Institute</td>
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<td>ETF</td>
<td>European Training Foundation</td>
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<td>ETP</td>
<td>European Technology Platform</td>
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<td>EU</td>
<td>European Union</td>
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<td>FP</td>
<td>EU Framework Programme for Research, Technological Development and Demonstration</td>
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<td>FP7</td>
<td>7th EU Framework Programme of the European Community for research, technological development and demonstration activities (2007-2013)</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>GERD</td>
<td>Gross Expenditure on Research and Development</td>
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<td>HEI</td>
<td>Higher Education Institution</td>
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<td>HSTC</td>
<td>Higher Council for Science and Technology</td>
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<td>HKUST</td>
<td>Hong Kong University of Science and Technology</td>
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<tr>
<td>IAEO</td>
<td>International Atomic Energy Organisation</td>
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<td>INCO</td>
<td>International Cooperation</td>
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<td>INCONET</td>
<td>FP7 Coordination (and Networking) Action for S&amp;T International Cooperation</td>
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<td>InExCB-KZ</td>
<td>Independent Expert Consulting Board to Promote Scientific Research Activity in Kazakhstan</td>
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<td>INSEAD</td>
<td>Institut Européen d'Administration des Affaires – “The Business School for the World”</td>
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<td>INTAS</td>
<td>International Association for the Promotion of Cooperation with Scientists from the Independent States of the Former Soviet Union</td>
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<td>IPR</td>
<td>Intellectual Property Rights</td>
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<td>ISTC</td>
<td>International Science and Technology Centre</td>
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<td>JSC</td>
<td>Joint stock Company</td>
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<td>ICT</td>
<td>Information and Communication technologies</td>
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<td>KISTEP</td>
<td>Korean Institute of Science and Technology Evaluation and Planning</td>
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<td>MEDT</td>
<td>Ministry of Economic Development and Trade</td>
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<td>MF</td>
<td>Ministry of Finance</td>
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<td>MEP</td>
<td>Ministry of Environmental Protection</td>
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<td>MES</td>
<td>Ministry of Education and Science</td>
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<td>Abbr.</td>
<td>Description</td>
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<tr>
<td>MINT</td>
<td>Ministry of Industry and New Technologies</td>
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<td>NATD</td>
<td>National Agency for Technological Development (formerly NIF)</td>
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<td>NATO</td>
<td>North Atlantic Treaty Organisation</td>
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<td>NCSTI</td>
<td>National Centre for Science and Technology Information</td>
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<td>NIF</td>
<td>National Innovation Fund (now NATD)</td>
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<td>NIS</td>
<td>National Innovation System</td>
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<td>NCS</td>
<td>National Science Council</td>
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<td>NSF</td>
<td>National Science Foundation</td>
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<td>NTP</td>
<td>National Technology Platform</td>
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<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
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<td>PIT</td>
<td>Park of Innovative Technologies</td>
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<td>QS</td>
<td>Quacquarelli Symonds World University Ranking</td>
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<tr>
<td>R&amp;D</td>
<td>Research and Technological Development</td>
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<td>RFO</td>
<td>Research Funding organisations</td>
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<td>RTDI</td>
<td>Research, Technological Development and Innovation</td>
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<td>RPO</td>
<td>Research Performing Organisations</td>
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<tr>
<td>Scopus</td>
<td>Abstract and citation database of peer-reviewed research literature</td>
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<td>S&amp;T</td>
<td>Science and Technology</td>
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<tr>
<td>SME</td>
<td>Small and Medium-sized Enterprise</td>
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<td>SPAIID</td>
<td>State Programme for Accelerated Industrial and Innovative Development of the Republic of Kazakhstan</td>
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<td>SEZ</td>
<td>Special Economic Zone</td>
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<tr>
<td>STI</td>
<td>Science, Technology and Innovation</td>
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<tr>
<td>TEMPUS</td>
<td>Trans-European Mobility Programme for University Studies</td>
</tr>
<tr>
<td>THES</td>
<td>Times Higher Education Supplement</td>
</tr>
<tr>
<td>TTP</td>
<td>Targeted Technology Programme</td>
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<tr>
<td>UNECE</td>
<td>United Nations Economic Commission for Europe</td>
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<tr>
<td>USAID</td>
<td>United States Agency for International Development</td>
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<tr>
<td>WEF</td>
<td>World Economic Forum</td>
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<td>WoS</td>
<td>Web of Science</td>
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1. Introduction: Background and approach of the exercise

The present Peer Review exercise regarding the Science and Technology Policy Mix of Kazakhstan is part of the FP7 Coordination and Support Action INCONET EECA (S&T International Cooperation Network for Eastern European and Central Asian Countries). The exercise aims to contribute to the specific aims of INCONET EECA:

- Supporting bi-regional EU – EECA S&T policy dialogue involving stakeholders from policy making, the science community and industry. The dialogue addresses S&T potentials, policy goals and demands in order to define common priorities and to develop joint scenarios and implementation strategies;

- Carrying out activities aiming at an increased participation of researchers from EECA countries in FP7;

- Implementing a series of analyses feeding the policy dialogue and increasing its efficiency, monitoring the project’s own activities with emphasis on their sustainability and implementing.

In particular, the exercise was launched following a letter from Minister Asset Issekeshev (01 November 2011) expressing his interest to include Kazakhstan in the pilot action on Science and Technology (S&T) Policy Mix Peer Review of Research Systems to be carried out in the context of INCONET EECA.

According to the Terms of Reference of the exercise, “The S&T policy mix peer review provides a view on the national STI1 system from the outside. The view is that of informed experts from partner countries (mostly governmental level), who themselves are interested to learn and to engage in a dialogue with policy makers and S&T experts from the Eastern European or Central Asian host country. Thus, the ultimate goal of a S&T policy mix peer review is to increase mutual understanding and learning. “

The present summary of the main findings, comments and recommendations of the present exercise addresses:

- The organisational and legal set-up of the science, research, technological development and innovation (RTDI) policy system,

- The funding of RTDI in Kazakhstan,

- The main RTDI structures and actors in Kazakhstan,

- The human resources for RTDI, and

- International RTDI cooperation activities of Kazakhstan.

The peer review team was formed by a group of experts mostly from government authorities with long-standing experience in national, European and international RTDI policies and programmes (see Annex).

On the side of Kazakhstan, the exercise was supported by:

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1 STI: Science, Technology and Innovation
Main steps of the peer review process are presented in Annex 2.

The exercise was based on detailed information presented by the Kazakhstan counterparts and discussed with the team during the kick off meeting in Vienna, the Country Report prepared by the Senior Country Correspondent and her team, interviews during the extensive peer review missions of the team and the team leader to Kazakhstan, in-depth desk research of the team leader, and continuous interaction between the team leader and the team members and most importantly with the Senior Country Correspondent and also the National Host. Additional information was provided by other public and private sources in Kazakhstan.

2. The science, research, technological development and innovation (RTDI) system of Kazakhstan

Since about 2004, following the instructions by President Nursultan Nazarbayev in his annual State of the Nation addresses plans and strategies of the government of Kazakhstan are oriented towards building and strengthening the national innovation system. The roles of science, research, technological development and innovation (RTDI) are especially highlighted in the priorities of Kazakhstan’s economic and social development policies (see e.g. 4). Social and economic modernization has been identified as the main vector of the development of the country. In his 2012 State of the Nation address, President Nazarbayev noted that “By 2015, the National Innovation System will be fully operational, and by 2020 it should already yield results in the form of developments, patents, and ready technologies to be introduced in the country”6. The highest political level shows great ambition and stimulates systematic effort to build the conceptional and legal framework and provide the necessary resources for these developments.

Kazakhstan possesses vast deposits of oil, gas and other natural resources. It disposes of the ninth largest proved oil reserves in the world and it is expected that due to its oil resources Kazakhstan will join the group of the top ten of oil extracting nations by 2015. In addition, Kazakhstan has the second largest reserves of uranium, lead, zinc and chromium and is among the world’s leading countries also with regard to reserves of coal, copper, gold, and iron. Actually, all elements on the periodic table can be found in Kazakhstan. These rich resources provide a sound basis for the economy of Kazakhstan.
However, in order to escape from a too narrow dependency on these resources, Kazakhstan sets targeted actions towards reducing the dependency on natural resource and moving towards diversification of the economy\textsuperscript{7, 8}. The Government has defined different sectors such as construction materials, food processing, metallurgy, oil and gas machine building, tourism, and transport logistics where the creation of clusters is promoted\textsuperscript{9}.

Main national policy stakeholders - including RTDI - in the Republic of Kazakhstan are:

- The President,
- The Government,
  - The Prime Minister,
  - Ministries,
- The Parliament (Senate and Mazhilis).

An important stakeholder that is most relevant for RTDI in Kazakhstan is also the Sovereign Wealth Fund “Samruk-Kazyna”\textsuperscript{10} that consolidates key state assets in more than 400 subsidiary companies including companies such as e.g. KazMunayGas, KazAtomProm, Kazakhtelecom, Air Astana, Samruk-Energy, SK-Pharmacy, KazPost, Kazakhmys plc., United Chemical Company. “Samruk-Kazyna” companies contribute more than 50% to the GDP of Kazakhstan. The objectives of “Samruk-Kazyna” are:

- Achieving sustainable growth of state economy,
- Promoting modernization and diversification of state economy;
- Increasing the effectiveness of the holding and all of its affiliates, and
- Promoting and implementing large-scale investment projects

The holding is a key player of the industrial and innovation development programme. It provides direct support of the small and medium size businesses.

Following the instructions by the president, laws and programmes are developed by the responsible ministries, agreed by the two chambers of the parliament – Senate and Mazhilis – and signed by the Prime Minister. The programmes are implemented by the responsible ministries or by the authorised agencies.

Regarding RTDI, a whole set of relevant laws, strategic plans and programmes have been launched especially in the last decade within the overarching frame of the Development Strategy of Kazakhstan until 2030 (“Kazakhstan 2030”)\textsuperscript{11} which was adopted in 1997 already. That provides a sound legal framework supporting the development of RTDI in Kazakhstan, with the following documents as the most important ones:


\textsuperscript{9} Op. cit.

\textsuperscript{10} http://sk.kz/page/kratko-o-fonde; see also Country Report, p. 7f.

\textsuperscript{11} http://www.akorda.kz/en/kazakhstan/kazakhstan2030/strategy_2030
- Strategic Plan for Development of Kazakhstan up to 2020,
- State Programme of Accelerated Industrial and Innovative Development of the Republic of Kazakhstan for 2010-2014 (SPAIID),
- State Programme for the Development of Innovation and Promotion of Technological Modernization of Kazakhstan for 2010-2014,
- Inter-sectoral Plan for Scientific-Technological Development of Kazakhstan until 2020,
- State Programme of Education Development in the Republic of Kazakhstan 2011-2020;

In the programmes SPAIID, on education development and the development of innovation and promotion of technological modernisation critical analyses of the present state of RTDI in the business and higher education sector are provided a starting point for the plans towards 2020. In those programmes, also indicative action plans are given for the implementation.

In the President’s instructions and, accordingly, in the in the different policy documents highly ambitious objectives, goals and time frames for realisation are defined for the Kazakhstan RTDI policies. Examples of such goals are:

- Raising the spending for R&D from 0.16% of GDP in 2010 to 1% in 2015 and 1.5% in 2020\(^{12,13}\);
- Developing the number of Kazakhstan universities listed in the ratings of the world’s best universities to one by 2015 and two by 2020\(^{14,15}\);
- Increasing the share of innovative companies from 4.3% in 2010 to 20% by 2020\(^{16}\).

There is a strong political commitment to implement the measures aimed at the creation of an innovation-based economy and a national innovation system in Kazakhstan. The vision of innovation development until 2030 is the basis for the transition of Kazakhstan from the model driven by the state to a stable system driven mainly by the private sector.

According to the Government Planning System\(^{17,18}\), strategic planning is coordinated by the Ministry of Economic Development and Trade (MEDT) supported by the Economic Research

\(^{12}\) Information from NATD on targets that are discussed currently
\(^{13}\) In the State Programme for the Development of Innovation and Promotion of Technological Modernization of Kazakhstan for 2010-2014, Article 4.2 the target is defined as 1% of GDP by 2014
\(^{14}\) State Programme of Education Development in the Republic for Kazakhstan for 2011-2020. Chapter 4
\(^{15}\) At present, there is no Kazakhstan university among the first 400 universities in the Times Higher Education Supplement (THES) World University Rankings 2011-2012; there is also no Kazakhstan university among the first 500 universities in the 2011 Academic Ranking of World Universities (ARWU) conducted by researchers at the Center for World-Class Universities of Shanghai Jiao Tong University (CWCU); in the 2011 QS World University Rankings, Al-Farabi Kazakhstan National University and LN Gumilev Eurasian National University are in the 400-450 group
\(^{16}\) President Nursultan Nazarbayev: About the Strategic Plan for Development of Kazakhstan up to 2020, 1 February 2010, No 922
\(^{17}\) Republic of Kazakhstan President’s Decree dated 18 June 2009, No. 827

9/82
Institute (ERI) that provides also economic forecasts for the government. For RTDI, the Ministry of Education and Science (MES) and the Ministry of Industry and new Technologies (MINT) are the main actors.

The Ministry of Finance (MF) fulfils its tasks mainly be collecting the data related to the budget and transferring public funds to the ministries.

The Law “On Science” of February 2011 replaced previous laws and provides now the basis for the future of science in Kazakhstan and the legal basis for research institutions, higher education institutions and research universities and defines the competences of the MES, the Highest Science and Technology Committee (HSTC), and the National Research Councils.

MES is responsible for the coordination of scientific and technical programmes and projects in basic and applied research\(^{19}\), research and higher education organisations and their accreditation, and also for human resources in research and higher education including the appointment of heads of publicly funded research institutions.

Regarding strategy development and the planning of the S&T activities there is a division of labour with the MES in a central coordinating position and the sectoral ministries such as agriculture, environmental protection, health, oil and gas, and transport and communication developing their own R&D plans which are submitted to the MES. MES pursues its coordinating role through the National Research Councils and the Highest Science and Technology Committee (HSTC)\(^{20}\).

The HSTC as a collegiate body chaired by the Prime Minister formulates the strategic objectives and priorities for the development of scientific, technological and innovation activities in Kazakhstan, identifies priority areas and approves funding proposals. The bases for the decisions of the HSTC are proposals by the National Research Councils (NRCs) that are established in specific S&T field and are responsible for the assessment of proposed research and S&T programmes and projects, their feasibility and requested funding\(^{21}\).

The Law “On Science” lays also the ground for funding research activities through basic funding, grant funding and programme funding. The National Centre for State Scientific and Technical Expertise\(^{22}\) is responsible for the evaluation of completed projects and programmes financed by the state budget.

The MES oversees and funds the public universities and a large number of research institutes\(^{23}\). In addition, MES is responsible for the National Scientific and Technological Holding JSC “Parasat”\(^{24}\) that in one of its areas of activities addresses also science and technology encompassing the Science Fund of the Republic of Kazakhstan and some of the research institutes that formerly belonged to the National Academy of Sciences of the Republic of Kazakhstan. The mission of the Science Fund is whose mission is “to create an enabling environment and directly participate in the acquisition, generation and

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\(^{19}\) Law of the Republic of Kazakhstan “On Science”, 18 February 2011. Article 4

\(^{20}\) Op. cit., Article 18

\(^{21}\) Op. cit., Article 19

\(^{22}\) Op. cit., Articles 20 and 21

\(^{23}\) In the course of this exercise, we have received information regarding the number of research institutes of MES varying between 35 and 42

\(^{24}\) See Country Report p. 42
commercialisation of scientific developments, demand for sustainable scientific, technological and socio-economic development of Kazakhstan.”

The priorities of the fund are Energy, Deep processing of raw materials and products, Information and Communication technologies, Life Sciences, and Intellectual potential of the country (basic research in science, socio-economic research and humanities, social and political sciences).

With the decision on the law “On State Support of Industrial and Innovative Activity” from January 2012 the main part of the legal framework for RTDI has been completed. Some accompanying laws are still under development.

The Ministry of Industry and New Technologies (MINT) participates in the development of science and technology policies and programmes. MINT has the central executive role in industrial research, technological development and innovation in the frame of the State Programme for the Development of Innovation and Promotion of Technological Modernization of Kazakhstan for 2010-2014 and plays the major role in the implementation of the State Programme of Accelerated Industrial and Innovative Development of the Republic of Kazakhstan for 2010-2014 (SPAIID).

The new law defines the competences of the authorized bodies and provides a comprehensive frame for the development and implementation of policies and programmes in the area of state support for industrial innovation including the roles of the Council for Technology Policy (CTP) as well as the national institutions involved in the implementation such as e.g. the National Agency for Technological Development, the National Agency for Technological Development (NATD) is in charge of a broad range of activities including technological foresight, analytical, advisory and information services in the field of innovation, investment in industrial and innovative projects, participating in the creation of innovation infrastructures, cooperation with international organizations, mechanisms for state support for business incubation and technology transfer, strengthening human resources, services related to the provision of innovative grants, and support for the development of risk investments funds.

The law defines the tools for the industrial innovation system including the process of technological forecasting exercises that aim at identifying priority technology area and envisages that these initiatives should take place at least once every three years. The aim is to identify critical technological needs, support the design and implementation of state plans and provide criteria for granting financial support.

In 2010, the National Innovation Fund (NIF), under the authority of the MINT, organised a foresight exercise that was supported by of the Korea Institute of Science and Technology.

25 http://www.science-fund.kz/?post=5&lang=rus
26 Priorities of investment of the JSC “Science Foundation” according to the Higher S&T Committee under the Government of the Republic of Kazakhstan protocol decision of April 21, 2010 No 20-55/371
27 Law “On Science”, op. cit., Article 5
28 Formerly the National Innovation Fund (NIF)
29 Law “On State Support of Industrial Innovation Activity”, 9 January 2012, Article 10.3
Evaluation & Planning (KISTEP) and national experts. This exercise was an important pilot action that not only produced relevant results regarding priority areas and critical technologies but also improved the communication between different parts of the emerging national innovation system of Kazakhstan. As a result, eight priority areas and sixty three critical technologies were defined which form the bases for the decision to develop ten strategic technology programmes\(^{31}\). The outcome of the foresight activity was an input for the Inter-sectoral Plan for Scientific-Technological Development of Kazakhstan until 2020 and is the basis for the development of Targeted Technological Programmes (TTPs).

The law defines the main elements of the industrial and innovation infrastructure\(^{32}\) and the respective laws defining the legal and regulatory framework for these structures.

Information is provided about the instruments to be applied for state support for information in accordance with the criteria: innovation, competitiveness and scale\(^{33}\). Also the rules for providing innovative grants are defined\(^{34}\).

The development of skilled human resources\(^{35}\) is another issue covered by the law where also the necessity of cooperation between MINT and MES is indicated.

The RTDI policies are implemented via substantial increases of investments in RTDI and new programmes, initiatives and infrastructures. For the higher education and research sector, the new Nazarbayev University in Astana is a flagship project. The emphasis on strengthening science-business cooperation and the commercial exploitation of research results are supported by the development of innovation infrastructure spearheaded by the flagship project of the Alatau Park of Innovative Technologies Special Economic Zone, another priority project of President Nazarbayev.

For the investment in RTDI, a stronger contribution from the business sector is envisaged with major contributions from the companies of Samruk-Kazyna and from companies active in the sub-soil sector. The Samruk-Kazyna companies are expected to act as “locomotives and catalysers” also for other enterprises in Kazakhstan.

In addition, there is the goal to achieve a substantial change of the proportion between the RTDI investments coming from state owned and from private companies with a stronger role for the latter. Entrepreneurship is seen as a driving force of the new Kazakhstan economy\(^{36}\). The clustering of high-tech companies around Nazarbayev University will act as examples also for other science and higher education centers\(^{37}\).

Finally, it has to be mentioned that following the instructions by President Nazarbayev major initiatives are launched towards affordable high quality “green” housing, healthcare, water quality and safety, agro-industry. Last but not least, huge technological infrastructure projects are initiated in the areas of railways, roads, logistic centers, oil refineries, oil and gas

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\(^{31}\) See Annex 6  
\(^{32}\) Op. cit., Article 11.1  
\(^{33}\) Op. cit. Article 10.6  
\(^{34}\) Op. cit. Article 20  
\(^{35}\) Op. cit., Article 21  
\(^{36}\) President Nursultan Nazarbayev: 2010 State of the Nation address: “A New Decade a New Economic Growth and New Opportunities for Kazakhstan”. Astana, 29 January 2010  
\(^{37}\) President Nursultan Nazarbayev: 2012 State of the Nation address: “Socio-economic Modernisation as the Main Vector for Kazakhstan’s development”. Astana, 27 January 2012
pipelines, power stations, mineral fertilizers and chemical plants play an important role in Kazakhstan’s modernisation programme.

**Comments and recommendations**

In the last six to eight years the legal framework for education, research and innovation has been developed in Kazakhstan. The structures and tasks of ministries and related bodies and organisations have been aligned with the policy objectives. New programmes and initiatives have been launched. It must be emphasised, however, that many activities are rather recent and it is much too early for the peer review team to make any in-depth assessment with regard to implementation.

Kazakhstan undergoes a dynamic development process and the roles and functions of the institutions seem to have changed quite often during the past years. However, due to the new laws on education, science and innovation adopted during the last two years there is the perspective of consolidation.

The peer review team found a wide variety of actors that have missions that partially overlap. These include the relevant ministries, agencies and also the state-owned enterprises and institutions that are linked to them. From a systems point of view this needs not be a disadvantage when it leads to interaction, linkages, coordination and cooperation, which, however, at present seems not necessarily be the case in Kazakhstan. While there is adequate consistency at the level of the overall policies and programme goals, mechanisms for the coordination of the development of initiatives and their implementation seem not so clear and there seems to be room for improvement.

The laws “On Science” and on “State Support for Industrial and Innovative Activity” as well as the programmes for education development and developing innovation and promoting technological modernization show overlaps especially in the area of science-business cooperation and the translation of research results into commercial success.

We see, however, that there still is no clearly defined “center responsible for the development and implementation of a unified state policy in the field of technological development and innovation and, as a consequence, a lack of coordination between government and institutions of innovation development scientific research organisations and enterprises of the real economy”\(^{38}\). Therefore, we recommend that the in the course of the implementation of the set of new laws a clear and efficient division of labour should be defined between MINT and MES, between HSTC and CTP as well as between NATD and the Science Fund.

As one promising example of coordination and cooperation we learned about the plans for coordination and cooperation between the MINT and the Ministry of Environmental Protection (MEP) in connection with the “Green economy” initiative. In well developed innovation systems there are many examples of fruitful cooperation between different actors jointly implementing RTDI programmes and initiatives.

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38 State Programme for the Development of Innovation and Promotion of Technological Modernization of Kazakhstan for 2010-2014. Chapter 4, last paragraph
The peer review team welcomed to see comparative studies of the NIF about RTDI policies and programmes in other countries\textsuperscript{39} that can be taken as examples of good practices. We were also glad that Kazakhstan policy makers, e.g. in MINT and NATD, emphasised that examples from other countries are useful but should not be copied one-to-one. They should act as inspiration for developing approaches well adjusted to the situation in Kazakhstan.

This leads to a general observation and assessment that many elements and structures of a national innovation system have been put in place in the last few years. However, the peer review team had difficulties to see the interactive linkages and processes that are decisive for a functioning national innovation system.

In order to link the different actors, we recommend to consider establishing appropriate organisational structures such as e.g. a Council for Science Research, Technological Development and Innovation as the joint body of the Highest Science and Technology Committee and the Council for Technology Policy. In addition, the boards of the Science Fund (SF) and the National Agency of Technological Development (NATD) could form a joint coordinating body. Also a new National Innovation Council could be considered as proposed by an expert group in a report by Columbia University\textsuperscript{40}.

The peer review team noted with great interest the ambitious policy goals. However, we didn’t see detailed roadmaps with the main actors and related activities, resources, commitments and timing for achieving the goals. The general rationales behind the political orientation are comprehensible. For a well-founded appraisal it would be necessary to see not only analyses of the present state but also feasibility studies for envisaged actions and the planned pathways towards achieving the goals in the planned timeframes.

For the peer review team, the relations and possible synergies were not clear between the priorities followed by MES and SF and the priority areas and critical technologies identified by the foresight exercise organised by NIF. In addition, we didn’t see the direct relations of these RTDI priorities and the important socio-economic initiatives and huge technological infrastructure projects defined by the President in his State of the Nation addresses. We see substantial potential of synergies between these initiatives and the overall RTDI objectives and plans.

It will be crucial that the development of RTDI programmes and initiatives follow a systematic approach where analyses of the present state, foresight, innovation and technology assessment, ex-ante evaluation and impact assessment\textsuperscript{41}, S&T roadmapping, monitoring of


implementation and strategy evaluation and benchmarking form a consistent policy cycle\textsuperscript{42, 43}.

We emphasise, that a long-term high level commitment of all actors at all levels as well as sustainable and efficient provision of adequate resources will be necessary to achieve the objectives.

In addition, as an important pre-condition, “ownership” of the transition process has to be achieved by active involvement of and participation of the main stakeholders and actor groups. Final success will depend on the relevant target groups understanding and subscribing to the ultimate goals and contributing actively and constructively. This will need also changes of mindsets and attitudes as well as social innovation regarding organisational structures and procedures. Organising appropriate processes are complex management tasks for the institutions and agencies in charge of the implementation of the policies; where necessary appropriate competences and capacities will have to be developed.

This holds especially where the achievement of the objectives will depend also on business initiatives and activities that are not under the full control of the government, such as innovation activities of private companies, their demand and adoption capacities for new technologies. Ensuring the contributions from the business sector in the foreseen manner will be a great challenge because that can only be stimulated by creating a favourable environment for research and innovation of companies.

Special attention must be put on SMEs that in most countries play a very important role in innovation. Increasing the share of private innovative SMEs by the envisaged percentage will need special provisions for encouraging the set-up of new companies and a favourable environment for business activities. Appropriate government measures, legal and regulatory provisions as well as tax incentives can stimulate the development of this possibly vibrant sector of innovative business. However, above all it will depend on persons with the appropriate mindset and entrepreneurial spirit taking the initiative to start innovative enterprises.

The objective of stimulating RTDI has to put a priority on the strengthening of education and research system - universities and research institutes - with a strong focus on developing the human potential for research and innovation as well as the appropriate science and research infrastructure. As the available analyses show the situation with regard to the quantity and quality as well as the age structure of human resources for research is critical. Substantive improvement will be necessary in order to ensure the adoption capacities for the envisaged substantial increase of investment in RTDI and the expected substantial contributions from this sector to the national development. This means not only a plan for the further strengthening of the university system but also a development plan for the research institutes based on a careful evaluation regarding structures and performance. These aspects will be further developed later in the report.


\textsuperscript{43} See also the related analyses published by VINNOVA, The Swedish Innovation Agency: http://www.vinnova.se/en/Publications-and-events/Publications/VINNOVA-Analysis/
We welcome the important role devoted to systematic foresight processes involving national and foreign experts for identifying priorities that are promising for the future development of Kazakhstan. If successful, foresight initiatives will not only produce results with respect to priority areas and key technologies but will also contribute to the further development of the RTDI community in Kazakhstan including stakeholders from government and regional authorities and agencies, science and business, and also users.

Through the foresight process an intensive dialogue between stakeholders and experts, including foreign experts, has been initiated that should be maintained. As experiences from other countries show such interaction is an important characteristic of a national innovation system. Processes must include all actors of the innovation system and are important means for developing a national RTDI community. In that context, also the science-based players should take a more active part in the process; otherwise an important part of the national RTDI potential is missed.

We welcome the cooperation with KISTEP as an institution with long-term experience in the area of foresight. However, we recommend to put an emphasis on building own capacities for these activities in Kazakhstan.

During the meeting at the National Center for Scientific and Technical Information (NCSTI) – the provider of National Scientific Web-Portal www.nauka.kz, it was underlined that the methodology of foresight by NIF was rather for technological foresight while science foresight was not covered. However, the peer review team was not able to get sufficient information regarding foresight initiatives except the information about the NIF/NATD activities. It has not become clear to the peer review team if there is a role of the National Center for Scientific and Technical Information (NCSTI) in foresight activities.

Moving Kazakhstan to the envisaged position on the international RTDI map will need appropriate strategic intelligence capacities and decision support in all stages of the programming processes of the country’s position and development towards the set goals and in comparison to developments at international level.

Programme implementation and management should be monitored closely, evaluation and impact assessment of programmes should be obligatory. Due to the ambitious approaches a careful monitoring of the implementation and – if necessary – corrective measures will be necessary. Therefore, we propose organising interim evaluations of the implementation also in 2015.

The peer review team sees a need for a major initiative to be launched for developing a RTDI “evaluation culture” in Kazakhstan. As the examples of countries that are successful in the area of RTDI show (44, 45, 46) effective and efficient policy development and implementation will only be possible when the programmes and processes are based on ex-ante evaluation,

monitoring of implementation, and intermediate evaluation at appropriate stages of implementation, and final evaluation at the end of a programming period. We recommend also learning from the approaches applied in the EU framework programmes\textsuperscript{47}. Ex-post impact assessment some time after the end of a programme will be the last step of the policy cycle\textsuperscript{48}. In addition, at the level of selecting and implementation of projects, a high quality of evaluation and project review by independent experts is necessary.

We welcome that there are plans going in the proposed direction already. In the Strategic Plan for 2020\textsuperscript{49} the implementation of a comprehensive system of monitoring and evaluation of strategy and programme documents is foreseen. “Monitoring of the Strategic Plan 2020 will ensure the coordination of government action to achieve national strategic objectives as well as mechanisms to adjust and tools to achieve national strategic objectives…”\textsuperscript{50}.

In addition, the National Centre for State Scientific and Technical Expertise has been charged with the evaluation of results of completed scientific research, scientific, technological and innovative projects and programmes\textsuperscript{51}. This is an important function and its realisation may become an important aspect of the development of an evaluation culture in Kazakhstan. During the present exercise, the peer review has not seen instruments in place for monitoring and evaluation of the national RTDI programmes and initiatives. However, this can be explained by the fact that the programmes are mainly in a starting phase.

Also the SF and NATD should be evaluated on a regular basis involving independent international experts utilizing also the capacities of the Kazakhstan S&T diaspora.

An important issue will be ensuring that decisions are based on reliable data. The peer review team was concerned to notice basic inconsistencies and deficits in the area of RTDI information and data. A sound indicator basis is necessary for policy planning and implementation as well as monitoring and evaluation. For delivering a plausible data basis the Agency for Statistics should not only collect the relevant data, but also should present it in formats, which would support evaluation and monitoring and which could be a useful data basis for analysis and strategy. In order to facilitate this, a concept should be worked out with the other relevant institutions, such as MES, MINT, and other ministries as well as NATD and SF.

In summary, realising the plans and implementing the programmes Kazakhstan faces a number of great challenges:

- Needs for better coordination and cooperation between the main RTDI stakeholders and strengthening linkages and interactions between the elements of the emerging national innovation system;
- A thin coating of human resources for research, technological development and innovation.

\textsuperscript{47} http://ec.europa.eu/research/evaluations/index_en.cfm?pg=system
\textsuperscript{49} About the Strategic Plan for Development of Kazakhstan up to 2020. President of the Republic of Kazakhstan as of February 1, 20120 No 922
\textsuperscript{50} Op. cit.
- At the moment, the institutional science and technology infrastructure may not have the capacities for substantial increases of investments,

- No actual necessity for the business to be innovative, no business demand for innovation,

- A small share of private companies, particularly a low number of SMEs,

- Two worlds: business innovation/commercialisation and science work separately,

- Inadequate statistics and data for strategic intelligence and decisions support.

The problem to be solved is to reconcile and to break free from the previous structures as well as attitudes and mindsets of Soviet times, while pursuing a sustainable development policy, using the substantial available financial resources generated by the exploitation of the subsoil resources. Important and decisive steps have been taken in that direction already but there are certainly still challenges ahead.

3. Investment in and funding of RTDI

At present, the political objective of Kazakhstan’s government is to reach a level of investment in R&D as percentage of GDP of 1% by 2014\textsuperscript{52}. However, currently it is discussed to strive for the 1% target for 2015 and reaching 1,5% of GDP by 2020. A step in the direction of the above policy goals is e.g. the substantial increase of R&D financing in the national budget from KZT 26,8 bn (€ 136,4 mio) in 2011 to KZT 49,7 bn (€ 252,9 mio) in 2012 which is an increase of 61%\textsuperscript{53}.

In 2010, the share of expenditures for R&D of the public sector are 37% and of business are 36,6%\textsuperscript{54}. In that context, it should be noted that in advanced countries the business sector’s share of R&D expenditures of amounts to about 66% (two thirds) or more.

There are ambitious goals with regard to increasing investments of the business sector in RTDI substantially above the present level.

Main agencies supporting R&D and innovation are: NATD, the JSC “National Agency of Technological Development” (former ”National Innovation Fund” NIF) in the domain of MINT and the JSC ”Science Fund” (SF) which is related to MES. Initially established as a self-standing entity SF was integrated into “Parasat”\textsuperscript{55} in 2008.

According to the Law of Science, funding for research and (or) scientific and technical activities of the state budget are provided in the following forms\textsuperscript{56}:

- basic institutional funding – for administration and maintenance of research infrastructure,

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\textsuperscript{52} State Programme for the Development of Innovation and Promotion of Technological Modernization of Kazakhstan for 2010-2014, Article 4.2

\textsuperscript{53} See news 31 January 2012 on Website of the Prime Minister: http://www.pm.kz/news/show/22/govnews_item-5382/31-01-2012

\textsuperscript{54} See Country Report p. 11

\textsuperscript{55} See Country Report p. 15

grant funding – essentially for personal costs for research and technological development projects, and

programme funding – for target oriented research based on state orders.

Funding can be carried out simultaneously on different forms of financing in order and on terms established by order of the basic and the grant programme.

MES provides funding for universities and research institutes according to the above three tracks, for grant and programme funding on a competitive basis. MES launches calls for proposals with the Science Fund (SF) as executive agency focusing on the national priorities. SF provides (co)financing of R&D activities, including the implementation of their results.

The evaluation of proposals is carried out by the National Centre for S&T Expertise with the help of independent experts that are selected using international data bases such as Thompson Reuters. The experts are working remote and receive copies of the proposals that have to be presented in Kazakhstan, Russian and English. Following the implementation of the law “on Science” in 2011, a first call for proposals was launched and more that 1.000 experts were involved in the evaluation with two thirds of them being from abroad. Universities were very active in that call and most applications came from the university sector.

In the domain of MINT, in April 2012 NIF was transformed into the National Agency of Technological Development NATD through the new law “On State support for Industrial Innovation”. As described in the previous chapter, the tasks, activity areas and instruments of the new agency are now well defined in one law and the spectrum of activities has been widened beyond being a fund of funds. NATD’s mission is the assistance in the coordination process of innovation development and provision of state support, with the main activities:

- Analytical and information support of innovation processes,
- Development of the commercialization system,
- Development of innovation infrastructures,
- Administration of service tools designed to support innovation,
- Investment support for innovative projects,
- Popularization of innovative activity.

Entrepreneurship is supported by innovation grants, project funding, venture funding, services of technological business incubation, services of sectoral design office, and international transfer centres. For more details regarding innovation infrastructure see Chapter 6.2.

A main task of NATD is technology foresight. On the basis of the first national scientific-technology foresight the MINT and NIF have started to implement a number of programmes in several sectors: Agro-Industry, Geology, ICT, Oil and Gas, and Mining and Smelting. However, most importantly, based on the eight areas and sixty three critical technologies identified in the course of the foresight exercise, ten Targeted Technological Programmes (TTPs) will be developed in a pilot mode in 2012. In Triple-Helix mode of cooperation, small

57 Greeting of Minister of Education and Science Mr. Zhumangulov B.T. at the ceremonial meeting devoted to the Day of Science, Astana, 12 April 2012
58 http://nif.kz/en/
groups of experts from (international) business, science and government will be assigned with developing the details of these programmes. The groups will develop road maps for RTDI infrastructure, human resource development and international partnering. In principle, the approach and instruments resembles small targeted technology platforms as known from the European Union. For different TTPs the mix of funding from industry, MES (e.g. Bolashak Programme) and NATD might be different and will be part of the programme design. According to the planned procedure, a ten to fifteen years timeline is considered as appropriate for an effective implementation of the programmes. The first years will be especially devoted to development of human resources and the RTDI infrastructure. Both in the development of human resources and in technological development international partners will play an important role.

MINT and NATD work closely together with the Sovereign Wealth Fund JSC “Samruk-Kazyna”. The plan is that Samruk-Kazyna shall act as a “locomotive” for the RTDI development process toward the 2020 targets, and also as a catalyser and motivator for private business.

National companies of Samruk-Kazyna should invest up to 10% from total income for innovation activities. In the further development and elaboration of activities in that context Samruk-Kazyna works closely together with MINT and NATD.

It is also worth mentioning that Samruk-Kazyna companies are responsible for the implementation of the above mentioned major multi-billion dollar infrastructure projects defined by President Nursultan Nazarbayev’s instructions in his State of the Nation addresses.

In addition, every sub-soil user will have to spend 1% of their total revenue from contract activities for research, scientific, technical and (or) development activities (RSTDA) including innovation infrastructure such as technology centers, commercialisation offices, etc. The amount of investment in RTDI in Kazakhstan shall be included in the obligations defined in the contract on subsoil use: “Performance of obligations on funding of RSTDA will be actually the costs incurred by subsoil user for the work under the subsoil use contract, as well as activities aimed at production of goods with high added value. This includes costs on research in the field of ecology, health, provision of operations safety and energy efficiency within the scope of process cycle, as well as the costs for funding of research and creation of elements of the industrial and innovation infrastructure. Subsoil users will have to submit reports on the implementation of commitments to fund RSTDA to the competent authority on a quarterly basis no later than the 15th of the month following the reporting period.”

Kazakhstan has also bi-lateral agreements on S&T cooperation with many countries and Kazakhstan institutions participate in the EU framework programmes which may also provide additional (co-)funding for collaborative RTDI activities and should be considered when developing the financial roadmap of investments in RTDI towards 2020.

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61 Yerbol Suleimenov, Deputy Director of the Committee of Science of MES, interview for the pm.kz site, 5 February 2012.
Comments and recommendations

Despite legal and institutional reforms, indicators of innovative activity show limited progress. Gross expenditure on research and development (GERD) remains very low, reaching 0.16% of GDP in 2011 (with only a minor contribution from private sector). It should be noted that the reality contrasts with the target expressed in the SPAIID where it is indicated\(^{63}\) that – according a recommendation of the InterAcademy Council\(^{64}\) - an increase of investment research and development towards 1-1.5% of GDP would be appropriate. However, it is worth noting that in SPAIID this goal is not defined as an explicit target. In the State Programme for the Development of Innovation and Promotion of Technological Modernization the target is formulated to reach a level of investment in R&D as percentage of GDP of 1% by 2014\(^{65}\). We note, however, with interest that the current discussions indicate that the goals will be reaching a level of investment in RTDI of 1% of GDP by 2015 and 1.5% of GDP by 2020.

GERD per capita in Kazakhstan is much lower than in Russia and Belarus. Such a low level of GERD constitutes a significant barrier to upgrading the quality of research equipment, and compensating for previous under-investment.

Higher levels of investment in RTDI are crucial in order to create a dynamic and competitive knowledge-based economy, capable of sustainable economic growth. Therefore, the planned substantial increase of public investment in R&D for 2012 is promising. Clear responsibilities and processes have to be defined for the budgeting and spending of the state money for RTDI. We recommend presenting a long-term plan for public investment in R&D till 2020 indicating also the expected contributions from the business sector – public and private. That would show the commitment of the highest political level in real terms and would also create a positive climate for RTDI, create trust of the main RTDI stakeholders and actors, and may also have a leveraging effect towards more business investment in that area.

In Kazakhstan, as an "oil economy", providing substantial financial resources for RTDI should not be a problem. More gradual increase of RTDI spending should be adopted in order to ensure a stable and sustainable long-term development.

However, problems may arise when immediate or too short term implementation of measures for strengthening RTDI is striven for and achieving the ambitious objectives may become unrealistic. As underlined already, also the adoption capacities with regard to human resources, scientific institutions and businesses as well as infrastructures and equipment have to be taken into account and included in implementation plans. Otherwise the sudden increase of available funds may lead to wanting to "buy" technologies and services immediately, rather than striving for a gradual ramp-up of endogenous national capacities. This is certainly also an issue to be considered in the context of the development of the Targeted Technological Programmes together with international business partners. It has to be ensured that in the course of these programmes national RTDI actors – universities and research institutes – are

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\(^{63}\) State Programme of Accelerated Industrial and Innovative Development of the Republic of Kazakhstan for 2010-2014 (SPAIID), Chapter 2.10

\(^{64}\) InterAcademy Council: Inventing a better future. IAC Report. 2008. p.2 and p. 38

\(^{65}\) State Programme for the Development of Innovation and Promotion of Technological Modernization of Kazakhstan for 2010-2014, Article 4.2
also involved and sometimes necessary short term acquisition of foreign technologies and technological know how is balanced by systematic strengthening of national RTDI capacities and activities in line with the objectives of the TTPs.

The peer review team is interested in information about how the different lines of financing via MINT and MES and sectoral ministries are in fact coordinated and controlled. In the team’s view, synergies, coordination and where possible and appropriate cooperation should be utilized including the initiatives of Samruk-Kazyna and the companies of the subsoil sector in the frame of an all encompassing National RTDI Plan.

The peer review team was glad to learn about the close cooperation between MINT, NATD and Samruk-Kazyna in the frame of the implementation of the TTPs and the programmes of Samruk-Kazyna. We welcome also the considerations towards the cooperation of MINT and MEP in the context of the plans regarding the “Green Economy”. The above proposed measures to bring the HSTC and the CTP closer together would certainly contribute to better concertation and alignment of the different initiatives, programmes and activities towards the common goals for 2020.

For stimulating RTDI the peer review team recommends to use the large infrastructure projects through pre-commercial procurement and public procurement towards innovation. This may be a way to attract also private innovative companies including SMEs to engage in RTDI. In that context, also new environmental regulations, codes and standards can play an important role for stimulating innovation, e.g. clean coal, environmental friendly mining and processing of raw materials with a close link to the strategy towards “Green Economy”. Also the establishment of an Environmental Protection Agency could be considered on the basis of the research institutes related to the Ministry of Environmental Protection.

The ministries, which are responsible for RTDI, should implement a decision and management process for policy and budgetary purpose.

The funding system should be structured in three levels:

- Short-term projects of limited duration (one to three years),
- Medium-term projects for periods of four to seven years,
- Long-term projects for strategic alliances and public-private partnerships (PPPs) between research organisations and also research organisations and companies.

The peer review team recommends including also the financial contributions from bi-lateral agreements with different countries and also from the EU Framework Programme\(^66\) in the multi-annual investment plan proposed above.

For the institutional development of the RTDI funding system in Kazakhstan international cooperation and mutual learning together with similar organisations abroad is recommended. Both organisations should develop an internationalisation strategy also as a contribution to opening to the world and supporting the integration of their respective target groups in international RTDI communities.

\(^66\) At present and till 2013: FP7; from 2014 to 2020: HORIZON 2020
Finally, we emphasise that it is important that Kazakhstan’s main funding organisations become visible and interact with international partners and initiatives. For the Science Fund, establishing contact and exchange of information with Science Europe\textsuperscript{67} would be interesting, the newly founded association of European research funding organisations (RFO) and research performing organisations (RPOs). Also the initiative started by the US National Science Foundation (NSF) to launch a Global Research Council should be considered\textsuperscript{68}. For NATD, TAFTIE the association of the leading European innovation agencies would be an interesting partner. Some times ago, TAFTIE has prepared a report on the Internationalisation Strategies of the association’s member agencies\textsuperscript{69} that is certainly interesting for the NATD.

4. Universities, research institutes, and the National Academy of Sciences\textsuperscript{70}

4.1 Introduction

Universities and research institutes form the main part of the research infrastructure of Kazakhstan. The organisational statistics are as follows\textsuperscript{71}:

<table>
<thead>
<tr>
<th>Organisations</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Institutes</td>
<td>133</td>
<td>31.4</td>
</tr>
<tr>
<td>Design, engineering design and technological organisations</td>
<td>26</td>
<td>6.1</td>
</tr>
<tr>
<td>Universities</td>
<td>121</td>
<td>28.5</td>
</tr>
<tr>
<td>Industrial enterprises</td>
<td>11</td>
<td>2.6</td>
</tr>
<tr>
<td>Others</td>
<td>133</td>
<td>31.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>424</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

There is no detailed report on the set-up of the research sector in Kazakhstan available so that the possibility of performing an in-depth analysis of this sector was limited. However, according to the general statistical data it is evident that the research institutes play an important role in research and technological development and contribute 31.4% to the research and development activities in Kazakhstan, while higher education institutes contribute 28.5%.

The Country Report provides information on the separate rankings of universities and research institutes prepared on the basis of bibliometric analysis of national publications by the National Centre of S&T Information (NCSTI) that runs also the Bibliographic Data Bank (BDB)\textsuperscript{72}.

The table below shows a combined ranking of universities and research institutes presenting the top 19 Kazakhstan institutions showing up in international citation databases Thompson Reuters Web of Science and Scopus with research institutes having a important share.

\textsuperscript{67} http://www.scienceeurope.org/
\textsuperscript{68} http://www.globalresearchcouncil.org/
\textsuperscript{70} See Country Report pp. 46 ff.
\textsuperscript{71} Country Report p. 68 (Source: Statistics Agency of the Republic of Kazakhstan)
\textsuperscript{72} Country Report, pp. 65-66
<table>
<thead>
<tr>
<th>#</th>
<th>Institution</th>
<th>Number of Publications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>National Academy of Sciences of Kazakhstan</td>
<td>1308</td>
</tr>
<tr>
<td>2.</td>
<td>Al-Farabi Kazakh National University</td>
<td>710</td>
</tr>
<tr>
<td>3.</td>
<td>Ministry of Education and Science of Kazakhstan</td>
<td>308</td>
</tr>
<tr>
<td>4.</td>
<td>D.V.Sokolsky Institute for Organic catalysis and Electrochemistry</td>
<td>214</td>
</tr>
<tr>
<td>5.</td>
<td>Institute of Nuclear Physics, National Nuclear Center of Kazakhstan</td>
<td>157</td>
</tr>
<tr>
<td>6.</td>
<td>Kazakh Institute for Oncology and Radiology</td>
<td>156</td>
</tr>
<tr>
<td>7.</td>
<td>Buketov Karagandy State University</td>
<td>136</td>
</tr>
<tr>
<td>8.</td>
<td>Bekturov Institute for Chemical Sciences</td>
<td>124</td>
</tr>
<tr>
<td>9.</td>
<td>Physics and Technology Institute</td>
<td>75</td>
</tr>
<tr>
<td>10.</td>
<td>Institute for Zoology</td>
<td>70</td>
</tr>
<tr>
<td>11.</td>
<td>National Nuclear Center of Kazakhstan</td>
<td>55</td>
</tr>
<tr>
<td>12.</td>
<td>Fasenkov Institute for Astrophysics</td>
<td>50</td>
</tr>
<tr>
<td>13.</td>
<td>Gumilyov Eurasian National University</td>
<td>36</td>
</tr>
<tr>
<td>14.</td>
<td>Satpayev Kazakh National Technical University</td>
<td>35</td>
</tr>
<tr>
<td>15.</td>
<td>Institute for Mathematics</td>
<td>31</td>
</tr>
<tr>
<td>16.</td>
<td>Semei State Medical Academy</td>
<td>31</td>
</tr>
<tr>
<td>17.</td>
<td>Kazakh-British Technical University</td>
<td>28</td>
</tr>
<tr>
<td>18.</td>
<td>Almaty Institute for Power Engineering and Communications</td>
<td>28</td>
</tr>
<tr>
<td>19.</td>
<td>Asfendiyarov Kazah National Medical University</td>
<td>20</td>
</tr>
</tbody>
</table>

Source: National Center for S&T Information (NCSTI)

While the production of scientific papers in international renowned journals is only one criterion for institutional assessment of universities and research institutes a broader assessment is applied for universities in the course of the accreditation procedure organised by the National Accreditation Centres of MES every five years\(^73\).

The information received from MES and from NCSTI as well as presented in the Country Report indicates that the strongest research areas in Kazakhstan are astronomy, chemistry, earth sciences, mathematics, and physics. The share of publications in the areas of agriculture and biological sciences, computer sciences and engineering, and areas related to medicine and health is rather low. Despite the relatively limited research activity in the areas of Life Sciences (including various sectors of biology, biotechnology and medicine), respective publications have the highest average citation rate. Also papers in health care, environmental sciences and pharmacology are actively cited. A more detailed assessment on the status of Kazakhstan science and research in international comparison, however, goes beyond the scope of this review.

Through contracts with Elsevier, Thomson-Reuters and Springer the Kazakhstan scientific community has access to the world-wide scientific literature. Furthermore, there are plans to develop incentive system for increasing the scientific productivity\(^74\).

\(^73\) Country Report, pp. 59ff.
\(^74\) Country Report, p. 67
4.2 Universities

According to the Ministry of Education and Science (MES), there are 146 higher education institutions (HEIs) in Kazakhstan:

- 9 National HEIs,
- 1 International HEI,
- 1 Autonomous Educational Organisation “Nazarbayev University”,
- 33 State HEIs,
- 16 Joint Stock Universities,
- 73 private HEIs, and
- 13 non-civil HEIs.

There is one international HEI, the Nazarbayev University (NU), which is the national flagship project in the sector of higher education and RTDI in Kazakhstan initiated on special instruction of President Nursultan Nazarbayev (see also below).

The nine universities with a status "National Higher Education Institutions" are leading in research and educational activities and receive special state funding.

In his 2011 address “Building the future together” President Nursultan Nazarbayev requested that “no less than two universities will be registered in the rating of the world’s top universities”; the request has been codified in law already and the government aims to have at least two universities in the Shanghai list of 100 top universities by 2020 (one by 2015 and two by 2020).

In the 2011 QS World University Rankings, two Kazakh national universities, Al-Farabi KazNU and LN Gumilev Eurasian National University and became the first Central Asian universities that approached the top-universities of the world due to “their exceptional student faculty ratios, and, in the case of the latter, an improved standing with academics, infrastructure, internationalization of science, innovations, teaching methodology, job opportunities and social support for students. This is consolidated by the increased number of international faculty, which suggests that it is becoming a more appealing prospect for international academics.” Within two years, Al Farabi KazNU climbed up 200 positions and took the 401-405th place of the QS ranking (601-605 place in 2009). Starting from 2005, the two universities have received $1 mio each for attracting foreign faculty and counselors.

During its mission to Kazakhstan, the peer review team had the opportunity to visit four universities:

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76 We have received different information about numbers of higher education institutions between 136 and 149.
77 State Program of Education Development in the Republic of Kazakhstan for 2011-2020. Approved by the decree of the President of the Republic of Kazakhstan dated December 7, 2010, No 1118, Astana 2010
78 http://www.topuniversities.com; see also the news of 18 January 2012 on the website of the Prime Minister
79 Website of the Prime Minister, op. cit.
- Nazarbayev University (NU)\textsuperscript{80} in Astana,
- Al-Farabi Kazakh National University (Al-Farabi KazNU), Satpaev Kazakh National Technical University (Saptaev KazNTU), Almaty Technological University in Almaty.

According to the ranking of Kazakhstan universities by their national publication activity, the three universities visited in Almaty are among the five leading universities\textsuperscript{81} with Al-Farabi KazNU occupying the first place. Also in the above ranking based on international publication databases Al-Farabi KazNU occupies the first place far ahead of the other Kazakhstan universities. Due to the fact that Nazarbayev Universities has been established only recently it doesn’t show up in rankings so far.

Nazarbayev University (NU) is receiving strong state support. NU was established by the order of the President of Kazakhstan within a specific legal background and is a new institution created from scratch. The guiding vision is to create a prestigious world-class university in Astana the capital city of Kazakhstan and to play a leading role in developing the intellectual scientific, technical and engineering elite of the country and become a central player in the region and beyond. The goals of NU are:

- Contributing to the development of Astana as the center of science, education and culture with talented and competitive human capital in Eurasia,
- Bring the scientific and educational system of Kazakhstan in compliance with international standards.

“On the basis of the new Nazarbayev University an innovative model of a higher education institution oriented at market demands is being formed. It aims to become a model for all universities in Kazakhstan”.\textsuperscript{82} An important part of the NU concept is the development of a cluster of innovative companies and maybe also research establishments around the university.

NU can be described as the first Kazakhstan initiative to integrate fully the three sides of the Knowledge Triangle of education, research and innovation, aiming to stand out as a world-class innovation-orientated reference model, inspiring and driving change in existing education and research institutions in Kazakhstan.

Al-Farabi KazNU is the oldest and most prestigious university of Kazakhstan and the flagship among the higher education institutions in the area of education and also with regard to research outputs as shown by national and international bibliometric and citation analysis as well as regarding cooperation with industry. It was the first university that signed up to the Bologna process and was also the first one accredited. Currently, the main priority is the transition towards the status of a “national research university” as foreseen in the State Program of Education Development\textsuperscript{83}.

\textsuperscript{80} See Country Report, pp. 14, 34
\textsuperscript{81} See Country Report p. 44
\textsuperscript{82} 2011 State of the Nation address of President Nursultan Nazarbayev
The university adheres to its double role for the country:

- providing high quality education for developing human resources with a focus on employability based on skills for research and innovation in industry and for solving complex problems, and

- contributing to the improvement of the economy and the developing of the knowledge society.

The university has a unique science, technology and innovation infrastructure including 9 research institutes and the S&T Park as well as 19 institutes and scientific centers. The university makes important contributions to the scientific activities of Kazakhstan especially for developing nano-science and nanotechnology and supporting chemical industry in the country.

At present, 48.2% of the academic staff is involved in the realization of scientific and technical programmes and projects. In the period from 2007 to 2011, scientists of Al-Farabi KazNU have implemented 335 international projects funded by ISTC, INTAS, TEMPUS, IAEA, and NATO showing that international cooperation is one of the university’s strategic priorities.

The university’s scientists have high level scientific achievements. In 2008, scientist of the university published 108 articles in journals with non-zero impact-factor, which accounted for more than 25% of the publications in the country. In 2011, university scientists in 2011 within the journals published 160 articles in high impact journals. Some scientists of KazNU have a Hirsch index (H-Idex) comparable to the index of the world’s top universities scientists. Also in 2011, the proportion of the faculty who obtained certificates, patents for inventions and other law enforcement documents recorded 11% of the university scientists total number.

The university has well equipped laboratories including a supercomputer. It disposes also of the appropriate infrastructure for working with industry. In order to support the translation of research results and new ideas of university students, scholars and faculty into innovations ideas the university has developed a “technological corridor” as a new concept in the industrial park providing services supporting the whole innovation chain from idea to implementation and commercialization: centre for project support, office of commercialization, university wide business incubator and student business incubators within the faculties. The university project “Al-Farabi KazNU Innovative Cluster” funded by the state will provide new buildings hosting these activities and is expected to further strengthen the position of the university in the new knowledge-based economy of the country.

Satpaev KazNTU is the leading university for education and training of engineers for the mining, metallurgical, geological, construction and other industry branches of Kazakhstan. Also KazNTU is working towards gaining the status of a national research university. Special features of KazNTU are modern laboratories for ICT including a super computer. The university has several international “dual Diploma Programmes” with universities in Europe, Russia, and the USA. In the area of international collaboration, bi-lateral centers have been established with France, Germany, and with Korea. The university has cooperation agreements with about 350 companies. A Technology Park has been established with the

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84 State Programme for the Development of Innovation and Promotion of Technological Modernization of Kazakhstan for 2010-2014
support of NATD. Following the initiative of the Rector, the university has been evaluated by EUA in the course of the EUA-Institutional Evaluation Programme.\footnote{M.H. Nazaré et al.: Kazakhstan National technical University named after K.I. Satpaev. Evaluation Report. EUA-Institutional Evaluation Programme. EUA, Brussels, May 2011}

Almaty Technological University is a private university specialised in the education and training of engineers in the fields of food production, light industries and design, engineering, information technology, economy and business. The university offers also preparatory courses and is engaged in life-long learning activities. The commercialisation office funded by NATD is fostering cooperation with industry and supports translating research results into innovation especially for the region and regional industry by targeted activities: searching for transferable technologies in the university, marketing university research results, assistance and advice regarding IPR, strategy development for commercialisation, assistance for the creation of university spin-offs.

Kazakhstan acceded to the Bologna Declaration and 30 universities have signed the Great Charta of Universities.

Links between universities and the research institutions are one of the steps to realise the governmental strategy to create national research universities. Therefore many universities of Kazakhstan, including national universities, have their own research institutes.

\textit{Comments and recommendations}

For the realisation of the government policies in RTDI the development of the higher education and research system of Kazakhstan must have top priority. First of all, it is truly necessary to consider the issue of increasing the funding of the university sector as one of the pillars of the national innovation system. The funding must ensure up-dated research and education infrastructure and also adequate salaries for academic staff able to compete with the non-university sector.

The availability of adequate human resources for higher education, research and innovation will be the main limiting factor and, thus, the biggest challenge. People will be needed with the appropriate mindsets towards science, research, innovation and entrepreneurship. This has to encompass attracting sufficient students to science and engineering and to offer attractive career paths both in academia and in industry and other parts of society. However, this will be possible only when the universities provide attractive environments for academics and students which calls for substantive efforts both for the government and for university leadership.

The Knowledge Triangle should be a central theme of the strategies for developing the higher education system in Kazakhstan, representing the integration of education, research and innovation working together as key drivers of the knowledge economy in delivering sustainable growth of Kazakhstan.

With about 140 universities, Kazakhstan has a relatively high number of universities and it is recommended to evaluate the whole system with regard to the appropriateness of the present institutional set up and its potential for supporting the policies, plans and strategies for the development of Kazakhstan.
During the mission to Kazakhstan the peer review team was impressed by the Nazarbayev University and by Al-Farabi KazNU as well as by the other universities visited in Almaty – Satpaev KazNTU and the private Almaty Technical University. The universities have up-to-date equipment and are implementing appropriate measures (e.g. the remodelling of curricula towards the Bologna structure, the Bolashak programme, joint study programmes with universities abroad, commercialisation offices, incubator, bilateral research centres with foreign partners) in order to provide up-to-date education, to strengthen the national research base and contribute to innovation in cooperation with business.

The scientific success and the advanced approaches in education and working with industry of Al-Farabi KazNU provides a promising basis for the university reaching the level of an autonomous national research university by 2015, and for entering the ranks of the world’s best universities by 2020.\(^\text{86}\)

We welcome that Al-Farabi KazNU organized a seminar on the Times Higher Education (THE) ranking methodology in 2011. Also the activities of the Independent Kazakhstan Agency Quality Assurance Agency (IQAA)\(^\text{87}\) show a high level of awareness of these issues in Kazakhstan and appropriate measures taken in the right direction.

However, we have to raise a word of caution with regard to the ambitions to joining the top ranks of world universities in very short time spans. International comparisons such as e.g. the example of Hong Kong University of Science and Technology (HKUST) show that even with huge financial investments invested in a totally new campus and in attracting top scientists from all over the world it takes at least years to enter the ranks of top world class universities.\(^\text{88}\)

The peer review team would also like to draw the attention of the Kazakhstan authorities to the initiatives of the European Commission towards developing a multi-dimensional global university ranking system.\(^\text{89}\)

We were able to get impressions of the parallel evolution in the Kazakhstan university system with, on the one hand, "old" structures during the visit in Almaty and, on the other hand, we visited the young Nazarbayev University.

Nazarbayev University (NU) is richly financed and mostly American teachers are engaged in developing Bachelor programmes and preparing the ground for higher level programmes as well as top level research. We recommend that NU’s human resource strategy is oriented towards developing an excellent sustainable human resource base of academics and other staff committed to the long-term development of education, research and innovation at this impressing pilot project for the benefit of the country and the region. By all means, it has to be ensured that the attracted academics are not engaged more like “mercenaries” who will not stay long there and will not be able to develop a competitive research ground.


The peer review team also recommends that the NU develops stronger links with European universities in accordance with the commitment to the Bologna Process and the aim towards integration in the European Higher Education Area\(^90\).

For Kazakhstan, the aim should be to develop around the NU flagship project a core group of world-class national research universities\(^91\) that will act as driving forces and role models for the whole higher education system. Al-Farabi KazNU, as the leading academic institution has the potential to play a prominent role in that context.

International experience shows\(^92\) that a carefully attuned mixed or two-pronged approach of establishing a new flagship university and the parallel targeted strengthening of selected existing universities bears the best potential for success. Therefore, it will be important to disseminate good practices and lessons learned from the experience of NU and other excellent national research universities to other parts of the tertiary education system and initiate fruitful interaction and mutual learning. The aim must be to develop the Kazakhstan higher education system towards a community of institutions committed towards the national development goals. It will be important to safeguard a positive spirit of evolution and to avoid the development of an academic “class society” of privileged lead universities and “underdog” institutions.

At the moment, the NU is too young to be able to present measurable results; there is no real research activity going on so far. The mostly U.S. academics have still to develop contacts, relations and cooperation with colleagues in the Kazakhstan science and research community. However, at the other universities that we visited we were able to identify positive attitudes and interest to cooperate with the new university. These attitudes should certainly be nurtured by initiating attractive joint initiatives with clear benefits for all partner organisations.

The peer review team welcomed the process of institutional change undertaken by Al-Farabi KazNU. The university set out five principles of transformation into the new type of university: Innovative education, innovative infrastructure, contemporary corporate culture and mindset, competitive institutional environment, modern management. For the realization of these principles the university has developed its own programme towards the transformation of a classical university into the national research university.

The highly ambitious goals of the national RTDI policies and, in that context, also for the university sector call for the development of a mid- and long-term plan for the development of the higher education system of Kazakhstan. The State Program of Education Development 2011-2020 provides a good basis but details of the action plan have to be further elaborated. The plan should be based on a comprehensive evaluation of the institutions involving international experts starting with the national research universities and the Nazarbayev University at a later, more appropriate stage. The aim must be to provide a long-term framework for the development of the higher education sector in Kazakhstan.


\(^{91}\) Op. cit.

The government should support the establishment of ‘Centres of Excellence’ at universities in particular fields of national interest with the specific aims of integrating education, scientific knowledge and innovation world-wide. Close cooperation and even mergers with research institutes should be considered in that context. Kazakhstan can learn from experiences in other countries, e.g. from the Centres of Excellence initiative in Sweden\(^93\) and from the Excellence Initiative in Germany\(^94\) as well as from the mergers of universities and research institutes in Denmark\(^95\) and in Germany\(^96\).

We recommend that the universities should get widest possible autonomy and self-responsibility. The peer review team welcomes the respective objectives formulated in the State Program of Education Development 2011-2020\(^97\). University funding should be provided at internationally comparable level based on performance contracts with the government. Performance indicators must cover the activities under the three university missions of education, research and collaboration with and services for business and society\(^98\). As international experiences show the pathway towards autonomy is challenging and needs new concepts of governance and – most importantly – appropriate leadership.

Accordingly, university governance - a favourable regulatory framework and strong and inspiring leadership and excellent management – has to be strengthened following international best practice based on clearly defined institutional mission, vision and strategy. Key elements are motivated students, excellent teachers and researchers with the appropriate mindsets and attitudes suitable for modern higher education and research institutions, and appropriate financial resources – including competitive salaries for academics and other university staff - as well as infrastructure and equipment. Kazakhstan will need excellent university leaders and managers at all levels of the institutions for managing the changes that are required to reach the high level objectives. In that context, we recommend that professional development of senior university leaders for institutional management should be encouraged and promoted\(^99\).

Kazakhstan universities are the main actors in their regional innovation eco-systems. The peer review team underlines the importance of universities taking a pro-active role as change agents in regional development and stimulating interaction and cooperation with the main actors in the region towards collaborative innovation. In that context, the Peer review team

\(^{93}\) http://www.hsv.se/qualityassurance/centresofexcellenceinhe.4.28afa2dc11bdcd557480001731.html/
\(^{94}\) http://www.dfg.de/en/research_funding/programmes/excellence_initiative/index.html/
\(^{95}\) Pinheiro, R., Maassen, P., Stensaker, B.: The Effects of Structural Integration amongst Universities and Research Institutes. Department of Educational Research, Faculty of Education, University of Oslo. 5 October 2011
\(^{96}\) See the merger between the University of Technology and the Research Centre Karlsruhe that led to the establishment of the Karlsruhe Institute of Technology (KIT); see: http://www.kit.edu/kit/english/
\(^{97}\) State Programme on Education Development, op. cit., Chapter 5.
\(^{99}\) See e.g. the OECD IMHE Programme on Institutional Management of Higher Education, or the Entrepreneurial university leadership programmes at the University of Oxford (UK) or at Stanford University (U.S.)
welcomed the information on the launch of the project "Innovative Municipal Almaty" in which Al-Farabi Kazakh National University will act as key player in the urban innovative system of the city, as well as of the country’s southern region. We appreciate that as most timely and far-sighted initiative.

In addition, universities need also to develop specific internationalisation strategies reviewing their cooperation agreements and concentrating on strategic partnerships that ensure mutual benefit. Providing local-global connectiveness for their region is also an important task of the universities.

In accordance with the aim of climbing up in international rankings publications (in English language!) in high impact journals should be promoted and rewarded. The rating system of Al-Farabi KazNU faculty staff adopted by the Academic Council can serve as an example of best practice where the key indicators are the scientific and innovative activities, namely publications in highly rated journals and innovative projects introduced in production. The peer review team welcomes the initiative of the Committee of Science “to work out concrete proposals for an increase of scientific publications, significantly raise the overall quality level of Kazakhstan scientific journals, to increase the number of domestic rating publications” but sees a need to take this initiative one step further.

Science-business cooperation at universities and research institutes is still of low intensity. Therefore, we welcome that such activities are supported by the MES respectively the MINT and NATD by funding commercialisation offices. In 2011, nine such offices were established. In order to further stimulate science-business cooperation activities, we recommend that the responsible authorities should consider also rewarding measures for universities and departments especially successful in science-business cooperation e.g. by widening the target groups of state prizes and awards also to institutions while, at present, they are only addressing individuals.

We see also the need that universities together with regional and national authorities should set initiatives and actions to raise public awareness of the importance of science, technology and innovation and implement targeted measures to raise the public image of careers in science and engineering – both at universities but also in companies.

Last but not least, the government should ensure better international visibility of Kazakhstan science and engineering by supporting participation in international conferences and fairs and also attracting such events to Kazakhstan. The Astana Economic Forum and the Innovation Congress are excellent examples. However, more RTDI-related events and conferences would be highly welcomed also by the international scientific community.

4.3 Research institutes and centres

Non-university research institutes and centres form an important part of the national innovation system of Kazakhstan. In the Soviet system, the “product” of universities was

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100 See Country Report p. 67: From the speech of the Minister of Education and Science Mr. B.T. Zhumagulov at the meeting on science development (conclusion word), Astana, 16 February 2012

101 See Country Report, p. 55

102 Law “On Science”, Article 15. Measures to encourage scientists, scholars of scientific organisations
personnel and the products of research centres were new technologies for specific industries. By definition research institutes cooperated more closely with industry especially also with industrial complexes in other parts of the Soviet Union. Following the independence of Kazakhstan these links were cut off and the research institutes faced a totally new situation. Due to the general economic situation in the transition to a new nation the financial situation of the institutions was difficult, the number of the institutes decreased and many scientists left in the course of internal and external “brain drain”.

In 2010, the number of research institutions comprised 133 units including research institutes under MES and under MINT as well as connected to sectoral ministries (e.g. Ministry of Environmental Protection). The largest group of 41 research institutes is connected to MES\textsuperscript{103}, \textsuperscript{104}.

Some institutes are organised under the roof of the JSC National Scientific and Technological Holding “Parasat”. The mission of “Parasat” is creating the foundation for high-tech and information society in Kazakhstan. The holding has four areas of activities with subsidiaries involved in these areas one of them addressing science and technology:

- Information and communication technologies:
- Mass media;
- Postal and financial services; and
- Science and technology: JSC “Science Fund”, JSC “National Center of Scientific and Technical Information of the Republic of Kazakhstan”, JSC “Center of Earth Sciences, Metallurgy and Enrichment”;

The main purpose of the holding is the targeted implementation of breakthrough research and investment projects for the introduction of advanced developments in various sectors of the economy. The research institutes are rooted in the former Academy of Sciences.

On the basis of the State Programme for the Development of Education in the Republic of Kazakhstan for 2007-2012, five national research laboratories for collective use have been established on a competitive basis\textsuperscript{105}.

At the same time; fifteen laboratories of engineering profile have been established at national and state higher education institutions\textsuperscript{106}. They are designed to ensure the development of their research results towards patenting, pilot testing, and commercialization. According to information received their work is characterised by scientific, technical and economic efficiency and effectiveness.

During their visit in Kazakhstan, the peer review team had the opportunity to visit several research institutes in Astana and in Almaty:

The Centre of Earth Sciences, Metallurgy and Enrichment is organised as a Joint Stock Company (JSC) fully owned by the government. It is involved in technological improvement of metallurgical processes and high-temperature synthesis of materials with desired properties. The research results presented to the team show great economic potential.

\textsuperscript{103} See Country Report, pp. 47-49
\textsuperscript{104} The peer review group was not able to get a complete list of all research institutes connected to different ministries.
\textsuperscript{105} See Country report, p. 46
\textsuperscript{106} See Country Report, p. 46-47
The National Center for Scientific and Technical Information (NCSTI) is in charge of gathering, systemising and analysing of scientific information of Republic of Kazakhstan. The work of NCSTI is dedicated on promotion of results of scientific-technical activity of Kazakhstan scientists, analysis of intellectual potential of realized scientific researches and developments. The NCSTI provided also supplementary information in support of the peer review exercise.

The National Center on Complex Processing of Raw Materials is affiliated to MINT and represents the country's largest scientific and technological capacity in the mining and metallurgical industry. The centre provides a wide range of services, from fundamental and applied research to development and implementation of new technologies and equipment (with the impressive number of about 100 new technologies in 15 years).

In the domain of the Ministry of Environmental Protection, the peer review team visited the Meteorology Institute “Kazhydromet” and got an insight into its work collecting meteorological and hydrological data from a vast network of measuring stations but lacking the computer infrastructure for more advanced processing and exploiting the data. Furthermore, a short meeting was arranged with representatives of the Institute of Ecology and Climate (IEC), the Information and Analysis Center of Environmental Protection (IACEP), and the Institute of Strategic Planning.

The National Nuclear Center outside Almaty is a centre of international standing managed according to high scientific quality standards.

Comments and recommendations

The peer review team was not able to develop a comprehensive overview about and insights in that part of the Kazakhstan research and innovation system because not even a list and overview of institutes and their affiliation to different ministries were available. Therefore, the review is based on the limited information available. In any case, it came as a surprise to the peer review team that for a most important part of the Kazakhstan RTDI system no report or other overall information was available. We noted also that – in contrast to the universities, the research institutes are hardly mentioned in the laws, strategies and plans that we were able to review.

Most of the few institutes visited during the peer review team’s visit to Kazakhstan in March showed convincing evidence of very good performance.

With regard to the research institutes related to the Ministry for Environmental Protection (MEP), we recommend to evaluate and possibly restructure and reorient them in a two-step process. First, a self assessment and human capital report should be prepared by the centres and, secondly, an evaluation by independent experts should take place. The MEP is engaged in developing a strategy for “Green Economy” and the institutes should be reoriented and get new tasks in that context. An external assessment of the institutes will provide an appropriate basis for such a reorganisation.

The peer review team recommends to consider as the option of transforming the institutes related to the MEP into a National Environmental Protection Agency with e.g. the tasks
described in the Strategic Plan of the MEP from December 2011\textsuperscript{107}. Such a new orientation would also be able to provide support for the implementation of the “Green Bridge” environmental initiative that was proposed by President Nursultan Nazarbayev to the 66\textsuperscript{th} UN General Assembly on 21 September 2011\textsuperscript{108}, presented by Minister N. Kapparov at the Rio+20 UN Conference on Sustainable Development\textsuperscript{109} and included also in the final outcome document of the UN Conference\textsuperscript{110}.

As a general conclusion for the whole institute sector of the national RTDI, we recommend an evaluation of the research institutes in order to get a basis for developing a comprehensive development plan of the research institutions in Kazakhstan identifying opportunities for utilizing their full potential for contributing towards realising the national goals towards 2020. This would provide complementary information to the before recommended university development plan. Possible synergies and complementarities of the two parts of the research systems should be identified in that context as a basis for decisions on the further development of the national RTDI system. As mentioned above already, following European examples, e.g. from Denmark and Germany, restructuring and mergers should be considered where appropriate.

4.4 The National Academy of Sciences of the Republic of Kazakhstan

In the course of the re-structuring of the science and research system of Kazakhstan since independence, the role of the National Academy of Science has been substantially redefined\textsuperscript{111}.

The National Academy of Sciences is still in a transition period between Soviet times and capitalism. Many things have changed, especially in science management and funding as defined by the new Law “On Science” from February 2011\textsuperscript{112}. The Academy was deprived of its traditional role as manager of research institutes and was re-established as a voluntary association with a membership of more than 150 eminent Kazakhstan and foreign scientists (academicians). According to the Law ”On Science", the Academy participates in formulating and implementing science, technology and innovation policies, is involved in identifying S&T priorities, provides expertise towards the nomination for science prizes, and contributes to the development of normative and legal acts regarding science and technology. The Academy

\textsuperscript{108} President of the Republic of Kazakhstan, Nazarbayev, N.: Statement at the sixty-sixth session of the United Nations General Assembly New York City, 21 September 2011, p. 2; see also: President Nursultan Nazarbayev: 2012 State of the Nation address: “Socio-economic Modernisation as the Main Vector for Kazakhstan’s development”. Astana, 27 January 2012;
\textsuperscript{111} Law “On Science”, Article 8.3.
\textsuperscript{112} Op. cit.
coordinates the preparation and publication of annual national reports on the development of science in Kazakhstan.

Comments

The peer review team would have been interested in more details about the restructuring process of the institutes of the Academy. This is, however, also connected to the general issue of the lack of information regarding the whole sector of the research institutes.

The peer review team recommends considering concrete tasks for the National Academy of Sciences beyond coordinating an annual report of science and technology in Kazakhstan e.g. as a consultative body for RTDI policy development.

5. The business sector and RTDI in Kazakhstan

The business sector in Kazakhstan is in a process of modernization of production capacities and of restructuring. Only a small number of enterprises are active in research and innovation.

According to a company survey in 2010 that didn’t distinguish between public and private companies, from a total of 10,937 responding enterprises only 467 economic entities reported technological innovation (in 2009 - 399 enterprises). However, when looking at this indicators in a time series from 2003 to 2010 one sees that the number of enterprises active in innovation has been steadily increasing from 148 to 467 which means an increase by 215.5 %\(^\text{113}\) or from 2.65 % to 4.27 % of the total. It is also interesting to note that of the 467 innovative enterprises 155 (33.19 %) are large, 122 (26.12 %) are middle sized and 190 (40.69 %) are small.

As shown on page 23 already, in 2010 a total of 424 organisations were active in research and development with 11 (2.59%) industrial enterprises. In 2000, in total 257 organisations were active in research and development including 5 industrial enterprises which was 1.95 % compared to the 2.59 % in 2010.

From a statistical point of view this is an increase but on an extremely low level. According to an instruction by the President the share of companies in research and development should be increased towards 20% by 2020\(^\text{114}\).

Large firms are mostly state-owned (see above) or are controlled or owned by foreign owners. Publicly owned enterprises play still the dominant role in the economy of Kazakhstan. As described already before, more than 400 state owned enterprises are organised as nationally-owned private companies under the institutional framework of the Sovereign Wealth Fund “Samruk-Kazyna”. As mentioned before already, those companies should invest up to 10% from their total income for RTDI activities which will mean an important boost of research and innovative activities in Kazakhstan. This action is expected to stimulate the whole business RTDI sector in the country.


\(^{114}\) President Nursultan Nazarbayev: About the Strategic Plan for Development of Kazakhstan up to 2020, 1 February 2010, No 922
Private companies are still a minority in the industrial and SME sector in Kazakhstan. RTDI capacities and activities of Kazakhstan companies are not very visible. However, the peer review team received interesting information and evidence of cooperation activities ongoing between science and business at Al-Farabi KazNU, Satpaev KazNTU and Almaty University of Technology.

Large parts of the oil, gas and mineral sector are occupied by foreign corporate groups. An interesting and promising government initiative is the regulation that firms active in the sub-soil sector have to invest 1% of their total revenue in RTDI infrastructures and activities. According to preliminary estimations, around $1 bln will be allocated additionally from the private sector, in particular from soil users\textsuperscript{115}

The main document summarizing Kazakhstan’s economic diversification strategy is the "State Program of Accelerated Industrial-Innovative Development" (SPAIID). SPAIID outlines the national plan for transforming the economy of Kazakhstan assuming an increase by 2015: of the share of innovatively active enterprises to 10% of total number of operating enterprises\textsuperscript{116}.

Attracting foreign investment into national industry did not result in a further development of the RTDI base in Kazakhstan as the investors bought all technologies abroad rather than building up the national capacities, mainly because no appropriate national scientific basis existed and respective academia-business links were under-developed.

The generally weak innovative performance of the Kazakhstan business sector (both domestic and foreign) represents a key systemic limiting factor for the development of knowledge linkages, as it contributes to a generally low demand for new knowledge. The Road Map “Business and Science 2020” launched by President Nursultan Nazarbayev is an initiative that aims to improve the situation.

Worldwide experience shows that SMEs play a most important role in innovation. However, in Kazakhstan the number of SMEs (according to EC definition) and their contribution to GDP is relatively low (less than 3,000 entities with about 20% contributions to GDP). According to the Statistical Agency of the Republic of Kazakhstan, of the 467 organisations active in innovation 190 are SMEs. This is mainly due to the fact that the SME sector comprises companies that are rather traditional and not innovative and hence large companies seem to be not interested in working with and invest into SMEs.

Kazakhstan is still in the initial stage of implementing the innovation policy and developing an innovation culture. As has been shown, the legal and the institutional framework is now in place\textsuperscript{117}.

An important aspect in that context is that Kazakhstan is continuously moving up the ranking list of Doing Business, e.g. from 2011 to 2012 from rank 58 to rank 47\textsuperscript{118}. The report

\textsuperscript{115} Minister of Education and Science of Kazakhstan Yerbol Suleimenov in exclusive interview for Pm.kz site: http://www.pm.kz/news/show/22/govnews_item-5446/05-02-2012

\textsuperscript{116} State Programme of Accelerated Industrial and Innovative Development of the Republic of Kazakhstan for 2010-2014 (SPAIID), Chapter 2.10

\textsuperscript{117} See e.g. the Law on “State support for Industrial and Innovative Activities”, 9 January 2012

confirms that Kazakhstan strengthened investor protection. This view is also shared by 43% of respondents to Ernst & Young’s 2012 attractiveness survey for Kazakhstan. However, related to the focus of the present review, only 15% of respondents to the Ernst and Young survey find R&D availability and quality attractive in Kazakhstan\textsuperscript{119}. The framework conditions for establishing a company are improving but there are deficits regarding R&D, university-business technology transfer and commercialisation. However, the Ernst & Young report acknowledges the continuous efforts to promote innovation and research, but notes “the comparatively low level of interest of the younger generation in pursuing engineering and technical careers”\textsuperscript{120}.

MINT is very well aware of the situation and is very active following also unconventional approaches for stimulating entrepreneurship in Kazakhstan, such as initiating the Kazakhstan version of the Dragon’s Den TV reality show where business ideas are presented by entrepreneurs to venture capitalists.

\textbf{Comments and recommendation}

The statistical data on organisations involved in research and development clearly show that extraordinary effort will be necessary for achieving the goals defined in national strategies.

As mentioned already, the realisation of the RTDI plans towards 2020 will need the full commitment of all actors. That means especially for the business sector – particularly the private sector – that “ownership” has to be created by involvement and participation both in the policy development and in the implementation processes. And, of course, incentives for engagement have to be created that provide benefit for the companies.

A main issue is developing favourable conditions for creating new innovative companies and for stimulating RTDI activities especially in cooperation with universities and research institutes. However, at present, in Kazakhstan, the private sector is still in a development stage. In addition, RTDI are not high on the agenda of firms. According to the anecdotal evidence received, only few SMEs show interest in RTDI. Thus, appropriate stimulation actions will be necessary. Intensifying science-business interaction and communication will play a major role with universities and research institutes taking a proactive approach.

The regulations regarding obliging “Samruk-Kazyna” companies and enterprises in the subsoil sector to invest in RTDI (see Chapter 3.) bear the potential to make an important contribution to the goal of substantially increasing the involvement of companies in RTDI activities and is also very important with regard to connecting private foreign companies that are active in that sector to the national RTDI system in Kazakhstan. However, it will be necessary to monitor the implementation of this approach carefully and making sure that the funds are spent in accordance with the original objectives of that measure.

The peer review team recommends exploring also the opportunities possibly offered in the course of the10% initiatives of Samruk-Kazyna realising the intention to use Samruk-Kazyna companies as “locomotives” for stimulating RTDI in Kazakhstan. Therefore, for the calls to be launched by Samruk-Kazyna in the future specific “marketing” activities towards involving also the private business sector should be considered.

\textsuperscript{119} Ernst & Young: 2012 Kazakhstan attractiveness survey Bridging the perception gap, pp. 14 and 19
\textsuperscript{120} Ernst & Young, op. cit. p. 14
The peer review team was able to see targeted efforts towards developing an innovation infrastructure. Also specific funding instruments and also accompanying measures are in place. This holds for the activities of the NATD, the Entrepreneurship Development Fund (DAMU) but also for schemes supported by international institutions such as the Business Advisory Services (BAS) of the European Bank for Reconstruction and Development (EBRD) and also a scheme by USAID.

The peer review team welcomes the spectrum of measures defined in the new law “On State Support for Industrial and Innovative Activity” and implemented by NATD. It will be important to monitor these activities carefully in order to be prepared for adaptation and refinement when needed an appropriate. This is a continuous learning process where regular feedback from the business community will be important too.

The authorities should continue their efforts to reduce the regulatory burden on SMEs, which has to be a priority policy goal. A main condition for strengthening business activities in RTDI is a favourable environment for innovation and market success.

Creating new innovative companies as well as stimulation and support actions has to be high on the agenda continuously. There is a need for a whole package of stimulation and support actions to increase the number of start-ups in Kazakhstan and to nurture their development. For example the Austrian promotional programme AplusB supports innovative, technology-oriented spin-offs from the academic sector. The programme funds the so-called AplusB-Centres providing professional support for scientists in the difficult process of turning a good idea into a viable business. This involves both: not only counselling and assistance during the actual start-up phase but also establishing the idea of entrepreneurship more firmly in academic theory and practice.

Another possibility to encourage SMEs to co-operate with research institutes and to support SME to start ongoing research and innovation activities is to offer an innovation-voucher.

There is a need for encouragement and supporting measures for SMEs to become more innovative and open for new technologies and processes e.g. via governmental-funded initiatives to promote cooperation with universities and applied research institutes such as innovation vouchers. Also programmes encouraging or requiring universities and research institutes to cooperate with businesses (large and SMEs) - also on an international level - should be launched and implemented.

Following the instructions of the President, major technological infrastructure projects are being implemented. These initiatives bear the potential for stimulating research and innovation. Therefore, the potential for pre-commercial procurement und public procurement based on requests for innovative solutions in accordance with new regulations and standards e.g. regarding clean technologies should be explored offering possible interesting opportunities also for SMEs getting involved in related RTDI activities and entering into collaboration with the main industrial companies involved in these national priority activities.

121 http://www.ebrd.com/pages/workingwithus/sbs/how/bas.shtml
122 http://www.ffg.at/en/aplusb-academia-plus-business
123 http://www.ffg.at/en/innovation-cheque
Supporting measures to achieve this could include awareness, stimulation and training measures for entrepreneurship, especially among the young generation. Initiatives towards entrepreneurship training are most welcome including learning from experiences and best practices abroad. A positive example is the educational programme for Kazakhstan entrepreneurs offered at the Nazarbayev University Graduate School of Business in cooperation with Duke Corporate Education (Duke University, USA). The national operator of the training is the Entrepreneurship Development Fund “DAMU”\textsuperscript{124}.

We recommend also to the Kazakhstan authorities learn from the UK experiences in that area\textsuperscript{125} and to explore the experiences of the National Centre for Entrepreneurship Education (NCEE)\textsuperscript{126}.

Therefore, universities should be encouraged to offer training for entrepreneurship and possibly also consider establishing entrepreneurship centres supporting innovation and university spin-offs. There are many excellent examples available at European universities such as e.g. the Oxford Centre for Entrepreneurship and Innovation\textsuperscript{127}.

Initiatives towards raising public awareness like the TV show Dragon’s Den launched by MINT have certainly the potential to create interest in entrepreneurial activities.

\section*{6. Science-business cooperation}
\subsection*{6.1 General issues}
Following the instructions of President Nazarbayev, the new law “\textit{On State Support for Industrial and Innovative Activity}” was adopted beginning of 2012. On that basis, the innovative potential of interaction between government, business and science – the Triple Helix – should be increased. For example, an innovative and intelligent cluster is to be formed around the Nazarbayev University\textsuperscript{128}, promoting development and transfer of new technologies. Furthermore, the President requested that a bill should be prepared which introduces new forms of public and private partnership.

On one hand there seems to be strong historically grown cooperation between state-owned companies and research institutes, and some of the universities. The mainly basic financed research institutes try to get funding from orders from industry; and some of them – depending on the objectives of their research – are quite successful, even on the international market.

On the other hand, the universities are requested to enforce their research activities and some universities begin to support the transfer or translation of their research results (e.g. in the frame the commercialisation offices, funded by the MINT via the NATD).

\begin{thebibliography}{9}
\item http://www.damu.kz/en
\item http://www.ncee.org.uk/
\item http://www.sbs.ox.ac.uk/centres/entrepreneurship/
\item President Nursultan Nazarbayev: 2012 State of the Nation address: Socio-economic modernization as the main vector for Kazakhstan’s development. 27 January 2012
\end{thebibliography}
However, the main challenge is the gap between science and business because, on the one hand, there is not enough demand for RTDI on the side of industry. The main approach is still to acquire technology from abroad instead of using the potential of the national RTDI system. On the other hand, university research is still strongly oriented towards its own interest and curiosity and less towards making possible contributions to the country’s social and economic development\textsuperscript{129}, \textsuperscript{130}.

**Comments and recommendations**

The Triple-Helix of government-industry-university relations\textsuperscript{131} and cooperation should be realised both at national but also at the regional and institutional level. The Triple-Helix concept must be combined with the knowledge triangle integrating education, research and innovation thus preparing the ground for science and business together co-creating and co-developing new technologies and new solutions in approaches going beyond traditional – sometimes narrow – transfer concepts.

This requires new qualification profiles of innovation managers as facilitators and stimulators of communication, interaction, coordination and cooperation between the actors in the innovation system.

There is still a gap between science and business because there is not enough demand for RTDI on the side of industry, which is common problem for all the post-Soviet countries. The main approach is still to acquire technology from abroad instead of using the potential of the national RTDI system. The implementation of programmes for establishment innovative infrastructures and intermediary organisations for the strengthening university-enterprise interaction and the commercialisation of technologies is a step in the right direction.

Fostering the opening of the research institutes and universities to business and encouraging the universities to actively approach and cooperate with business should be high on the agenda. Experience shows that this is a long-term process requiring a substantial change of mindset and attitudes which are the most difficult part of the strategy, thus one should not expect very quick and radical changes. That means that a long-term political commitment will be needed for realising the objectives.

For stimulating and enhancing science-business cooperation the provision of “physical” innovation infrastructure is not sufficient. This holds especially for the case of Kazakhstan where obviously the demand from the side of the industry for new technologies is not well developed and there is not enough interest on the side of industry towards innovation. Therefore, the universities and research institutes have to develop innovative multi-level communication approaches bringing science and business together, creating interest and awareness about promising opportunities for cooperation for mutual benefit. This can be achieved by e.g. open house days at department or faculty level, exploratory science-business workshops, mini-foresights involving university and industry experts, presentations of

\textsuperscript{129} State Programme for the development of education in the Republic of Kazakhstan 2010-2020. Chapter 3

\textsuperscript{130} Programme “On the development and promotion of technological innovation modernization of the Republic of Kazakhstan for 2010 – 2014”, Chapter 3.1

institutes to SMEs and industry, company visits of university experts, technology transfer days, fairs etc..,

The peer review team has seen a very good example of a fair organised for our visit by Al-Farabi KazNU involving senior and young faculty members as well as students who presented very interesting research results with potential for commercialisation.

Science-business cooperation is an area where the universities should be creative in developing tailor-made approaches that are appropriate for their specific context and environment – there innovation eco-system.

Science-business interaction and cooperation can be realised in multiple forms from short-term expert consultancy towards long-term strategic alliances and public-private partnerships.

We suggest exploring the possibilities of establishing National Technology Platforms (NTPs) including companies, universities, research organisations and other organisation as appropriate as bottom up instruments also supported by sectoral ministries. The objectives of NTPs could be set as:

- preparation of ambitious national RTDI demand-driven programmes concerning strategic economy sectors which would become Targeted Technological Programmes in the follow up of the NIF foresight exercise,
- identification and integration of key economic and research partners in the frame of joint strategic research agendas,,
- mobilisation of essential public and private as well as national and foreign resources,
- promotion and lobbying of RTDI activities profitable for sectors of economy represented by the platforms.

A Kazakhstan NTP initiative could learn from the experiences of the European Technology Platform scheme but also from initiatives in European Union member states such as Poland. In a later stage, this could be a good systematic approach providing international partner platforms e.g. in the frame of the Astana Economic Forum, especially for International Innovative Congresses, as an accompanying measure for Kazakhstan’s goal of entering the top 50 most competitive countries in the world.

Public-Private-Partnerships (PPPs) are an interesting development area for Kazakhstan. There are many successful approaches in Europe (e.g. Austria, Finland, Sweden, The Netherlands) where science and business are working closely together in competence centres, centres of excellence and other arrangements that are organised as PPPs. A good example for such a programme could be the Austrian “COMET-Programme”.

In addition, there are also huge European initiatives in that area – Joint Technology Initiatives and the Knowledge and Innovation Communities (KICs) of the European

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However, careful planning and design will be necessary though. Science-business cooperation in the form of PPPs is usually applied in advanced and mature innovation systems.

6.2 Innovative infrastructures

The legal framework for establishing innovative infrastructure is defined by the laws “On science”\(^\text{139}\) and “On state support for industrial and innovative activities”\(^\text{140}\), as well as in the “Programme on the development and promotion of technological innovation and modernisation of the Republic of Kazakhstan for 2010-2014”\(^\text{141}\) and the “Plan for the development of education in the Republic of Kazakhstan for 2011-2020”.

Recently, substantive investments have been made in developing and establishing infrastructures supporting innovation at institutional, regional and national level\(^\text{142}\). The implementation of such interfacial structures connecting science and business is a recent initiative in Kazakhstan. However, the National Centre for Commercialisation, three regional centers of commercialisation and also nine commercialisation offices at universities, research institutes and enterprises have been established already and more are about to be realised.

As examples, the peer review team was able to receive direct information on some of the organisations: Supported by MINT and NATD respectively, Nazarbayev University and Al-Farabi KazNU and also the Satpaev KazNTU and Almaty University of Technology have already established units for technology transfer and commercialisation also with international companies being involved. As for private universities, also Almaty Technical University has established a commercialisation centre already. Although these initiatives were still in a starting phase the peer review team got very positive impressions.

There are also interesting approaches involving international partners such as French-Kazakh laboratories, the Kazakh-German University, and the British-Kazakh Technical University. In these partnerships also European companies are involved.

There are a number of regional innovative infrastructures, like the Park of Innovative Technologies (PIT) Special Economic Zone (SEZ) in Alatau near Almaty. Together with Nazarbayev University, the latter is one of President Nazarbayev’s two priority projects. Both projects profit from substantive involvement of people that have been promoted in the frame of the “Bolashak” programme. A major aspect of the development plan of Nazarbayev University is the creation of a business cluster around the university.

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\(^{139}\) Law “On science”, op. cit., Article 28.

\(^{140}\) Law on “State support for industrial …”: op. cit., Article 11.

\(^{141}\) See Chapter 4 of the Programme

\(^{142}\) See Country Report: pp. 82-86
A number of regional technology parks have also been established as well as bi-lateral technology transfer centres with International partners from Finland, France, Germany and Korea\textsuperscript{143}. Technopoles created are very young and results are not available yet. All conditions are present and if close links and interactions with universities and research centers are ensured they can have a substantial impact on the development of innovative activities in Kazakhstan.

**Comments and Recommendation:**

The peer review team welcomes the initiatives for establishing innovation infrastructures at institutional, regional and national level as important elements of the national innovation system. It is well appreciated that an impressing number of institutions has been established in short time already. However, we had difficulties to understand the respective roles and responsibilities as well as the division of labour, coordination and cooperation between MES and MINT and the NATD in that context.

In many countries, extensive experience is available in the area of university-business collaboration\textsuperscript{144}, \textsuperscript{145} and interfacial structures bridging the science-business divide\textsuperscript{146} that should be exploited to learn from approaches that are applied in different contexts and environments.

It might be interesting for the Kazakhstan authorities that in the follow up of the above referenced Wilson Report the UK Council for Industry and Higher Education (CIHE) has announced plans to establish a National Centre for Universities and Business\textsuperscript{147}.

It is very important to consider that managers of innovation infrastructures have to be agents of change in their environment. They have to be key actors in their specific innovation ecosystem (which in many cases has still to be developed). This requires very special qualification profiles beyond just usual management skills.

The peer review team strongly recommends forming a network of the managers and key actors in organisations of the innovation infrastructure in Kazakhstan as a platform for exchange of experience and mutual learning. Also targeted training programmes as well as expert groups and consultations should be offered involving experienced practitioners and experts from abroad. Also organising missions to interesting institutions in other countries would be advisable. The impressing establishment of the innovation infrastructure should be

\textsuperscript{143} See Country report: p. 85
\textsuperscript{147} http://www.hefce.ac.uk/news/newsarchive/2012/name,73447,en.html
accompanied and supported by the development of a community of committed and highly qualified professionals in that area supporting the Kazakhstan plans towards 2020.

In the peer review team’s opinion it would be very useful when research managers and managers of innovation infrastructures get in contact and involved in European and international networks of research managers and administrators as well as technology transfer and innovation managers such as the Association of European Science and Technology Transfer Professionals (ASTP)\textsuperscript{148}, The European Association of Research Managers and administrators (EARMA)\textsuperscript{149}, or the Association of University Technology Managers (AUTM)\textsuperscript{150}. Also national platforms in the different EU countries could present valuable entry points for networking and information exchange (e.g. Germany’s Excellence Clusters and other initiatives).

We recommend creating technoparks including business incubators in the vicinity of universities or – in any case - to support close connections and cooperation with universities in order to provide incentives and appropriate information, training, coaching and advice services for innovative start-ups. However, it has to be ensured that such new infrastructures are not mis-used just as new laboratory space for the host or neighbouring universities. There have to be clear rules for the use of these infrastructures.

It is recommended to consider open innovation business concepts when designing the concept for such establishments\textsuperscript{151}. There are convincing and successful examples at many places in Europe, such as in Cambridge, Eindhoven, Gothenburg, Rzeszów and others. Such concepts could also be interesting for the development of the Single-Industry Towns in Kazakhstan\textsuperscript{152}.

For the future development, Regional Innovation Strategies (RIS)\textsuperscript{153} will be crucial, as the recognition of the regional dimension of innovation policies and the mobilisation of regional assets are seen as important contributors to overall innovation performance. In addition, support to Regional Innovation Strategies could play a role as an instrument to reduce the gap between the advanced and less developed regions of a country and foster the development of clusters and public-private partnerships (PPPs). Kazakhstan may benefit from learning from approaches applied in other countries\textsuperscript{154, 155, 156, 157}.

\textsuperscript{148} http://www.astp.net/
\textsuperscript{149} http://www.earma.org
\textsuperscript{150} http://www.autm.net/
\textsuperscript{154} http://ec.europa.eu/enterprise/policies/innovation/policy/clusters/
The Peer review team welcomed the information on the launch of the project "Innovative Municipal Almaty" in which Al-Farabi Kazakh National University will act as key player in the urban innovative system of Almaty as well as in the country’s southern region. We see that as a most timely and far-sighted initiative.

6.3 Intellectual Property

During its mission the peer review team didn’t get sufficient insight in the ways IPR are handled in the area of science-business cooperation. Also, IPR doesn’t seem to be an important topic to most of the universities and research institutes.

Comments and recommendations

As emphasised before, ambitious plans and programmes call for effective monitoring and evaluation instruments for implementation. It needs some time and mobilisation of adequate human resources, regulatory framework and mutual understanding in science and in business to develop and strengthen science-business links for mutual benefit.

It is a crucial starting point for university-business cooperation: from the first stage of a research activity with different partners IPR agreements have to be in place. At research institutions, general internal IPR management regulations have to be defined as framework for the cooperation with external partners.

In that context, also training is needed in universities to help young and "old" researchers and faculty to integrate the essential concepts of managing intellectual property into their work. Specific rules must be created to alert researchers to the benefits of licensing arrangements.

Regulations are necessary to clarify the role of each actor - company, university, and researcher. The research centers and universities should become owners of patents. Researchers and academics should be the authors. Institutions should fund deposits of patents. Royalties from sales of licenses should be distributed among the researchers (authors), institutions and organizations that were involved in the research and development work and in the filing of the patents.

There is a need to consider a balanced and fair cooperation between industry and science institutes, so that science partners get a fair payment from the enterprises and industry knows the “rules of the game” from the beginning. In a first step only the most important universities and research institutes should begin to apply for patents themselves. It needs money and trained staff to succeed with IPRs.

There are lessons to be learned from U.S. experiences\textsuperscript{158}. Also European guidelines will certainly be helpful as inspiration for supporting the development of this area in Kazakhstan\textsuperscript{159, 160, 161}.

\textsuperscript{159} E.g. European University Association (EUA) et.al. (Eds.): Responsible Partnering. Joining forces in a world of open innovation. A guide to better practices for collaborative research between science and industry. 2005
\textsuperscript{160} \url{http://ec.europa.eu/invest-in-research/policy/ipr_en.htm#3}
7. Human resources for RTDI

Attracting young people to science and engineering is an important issue for Kazakhstan. It was noted that about 70% of graduated students want to join the private sector. A similar situation is the case of young researchers. The generation gap is a real problem; there is a lack of young researchers at universities and other research organisations. The average age of researchers is 55 years today. The human resource development for RTDI sector is a crucial issue and may become a limiting factor in the course of the implementation of the government plans and programmes. This is underlined by Ernst & Young’s 2012 attractiveness survey in Kazakhstan where the report notes “the comparatively low level of interest of the younger generation in pursuing engineering and technical careers”.

In general, with the exception of the new attractive institutes such as the Nazarbayev University, there is a lack of students and junior researchers in the areas of science and engineering.

As an example, the Kazakhstan National University named after Al-Farabi presents itself as young with many students and junior scientists. However, insecurity of the workplaces, unclear career paths and low salaries discourage graduates to become scientists. Investments in some universities in that area have proofed fruitful; however, other universities are falling behind due to the lack of young staff.

The plans for improving the whole education system are all-encompassing spanning from preschool education to higher-education and life-long learning.

Substantial funds are spent for accreditation of university programmes with respect to Bologna. In the following, the higher education system in Kazakhstan has been reorganised towards the Bachelor-Master-PhD structure.

Kazakhstan President’s Bolashak International Scholarship Programme of education is a very important instrument for creating an internationally open-minded young generation of specialists (it started from BSc, but is currently limited for education of MSc and PhD and also for conducting research since 2008). The programme is fully funded by the Government of Kazakhstan. Very strict selection criteria are applied and grants are awarded to the best students only. Upon completion of their programmes, scholarship recipients return to Kazakhstan to work there for a period of 5 years (3 years after research internship). More than 2100 experts trained under the Bolashak Programme are already working in various sectors of Kazakhstan's economy and public administration and make important contributions to the development of their country. Up to 3,000 scholarships awarded annually (since 2005). The

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161 A good overview about international codes, guidelines and model contracts will be available within a few weeks on the homepage of the NCP-IPR of Austria: http://www.era.gv.at/space/11442/directory/20021.html
162 See also Country Report, pp. 72 ff.
164 Ernst & Young, op. cit. p. 14
165 European Commission: Higher Education in Kazakhstan. TEMPUS. October 2010
peer review teams met past Bolashak fellows in different leading positions in the Kazakhstan RTDI policy system.

There are also measures very actively supported and implemented for attracting foreign scientists. In addition, there are also schemes encouraging Kazakhstan scientists from abroad to return to Kazakhstan.

As soon as the government measures such as the pilot project Nazarbayev University and others will take effect in the future, the attractiveness of science and research may increase; that means that in the mid-term when advanced S&T infrastructure in Kazakhstan will be available chances will increase so that young scientists might become inclined to return to their country and contribute to its development. The first experiences of Nazarbayev University are encouraging which attracted world-class scientists, researchers and engineers from abroad, mainly the USA.

Comments and Recommendation:

In government plans the importance of attracting foreign scientists and engineers is emphasised. However, as the analysis in the State Program of Education Development in the Republic of Kazakhstan 2011-2020\(^{167}\) shows there are substantial the main issue will be to develop, strengthen and broaden the national human resource base for RTDI by attracting and nurturing national talent to the RTDI sector in universities, research centres and innovative enterprises as well as by maintaining the base of excellent researchers and engineers at universities and research institutes by providing optimal working conditions including competitive salaries.

For ensuring the adoption capacities of the emerging Kazakhstan national innovation system ensuring the adequate human resources base for research is of central importance and is also a major challenge.

In order to offer attractive career paths the human resource strategies and the funding of universities – including the performance based competitive salaries and incentives of university faculty - need to be re-considered and also long-term planning will be essential as mentioned above already. The legal basis for the implementation of a policy and strategy for scientists, researchers and engineers is provided by the law “On Science”\(^{168}\).

It is possible to encourage graduates and young scientists to stay in the academic field – and in the country - by developing and offering new opportunities for RTDI on attractive topics linked to the national goals as defined in President Nursultan Nazarbayev’s annual State of the Nation addresses such as e.g. energy, modernising education, e-government, healthcare, modernising housing, regional development, urbanisation, water as well as the huge projects for technological infrastructures. Also the orientation towards “green economy” opens many areas where RTDI activities will be needed. This can be put in the context of the development of new areas of interdisciplinary research connected to the diversification of industry beyond oil, gas and raw materials. Therefore, we recommend that the responsible authorities consider developing programmes addressing “societal challenges” thus linking the RTDI

\(^{167}\) State Program of Education Development..., op. cit. Chapter 3.
\(^{168}\) Law “On science”, op.cit. Chapter 4
system to needs and requirements of national development. Also the role of social sciences and humanities need to be considered in that context.

When striving towards strengthening the science base and promoting to quality in science and research one could possibly learn from approaches in other countries such as from the national system of scientists (SNI) in Mexico that is managed by the national science and technology council (CONACYT) and provides bonuses based on regular assessment of scientific performance. In general, one could consider defining criteria for performance assessment in accordance with the specific requirements of the country. The approach taken by Al-Farabi KazNU is an example of best practice that should be taken as a model to be followed by other universities.

We recommend that mobility of students and researchers should be strengthened in the course of opening Kazakhstan towards partnerships all over the world. For Master students, obligatory study abroad parts should be considered. For researchers at post-doc level, also opportunities of the FP7 Marie Curie scheme and the follower scheme in HORIZON 2020 the future EU framework programme for research should be considered.

Mobility of researchers should also include intersectoral mobility between science and business – in both directions.

For developing the human resources base for science, R&D and innovation the existing programs Bolashak programme as well as the establishment of Nazarbayev University, the successful development of Al-Farabi KazNU and the other national higher education institutions but also other universities including private ones, are steps in the right direction. Also, developing a business component of the Bolashak programme might be worth considering. Finally, aligning the qualifications of the Bolashak students with the needs of the national system should be considered, e.g. if more engineers are needed, more Bolashak students should be sent for engineering degrees abroad.

Utilizing the potential of the Kazakhstan scientific diaspora will be a way to strengthen the international orientation and to support the development of the human resource base by offering part-time education and research positions for guest professors in Kazakhstan and possibilities for postgraduate education and research of Kazakhstan students abroad possibly in the frame of the Bolashak programme. Forming a network of Kazakhstan expatriates in different world regions will be an initiative that has proven successful when applied by other countries such as e.g. the network of Austrian Scientists and Scholars in North America (the USA, Canada, and Mexico).

For the peer review team the relative importance of foreign funds such as from the German DAAD or from European schemes compared to Kazakhstan funds for financing inward mobility of foreign researchers was not clear

In many countries, there are programmes for attracting scientists and researchers from abroad and Kazakhstan can learn from them.

170 http://ascina.at/
171 E.g. the Austrian programme “Career-Grants” http://www.ffg.at/career-grants
For assessing the present situation and the foreseeable development in connection with the implementation of the RTDI strategy detailed information of the human resource base for research including the age distribution (by sector of activity) is needed as well as getting an overview of the concerted effects of different programmes – funded from Kazakhstan or foreign sources - attracting young researcher to the RTDI system is important. This should be the basis for developing a mid- and long-term strategy for the development of the human resource base for Kazakhstan towards 2020 and 2030.

8. International cooperation

8.1 General issues

In Kazakhstan, there is a general openness for international RTDI cooperation with the legal basis provided by the Law “On Science”. However, at present, the framework conditions regarding e.g. visa and requirement to registration are not conducive to cooperation.

Kazakhstan is actively engaged in international cooperation in the field of education and research. The Bolashak Programme enjoys high level support and is oriented towards the elite. It is an excellent example of good practice also in international comparison. The second model example is the Nazarbayev University in Astana - designed along the lines of internationally recognized models of higher education to further accelerate the process of internationalization. NU partners include a number of high-ranking universities mainly from the USA. Also the well established universities like Al-Farabi KazNU and Satpaev KazNTU enjoy well established and long-term international partnerships.

The Astana Economic Forum and the International Innovative Congress has become a high ranking international platform and contributes to the visibility and the reputation of Kazakhstan.

There seems to be a substantial increase in (English) language proficiency; nevertheless, in many sectors foreign/specialized language proficiency is still insufficient. However, language proficiency – particularly in English- is a basic requirement for success in the global RTDI community.

Comment and Recommendation

Many scientists are still publishing scientific articles in Russian language in Kazakhstan and Russian journals. For strengthening the integration of Kazakhstan scientific community in European and global science and research communities and networks an increase in the number of publications in English language journals will be necessary. Also, the participation of Kazakhstan scientists and researchers in international conferences should be promoted.

There is a need to increase the international visibility of Kazakhstan universities and research institutes. Websites of universities and research institutes as well as internet-based communication in English still show room for improvement.

We recommend developing an internationalisation strategy for RTDI in accordance with the general Kazakhstan development objectives and the specific RTDI goals defined in the

relevant laws, plans and strategies. In such a strategy, the cooperation with the Commonwealth of Independent States, the European Union in the Framework Programme, bi-lateral agreements with individual countries, and other international collaborative links should be assessed and re-considered respectively re-oriented in order to ensure the best possible contribution to national goals but also considering mutual benefits for international partners.

8.2 Commonwealth of Independent States (CIS)

Kazakhstan cooperates closely with the post-Soviet countries. In order to facilitate further integration and cooperation the Agreement on deepening of the integration in economic and humanitarian field of four countries (Belarus, Kazakhstan, Kyrgyzstan, Russia) was signed in 1995; the corresponding coordinating bodies were established in parallel. The Republic of Tajikistan was recognized as participant of the customs union enjoying full rights.

In October 2000, the Heads of five countries (Belarus, Kazakhstan, Kyrgyzstan, Russia, and Tajikistan) signed an Agreement on creation of Eurasian Economic Community (EAEC). At present Armenia, Moldova and Ukraine have the status of the observer under EAEC.

In September 2003, four countries - Belarus, Kazakhstan, Russia and Ukraine - signed an Agreement on Formation of CES (Common Economic Space).

Comment and Recommendation:

We fully support the regional cooperation as there are and have been strong links in the scientific community that should be utilized and extended. The economic ties have to be followed also by the increase in scientific/innovative collaboration which, however, is not necessarily the case at present. Collaboration with CIS partners should be used also for achieving critical mass for getting involved in collaborative RTDI activities with the European Union where a future focus will be on collaboration with regions.

The use of joint research infrastructure is also an area where extending collaboration would be worthwhile to consider.

8.3 European Union (EU) – Participation in FP7, perspectives for HORIZON 2020

Kazakhstan is an emerging economy with a central role in Central Asia. However, although the EU is a main trade partner it is not a main partner in research and education despite the explicit goal of getting integrated in the European Higher Education Area (EHEA).

There is a broad range of cooperation opportunities and programmes between the EU and Kazakhstan. In the present report, we concentrate on research and technology cooperation in the frame of FP7 – the 7th EU Framework Programme for Research, Technological Development and Demonstration. In addition, also the cooperation programmes such as Erasmus Mundus, TEMPUS and the European Training Foundations should be mentioned.

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173 Country Report, pp. 88-90
174 State Program of Education Development in the Republic of Kazakhstan for 2011-2020. Chapter 4
For information and assistance of Kazakhstan parties interested in participation in FP7 a support structure – the Kazakhstan National Contact Point (NCP) system - has been established coordinated by Mrs Kamila Magzieva from InExCB-KZ following the Guiding Principles of the European Commission\textsuperscript{175}. The National Coordination Board on Cooperation with the EU Framework Programme was created by the order of the Ministry of Education on 22 July 2010. Eight thematic and three horizontal NCPs have been nominated that are based in ministries, university, research institutes, and in the “Parasat” holding. The NCPs are in most cases high level representatives of their organisation.

So far, in FP7, 20 Kazakhstan organisations are successfully involved in 19 FP7 projects and actions. Main areas of cooperation are Environment, Food, Agriculture and Fisheries, and Biotechnology, Activities in International Cooperation, Health, and Information and Communication Technologies. With the exception of InExCB-KZ that is very successful in coordination and support actions, main participating organisations are research institutes and universities. Coordinators of projects with Kazakhstan partners come from Germany (4), Greece and Italy (each 3), The Netherlands and UK (2 each), and Austria, Belgium, Czech Republic, France and Hungary (each 1).

In preparation for the peer review exercise, a questionnaire survey on the FP7 related activities in Kazakhstan was organised by the National NCP Coordinator. The survey confirmed the interest of Kazakhstan researchers to cooperate with European partners. The main motivations are connecting to the international research and technology community and not financial reasons. The work of the National NCP Coordinator and the NCPs is appreciated but there is a clear need for more information, assistance and also training.

The next framework programme, HORIZON 2020 (2014-2020)\textsuperscript{176,177}, will have broader objectives including both research and innovation as well as international cooperation as a cross-cutting issue. The three pillars of the new programme will cover societal challenges, industrial competitiveness, and excellent science. In addition, the budget is expected to be substantially increased with the proposed level amounting to € 80 billion. Thus, the position of the EU Framework Programme as the largest competitive transnational research and innovation programme will be confirmed and strengthened. As a consequence, the programme will be even more interesting for the Kazakhstan RTDI community.

Regarding contributions from international institutions to RTDI funding in Kazakhstan it has to be noted that according to information from the EU Delegation Kazakhstan might not be eligible anymore for the Development Cooperation Instrument (DCI) in the near future. Kazakhstan will be classified as an emerging economy (like Russia) and, thus, will be qualified for programmes such as the Instrument for Industrialized Countries ICI+. In HORIZON 2020, according to preliminary informal information Kazakhstan institutions will probably be still eligible for financial contributions from the European Commission in special cases duly specified in annual work programmes. For September this year, the European

\textsuperscript{175} European Commission: Guiding Principles for setting up systems of National Contact Points (NCP Systems) for the Seventh Framework Programme for Research and Technological Developments (FP7). European Commission DG RTD A1, 12/12/2007

\textsuperscript{176} http://ec.europa.eu/research/horizon2020/

Comments and recommendations

Kazakhstan is currently strongly oriented towards Russia (historically grown) and to the U.S., Korea, Japan as well as China. However, the EU is an interesting partner for Kazakhstan because of historical ties, the Bologna Process and the opportunities offered by the Framework Programme to link up to European and international RTDI community. The Framework Programme (till 2013 FP7 and in the future from 2014 to 2020 HORIZON 2020) is the largest cooperative research and innovation programme worldwide and is open for cooperation with non-EU countries. On the other hand, also Kazakhstan is an interesting partner for the EU due to its dynamic development and its focus on RTDI in a strategic geographical area between Europe and Asia. Thus, strengthened RTDI cooperation between Kazakhstan and the EU will be of mutual benefit and should be improved; the existing opportunities should be better exploited.

Kazakhstan could much stronger present itself as an attractive emerging economy but also as an attractive partner for research projects with European partners. Core competences could be promoted and Kazakhstan should focus its energies on specific fields relevant to national RTDI priorities and strengths and to the requirements of their international partners (i.e. agriculture, energy, environment, health, mining, transport).

It is recommended that in a future internationalisation strategy for RTDI the EU is addressed more adequately than before as well as bilateral research cooperation activities with EU member states.

Successful participation in the EU Framework Programme is strongly depending on how a country is organised with regard to the provision of information and assistance for researchers.

The current organisational structure of the Kazakhstan NCPs is distributed across the areas of influence of different ministries. This is an advantage because the responsible ministries are supporting the activities of the NCP Coordinator and the NCPs. However, the involved high level persons are most likely not in the position to do the everyday work of NCPs. Therefore, we recommend inviting these persons to form a high-level Advisory Board. For the hands-on everyday work of informing and assisting Kazakhstan researchers interested in RTDI cooperation with the EU full time NCPs in strategically important areas of FP7 and later HORIZON 2020 should be established.

However, at present there is no government or other funding of the NCPs. Therefore, it is difficult to build such a stable service structure. Therefore, we highly recommend developing the NCP system further, using the existing potential and experience and introducing a financial support for the NCP Coordinator and for some NCPs in selected programme areas of specific interest for Kazakhstan. There is a need for continuous public financial support for the NCP coordinator and the NCPs based on regular performance review supported by the high level Advisory Board.
In the past, the NCP coordinator has done excellent work and it would be a good investment for Kazakhstan to support such well established structure that is also active and well recognised at the EU and international level.

Two round table discussions pointed out that the existing FP7 NCP system in Kazakhstan plays an important role in supporting the Kazakhstan participation in FP7. The added value for Kazakhstan institutions is rather obtaining access to international best partnerships than EU funding. This confirms the peer review team’s view that the EU Framework Programmes is an excellent instrument raising the visibility and the integration of Kazakhstan researchers in European and international RTDI networks.

Also making cost-benefit calculations of investing in the NCP system and which gains from the projects are arising should provide evidence that will support the system in front of the Ministries. However, it has to be emphasised that the main gains are involvement in international networks and knowledge exchange as well as acquiring knowledge, capabilities and skills in research management in internationally distributed teams. A narrow focus on financial returns would not be appropriate for catching the benefits of international collaboration.

Kazakhstan institutions should use the Bolashak programme at post-graduate level not only for promoting individual careers but also for establishing contacts and cooperation with universities and research institutes in the EU.

In addition to supporting the NCP system, Kazakhstan authorities should consider setting up a funding mechanism through which the participation of Kazakhstan researchers in Framework Programme projects is nationally funded when the respective application has been evaluated positively in the course of the peer review evaluation processes organised by the European Commission in Brussels.

Excellent collaborative/international research requires professional research project management and local institutional support in the form of research support offices or international offices (the staff has to be fluent in English, helping in understanding the rules for participation, providing assistance and advices for preparing application, better internet infrastructure…). Education and training for graduate students and academic staff in this field may be also crucial.

As mentioned above, Kazakhstan has many bilateral agreements. Yet these are not all fully used to their potential yet. They should also be used for extending bi-lateral collaborative activities to cooperation at EU level.

9. Summary of main comments and recommendations

During the last years a great number of activities were started to strengthen the RTDI system for the benefit of economic development in Kazakhstan. Especially the new legal basis, the foresight exercise, the commitment to raise the investment in RTDI substantially, the plan to stimulate increased spending of - public and private - business for RTDI, the push to increase the demand for innovative products and to increase the number of private innovative companies show the commitment of the government for radical changes.
Kazakhstan undergoes a dynamic development process and the roles and functions of the institutions seem to have changed quite often during the past years. However, due to the new laws on education, science and innovation adopted during the last two years there is the possibility for the necessary consolidation.

Preparation and implementation of the new programmes and initiatives will need continuous long-term political support from all stakeholders, ministries (MINT and MES, and others), the HSTC and the CTP, the Science Fund and NATD, as well as detailed roadmaps and efficient and effective coordination and cooperation. Establishing appropriate coordinating structures between HSTC and CTP as well as between the Science Fund and NATD should be considered.

For the implementation of the initiatives and programmes of industrial and innovative activities including innovation infrastructures and targeted technology programmes the central role of MINT, the Council for Technology Policy and NATD in the policy cycle should be clearly defined.

The peer review team recommends an alignment between the funding priorities of the Science Fund with the outcomes of the NIF foresight exercise and the forthcoming Targeted Technology Programmes as well as with the RTDI activities of “Samruk-Kazyna”. We propose to consider a structure

- Programme for enabling science and technologies,
- Programme for socio-economic challenges, and
- Targeted Technology Programmes,

The programme for socio-economic challenges should be designed for supporting the development and implementation of the major socio-economic initiatives following the instructions of President Nursultan Nazarbayev in his annual State of the Nation addresses.

Strengths and weaknesses, opportunities and threats are well identified in SPAIID\textsuperscript{178}, the State Programme for the Development of Innovation and Promotion of Technological Modernization\textsuperscript{179} and in the State Programme for Education Development\textsuperscript{180} (see also\textsuperscript{181}). Goals and targets are defined and outlines of action plans are formulated. However, there is a need to address also the feasibility and possible impacts of the planned measures and to give full particulars of the realisation in well elaborated roadmaps for implementation.

At all levels of national plans and programmes, institutional and individual performance an “evaluation culture” has to be developed in order to support such an orientation. For the science sector the National Centre for S&T Expertise is active in that area already. However, monitoring and evaluation have to be applied across the whole RTDI sector including institutions, programmes and also the project level. Kazakhstan authorities may learn from international experiences especially from the system applied by the European Commission for the Framework Programmes but also from experiences in different EU member states.

\textsuperscript{178} State Programme of Accelerated Industrial and Innovative Development of the Republic of Kazakhstan for 2010-2014 (SPAIID)
\textsuperscript{179} State Programme for the Development of Innovation …. op. cit, Chapter 3.
\textsuperscript{180} State Programme for Education Development…. op. cit., Chapter 3.
\textsuperscript{181} Country Report, pp. 108ff.
We propose to present an Annual RTDI Report and also to plan a mid-term evaluation of all the plans and actions that are oriented towards 2020. 2016 may be an appropriate time for presenting the results of such an evaluation.

An issue of central importance is getting the main actors of the innovation system “on board” and developing their “ownership” and commitment for the change processes. The planned RTDI development path towards 2020 has been initiated in a top-down mode but the implementation must be understood as a complex social process where the support and the readiness to join in of all actors have to be gained so that complementary bottom-up processes and contributions are initiated.

The NATD initiatives towards technological foresight prepare the ground for developing Targeted Technology Programmes while they should also be explicitly used for involving and further strengthen the Kazakhstan RTDI community through the interaction in working groups and platforms.

The cooperation with foreign experts, especially from KISTEP, provided a sound basis for developing these activities in Kazakhstan. However, for the future endogenous capacities should be developed in Kazakhstan. In that context, also structures and resources for strategic intelligence have to be developed for monitoring international developments and for benchmarking.

Many elements and structures of a national innovation system have been put in place in Kazakhstan in the last few years. However, the peer review team had difficulties to see the required interactive linkages and processes that are decisive for a functioning national innovation system.

Activating linkages and stimulating appropriate interactions and cooperation will need at all levels including the Ministries adequate professionals for managing the processes at the science-business interface and acting as organisers, facilitators, stimulators, and moderators of the interaction, coordination and cooperation processes.

At present, the low level of investment in RTDI presents a challenging starting position. There is a need for the government to present a long-term investment roadmap towards 2020 and possibly beyond in order to show the commitment and initiate also possible leverage effects towards business investment in RTDI.

A main problem is the generally low business demand for research, technology and innovation in Kazakhstan, its inefficient structure and excessive edge toward the purchase of ready-made equipment abroad instead of implementation of own new developments.

The level of innovation activity of Kazakhstan enterprises is considerably inferior to indicators of leading countries in this field. The contribution of SMEs to GDP is low (20%) but the ambitions for change are high and the spectrum of tools and instruments applied by NATD is well defined in the plan for industrial and innovative activities and are promising as the very first results of implementation show. The innovation infrastructures developed in that framework have the potential to play an important role in the long run.

Financial investment in RTDI and physical research, technological development and innovation infrastructures are essential but in the end it is all about social innovation driven
by people with the appropriate systems understanding as well as communication and management knowledge, capabilities and skills. Therefore, a national network of the persons in charge of these activities should form a platform for exchange of experience and mutual learning. In addition, these persons should get involved in relevant professional European and international networks, start cooperation with foreign partner institutions and utilize opportunities for mutual learning.

A balanced approach towards innovation has to be followed where there is room for the whole spectrum of innovative activities from incremental innovation to breakthroughs and also innovation based on R&D and non-R&D innovation e.g. at the workplace and also social innovation with regard to new management approaches e.g. for research, production, marketing, organisational development, institutional change etc.. The Productivity 2020 programme has a specific role to play in that spectrum too.

For stimulating RTDI, the peer review team recommends also to use pre-commercial procurement and public procurement for stimulating innovation in connection with the implementation of national socio-economic goals and initiatives as defined in President Nursultan Nazarbayev’s annual State of the Nation addresses, such as e.g. energy, modernising education, e-government, healthcare, modernising housing, regional development, urbanisation, water as well as the huge projects for technological infrastructures such as railways, roads, logistic centers, oil refineries, oil and gas pipelines, power stations, mineral fertilizers and chemical plants. This may be a way to attract also private innovative companies including SMEs to engage in RTDI.

Also the strategies towards “Green Economy” and “Green Bridge” open many areas where RTDI activities will be needed. This can be put in the context of the development of new areas of interdisciplinary research connected to the diversification of industry beyond oil, gas and raw materials. In that context, also new environmental regulations, codes and standards can play an important role for stimulating innovation, e.g. clean coal, environmental friendly mining and processing of raw materials. Also the establishment of an Environmental Protection Agency could be considered on the basis of the research institutes related to the Ministry of Environmental Protection.

For developing the national innovation system in Kazakhstan, the structure and performance of the science sector has to be substantially improved as the analyses in the government plans and the international comparison of RTDI indicators show. Structured information and reports as well as development plans for the system of universities and research institutes should be prepared based on thorough evaluations. As a result, there may be also needs for substantial changes and restructuring in the system in addition to what has been initiated in the past already.

Financing of universities has to be improved while giving them also more autonomy based on accountability and regular performance evaluation. Strengthening the institutional management of universities in accordance with the requirements for integrating education, research and innovation towards entrepreneurial approaches should be high on the agenda and professionalisation will be essential with quality as the main guiding principle.
With the establishment of the Nazarbayev University in Astana Kazakhstan has embarked on an ambitious development plan for the higher education system. The protagonists and agents of change need to be careful avoiding creating a two-class-system by separating the promotion and implementation of modern projects and new investments from the maintenance, further development and change of existing infrastructure and institutions such as the Al-Farabi KazNU and other research oriented universities in Kazakhstan. Interaction, cooperation and mutual learning in a community of higher education institutions committed to contribute to the national development will be essential for success. Also the contribution of smaller initiatives in existing organisations to a continuous and sustainable development can be very valuable too.

Development of human resources for RTDI regarding numbers and quality must be a top priority in order to ensure that increased financial investments in higher education and RTDI are met by the adequate work force needed for implementing the measures defined by the government plans. However, in order to attract talented students and highly qualified young researchers to universities – especially in science and engineering - favorable working environments and competitive salaries and incentives as well as attractive career paths have to be offered.

At present, in general, as identified in the available analyses, both the deficits in the quality of researchers and the high average age are challenging. Regarding quality, the leading universities like Al-Farabi KazNU are in a better situation. However, the aging faculty is a challenge in the whole system. The key word for human resource development is a strong orientation towards quality and performance assessment and evaluation including international benchmarking.

We recommend also exploring the possibilities to attract more students to science and engineering and to encourage graduates and young scientists to stay in the academic field – and in the country - by developing and offering new opportunities for RTDI on attractive topics linked to the national goals as defined in President Nursultan Nazarbayev’s annual State of the Nation addresses.

Also the new strategies towards the “Green Economy” and the “Green Bridge” will open many interesting areas for interdisciplinary RTDI activities. Therefore, we recommend that the responsible authorities consider developing a programme addressing “societal challenges” and universities to design new curricula linking the education and RTDI system to needs and requirements of national development. Also the role of social sciences and humanities need to be considered in that context.

The openness of universities and research institutes for working with business and other social actors like regional and national authorities has to be further developed. It is not sufficient to complain about low business demand for RTDI. Universities and research institutes have to take an active role as agents of change developing adequate communication channels and platforms to interact and work with business towards identifying problems and co-developing solutions for “real-world” problems. As international experiences shows, science-business interaction and cooperation is beneficial for both sides – improving business performance and success while also providing challenging scientific problems that are interesting for academic performance and progress.
In order to stimulate entrepreneurship as well as research and innovation management also appropriate practice oriented information, training and coaching programmes for graduate students, academic staff and also for non-academic interested parties should be offered by universities and research institutes but also on regional and possibly national level. There is a rich body of experiences available in the area of developing entrepreneurship that should be exploited.

The focus on innovation, commercialisation and translating results into societal applications is very important. However, it must be avoided by all means that basic research is eclipsed and not sufficiently supported and promoted. It has to be considered, that basic curiosity-driven research is the “humus” for new ideas and scientific breakthroughs with possible high potential for future innovation.

International RTDI cooperation is becoming more and more important as many challenges need the transnational involvement of complementary competences and hardly any nation can cover all required areas of science and technology. For Kazakhstan improving the visibility in the international science and technology communities should be high on the agenda and different means should be used towards that goal such as student and researcher mobility, international conferences, publishing in international journals (in English!), and participating in international collaborative programmes.

At present, there is a strong orientation towards the United States. At the same time, Kazakhstan has joined the Bologna Process and has set the goal of integration in the European Higher Education Area (EHEA). Therefore, we recommend setting targeted actions to strengthen the RTDI cooperation also with Europe and the European Union in particular.

The EU Framework Programmes (at present FP7, and in the future HORIZON 2020) are the largest transnational collaborative RTDI programme world wide and is open for participation also for Kazakhstan. It offers excellent opportunities for joining European and international RTDI consortia and thus getting stronger integrated in global RTDI communities. However, as experiences of EU member states show success in FP depends strongly on how a country is organised for providing information and assistance for the participation of its researchers.

In Kazakhstan, a National Contact Point (NCP) system put in place by the NCP Coordinator should be strengthened based on public funding. We propose that the NCP Coordinator and some full-time NCPs in areas of strategic importance for Kazakhstan are publicly funded. In the last years, the NCP Coordinator has done an excellent job and is also highly recognised in the international community. However, with the forthcoming substantially larger programme HORIZON 2020 the Kazakhstan NCP system will need an upgrade and also a sound financial basis. This will be an investment that will mobilise important returns in the form of international networking and knowledge exchange, access to new knowledge resources and scientific and technological infrastructures and equipment and will provide also financial returns. In addition, the participation in the Framework Programme is also an important opportunity for professional development in research management in international distributed teams.

In order to further stimulate the Kazakhstan’s participation in the FP we propose, in addition, that public funds are guaranteed for the participation of Kazakhstan researchers whose FP
project applications have been positively evaluated by the peer review system of the European Commission in Brussels.

Last but not least, we emphasise that for all phases of the policy cycle a sound basis of reliable data in accordance with international standards is essential. This is an area that needs improvement and has to be further developed.

Finally, maintaining and strengthening the motivation and enthusiasm of people in all parts of the national RTDI system must be the key priority.

10. Acknowledgements

Finally, the team leader and the whole team would like to acknowledge the open and collaborative spirit that characterised the whole exercise; this applies to the top representatives of the Kazakhstan political system that the team had the privilege to meet and also to all other representatives and actors of the Kazakhstan RTDI system.

Special thanks go to Mrs. Kamila Magzieva and her team. The strong commitment and excellent networking capabilities of Mrs. Magzieva the whole exercise and in particular the organisation of the missions to Kazakhstan would have been absolutely impossible to realise. The preparation of the Country Report was a huge task and not least due to the peer review team’s repeated requests for additional information and clarification certainly exceeded the originally planned necessary effort. The report showed also our correspondent’s in-depth knowledge of and insight into the RTDI system of Kazakhstan and was an excellent basis for our work.

The team appreciated also the support and input provided by the National Innovation Fund (NIF, later NATD) and, in particular, by Mr. Zhumatay Salimov. Especially, the detailed comments provided by Mr. Salimov to the final draft of the report were very important.

The exercise was in particular supported by Minister Asset Issekeshev and Vice-Minister Kanysh Tuleushin; the latter followed the exercise closely and was prepared for several in-depth discussions providing important detailed information about the Kazakhstan RTDI system.

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63/82
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Main Internet resources:

Official website of the Prime Minister of the Republic of Kazakhstan – http://www.pm.kz


FP7 projects with partners from Kazakhstan: http://cordis.europa.eu/fetch?CALLER=FP7_PROJ_EN&QZ_WEBSRCH=&QM_PJA=&QM_EN_OC_A=KAZAKHSTAN&USR_SORT=EN_QVD+CHAR+DESC
ANNEX 1

The International Peer Review team

- **Prof. Manfred Horvat** (Team leader)
  Senior S&T Policy Analyst, European and International Research and Technology Cooperation, Vienna University of Technology; former Director European and International Programmes, Austrian Research Promotion Agency (FFG), Austria

- **Prof. Jean-Luc Clement**
  Adviser on research affairs, Ministry of Higher Education and Research, France

- **Margit Harjung**
  Deputy Head of Unit for R&T Funding, Federal Ministry of Transport, Innovation and Technology, Austria

- **Michael Schlicht,**
  Head of Department for Cooperation with Russia and CIS, Federal Ministry of Education and Research, Germany

- **Vardan Sahakyan**
  Head of Science Policy Department, State Committee of Science of the Republic of Armenia

- **Zygmunt Krasiński**
  Deputy Director of National Contact Point for EU Research Programmes, Polish Academy of Sciences, Poland

Observer on behalf of the IncoNET EECA project:

- **Kirsten Kienzler**
  Senior Scientific Officer at the International Bureau of the Federal Ministry of Education and Research, Germany
ANNEX 2

The main steps of the Peer review exercise

- Beginning of January 2012: provision of first background material by the INCONET EECA Work Package leader,
- 23-24 January 2012: Kick-off Meeting in Vienna in the premises of the Centre for Social Innovation (ZSI),
- On 8 February 2012, the Draft Country Report Kazakhstan was delivered by Mrs. Magzieva,
- On 6 March 2012, based on a careful analysis of the Draft Country Report by all team members, the peer review team leader provided detailed comments as well as requests for clarification and further information to the Senior Country Correspondent;
- 10-17 March 2012, the peer review team was on a five days mission to Kazakhstan (Astana and Almaty) and worked off an extremely tight interview programme of meetings with the main RTDI policy stakeholders and RTDI actors representing the science and business sector as well as intermediary organisations and also participants in FP7 projects (for the Agenda of the peer review mission see Annex 3);
- In the course of April till beginning of May, the team members prepared and provided the team leader with reports on their impressions, assessments, conclusions and recommendations based on the information gained during the mission to Kazakhstan;
- In parallel to the overall process, the Team Leader did extensive desk research in order to broaden the evidence base and reference material of the exercise complementing the substantial information contained in the Country Report and collected during the mission of the team to Kazakhstan;
- On 9 April 2012, the Senior Country Correspondent presented a totally revised Country Report with comprehensive information on the S&T sector of Kazakhstan;
- Beginning of May, the team leader requested further clarifications regarding details of the revised Country Report from the senior country correspondent, which were provided on short notice on 13 May 2012;
- On 14 May 2012, the team leader had the opportunity to meet Mr. Aidyn Kulseitov (Chairman of the Board, NIF) and Zhumatay Salimov (Managing Director, NIF) in Vienna and to discuss details of NIF activities, especially with regard to the national foresight initiative and the following programme development activities;
- From 21 to 24 May, the team leader visited Astana for meetings with main stakeholders of the Ministry of Industry and New Technologies (MINT), the Ministry of Environmental Protection (MEP), NATD The National Agency for Technological Development (former NIF), and Samruk-Kazyna. According to the original plan, also meetings with the Ministry of Science and Technology (MES) and the Science Fund were planned. However, due to one day delay of the flight to Astana because of technical reasons these meeting could not be realised. During the meetings, first preliminary results and recommendations of the peer review exercises were discussed but also further clarifications were achieved. The visit was
also used to attend the Innovation Congress in the frame of the Astana Economic Forum where additional short discussions with representatives of the Kazakhstan science, technology and innovation system were possible.

- Following the visit to the National Centre of Science and Technology Information (NCSTI) in Almaty on March 15 March, the Centre has offered to provide further information that could not be provided during the short meeting. On 31 May 2012, the team received some additional information that supported and complemented the information from the Country Report.

- 27 June, delivery of Draft Final Peer Review Report for discussion and consolidation.

- 27-29 June, visit of the team leader to Astana for presentation and discussion with stakeholders from Kazakhstan, consolidation and dissemination meetings with stakeholder in Astana (list of participants see Annex 4).

- Final comments and feedback from Kazakhstan stakeholders, members of the peer review team, and from the steering INCONET EECA support team.


- Autumn: Dissemination meeting for S&T policy stakeholders and actors in Kazakhstan.
ANNEX 3

Visiting agenda of international team of peer reviewers

IncoNet EECA Science and Technology Policy Mix Review of the Research Systems

Astana, Almaty, 11-17 March 2012

Visitors:
1. Team Leader: Mr. Manfred Horvat, Senior Policy Analyst, Hon.-Prof. Vienna University of Technology, Austria
2. Mr. Jean-Luc Clement, Adviser on Research Affairs, Ministry of Higher Education and Research, France
3. Ms. Magrit Harjung, Deputy Head of Unit for Research and Technology Funding, Federal Ministry of Transport, Innovation and Technology, Austria
4. Mr. Zygmunt Krasinsky, Deputy Director of National Contact Point for Research Programmes of the EU, Polish Academy of Sciences, Poland
5. Mr. Vardan Sahakyan, Head of Science Policy Department, State Committee of Science, Armenia
6. Mr. Michael Schlicht, Head of Department for Cooperation with Russia and CIS, Federal Ministry of Education and Research, Germany
7. Ms. Kirsten Kienzler, International Bureau of the Federal Ministry of Education and Research at the Project Management Agency c/o German Aerospace Center (DLR), Germany
8. Ms. Kamila Magziyeva, FP7 National Coordinator, Director of InExCB-Kz, Kazakhstan
9. Mr. Zhumatay Salimov, Managing director, Director of Analytical Center, National Innovation Fund, Kazakhstan

Sunday, 11 March 2012

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<td>Transfer will be organized by the King Hotel Tel: +7(7172)705-705. <a href="http://www.kinghotel.kz">www.kinghotel.kz</a> Responsible person for transfer – Gulmira Badambayeva +77019558256</td>
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68/82
### Monday, 12 March 2012, Astana

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<td>Driver Denis Ostrovenko +7 701 526 64 65</td>
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<tr>
<td>09:15-11:00</td>
<td>Aidyn Kulseitov, CEO of the National Innovation Fund</td>
<td>Syganak str., 29 Business center “Euro-Center”</td>
<td>Zhumatay Salimov NIF Managing director Tel.: +7 777 774 57 56</td>
</tr>
<tr>
<td>11.30-12.30</td>
<td>Asset Issekeshev, Minister Kanysh Tuleushin</td>
<td>Ministry of Industry and New Technologies Transport Tower Kabanbay Batyr ave. 32/1</td>
<td>Zhumatay Salimov Tel.: +7 777 774 57 56</td>
</tr>
<tr>
<td>12:30-14:00</td>
<td>Lunch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14:30-15:30</td>
<td>Kuandyk Zhaksinbayev, Director, Department for planning and analysis</td>
<td>Ministry of Finance, 33 Zhenis av.</td>
<td>Aslan 8-701-222-81-68</td>
</tr>
<tr>
<td>16:00-17:00</td>
<td>Mirlan Mukhanbetov, Vice-Minister</td>
<td>Ministry of Environment House of Ministries Orynbor str. 8, entry 14</td>
<td>Assistant Alibek t. 74-00-69 Alena 8-777-621-44-43</td>
</tr>
<tr>
<td>17:30-18:30</td>
<td>Adilbek Nietkaliyev, Director, Technology policy department</td>
<td>“KazTransOil”, JSC (Science and technology centre) Kabanbay Batyr av., “KazMunaiGaz” bld.,</td>
<td>Talga t. 8-701-999-33-17</td>
</tr>
<tr>
<td>Time</td>
<td>Event</td>
<td>Location</td>
<td>Contact Information</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>19:00</td>
<td>Dinner</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Tuesday, 13 March 2012, Astana</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09:00</td>
<td>Departure from the Hotel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:00 – 11:00</td>
<td><strong>Murat Orunkhanov</strong>&lt;br&gt;Vice-Minister</td>
<td>Ministry of Education and Science, Orynbor str., House of Ministries</td>
<td>Assistant - Arman</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8-701-519-50-03</td>
</tr>
<tr>
<td>12:00-13:00</td>
<td><strong>Zhasser Jarkinbayev</strong>&lt;br&gt;Deputy Chairman of the State Statistics Agency</td>
<td>State Statistics Agency Ministry’s House Orynbor str. 8, entry 4</td>
<td>Zhanna</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>t. 74-93-29</td>
</tr>
<tr>
<td>13:30-14:30</td>
<td>Lunch</td>
<td>Nazarbayev University</td>
<td>Aida</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8-775-163-50-73</td>
</tr>
<tr>
<td>14:30-15:00</td>
<td>Inside sightseeing tour with <strong>Ronald Balbulen</strong>,&lt;br&gt;Dean of Science and Technology School</td>
<td>Nazarbayev University</td>
<td>Aida</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8-775-163-50-73</td>
</tr>
<tr>
<td>15:00-16:00</td>
<td><strong>Kanat Baigarin</strong>&lt;br&gt;Managing Director</td>
<td>Nazarbayev University</td>
<td>Aida</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8-775-163-50-73</td>
</tr>
<tr>
<td>16:45-17:45</td>
<td><strong>Eldar Syzdykov</strong>&lt;br&gt;Head of Centre for Strategic Developments and Analysis</td>
<td>Administration of the President, House of Government.</td>
<td><strong>Cancelled</strong></td>
</tr>
<tr>
<td>18:00-18:40</td>
<td><strong>Galym Amreyev</strong>&lt;br&gt;Director, Department of Innovative Policy</td>
<td>Sovereign Wealth Fund “Samruk-Kazyna” Kabanbay Batyr Ave. 19</td>
<td>Perizat</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>t. 55-22-98</td>
</tr>
<tr>
<td>19:00</td>
<td>Dinner</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Wednesday, 14 March 2012, Astana</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08:40</td>
<td>Departure from the Hotel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>09:30-10:15</td>
<td><strong>Aigul Toxanova</strong>&lt;br&gt;Vice President</td>
<td>“Economic Research Institute”, JSC, 65 Temirkazyk str.</td>
<td>Nurlan</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>t. 70-18-22</td>
</tr>
<tr>
<td>Time</td>
<td>Event</td>
<td>Location</td>
<td>Contact Person</td>
</tr>
<tr>
<td>-----------</td>
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<td>----------------------------------</td>
</tr>
<tr>
<td>10:30-11:45</td>
<td>Round Table with FP7 NCPs and participants of FP7 projects</td>
<td>National Innovation Fund</td>
<td>Zhumatay Salimov</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Syganak str. 29 Business Center</td>
<td>Tel: +7 777 774 57 56</td>
</tr>
<tr>
<td>12:00-13:00</td>
<td><strong>Nurken Sultanov</strong> First Deputy of Director General of Kazgidromet</td>
<td>Meteorology Center “Kazgidromet”</td>
<td>t. 79 83 84 +77015175991</td>
</tr>
<tr>
<td>13:30-14:30</td>
<td>Lunch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15:00-16:00</td>
<td><strong>Aurelia Bouchez</strong> The EU Ambassador</td>
<td>The EU Embassy BC RENCO</td>
<td>Kristiina SAARNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kosmonavtov str. 62 Chubary district</td>
<td>Tel: +7 (7172) 97 11 44</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>E-mail: <a href="mailto:kristiina.saarna@ee.as.europa.eu">kristiina.saarna@ee.as.europa.eu</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Aigul Zharylgassova</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+7-7172-97-97-16-41</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:Aigul.Zharylgassova@eeas.europa.eu">Aigul.Zharylgassova@eeas.europa.eu</a></td>
</tr>
<tr>
<td>16:00</td>
<td>Departure to airport</td>
<td>Transfer – Gulmira Badambayeva</td>
<td>+77019558256</td>
</tr>
<tr>
<td>18:40-20:20</td>
<td>Flight to Almaty Air Astana KC 997</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21:30</td>
<td>Accommodation and dinner at the Hotel “Astana” in Almaty</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Baitursynov str. 113; Tel: 7 (727) 250 70 50; <a href="http://www.astana-hotel.kz">www.astana-hotel.kz</a></td>
<td></td>
</tr>
</tbody>
</table>

*Transfer within Almaty from 15 till 16 March will be done on «Ford Transit» (car number А А А А 286 FPO). Driver – Volodya (+7 700 311 9203).*

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**Thursday, 15 March 2012, Almaty**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
<th>Contact Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:15-10:30</td>
<td><strong>Zhhexenbek Adilov</strong> Rector of the University</td>
<td>Kazakhstan National Technical University</td>
<td>Izim Dussembayev</td>
</tr>
<tr>
<td></td>
<td></td>
<td>named after Satpayev</td>
<td>8-701-339-64-75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Baitursynov str. 122/</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Satpayev str. 22</td>
<td></td>
</tr>
<tr>
<td>11:00-12:00</td>
<td><strong>Askar Kenzhekhanov</strong> President</td>
<td>National Centre for</td>
<td>Alexander</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scientific and Technical</td>
<td>378-05-56 ext. 139</td>
</tr>
<tr>
<td>Time</td>
<td>Event</td>
<td>Location</td>
<td>Contact Information</td>
</tr>
<tr>
<td>------------</td>
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<td>-----------------------------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>12:00-13:00</td>
<td>Lunch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13:15-14:30</td>
<td><strong>Kuralbek Kulazhanov</strong> Rector</td>
<td>Almaty Technological University</td>
<td>Sabit Rashev 7 7052181851</td>
</tr>
<tr>
<td>15:30-16:15</td>
<td><strong>Nurlan Kopbosynov</strong> Director</td>
<td>Almaty Regional Technology Park &quot;ALATAU IT CITY&quot; Alatau village, Ibragimov str, 9</td>
<td>8(727) 2275-912; 2275-922</td>
</tr>
<tr>
<td>16:15-17:00</td>
<td><strong>Erlan Batyrbekov</strong> Director</td>
<td>Institute of Nuclear Physics</td>
<td>+7 727 3866800 8-701-477-44-04 Aktorgyn</td>
</tr>
<tr>
<td>19:00</td>
<td>Dinner</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Friday, 16 March 2012, Almaty</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09:00-10:30</td>
<td><strong>Abdyrasul Zharmenov</strong> Director General</td>
<td>National Centre for complex processing of mineral raw materials Jandosov str, 67</td>
<td>8 (727) 259 00 70 Alma</td>
</tr>
<tr>
<td>10:45-11:15</td>
<td><strong>Zinesh Abisheva</strong> President</td>
<td>Center of the Earth Sciences, Metallurgy and Enrichment Shevchenko str., 29</td>
<td>+7 (727) 2918127</td>
</tr>
<tr>
<td>11:45-12:30</td>
<td><strong>Tolegen Kozhamkulov</strong> Vice President</td>
<td>Academy of Sciences Shevchenko str., 28</td>
<td>t. 261-00-25 Rasulda 91-68-04, 93-95-09 Secretary Ludmila - 610025</td>
</tr>
<tr>
<td>12:30-13:30</td>
<td>Lunch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14:00-16:00</td>
<td>Round Table with FP7 NCPs and participants of FP7 projects</td>
<td>Al-Farabi Kazakhstan National University Al-Farabi Ave. 71</td>
<td>Khaidar Tasibekov, Director of RTDI Department</td>
</tr>
</tbody>
</table>
### S&T Policy Mix Peer Review for Kazakhstan - Final Report - July 2012

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Contact Person</th>
<th>Phone Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>16:00-17:00</td>
<td><strong>Galym Mutanov</strong>&lt;br&gt;Rector&lt;br&gt;Al-Farabi Kazakhstan National University&lt;br&gt;Al-Farabi Ave. 71</td>
<td>Aizhan Smailova, +7 727 377 33 11, +7 777 272 43 57</td>
<td>+7 727 377 33 12, +7 777 396 11 44</td>
</tr>
<tr>
<td>18:00</td>
<td>Working dinner with <strong>Kanysh Tuleushin</strong>&lt;br&gt;Vice Minister of Industry and New Technologies</td>
<td>Restaurant “Palladium”</td>
<td></td>
</tr>
</tbody>
</table>

**Saturday, 17 March 2012, Almaty**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Contact Person</th>
<th>Phone Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>06:30</td>
<td><strong>Transaero - Flight UN 0206</strong>&lt;br&gt;Vardan Sahakyan&lt;br&gt;Departure from the hotel at 04:00 am</td>
<td>Transfer – Gulmira Badambayeva +77019558256</td>
<td>+7 701 955 8256</td>
</tr>
<tr>
<td>10:00-18:00</td>
<td>Magrit Harjung&lt;br&gt;Sightseeing tour&lt;br&gt;Gulmira Badambayeva +77019558256</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Sunday, 18 March 2012, Almaty**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Contact Person</th>
<th>Phone Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>04:55</td>
<td><strong>Lufthansa-LH647</strong>&lt;br&gt;Magrit Harjung&lt;br&gt;Departure from the hotel at 02:00 am</td>
<td>Transfer – Gulmira Badambayeva +77019558256</td>
<td>+7 701 955 8256</td>
</tr>
</tbody>
</table>

**Contact points:**

**Dr. Kamila Magzieva, PhD**
National Coordinator FP7-NCP-Kz
Director InExCB-Kz
Jandosov str. 36, MASAT building, office 28
050057 Almaty
Kazakhstan
Tel. +7 727 329 31 36;
Mobile: +7 701 717 98 40; +7 777 215 09 15
E-mail: kamila.magzieva@gmail.com
URL: www.inexcib.kz
## ANNEX 4

**IncoNet-EECA, WP9, Peer Review**  
**LIST OF PARTICIPANTS**  
**Dissemination meeting at the Ministry of Industry and New Technologies**  
**27th June 2012**  
**Astana, Kazakhstan**

<table>
<thead>
<tr>
<th></th>
<th>Name</th>
<th>Title and Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Kanysh Tuleushin</td>
<td>Vice Minister of the Ministry of Industry and New Technologies</td>
</tr>
<tr>
<td>2.</td>
<td>Manfred Horvat</td>
<td>Professor of Vienna Technology University, Team Leader, Austria</td>
</tr>
<tr>
<td>3.</td>
<td>Vladimir Solodvnikov</td>
<td>The EU Embassy, Astana</td>
</tr>
<tr>
<td>4.</td>
<td>Kamila Magzieva</td>
<td>FP7 NCP-Kz, InExCB-Kz</td>
</tr>
<tr>
<td>5.</td>
<td>Muslim Umiriyaev</td>
<td>Vice Minister of Agriculture</td>
</tr>
<tr>
<td>6.</td>
<td>Zhaser Zharkinbayev</td>
<td>Vice Chairman of the State Statistics Agency</td>
</tr>
<tr>
<td>7.</td>
<td>Baurzhan Baiserkin</td>
<td>Chairman of the Committee of medical and pharmaceutical activity of the Health Ministry</td>
</tr>
<tr>
<td>8.</td>
<td>Nurlan Ybyraiym</td>
<td>Chairman of the Committee of Science of the Ministry of Education and Science</td>
</tr>
<tr>
<td>9.</td>
<td>Asanbay Jumabekov</td>
<td>President of the National Center of the State Scientific-technical Expertise</td>
</tr>
<tr>
<td>10.</td>
<td>Abdikarim Zeinullin</td>
<td>Vice Chairman of the Scientific-technical Holding Parasat</td>
</tr>
<tr>
<td>11.</td>
<td>Ismail Tokbergenov</td>
<td>Acting Director of Holding KazAgroInnovation</td>
</tr>
<tr>
<td>12.</td>
<td>Alma Terlikbayeva</td>
<td>First Deputy of Director General of National Center of Complex Processing of Mineral Resources</td>
</tr>
<tr>
<td>13.</td>
<td>Marinat Bapieva</td>
<td>Vice President of the National Center of Scientific-technical Information</td>
</tr>
<tr>
<td>14.</td>
<td>Tlekkabyl Ramazanov</td>
<td>Vice Rector on Research and Innovation of the Al-Farabi National University</td>
</tr>
<tr>
<td>15.</td>
<td>Yerzhan Kuldeev</td>
<td>Vice Rector on Research and Innovation of the Satpayev National Technical University</td>
</tr>
<tr>
<td>16.</td>
<td>Maxim Zdorovets</td>
<td>Head of Astana Branch of the National Center of Nuclear Research</td>
</tr>
<tr>
<td>17.</td>
<td>Alya Myrzagaliyeva</td>
<td>Deputy Director of Department of Energy of the Ministry of Industry and New Technologies</td>
</tr>
<tr>
<td>18.</td>
<td>Marat Urazbayev</td>
<td>Deputy Director of the Department of Green Technologies of the Ministry of Environment</td>
</tr>
<tr>
<td>19.</td>
<td>Rauan Skakov</td>
<td>Head of Department of the Industry, Agriculture and Ecology of the Ministry of Economy Development</td>
</tr>
<tr>
<td>20.</td>
<td>Alikhan Yerzhanov</td>
<td>Chief Expert of Department of the Industry, Agriculture and Ecology of the</td>
</tr>
<tr>
<td></td>
<td>Ministry of Economy Development</td>
<td></td>
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<tr>
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</tr>
<tr>
<td>21.</td>
<td>Zhumatay Salimov</td>
<td>Executive director of the National Agency of Technology Development</td>
</tr>
<tr>
<td>22.</td>
<td>Nurlan Syzdakov</td>
<td>Expert of the National Agency of Technology Development</td>
</tr>
</tbody>
</table>
ANNEX 5

State of the Nation addresses of President Nursultan Nazarbayev 2004 – 2012

2004 - “Towards competitive Kazakhstan, competitive economy, competitive nation”, 19 March 2004

2005 - ”Kazakhstan on its way to accelerated economic, social and political modernisation”,

2006 - ”The Kazakhstan strategy on entering in the world’s 50 advanced countries”, 6 March 2006


2008 - “Growth of welfare of Kazakhstan’s citizens is the primary goal of state policy”,

6 February 2008

2009 - “Through crisis to innovation and development”, 6 March 2009

2010 - ”New decade – new economic growth – new opportunities for Kazakhstan”, 29 January 2010


2012 – “Socio-economic modernization as the main vector for Kazakhstan’s development”,

27 January 2012
### ANNEX 6

**Result of the NIF technology foresight exercise: Priority Areas and Critical Technologies**

<table>
<thead>
<tr>
<th>Priority areas</th>
<th>Critical technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Alternative energy forms and energy efficiency technologies</td>
<td>1. Technologies for the production of ionistors and condensers of new type</td>
</tr>
<tr>
<td></td>
<td>2. Technologies for the production of new-generation batteries</td>
</tr>
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<td>3. Technologies for the production of fuel assemblies</td>
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<tr>
<td></td>
<td>4. Technologies for creation of a new type of fuel</td>
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<tr>
<td></td>
<td>5. Technologies for manufacturing of various radioisotope production (for nuclear medicine and other industries)</td>
</tr>
<tr>
<td></td>
<td>6. Technologies for the production of boiler units using pyrolysis and gasification of coal</td>
</tr>
<tr>
<td></td>
<td>7. Technologies for the production of small boiler units for all types of fuels</td>
</tr>
<tr>
<td></td>
<td>8. Technologies for the production of wind vortex units, which can take the energy of wind pressure of any direction as well as for rotation of the turbine the thrust generated by the differential pressure is used</td>
</tr>
<tr>
<td></td>
<td>9. Technologies for the production of wind units that use air flow concentrators</td>
</tr>
<tr>
<td></td>
<td>10. Technologies for the production of thermocouples and (solar) photoelectric cells</td>
</tr>
<tr>
<td></td>
<td>11. Technologies for the production of new materials based on nanotechnology for energy generation</td>
</tr>
<tr>
<td></td>
<td>12. Technologies for heating supply and electricity generation from sunlight</td>
</tr>
<tr>
<td></td>
<td>13. Technologies for the production of solar concentrators</td>
</tr>
<tr>
<td></td>
<td>14. Technologies for the production of free-flow hydro with straight-flow turbines</td>
</tr>
<tr>
<td></td>
<td>15. Technologies for the production of straight-flow turbines for mainland pipeline</td>
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<tr>
<td></td>
<td>16. Technologies for the production of LED light lamps</td>
</tr>
<tr>
<td></td>
<td>17. Technologies for the production of monitoring sensor and devices for accounting regimes of power plants</td>
</tr>
<tr>
<td></td>
<td>18. Technologies for economic stimulus to reduce greenhouse gas emissions and introduction of renewable energy</td>
</tr>
<tr>
<td>2. Advanced engineering technologies, including the use of</td>
<td>19. Technologies of mechanical activation</td>
</tr>
<tr>
<td></td>
<td>20. Technologies for the production of composite and ceramic materials for the replacement of metal products</td>
</tr>
<tr>
<td></td>
<td>21. Technology for the production of composite parts</td>
</tr>
<tr>
<td>Category</td>
<td>Number</td>
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<td>----------------------------------------------------</td>
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</tr>
<tr>
<td>new materials</td>
<td></td>
</tr>
<tr>
<td>23 Technologies for the protection of materials from the mechanical effects (surfacing, coating, lining of the protective layer)</td>
<td></td>
</tr>
<tr>
<td>24 Technologies for the protection of materials from chemical attack (corrosion coatings, paint, oxide)</td>
<td></td>
</tr>
<tr>
<td>25 Technologies of units assembly (assembly units)</td>
<td></td>
</tr>
<tr>
<td>26 Technologies for manufacturing of all-rolled wheels and centres</td>
<td></td>
</tr>
<tr>
<td>3. Advanced technology of chemistry and petro-chemistry</td>
<td></td>
</tr>
<tr>
<td>27 Biochemical technology for the production of biomass (second generation bio-ethanol, bio-degradable polymers)</td>
<td></td>
</tr>
<tr>
<td>28 Technologies for the production of chemical products from coal (methanol, olefins, ammonia, urea)</td>
<td></td>
</tr>
<tr>
<td>29 Catalytic technologies for the processes of the production of polymers and elastomers (polyethylene, polypropylene, synthetic rubber)</td>
<td></td>
</tr>
<tr>
<td>30 Development of nanocatalysts for the processes of oil and gas processing</td>
<td></td>
</tr>
<tr>
<td>31 Technologies for the production of complex mineral and organo-mineral fertilizers</td>
<td></td>
</tr>
<tr>
<td>32 Coal Gasification Technology</td>
<td></td>
</tr>
<tr>
<td>4. Biotechnology</td>
<td></td>
</tr>
<tr>
<td>33 Engineering enzymology</td>
<td></td>
</tr>
<tr>
<td>34 Cellular and Genomic Selection</td>
<td></td>
</tr>
<tr>
<td>35 Cellular and Molecular Engineering</td>
<td></td>
</tr>
<tr>
<td>36 Technology for the production of biological preparation</td>
<td></td>
</tr>
<tr>
<td>37 Methods of ensuring of products biosafety</td>
<td></td>
</tr>
<tr>
<td>5. Advanced technology in MMC</td>
<td></td>
</tr>
<tr>
<td>38 Technologies for the production of collective concentrates</td>
<td></td>
</tr>
<tr>
<td>39 Technologies for the production of non-ferrous alloys</td>
<td></td>
</tr>
<tr>
<td>40 Technologies for the production of complex ferroalloys</td>
<td></td>
</tr>
<tr>
<td>41 Technologies of direct reduction of iron</td>
<td></td>
</tr>
<tr>
<td>42 Technologies for leaching of metals</td>
<td></td>
</tr>
<tr>
<td>43 Technologies for smelting wear resistant alloys</td>
<td></td>
</tr>
<tr>
<td>44 Technologies for casting wear-resistant and heat-resistant products</td>
<td></td>
</tr>
<tr>
<td>45 Technologies for molding of cast iron, steel, nonferrous metals</td>
<td></td>
</tr>
<tr>
<td>46 Technologies of geological and geophysical methods for prospecting and exploration of SIM</td>
<td></td>
</tr>
<tr>
<td>47 Technologies of processing technogenic deposits</td>
<td></td>
</tr>
<tr>
<td>6. Information</td>
<td></td>
</tr>
<tr>
<td>48 Cloud Computing</td>
<td></td>
</tr>
</tbody>
</table>
### Technologies and ICT

<table>
<thead>
<tr>
<th>#</th>
<th>Technology Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>49</td>
<td>Mobile Technology</td>
</tr>
<tr>
<td>50</td>
<td>Multimedia Technology</td>
</tr>
<tr>
<td>51</td>
<td>Technologies of pattern and speech recognition</td>
</tr>
<tr>
<td>52</td>
<td>Information Security Technology</td>
</tr>
</tbody>
</table>

### 7. Advanced technologies in agriculture

<table>
<thead>
<tr>
<th>#</th>
<th>Technology Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>53</td>
<td>Reproduction of soil fertility</td>
</tr>
<tr>
<td>54</td>
<td>Progressive irrigation systems</td>
</tr>
<tr>
<td>55</td>
<td>Technologies intensive livestock development</td>
</tr>
<tr>
<td>56</td>
<td>Technologies for deep processing of agricultural raw materials</td>
</tr>
</tbody>
</table>

### 8. Advanced technologies of exploration, production, transportation and processing of mineral and hydrocarbon material

<table>
<thead>
<tr>
<th>#</th>
<th>Technology Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>57</td>
<td>Technologies for enhanced oil recovery onshore and offshore fields</td>
</tr>
<tr>
<td>58</td>
<td>Technologies for maintenance of reservoir pressure</td>
</tr>
<tr>
<td>59</td>
<td>Technologies of well drilling in special circumstances</td>
</tr>
<tr>
<td>60</td>
<td>Technologies for prospecting seismology at high resolution</td>
</tr>
<tr>
<td>61</td>
<td>Technologies of integrated interpretation of seismic data to create a detailed model of a deposit</td>
</tr>
<tr>
<td>62</td>
<td>Technologies for optimization and increasing energy efficiency of oil and gas transport</td>
</tr>
<tr>
<td>63</td>
<td>Technologies for catalytic cracking, alkylation, isomerization, hydrotreating</td>
</tr>
</tbody>
</table>
ANNEX 7

Country Report prepared by InExCB-KZ
Table of contents

Introduction ............................................................................................................................................... 2

Short description of the Kazakh R&D and Innovation System and short description of Policy Mix and its performance (including main performance indicators and its evolution over the last decade) ................................................................................................................................. 10

Self-assessment of the Kazakh R&D and Innovation System – Strengths and Weaknesses ................................................................. 19

General policies and the role of R&D and innovation of Kazakhstan ................................................................. 19

Institutional set-up of the Kazakh R&D and Innovation System ................................................................................. 22

Governance issues: R&D and innovation policy formulation structures and processes (ministries, councils, commissions, advisory bodies, etc.) ......................................................................................................................... 24

R&D and innovation policies, programmes and their implementation structures and processes 29

Policies and strategies ........................................................................................................................................... 29

Programmes (bottom up schemes, sectoral and functional programmes, direct vs. indirect funding) .................................................................................................................................................................................. 33

Policy and programme implementation structures (e.g. ministries, funding agencies or councils), instruments (e.g. individual and collaborative R&D projects, networks, PhD and post-graduate fellowships, mobility grants, etc.) and processes (e.g. calls for proposals, evaluation and selection, programme monitoring and evaluation) ............................................................................................................. 39

The public science base – universities, Academy of Sciences, sectoral R&D institutes ........................................ 46

Public and Private (industrial and SME) R&D and innovation structures and activities ........................................... 68

Human resources for R&D and innovation .................................................................................................................. 72

Science-business knowledge and technology transfer – activities, support structures, IPR legislation ........................................................................................................................................................................... 78

Cooperation in STI at national level .......................................................................................................................... 80

Support structures (e.g. technology transfer centres, National Contact Points) ......................................................... 85

International cooperation in STI ................................................................................................................................... 86

Bilateral and multilateral and European cooperation ................................................................................................. 86

Support structures (National Contact Points) .............................................................................................................. 94

Summary: Self-assessment of the policy and programme mix including SWOT analysis ........................................ 108

Conclusions and outlook ......................................................................................................................................... 115

References ............................................................................................................................................................. 118

List of abbreviations .................................................................................................................................................. 120
## Introduction

Includes peer reviews done in the country, short description of the overall economic context using the main statistic indicators (including structure of the economy, GDP, etc), identification of main RTDI stakeholders

<table>
<thead>
<tr>
<th>Country name</th>
<th>The Republic of Kazakhstan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>16,441,959 thousand people. Density of population is 5.5 people on 1 square kilometre. The urban population forms 57%, the rest is rural population.</td>
</tr>
<tr>
<td>Area</td>
<td>By the territory Kazakhstan occupies 9-th place in the world, yielding only to Russia, China, USA, Argentina, Brazil, Canada, India and Australia. The territory of the republic is 2,724,900 square kilometres.</td>
</tr>
<tr>
<td>Capital</td>
<td>Astana</td>
</tr>
<tr>
<td>System of Government</td>
<td>Kazakhstan is a unitary state with a presidential form of government. President is elected by direct, privy, universal suffrage for 7 years. The first and current President of the Republic of Kazakhstan – Nursultan Nazarbayev. The President is head of state and nominates the head of government. Executive power is exercised by the government. The head of the Government is the Prime Minister of the Republic of Kazakhstan. Government is responsible to the President in its activity and is accountable to the Parliament in connection with approval or alteration of the governmental programmes. Legislative power is vested in both the Government and the two chambers of the Parliament. The judicial branch consists of the Supreme Court (44 members) and the Constitutional Council (7 members). Important political decisions in the state must be approved by the President (Nursultan Nazarbayev), the Government (Prime Minister - Karim Massimov), and the Parliament. The Parliament consists of two chambers: Senate (Speaker - Kairat Mami) and Majilis (Speaker - Nurlan Nigmatulin) acting on a constant basis.</td>
</tr>
<tr>
<td>Head of the Government</td>
<td>Karim Massimov, Prime Minister</td>
</tr>
<tr>
<td>Main RTDI stakeholders:</td>
<td>Prof. Dr. Bakhytzhan Zhumagulov, Minister of Education and Science of the Republic of Kazakhstan</td>
</tr>
<tr>
<td>Ministry of Education and Science</td>
<td>Dr. Asset Issekeshev, Minister of Industry and New Technologies of the Republic of Kazakhstan</td>
</tr>
<tr>
<td>Ministry of Industry and New Technologies</td>
<td>The Parliament consists of two chambers: Senate and Mazhilis acting on a constant basis.</td>
</tr>
</tbody>
</table>
The Senate (47 members) is formed by the deputies elected by two persons from each region, cities of the republican value and capitals of the Republic of Kazakhstan (RK). Fifteen deputies are nominated by the President of the Kazakhstan for the term of Senate authorities. The half of elected Senate deputies is re-elected each three years. The term of authorities of the Members of the Senate is six years.

Mazhilis consists of 107 members. Ninety-eight deputies of the Majilis are elected from political parties in accordance to the parties’ lists. Nine Majilis deputies are elected by the Assembly of Peoples of Kazakhstan. The term of authorities of the Mazhilis deputies is five years.

Administrative structure

The capital of Kazakhstan is Astana city (since December 10, 1997). The population is 701,307 people. For administrative purposes, Kazakhstan is divided into 14 regional provinces (oblasts), 86 cities, including 2 cities of the republican value, municipal districts: Astana and Almaty, 168 districts (8 districts in the cities), and 174 villages. Astana is the capital. Almaty is the financial and business center of the country.

Some oblasts particularly depend on the oil and gas sectors (Atyrau, Mangystau, West-Kazakhstan, Aktobe and Kyzylorda), while others may be characterized as agrarian-industrial regions (Kostanai, North-Kazakhstan and Akmola oblasts in the north, Zhambyl and South-Kazakhstan oblasts in the south and Almaty oblast in the south east). Industrial oblasts include Pavlodar, East-Kazakhstan and Karaganda. Over the past decade, economic expansion has been particularly rapid in Atyrau, Almaty, Kyzylorda and Mangystau.

Geography (short description, up to 300 characters)

Kazakhstan is located on the border of two continents, Europe and Asia. With the total area of 2,724,900 square kilometers, it stretches from the Caspian Sea and Volga plains in the West to the mountainous Altai in the East, and from the foothills of Tien Shan in the south and south-east to the West-Siberian lowland in the north. The extent of the territory from east to west is more than 3,000 kilometers and from North to South – 1,700 kilometers. This makes Kazakhstan ninth largest country in the world and second largest in the CIS. Kazakhstan borders on Russia in the east, north and northwest, Uzbekistan, Kyrgyzstan and Turkmenistan in the south, and China in the south-east.

Since its independence Kazakhstan has achieved macro-economic and fiscal stability, and recently embarked upon an ambitious public administration reform. Despite the effects of the Global Financial Crisis, the country has enjoyed strong economic performance. Kazakhstan is important to world energy markets due to its significant oil and natural gas, and mineral resources reserves. The following figures show growth of contribution of Kazakhstan into the world energy market in 2010 in comparing with 2009:

- in 2010 Kazakhstan produced 68.1 million tons of oil and gas condensate, while in 2009 it was 64.4 million tons;
• in 2010 it Kazakhstan produced 110.9 million tons of coal, while in 2009 it was 100.9 million tons;
• in 2010 it was production of 37.4 million cubic meters of natural gas, while in 2009 – 35.9 million cubic meters

Selected economic indicators of Kazakhstan for 2010 are the following:
• GDP - $146.9bn, real economic growth - 7%;
• GDP per capita – $9,000,
• GDP per capita (PPP) - $12,700, industrial production growth – 7.3%;
• GDP composition: agriculture – 5.4%, industry – 42.8%, services – 51.8%
• Government budget – $30.3bn (20.7% of GDP), budget deficit – $3.6bn (2.5% of GDP)
• Export – $59.2bn, import – $29.8bn
• Unemployment rate – 5.8%, inflation (CPI) – 7.1%, central bank discount rate – 7.5%
• Accumulated FDI - $141bn
• R&D expenditures are equal to 0.16% of GDP.

The National Action Plan of Kazakhstan has two primary goals for the period 2010-2015:
• to become a full member of the global economy through the adoption of international standards for its productive financial and public sectors;
• to diversify the economy away from reliance on extractive industries.

Main documents, which identified research and technology development and innovation activities in Kazakhstan are the basic regulations of the Constitution of the Republic of Kazakhstan, the Development Strategy of the Republic of Kazakhstan “Kazakhstan – 2030”, the Strategic Development Plan of the Republic of Kazakhstan until 2020, the laws of the Republic of Kazakhstan “On state support of industrial and innovative activity” and “On Science”. These documents are background to develop national action plans and state programs for education, science, and innovation activities. The section 3 of the Country Report includes general description of main programs reflected to RTDI policy of Kazakhstan.

International cooperation in research, science and technology are regulated by the Law of Kazakhstan “On Science” chapter 7, article 29. The cooperation is based on international agreements and contracts. There are more than 140 agreements and contracts with different countries on research cooperation. It is necessary to note that any international grant agreement in Kazakhstan is free from any local taxes and duties, with the exception of individual incomes in accordance to the Tax Code of Kazakhstan.

The new Law on Science foresees participation of foreign researchers in national calls for proposals. Participation of scientists in different activities of the Kazakh research mainly includes scientists from EECA. Scientists from far foreign countries participate in the projects based on bilateral and multilateral agreements.

The main national stakeholders of the research, technology and innovation policy of the country are: President of the Republic of Kazakhstan, the legislative bodies (Parliament of the Republic of
Kazakhstan), the Government of the Republic of Kazakhstan, Ministry of Education and Science, Ministry of Industry and New Technologies and other executive bodies (ministries, agencies). Highest Scientific and Technical Commission (HSTC) and Technology Development Policy Council (TDPC) are the advisory consultative bodies under the Government of Kazakhstan.

The HSTC is headed by the Prime Minister of Kazakhstan and is responsible for setting forecasts and state priorities of the development of fundamental and applied science and technology. Operational body of the HSTC is the Ministry of Education and Science. Activity and tasks of HSTC are described in the Law on Science and at the Order of the Government of Kazakhstan No. 429 dated by 20 April 2011, by which it was created.

Decisions of HSTC are approved collectively by its members – representatives of governmental bodies (ministries and the state agencies), leading academic and educational institutions, outstanding scientists, and experts from various disciplines, representatives of the national holding companies, national development institutions, private enterprises, and public research organizations. The main objectives of HSTC are:

- generation of strategic tasks and priorities for research, scientific-technical and innovation activities;
- identification of priorities of basic and applied research in different scientific fields;
- consideration of proposals of the National Scientific Councils;
- development of proposals for funding research and/or scientific-technical activities;
- development of proposals for the research mainstream and amount of grants for proposals recommended by the National Scientific Councils
- approval of applications for the research and scientific-technical programs included into the program targeted funding
- development of recommendations for attracting foreign investments for the realization of innovative projects and programs
- development of proposals to provide interaction between, research, education and industry for implementation of the state research, technology and innovation policy;
- development of the recommendations for the Republican Budgetary Committee on amounts of grants and the program targeted funding

Technology Development Policy Council (TDPC) is created by the Order of the Government of Kazakhstan No. 1386 on 29th November 2011. The Council is headed by the Prime Minister of Kazakhstan. Operational body of TDPC is the Ministry of Industry and New Technologies. Members of TDPC are relevant research, technology and innovation stakeholders, ministries and state agencies, heads of industrial companies and share holdings from seven sectors identified as national priorities, including sectors of:

- metallurgy and mining,
- energy,
- agro-industrial complex,
- information and communication technology,
- atom energy,
- oil and gas,
- chemistry and pharmaceutics, and engineering industry.
The Council’s main task is identification of the mainstream in the field of:

- State policy in the industrial-innovation activities, including approval and updating of inter-branch research and technology action plan as well as the list of proposed technological programs
- Realization of the grant programs
- Shaping of specifications for the high-tech and medium-tech products

The system of public authorities responsible for science, technology and innovation policy includes the following ministries and agencies:

- The Ministry of Education and Science of RK (MES) and the Ministry of Industry and New Technologies of RK (MINT) are main stakeholders in research, technology and innovation policy;
- Other state bodies involved in RTDI are the Ministry of Economic Development and Trade of RK, Ministry of Finance of RK, and other sectoral ministries, such as Ministry of Environment, Ministry of Agriculture, Ministry of Oil and Gas, Ministry of Health, and others.
- Development institutions were created including Development Bank of Kazakhstan, Investment Fund of Kazakhstan, National Innovational Fund, Entrepreneurship Development Fund
The table shows interaction between different governmental bodies to manage the RTDI activities in Kazakhstan. Relevant orders approved by the President go to the Office of the Prime Minister and then to main stakeholders such as Ministry of the Economy Development and Trade (MEDT), Ministry of Finance (MF), Ministry of Education and Science (MES), Ministry of Industry and New Technologies (MINT), and to other sectoral ministries.

Sovereign Wealth Fund “Samruk-Kazyna” plays significant role in RTDI policy of the country. The Fund was founded in October 2008 by the Decree of the President of the Republic of Kazakhstan concerning Samruk State Fund of Sustainable Growth and Kazyna State Holding merging into National Welfare Fund Samruk-Kazyna. The main objective of the Fund is to promote investments and innovations in all sectors of the economy of the Republic of Kazakhstan through effective corporate governance of state development institutions. Board of Directors of the National Welfare Fund Samruk Kazyna is headed by the Prime Minister. Samruk-Kazyna controls $78 billion in assets, or nearly 56% of GDP. Currently it is completing the implementation of anti-crisis tasks and returns to its main mission aimed at raising people's welfare by increasing the value of state assets. Samruk-Kazyna participates, either in whole or in part, and coordinates strategies across more than forty direct subsidiaries, including main national holdings and companies, banks and national post and telecommunication operators.

The Samruk-Kazyna is the major operator of the State Programme of the Industrial and Innovational Development. Almost all key sectors of the economy are involved, and scale of the projects will allow having multiplicative effects. The projects will result in improved refining capabilities, increased energy capacities of power stations, widened transport and transit potential, and overall diversification of the economy.
Established in October 2008 in the midst of the global economic crisis through a merger of two state-owned holdings, Samruk (State's Assets Management Holding) and Kazyna (Sustainable Development Fund) aimed to sustain the development of national economy and stabilize the financial system, and defines strategy for state-owned companies and is the main instrument for implementation of government policies as key player of the industrial and innovation development program for:

- Promotion and implementation of large-scale investment projects for diversification of the economy
- Implementation of efficient corporate governance according to the best international practices in corporate management and financial control
- Creation of efficient tool in implementation of the anti-crisis program

### Strategic Planning in Kazakhstan

<table>
<thead>
<tr>
<th>Sectoral Programs</th>
<th>Functional Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP on Oil&amp;Gas</td>
<td>FP on Standardization</td>
</tr>
<tr>
<td>SP on Agro</td>
<td>FP on Competition Development</td>
</tr>
<tr>
<td>SP on Metallurgy</td>
<td>FP on Innovation and Technological Development</td>
</tr>
<tr>
<td>SP on Chemical</td>
<td>FP on Energy Efficiency</td>
</tr>
<tr>
<td>SP on Energy</td>
<td>FP on Science Development,</td>
</tr>
</tbody>
</table>

The Strategic Development Plan of Kazakhstan until 2030 was adopted in 1997 as a set of the long-term strategic priorities for Kazakhstan’s future development. One of the fundamental ideas of the strategy is to use the country’s vast natural resources for the good of the people. The strategy implies emergence and active role of prominent state-owned enterprises (national companies) in implementing the long-term priorities. It includes seven strategic priorities such as:

- national security
- political stability
- economic growth
- social well-being
- use of energy resources
- infrastructure development
- professional government

The authors of this strategy are the Ministry of Economy and Budget Planning of the Republic of Kazakhstan jointly with the Ministries of Industry and New Technologies; Education and Science;
Short description of the Kazakh R&D and Innovation System and short description of Policy Mix and its performance (including main performance indicators and its evolution over the last decade)

At present, innovation activity has not become the basis of socio-economic development of the country: in domestic economy no significant technological breakthroughs, no signs of intensive mass development of R&D results are observed. Low level of innovation activity is characteristic of all economic activities, as well as for all types of innovation (technological, organizational, and marketing). The main problem is the generally low demand for innovation in Kazakhstan economy, its inefficient structure - excessive edge toward the purchase of ready-made equipment abroad instead of implementation of own new developments. The level of innovation activity of enterprises is considerably inferior to indicators of leading countries in this field. Expenditures on R&D are one of the main indicators of innovation.

In recent years there has been a positive trend of increasing of R & D expenditures in Kazakhstan in 2007 - 0.21%, in 2008 - 0.22%, in 2009 - 0.24% of GDP. The exception is 2010, in which the levels of spending on R&D sharply decreased and became equal to 0.16% of GDP, at the same time falling till the level of 2000 (Diagram 1).

![Diagram 1. Internal expenditures on R&D in Kazakhstan for the period 2003-2010](image)


Actual priorities of Kazakhstan is attracting investments in science from the private sector and setting up national system of commercialization of the scientific research results. It is planned to progressively increase public funding for science, and increasing funding for science in 2014 up to 1% of GDP, which would be about $ 2.5 billion.
The government aims to allocate 42 billion Tenge (0.21 bln. Euro) of public funds for RTDI in 2012; it is two times more than during three preceding years. In the next three years for these purposes will be allocated 118 billion Tenge (0.58 bln. Euro).

Analysis of the structure of internal expenditures on R&D by sector of activity for 2006-2010 shows that the proportion of the public sector to conduct R&D in 2010, which is primarily dominated, has equalized with a share of the business sector (37% - public sector and 36.6% - business sector respectively). The share of funding for the higher education sector in recent years amounted to an average of 15%, but in 2010 was equal to 17.2%, growth rate in 2006-2010 was 42.1% from total funding from both public and private sectors. There is a tendency to reduce the share of the public sector to conduct R&D by 28.3% in 2010 relative to 2006, with a sharp increase in the share of private non-profit sector from 1.1% in 2006 to 9.2% in 2010 (Diagram 2.)

Diagram 2. Structure of internal expenditures for R&D on sectors of activity in Kazakhstan for the period 2006-2010
Source: Statistics Agency of RK, 2011

Total S&T funding in Kazakhstan for 2010 from different sources in accordance to the Statistic Committee are the following:
- 59.0% - means of the state budget
- 16.5% - means of the regional budget
- 0.3% - means of the institutes of development
- 22.4% - private budgets
- 1.2% - other incomes
- 0.6% - means of the foreign investors

Organizations are engaged in research, technology development and innovation activities, but which are not having profit form the RTDI, e.g. do not sell their research results as a commodity, not engaged in the commercialization of products, and mostly from the private research institutions existing on the grant funding are the following.
In 2010:
23.6% - private non-commercial sector
25.5% - business sector
28.5% - sector of high education (public and private universities)
22.4% - state sector

In 2011:
15.3% - private non-commercial sector
36.2% - business sector
27.9% - sector of high education (public and private universities)
20.6% - state sector

In 2010 educational activity is carried out by 42 state civil (including National High Educational Institutions (HEIs) – 9 and State HEIs – 33), 13 non-civil and 90 private High Educational Institutions (HEI)(including International HEIs - 1, private HEIs - 73 and 16 joint stock HEIs). At the same time the number of private higher education institutions increased from 71 in 1996 to 90 in 2010. The number of university students increased from 514,738 people in the 2001-2002 academic year to 610,264 people in the 2009-2010 academic year. There have been qualitative changes of teaching staff. If in 1992 the teaching staff of state civil universities accounted for more than 17,100 people, in the 2009-2010 academic year - about 39,200 people.

The percentage increasing of universities' settle down is first of all connected with the shift of scientists from research institutions in the higher education system, as well as the increase in the number of degrees awarded to candidates and doctors of science.

Beginning from 2005 for attraction of foreign teachers and counselors, $2 million of republican budget (1 million for each university) allocated for two universities (Kazakh National University named after al-Farabi and the Eurasian National University named after LN Gumilev).

A new classifier of specialties of higher and postgraduate education, harmonized with the International Standard Classification of Education (ISCED) and the relevant to substantive provisions of the Bologna Declaration. The transition to a three-stage model of staff preparation was implemented: Bachelor - Master - Doctorate. Post-graduate, doctoral transformed into a doctoral Ph.D.

The Republic of Kazakhstan has acceded to the Bologna Declaration. 30 universities have signed the Great Charta of Universities. There are two international universities such as International University of New Information Technologies (Almaty) and Nazarbayev University (Astana).

The procedure of state accreditation, taking into account international practices of quality assess of higher education have been introduced. The Concept of State Youth Policy of the Republic of Kazakhstan was approved. In order to support talented young people the State Youth Prize "Daryn" was established (1992).
In technologically advanced countries, the expenses of business sector on scientific research (60-70%) far exceed the public spending on R&D. In most countries, including Kazakhstan, basic research has traditionally carried out, mainly, in the public sector and the business sector engaged in applied research. National innovation system will be effective and bring high profit only if there is a developed business sector in the country. In Kazakhstan, there is a positive trend of share decreasing of the public sector to conduct R&D.

The main indicators, characterizing innovative activity of all types of enterprises including SMEs in Kazakhstan in 2006-2010

<table>
<thead>
<tr>
<th>Indicators</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of respondents (all types of enterprises), total</td>
<td>10 591</td>
<td>10 889</td>
<td>11 172</td>
<td>10 096</td>
<td>10937</td>
</tr>
<tr>
<td>among them: engaged in technological innovative products</td>
<td>505</td>
<td>526</td>
<td>447</td>
<td>399</td>
<td>467</td>
</tr>
<tr>
<td>level of activity in the area of innovation, %</td>
<td>4,8</td>
<td>4,8</td>
<td>4,0</td>
<td>4,0</td>
<td>4,3</td>
</tr>
<tr>
<td>have not innovations</td>
<td>10 086</td>
<td>10 363</td>
<td>10 725</td>
<td>9 682</td>
<td>10470</td>
</tr>
<tr>
<td>level of passivity in the area of innovation, %</td>
<td>95,2</td>
<td>95,2</td>
<td>96,0</td>
<td>96,0</td>
<td>95,7</td>
</tr>
<tr>
<td>Share of innovative production in GDP, %</td>
<td>1,53</td>
<td>1,19</td>
<td>0,69</td>
<td>0,51</td>
<td>0,66</td>
</tr>
</tbody>
</table>

Source: Data of Agency on Statistics

By the data of the State Statistics Agency for 2010 among 10 937 only 467 economic entities with both private and public forms of properties are engaged in development of new innovative technological products. According to estimates of the susceptibility of industrial enterprises to innovative processes, which is characterized by share of active enterprises, innovative activity of enterprises in Kazakhstan in 2010 was 4.3%, which is higher than in 2004 to 1.9 times (Diagram 3.)

Diagram 3. Level of innovative activity of Kazakh enterprises in 2004-2010
Source: Statistics Agency of RK
The figures above do not include activity of Sovereign Wealth Fund Samruk-Kazyna, largest state-owned holding company of Kazakhstan, which acts under a separate law, provided special status and rights to the Fund.

Other RTDI stakeholders of Kazakhstan are the state-owned holdings in the field of research and technology development, among of which the Nazarbayev University is number one.

Autonomous Educational Organization Nazarbayev University is a new university initiated by the President of Republic Kazakhstan, Nursultan Nazarbayev. In doing this, President Nazarbayev seeks to promote a qualitative leap forward in the preparation of the next generation of national technical and scientific elites, in order to assist in the industrial-innovative development of the country. Nazarbayev University considers its mission the advancement of the development of education and research in the Republic of Kazakhstan, as well as to contribute to Astana's aspiration to become the research and educational center of Eurasia. The University’s vision is creating graduates prepared according to the highest international standards in order to contribute to research, education, and the national economy. This university works under its own educational standards. Its activity has been regulated by a special Law of the Republic of Kazakhstan from Jan.19, 2011: “About status of “Nazarbayev University”, “Nazarbayev Intellectual Schools” and “Nazarbayev Fund”.

Innovation Focus of the University is constantly strive to employ cutting edge methods and technologies; readiness to utilize new knowledge and information. Nazarbayev University aims to become a university with a strong and modern scientific infrastructure, science and engineering workforce capable of meeting the challenges according to the needs of economics and the country overall. To solve these problems, the best researchers of the country and abroad are invited to cooperate with the University.

The model for the strategic development of Nazarbayev University is based primarily on partnership with the top 30 ranking universities in the world including University College London (UK); iCarnegie, affiliate of Carnegie Mellon University (USA); University Wisconsin-Madison (USA); Duke University Fuqua School of Business (USA); National University of Singapore, Lee Kuan Yew School of Public Policy (Singapore); University of Pennsylvania (USA); Lawrence Berkeley National Laboratory (USA) – partner in the Centre for Energy Research; Argonne National Laboratory (USA); McGowan Institute for Regenerative Medicine, Pittsburg University (USA)

The University structure includes three centres: Center for Energy Research; the Center for Life Sciences, and the Centre for Educational Policy and two affiliated organizations: National Medical Holding JSC and National Analytical Center JSC.

JSC “KazAgro” management Holding, which manages the state’s agricultural companies, including: National Food Contract Corporation (wheat trade); KazAgroFinance (leasing to farmers); Agrarian Credit Corporation; Corporation on Livestock Development; Fund of Financial Assistance to Agriculture. The mission of the Holding is implementation of the state policy on stimulating
industrial development of agro-industrial complex on principles of effectiveness, transparency and effective corporate management of the Holding's structures.

JSC National Scientific and Technological Holding “Parasat” stimulates the development of scientific research and domestic know-how in the high-tech sector, manages several scientific institutions and funds: JSC “Science Fund”, JSC “National Center for Scientific and Technical Information of the Republic of Kazakhstan”, JSC “Center for Earth Sciences, Metallurgy, and Ore Beneficiation”. Holding’s mission is creation of the foundation for high-tech and informative society in Kazakhstan through creation of favourable conditions for scientific and technological development of the state including by means of forming consolidated information and communication environment, information systems, resources and standards; ensuring equal access to information, ideas, knowledge and information and telecommunication services and technologies for all citizens regardless of their social status, age and geographical location; development of competitive, effective and growing business which would conform to the best worldwide experience.


“Zerde” Holding’s major object of activity is an efficient management of legal entities whose blocks of stocks (shares of participation) were passed to pay for the allocated shares of “Zerde” Holding in order to create opportunities for improvement of ICT competitiveness and economic efficiency, development of ICT resources and standards, encouragement of investment and innovation activity in ICT. “Zerde” Holding’s activity relies on the following major principles: improvement of the Companies’ competitiveness and economic efficiency; implementation of global best practices in corporate governance of “Zerde” Holding and Companies; development of modern information and communication technologies, and stimulation of investments and innovations in the communication sector. “Zerde” manages the legal entities such as JSC “KazSatNet” National Company (Kazakh Satellite Network); JSC “National Information Technologies”, JSC “National Processing Center”, “Financial Systems Informatization Center” LLP, and “e-Commerce Center” LLP.

Innovative activities and its definition in Kazakhstan

All above mentioned holdings have impact to development of innovative activities in Kazakhstan. Innovative activity of Kazakhstan is based on implementation of new ideas, scientific knowledge, new technologies and new products into different fields of industry and human resources. Indicators of the innovative activities are identifies by the Law of the Republic of Kazakhstan No.
In accordance to these laws the State Statistics Agency has developed the statistic reporting forms with questionnaires, which are filled in by all enterprises registered in Kazakhstan. The forms allows to identify how innovative productions of the enterprise. Completion of the forms is not compulsory; it depends on real activities of the enterprises and their own definition of the level of innovation used at their usual practice. The figures in the table below show shares of innovative activities among public and private enterprises, and their interests to be involved into development of the innovative products. Certainly the public bodies are involved into innovative activities more intensively than private enterprises.

**The share of innovative enterprises by ownership**

<table>
<thead>
<tr>
<th>Ownership of other countries and their legal entities and citizens</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>State ownership</td>
<td>3.7</td>
<td>5.5</td>
<td>7.5</td>
<td>8.9</td>
<td>8.0</td>
<td>7.7</td>
<td>8.1</td>
<td>9.8</td>
</tr>
<tr>
<td>Private ownership</td>
<td>5.0</td>
<td>1.9</td>
<td>3.0</td>
<td>4.4</td>
<td>4.5</td>
<td>3.6</td>
<td>3.7</td>
<td>4.0</td>
</tr>
<tr>
<td>Ownership of other countries and their legal entities and citizens</td>
<td>0.6</td>
<td>3.6</td>
<td>3.6</td>
<td>5.0</td>
<td>5.6</td>
<td>5.9</td>
<td>4.2</td>
<td>3.6</td>
</tr>
</tbody>
</table>

According to the data of the State Statistics Agency, in 2010, the volume of innovative products in Kazakhstan significantly increased in comparison with 2009 at 72.1% and amounted to 142 166,8 million Tenge (about 725,02 M euro). There were provided innovative products (new or significantly improved, better quality technologies or services) on 18 240.4 M Tenge (about 93,022 M euro), which is 2.4 times higher than the previous year. This circumstance indicates that Kazakhstan strongly depends on foreign developments and has already implemented and used technologies to manage and modernize its industrial base. It should be noted that the distribution
of innovative products in the total domestic production of industrial enterprises in 2010 amounted only 1.2% (2.4% in 2006). For comparison: the share of innovative-active enterprises in Germany are 80%; in USA, Sweden, Italy, France around 50%; in Russia-9.1%.

Among the innovative products of industrial enterprises largest share of innovative products belongs to products, newly introduced or exposed to significant technological change - 89.8%; products, subject to improvement, amounted 9.5%, and other innovative products - 0.7% (Diagram 5).

In accordance to the Law of the Republic of Kazakhstan No. 135 dated 23.03.2006 “About State support for innovation activity” definition of innovative products is the following:

- Innovation is result of scientific or research and technology development activity, which is subject of the intellectual property rights and implementation of which into different spheres of industry and governance is recognized as economically effective and/or socially and ecologically;
- Innovation grant is transfer from budget, assigned by terms of the agreement between the grantors and grantees to realize RTD project, development of technical and economic background for innovation project, patenting of industrially targeted properties at the foreign countries and/or at the international patent institutions;
- Innovation project is set of activities aimed to implement innovations and to foresee investments, which are realized within certain period and which have a complete form;
- Innovation infrastructure is the system of interacted specialized subjects of the innovation activities of Kazakhstan;
- Innovation fund is legal body supporting the innovation activity by funding the innovation projects and infrastructure, as well as by providing service in the sphere of innovation activity;
- Innovation activity is utilization of innovation by its implementation into different spheres of the industry and governance.
Dark red color in the Diagram 5 show amount of new products or products subjected to significant technological modification. Red colour is used to identify the modified product. Pink colour is definition of other innovative products, which are mostly re-introduced or slightly modified product.

Almost 90% of new or significantly modified technologies belong to the manufacturing industry. The largest portion of investment in innovation projects in 2010 accounted for own means of enterprises - 93%, foreign investments - 3%, the national budget - 2%.

Total costs of technological innovation in 2010 amounted to 235,501.7 M Tenge (about 1,201.01 M euro), including costs of purchasing machinery and equipment related to the technological innovations and accounted for 26.7%, to research and development of new products, production processes it was directed - 10.9 %, on purchase of new technology only - 7%, which increases the tendency to innovative dependency to industrialized countries. The rest 55% are expenses for technological innovations.

Insufficient level of innovation activity is exacerbated by low-impact implementation of technological innovations. Nevertheless, the costs of technological innovation grow at the same time even faster, almost 7 times.

**Table 1**

<table>
<thead>
<tr>
<th>Ratio of volumes and costs of innovation products, M Tenge</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M Tenge</td>
<td>74,718.5</td>
<td>120,408.4</td>
<td>156,039.9</td>
<td>152,500.6</td>
<td>111,531.10</td>
<td>82,597.4</td>
<td>142,166.8</td>
</tr>
<tr>
<td>M euro</td>
<td>440.12</td>
<td>724.29</td>
<td>993.49</td>
<td>914.52</td>
<td>628.45</td>
<td>405.17</td>
<td>725.02</td>
</tr>
<tr>
<td>expenses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M Tenge</td>
<td>35,360.3</td>
<td>67,088.90</td>
<td>79,985.90</td>
<td>83,523.40</td>
<td>113,460.0</td>
<td>61,050.9</td>
<td>235,501.7</td>
</tr>
<tr>
<td>M euro</td>
<td>208.29</td>
<td>403.56</td>
<td>509.26</td>
<td>500.88</td>
<td>639.32</td>
<td>299.48</td>
<td>1,201.01</td>
</tr>
<tr>
<td>Coefficient of expenses effectiveness for R &amp; D</td>
<td>2.29</td>
<td>2.15</td>
<td>2.18</td>
<td>2.00</td>
<td>1.14</td>
<td>2.66</td>
<td>0.65</td>
</tr>
</tbody>
</table>

Source: Calculated according data of Statistics Agency of RK

It should be taken into account that business in Kazakhstan is in the process of modernization of production capacities and dominance of ways to update the technology investment for it is quite natural.
Self-assessment of the Kazakh R&D and Innovation System – Strengths and Weaknesses

General policies and the role of R&D and innovation of Kazakhstan

State innovation policy - an integral part of socio-economic policy, which expresses relation of state to innovation, defines the goals, directions, forms of public authorities of the Republic of Kazakhstan in the field of science, technology and implementation of science and technology achievements.

The state scientific and technical policy of the Republic of Kazakhstan on the long-term and intermediate term perspective is oriented on solving major national problems: providing the country with foodstuffs, materials, energy, guarantee of national security increase of the quality of public health services, preservation of environment, stimulation of employment of the population, development of transport and communication, increase of the competitiveness of the economy on the basis of the development and application of advanced technologies to the leading branches of science.

Since June 2007 Kazakhstan implements the State Programme on Science Development in Kazakhstan for 2007-2012. The aim of the programme is to achieve a competitive and balanced system of science providing a high level of knowledge relevant for a sustainable socio-economic development of the country. Main goals of the research system included in the programme are the modernisation of the RTD management system and the RTD infrastructure as well as its legal background and increasing governmental financial support for RTD.

In 2010, the Government of Kazakhstan adopted a new State programme for Accelerated Industrial-innovative development of Kazakhstan for 2010-2014 elaborated in accordance with the key areas of the Strategic Plan of Development of Kazakhstan until 2020, which is the second stage of Kazakhstan Development Strategy up to 2030. The programme is aimed at ensuring the sustainable and balanced economic growth through diversification and an increased competitiveness. In 2015 the main priority of the rapid industrialisation will be the implementation of major investment projects in the traditional export oriented sectors, with animation of new business opportunities for small and medium-sized businesses through the purposeful development of local content, the subsequent redistribution and recycling. Systematic measures of the economic policy will focus on the formation of a favourable macro environment and an investment climate, but also on measures to improve productivity and competitiveness of the national economy.


Further development of research and innovation system in Kazakhstan, corresponding to the new realities and the prospects for long-term development of the country, faced with systemic problems, such as:

strengthening the gap between interdisciplinary connections and chain "basic research - applied research - industrial production";

2 Presidential Decree, Republic of Kazakhstan March 19, 2010 № 958
the gap between science and education, there are no synergies between research and education: research results are not used in the education, and research does not involve youth; availability of low demand from the real sector of the economy in perspective, in terms of their commercial application, the results of scientific and technological activities. The major economic factors constraining innovation activity of enterprises of real sector of the economy are:

- the lack of own funds for the expansion of this activity, the high cost of innovation, economic risks and long payback periods;
- low level of development of small innovation entrepreneurship (including, SE without forming a legal entity), the existence of legal restrictions that prevent the use of budgetary funds allocated to research organizations to develop innovative activities, primarily to the creation of innovative enterprises;
- outdated scientific equipment and testing facilities limit the implementation of existing human research potential and the attractiveness of scientific activities for young professionals;
- low capitalization of research results and, consequently, insufficient attractiveness of research institutions and innovative enterprises as an investment and lending;
- lack of development of economic and legal mechanisms to implement the results of intellectual activity into economy turnover

Interdisciplinary plan of scientific and technological development of the country until 2020, approved by the Decree of the Government of Kazakhstan No. 1291 on 30.11.2010, significantly impacts to use traditional industries in order to maximize national welfare of Kazakhstan, as well as to build-up the foundation for the development of new industries in the economy based on new research and technology.

It is important to understand long-term plan. Degradation of the scientific and technological areas in the country in the last 20 years, the loss of many experienced manufacturing and design institutes, brain drain, inadequate funding for R&D led to a decline of the intellectual potential of the country in many areas. Restoration of this potential, its output to the level of global competitiveness is main aim of the Plan.

The Plan focuses on development of key scientific and technological priorities of Kazakhstan, taking into account certain internal features of the country, the prospects for national economic development, and the world trends. The Plan accelerates creation of basis of technological leadership in key areas of Kazakhstan, in order to ensure the competitiveness of the country.

The main document summarizing Kazakhstan's diversified economic strategy is the "State Program of Accelerated Industrial-Innovative Development" (SPAIID). SPAIID outlines the national plan for transforming the economy of Kazakhstan in accordance with the abovementioned goals. SPAIID seeks to provide an integrated, interrelated, and systematic approach to economic development based on technological innovation.

SPAIID focuses on next strategic areas:

- implementation of strategic policy to diversify the economic structure based on overcoming the one-sidedness of its raw materials;
- support rapid development in the consumer sector, which creates conditions for increasing the level and quality of life - the priority national projects in health, education, housing and agriculture;
• modernizing the mineral-based sectors as well as the agricultural sector to add value to and diversify the economy towards sectors in which international competition is feasible, such as machine building, petro-chemicals, food processing, and basic pharmaceuticals, etc.;
• increasing competitiveness and improving the structure of the economy and foreign trade of Kazakhstan on the basis of realization of a strategy of innovation breakthrough.

The implementation of the Strategy of Industrial and Innovation Development of Kazakhstan defines three phases.
In the first phase, in 2003-2005, there will be changes in legislation, industry development program, identified the funding of science, education, and training of specialists. There will also be created by development institutions, through which the state will ensure their participation in the program.
The second phase, 2006-2010, involves the examination of private sector initiatives, looking for investors – participants in the implementation of selected projects, training, construction and reconstruction of main and auxiliary facilities.
In the third stage, in 2011-2015, will complete the whole complex of organizational measures and accelerate the development of competitive manufacturing. The result of the Program will be changing the structure of the economy and diversification of exports.
**Institutional set-up of the Kazakh R&D and Innovation System**

For 2010 the State Statistics Agency of Kazakhstan registered 424 organizations, which are engaged in research and development. This figure shows only registered organizations in accordance to their activities included into their formal statutes, not saying about their technological and innovative products. In comparing with 2000, in 2010 the number of scientific institutions are increased by 167 units, or 61.1%, mainly due to increase of number of institutions of higher education (public and private universities) (2.7 times) and other companies (2.6 times).

The basis of the scientific sphere in Kazakhstan is research institutes, most of which are separate from production and education. In 2010, the number of research institutions comprised 133 units. And share in the total aggregate of all organizations of science – 31.4%. Share of scientific activities carried out by 121 institutions of higher education is 28.5%. The rest 40% are R&D, technological organizations, industrial companies and others.

An important indicator that reflects the level of scientific and technological potential and the dynamics of its development is the funding of science. Stable financial position of scientific organizations is a necessary condition for research. In Republic of Kazakhstan, for 1995-2010 funding for science has increased in real terms by 31.4%.

Table 2 below shows amount of funding the science during this period. These are internal expenses for research and development. Table 1 describes volumes and expenses for innovative products and not for researches.

**Table 2**

**Dynamic of GDP and volume of expenses for R&D in Kazakhstan for 2000-2010, B Tenge**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>years</th>
<th>2000</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010**</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP volume</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tenge</td>
<td></td>
<td>2,599.90</td>
<td>7,590.60</td>
<td>10,213.70</td>
<td>12,849.80</td>
<td>16,052.90</td>
<td>17,007.70</td>
<td>21,815.51</td>
</tr>
<tr>
<td>Euro</td>
<td></td>
<td>19.36</td>
<td>45.66</td>
<td>65.03</td>
<td>77.06</td>
<td>90.45</td>
<td>83.43</td>
<td>111.25</td>
</tr>
<tr>
<td>Volume of S&amp;T executed works</td>
<td></td>
<td>6.10</td>
<td>29.60</td>
<td>35.57</td>
<td>37.04</td>
<td>49.78</td>
<td>46.83</td>
<td>57.51</td>
</tr>
<tr>
<td>Tenge</td>
<td></td>
<td>0.05</td>
<td>0.18</td>
<td>0.23</td>
<td>0.22</td>
<td>0.28</td>
<td>0.23</td>
<td>0.29</td>
</tr>
<tr>
<td>Euro</td>
<td></td>
<td>0.04</td>
<td>0.18</td>
<td>0.23</td>
<td>0.22</td>
<td>0.25</td>
<td>0.24</td>
<td>0.23</td>
</tr>
<tr>
<td>Gross expenses for R&amp;D, total</td>
<td></td>
<td>6.00</td>
<td>29.20</td>
<td>35.59</td>
<td>37.15</td>
<td>44.60</td>
<td>49.03</td>
<td>46.08</td>
</tr>
<tr>
<td>Tenge</td>
<td></td>
<td>0.04</td>
<td>0.18</td>
<td>0.23</td>
<td>0.22</td>
<td>0.25</td>
<td>0.24</td>
<td>0.23</td>
</tr>
<tr>
<td>Euro</td>
<td></td>
<td>0.04</td>
<td>0.18</td>
<td>0.23</td>
<td>0.22</td>
<td>0.25</td>
<td>0.24</td>
<td>0.23</td>
</tr>
<tr>
<td>including:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>external</td>
<td></td>
<td>1.30</td>
<td>7.70</td>
<td>10.80</td>
<td>10.31</td>
<td>9.84</td>
<td>10.04</td>
<td>12.61</td>
</tr>
<tr>
<td>Tenge</td>
<td></td>
<td>0.01</td>
<td>0.05</td>
<td>0.07</td>
<td>0.06</td>
<td>0.06</td>
<td>0.05</td>
<td>0.06</td>
</tr>
<tr>
<td>Euro</td>
<td></td>
<td>0.01</td>
<td>0.05</td>
<td>0.07</td>
<td>0.06</td>
<td>0.06</td>
<td>0.05</td>
<td>0.06</td>
</tr>
<tr>
<td>internal</td>
<td></td>
<td>4.70</td>
<td>21.50</td>
<td>24.80</td>
<td>26.84</td>
<td>34.76</td>
<td>38.99</td>
<td>33.47</td>
</tr>
<tr>
<td>Tenge</td>
<td></td>
<td>0.04</td>
<td>166.24</td>
<td>157.06</td>
<td>166.75</td>
<td>177.47</td>
<td>203.86</td>
<td>196.09</td>
</tr>
<tr>
<td>Euro</td>
<td></td>
<td>0.04</td>
<td>166.24</td>
<td>157.06</td>
<td>166.75</td>
<td>177.47</td>
<td>203.86</td>
<td>196.09</td>
</tr>
<tr>
<td>Share of expenses for R&amp;D in GDP, %</td>
<td></td>
<td>0.18</td>
<td>0.28</td>
<td>0.24</td>
<td>0.21</td>
<td>0.22</td>
<td>0.24</td>
<td>0.16</td>
</tr>
<tr>
<td>Expenses for R&amp;D from</td>
<td></td>
<td>1.90</td>
<td>11.00</td>
<td>14.20</td>
<td>13.70</td>
<td>15.10</td>
<td>21.54</td>
<td>No data</td>
</tr>
</tbody>
</table>

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In 2010, domestic expenses on research and development accounted for 33,466.8 million Tenge (about 196.09 M euro). As a result, the share of R&D expenditures in GDP - a key indicator of scientific and technical potential of the country - in 2009 was 0.24% vs. 0.18% in 2000. In 2010, expenditures on R&D sharply decreased and became equal to 0.16 % of GDP. The share of spending on science recommended by the International Academic Council³ for developing countries is between 1-1.5% of GDP.

Table 3
Weight and growth rate of domestic spending on R&D by type of activity *

<table>
<thead>
<tr>
<th>Resource of funding</th>
<th>Expenses</th>
<th>Growth rate (in times)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2000</td>
<td>2009</td>
</tr>
<tr>
<td></td>
<td>Mn. Tenge</td>
<td>MEUR</td>
</tr>
<tr>
<td>Domestic expenses on R&amp;D (at current prices)</td>
<td>4,706.9</td>
<td>35.1</td>
</tr>
<tr>
<td>Capital expenditures</td>
<td>42.8</td>
<td>0.3</td>
</tr>
</tbody>
</table>

* on the basis of data of Statistics Agency of RK
Kazakhstan gives up to developed countries on this indicator in more than 10 times

³ International Academic Council - [http://www.interacademycouncil.net/23450/27799.aspx](http://www.interacademycouncil.net/23450/27799.aspx) The InterAcademy Council (IAC) is a multinational organization of science academies created to produce reports on scientific, technological, and health issues related to the great global challenges of our time, providing knowledge and advice to national governments and international organizations.
Governance issues: R&D and innovation policy formulation structures and processes (ministries, councils, commissions, advisory bodies, etc.)

Tasks to improve the management system of scientific-technical sphere and the mechanisms of financing of science is to implement the new Law of the Republic of Kazakhstan "On Science", which provides a unified coordination and administration of research programs by authorized body in S&T sphere, taking into account the expert opinion of the scientific community, including the following area:

Development of system definition and implementation of breakthrough scientific fields, clear procedures for participation in setting priorities in the scientific and expert community (the formation of the National Research Council and the National Centre for State S&T expertise);

Selection and analysis of the priority areas of S&T of the Republic of Kazakhstan, the formation of a specific list of perspective scientific research and critical technologies for the benefit of priorities for technological development and their support with the use of public-private partnership;

Development of basic and program-oriented approach with application of basics and principles of "result management", competitiveness, objective expertise and strict reporting;

Increase spending on research and development, both in absolute and relative expression in combination with a concentration of resources on the programs implemented by leading academic, scientific and educational centres.

Under the new law of RK "On Science" a new system of research funding is introduced. Clearly demarcated sources of financing of maintenance of public research organizations (basic funding), and own research projects (grants and program-targeted). The procedure of organization of research funding (grant, program-target):

- determination of priority directions of development of national science, competitions and projects and programs;
- the announcement of target programs calls or grant competitions for basic and applied research;
- the participation of research centres, research institutes, universities in program calls and projects;
- expertise of submitted projects or programs involving local and foreign experts-evaluators;
- determination of the projects approved for financing, and transferring them to the commissioner and / or industry authorities;
- approval of the list of projects and programs to be funded.

State scientific and technical evaluation is carried out in order to prepare an analytical evaluation of scientific, technical and innovative projects and programs on the principles of independence, objectivity, competence, integrity, authenticity, completeness and validity of expert opinions. State scientific and technical evaluation of scientific, technical and innovative projects and programs to be funded from the state budget is carried out by the competent foreign and Kazakh experts.
In order to attract experts to conduct scientific and technical expertise creates a database of international experts nominated by the leading foreign universities, research institutions, national academies of science and scientific communities. The selection of experts shall be in accordance with their specialization and the characteristics of the project. Scientists, experts, including foreign, involved in the evaluation of scientific, technical and innovative projects and programs are required to maintain confidentiality and ensure the preservation of trade secrets submitted to the examination of materials.

The Intergovernmental S&T Cooperation must meet the challenges of development and reform of Kazakhstan science in a market economy in view of foreign policy and foreign economic policy of the country. Differences between the intergovernmental and international cooperation are still not clearly identified in the scientific literature, but there is strong recommendation to recognize the intergovernmental cooperation as the cooperation, which has strong legislative basis or supported by the laws of the governments while parties in the international cooperation keep mostly rules of own states and follows special clauses of the international cooperation agreement.

The Government of the Republic have a particular interest (in the long-term program of innovation and industrial development and strategy for becoming one of the top fifty most competitive countries in the world) in the further implementation of a balanced and responsible foreign policy, development of comprehensive cooperation with the European Union with greater richness in regional and international security, economic and cultural, scientific and technological development, creating a European political partners for favourable conditions for investment activities of major international projects in the country and attracting advanced technologies and knowledge.

The structure of goals and objectives of the Intergovernmental S&T Cooperation directly or indirectly affected by today's geopolitical and geo-economic processes. They are characterized by trends of globalization and integration of world economy, widespread use of information technology. Traditional forms and mechanisms of international cooperation in science and technology have changed, as well as the state's role in the regulation of these processes. Close interconnection of scientific and technological, and foreign trade and economic policy in the sphere of international scientific cooperation is planned.

The sectoral Program on Science Development in the Republic of Kazakhstan for 2011-2015 describes that these factors determine the following long-term strategic objectives for the international S&T cooperation:

- full and cost-effective participation of the Republic of Kazakhstan in the global integration processes in science, technology and knowledge-intensive production;
- improving the competitiveness of the national science and technology, the output of the Republic of Kazakhstan on the world market of intellectual products, high technology products and services;
- the development of new forms of international cooperation;
- harmonization of infrastructure of international S&T cooperation and its adaptation to international practice.
Co-ordination of S&T policy includes identification of priority areas of cooperation in key areas of science and technology to achieve common standards and methodologies of research, avoiding duplication in research and development and the fullest use of existing infrastructure and resources.

The major direction of S&T policy is the development of international S&T cooperation with industrialized countries, the implementation of the existing potential in local basic science for a decent position in the international integration, cooperation and division of labour in the field of basic science, participation in solving human problems, the implementation of global projects and programs. Intergovernmental S&T Cooperation focused on the practical use of the achievements of Kazakhstan science in addressing global issues and sustainable development of modern civilization (environment, energy, global climate change, global information infrastructure, etc.).

The program states that with regard to applied research policy Intergovernmental S&T Cooperation should be directed to the development of cooperation in priority areas of science and technology, carried out with leading international and national research centres in Western Europe, USA, Korea, China, South-East Asia (SEA). Everything possible is being done to spread abroad the achievements of national science. It is helpful to make active use of existing infrastructure for this purpose.

In January 2012, the law "On state support for industrial innovation" was signed. It aims at establishing the legal, economic and institutional frameworks to promote industrial innovation in the priority sectors of the economy and the identification of measures of state support. The objectives of the state support of industrial and innovation are:

- creating and enabling environment for the development of priority sectors;
- providing conditions for the development of new competitive industries;
- creating favourable conditions for modernization (technical modernization) of existing facilities to increase productivity, as well as lengthening of the production chain and market expansion;
- supporting the effective implementation of innovations and development of high-tech productions;
- increasing the investment attractiveness and export potential industrial innovation;
- assisting the subjects of industrial and innovation in technology commercialization;
- assisting the subjects of industrial and innovation in the development of export potential;
- development of the research base in the priority sectors of the economy and its integration with the production process;
- assisting the subjects of industrial and innovation activity in international cooperation in the field of industrial-innovative activities, including cooperation in the training of skilled personnel for industrial innovation.

The law requires the formation of industrial-innovative small and medium businesses, ensuring a comprehensive and rational industrial-innovative development of the regions of the republic, increasing productivity and productive capacity.
The law "On state support for industrial innovation" aims at introducing innovation management technologies, creation of Council on Technology Policy of the Government, which determines the direction of innovative development, the national carrier of technological development, which will be responsible for coordinating the development of innovative and technological upgrading. The Technology Policy Council (TPC) is created by the Resolution of the Government of the Republic of Kazakhstan # 1386 dated November 29, 2011. The main objectives of the Council on Technology Policy are:

- determination of the main directions of state policy in industrial innovation and the list of technology programs proposed for development,
- determination of the main directions of implementation of grant programs,
- formation of list of high-and medium technology products.

The working body of the Council on Technology Policy is the Ministry of Industry and New Technologies of the Republic of Kazakhstan. To ensure the effectiveness of innovation policy as a national operator of technology development a joint-stock company "National Agency for Technological Development" has to be created by September 2012 and will play a role of a single operator to coordinate the processes of innovation development and provision of government support measures. This Agency will continue implementation of main task of the National Innovation Fund – funding of innovation and new technological projects.

The functions of the Agency will include: work on the development of innovative systems, information-analytical support of innovative development, carrying out works on technology foresight and planning. Coordination of technology programs topics, the monitoring results of carried out projects, creation of data bank on innovation projects and implementation services for commercialization, management of innovation infrastructure, cooperation with international organizations with a view to bringing their information, education and financial resources.

In accordance with the Law of the Republic of Kazakhstan “On State Support of Industrial Innovative Activities” the Ministry of Education and Science is responsible for education and training of staff requested by industry and SMEs of the real sectors of the economy. Priorities of the education in these fields will be identified at joint meetings of different ministries and agencies members of the TPC.

At the Forum "Innovative Kazakhstan - 2020" President Nursultan Nazarbayev outlined the priorities of the Science of Kazakhstan. In the framework of Intersectoral Science and Technology Plan, the State must combine the scientists and production; create direct order from the industry to science, because it is necessary to modernize the scientific research base of the country and system of management of innovation. The Highest Scientific and Technical Committee (HSTC) and Technology Development Policy Council should include representatives of business, science, national holdings and companies. It is necessary to ensure their clear interaction. Need to review the activities of the holding "Parasat", making it an effective state operator in science sphere. It should provide an opportunity for scientists to commercialize innovations and intellectual property.

created in the frame of budget financing; it should define priority innovative technologies, products and services to balance them through the Intersectoral Science and Technology Plan; bring into line with international practice the structure of R&D funding, raising the innovative part. A key issue for innovation should be the staff support.
R&D and innovation policies, programmes and their implementation structures and processes

Policies and strategies

Based on a detailed analysis of global and domestic trends in the development of science and technology, as well as the results of positioning the level of competitiveness of Kazakhstan in comparison with other countries, expert groups consisting of highly qualified 33 experts-evaluators from different sectors of economy, scientific and academic sphere headed by the National Innovation Fund and the Institute of Economy Research of Kazakhstan formulated a vision, goals and objectives of scientific and technological development of Kazakhstan until 2020. The list of products and services that are necessary for Kazakhstan to achieve the desired variant of development up to 2020 is determined.

The introduction of technological forecasting and planning in Kazakhstan developed by the joint team of experts is primarily focused on:
- Identification of priority sectors of technological development;
- Evaluation of possible innovations and technological solutions to critical technologies;
- Establishing programs for scientific and technological development in priority sectors.

The National Innovation Fund, which organised number of reviews of innovation and new technologies system of Kazakhstan, is one of main operators of the innovation process in the country. It was established in 2003 to promote innovation activity in the country and to develop technology-intensive enterprises. To support the innovation in Kazakhstan the NIF realizes the following activities:

- Grant financing for innovation projects: in 2010 the Government started to provide 4 types of innovation grants: R&D, Proof of Concept, Patenting in foreign organizations, and Purchase of technologies. Since 2011 NIF is the operator of innovation grant program. The total amount of money available for 2011 is $50 mln.
- Technological business incubation: set of activities for assistance of realization of innovation projects by leasing of facilities and technological equipment, providing educational, technological and informative consulting. It is planned to support in 2010 – 36 projects, and in 2011 – 40 projects.
- Contribution into the “PRODUCTIVITY 2020” Program: in the March 2011 the Government of the Republic of Kazakhstan approved the Program “Productivity 2020” directed to the rising of industrial enterprises competitiveness in the economic sectors with high priority by increasing of labour productivity. Four types of instruments:
  - technology purchase grants
  - attraction of highly qualified human resources
  - introduction lean and production technologies
  - attraction of engineering and project companies
- Development of Commercialization System in Kazakhstan: NIF is conducting competitive selection of commercialization offices under scientific-research institutes and universities, selecting of 18 projects for Proof of concept and 7 projects for further commercialization.
To realise one of its main tasks as information-analytical support the NIF has supported “Innovation Performance Review of Kazakhstan” undertaken in 2011 at the request of the Government of Kazakhstan by the UNECE and jointly implemented by international and national experts and supported by the Eurasian Development Bank. This critical review of the national innovation system and innovation policy framework provides concrete policy recommendations in these areas.

“Stimulating Industrial Innovation in Kazakhstan” undertaken by the NIF and the Columbia University (USA) also in 2011 identifies most relevant hurdles for innovation in Kazakhstan, the consolidation of five hurdles as focus topics, the selection of five benchmark countries, and the investigation of best practices centred on these five topics from the benchmark countries and develops policy recommendations for Kazakhstan based on best practices observed in strategically selected benchmark countries.

Analysis of the current policy of state regulation of industrial innovation concludes that the authorized state body responsible for the development and implementation of industrial policy - innovative development is the Ministry of Industry and New Technologies of the Republic of Kazakhstan, whose functions include: making proposals to the Government of the Republic of Kazakhstan on the priority areas of innovation, selection of innovative grants, implementation and monitoring evaluation of the implementation of innovative projects at the expense of innovation grants, state control over the execution of the legislation of the Republic of Kazakhstan on state support for innovation, including the implementation of measures of innovation development.

The Ministry of Education and Science of Kazakhstan is the authorized body responsible for the formation, implementation and coordination of all basic and applied research in the country, state, and the development of research infrastructure, training and development of scientific personnel, as well as conducting research of the State Examination research projects and programs implemented by the state budget.

Innovation activity in the country is governed by Laws of the Republic of Kazakhstan "On state support of innovative activity" and "On Science." The disadvantages of the current legislation in the area of innovation is the lack of the center responsible for the development and implementation of unified state policy in the field of innovation and technological development and, consequently, lack of coordination between government agencies and institutions of innovation development, scientific research organizations and enterprises of the real economy.
Results of the first National Scientific-Technological Foresight in Kazakhstan

Cooperation with Korean Institute of Scientific-Technological Evaluation and Planning (KISTEP)

KISTEP jointly with NIF during 2010-2011 is building the system of foresight conducting and carrying out the first National Scientific-Technological Foresight in Kazakhstan.

The examples of critical technologies for Kazakhstan

- The technologies of direct recovery of iron
- The technologies of production of goods from alloys with the memory of forms
- The technologies of nanomaterials for increasing of extraction of useful subsistence from ore rocks
- Road Map of Mining and Metallurgical complex
- Road Map of Agriculture Industrial Complex
- Road Map of ICT
- Road Map of Oil and Gas sectors

Based on conducted researches, the following mega-trends of development of science and technologies were classified to the major domestic and global mega-trends which will have a significant impact on the development of Kazakhstan till 2020:

- Raising the profile of issues related to environment and natural resources;
- Globalization and the transition to a knowledge economy;
- Changes in the structure of social attitudes and mentality of the population;
- Strengthening links between science, education and industry;
- The emergence of new problems related to security.

Based on the results of foresight researches in 2012 it is planned to develop targeted technology programs. List of developing target technology programs approved by the Technology Development Policy Council under the Government of the Republic of Kazakhstan, while in 2012, provides funding on developing of 10 pilot target technology programs.

The target technology program will be a tool for mobilizing all stakeholders (government, business, academia) to solve the technological problems of the business for the long term within the scientific and technological development. Realization of the target technology program is based on the principles of co-financing with the business.

It is assumed, that the target technology programs will be an effective mechanism for public-private partnership in the sphere of science and technology in the long term and can play a positive role in enhancing the competitiveness of various sectors of the economy.

According to the Report on trends of the innovation development in the world and in the Kazakhstan developed by the National Innovation Fund in 2011 the main goal of scientific technological development is to build competitive systems for the generation of knowledge (62%), the growth of successful innovative companies (55%), and resource efficiency for modernization of
industry, regional development and international integration in order to promote innovation (by 53%), innovation for welfare (52%).

At present, in terms when Kazakhstan comes away from being source of raw materials, but still is in transition to innovative development, there is need to build up all areas of scientific and technological breakthroughs in the future, owing to the underdevelopment of science and innovation sector in the country.

In this regard, it is necessary to have the state selective investment support by which the state will be able to develop those scientific and technological directions in which there is a basis. State innovation policy is aimed at achieving the following objectives:

- creating conditions for increasing innovative activity of entrepreneurs;
- development of science and its focus on solving problems of innovative development of the country;
- development of cooperation between research centres and enterprise, improving the mechanisms of diffusion and transfer of knowledge;
- support for cutting-edge areas of innovation and technological trends.
Programmes (bottom up schemes, sectoral and functional programmes, direct vs. indirect funding)

Since 2003 Kazakhstan is oriented to the modernization of the economy by strengthening the industry and innovation activity, and since that time the Kazakh Government is approved 11 special laws and decrees for these fields.

Law of the Republic of Kazakhstan № 373-II "On Investments" were approved on January 8, 2003. It is amended and supplemented by the Law of RK of 04.05.05 № 48-III, from 31.01.06 № 125-III, on 19.02.07, № 230-III. This law regulates the relations connected with investments in Republic of Kazakhstan, and defines the legal and economic framework for investment incentives, guarantees the protection of investors for investments in the Republic of Kazakhstan; defines measures of state support of investment, arbitration of disputes involving investors.

In order to ensure sustainable development of Kazakhstan through diversification and modernization of the economy and creating conditions for the production of competitive products and export growth, the Decree of the President of the Republic of Kazakhstan as of May 17, 2003, was approved by the Strategy of Industrial and Innovation Development of Kazakhstan for 2003-2015.

The authors of this strategy is the Ministry of Economy and Budget Planning of Kazakhstan jointly with the Ministries of Industry and Trade, Science and Education, Transport and Communications, Labor and Social Protection, Energy and Mineral Resources, Finance of the Republic of Kazakhstan Agency for Regulation of Natural Monopolies and Protection of Competition National Bank.

Strategy of Industrial and Innovation Development of Kazakhstan aims to shape public policy of Kazakhstan for the period until 2015 and aims to achieve sustainable development through economic diversification and away from raw materials to processing. The main objectives of the Strategy of Industrial and Innovation Development of Kazakhstan are:

- providing the manufacturing industry average growth rates in the range of 8-8.4%, increase in labour productivity by 2015 compared to 2000 at least 3 times and reducing energy intensity of GDP by 2 times;
- increasing productivity of fixed assets of manufacturing;
- creating the business climate, structure and content of public institutions that will encourage the private sector, and improve the competitive advantage to master the elements in the chain of value added in specific industries, ensuring the greatest value;
- encourage the creation of high-tech export-oriented industries;
- diversification of the export potential of the country in favour of goods and services with high added value, the transition to international quality standards;
- development of integration with regional and global economy with participation in global science and technology and innovation.

Production and export of competitive goods and services in the manufacturing and service sector is the main subject of the state's industrial and innovation policies. Against the backdrop of a
globalized world economy, Kazakhstan's economy faces a number of objective problems, among which are: raw-material orientation, little integration with the global economy, weak inter-sectoral and inter-regional economic integration within the country, the low consumer demand for goods and services in the domestic market (small economy), underdevelopment of the industrial and social infrastructure, the overall technical and technological backwardness and lack of effective communication of science and production, lower costs for research and development activities (hereinafter - the R & D), incompatibility of management problems of the economy to adapt to globalization and the transition to service and technology economy.

Therefore, to solve problems and achieve goals and objectives of the Strategy is supposed to strengthen the functioning of institutional structures such as the National Fund of Kazakhstan JSC "Development Bank of Kazakhstan", JSC "Investment Fund of Kazakhstan", JSC "National Innovation Fund" which are the major tools of the implementation of the Strategy. In general, these institutions will pursue a policy of investing in new and developing existing industries with high added value and support scientific and technological research and development on the basis of comprehensive analysis of the promising sectors identify their most important elements.

The Law No. 135 “On state support of innovation” dated March 23, 2006 establishes the legal, economic and organizational framework to stimulate innovation in the Republic of Kazakhstan and determine the measures of state support. The objectives of the implementation of state support for innovation are:
the development of innovative potential of the Republic of Kazakhstan;
increase the share of high-tech products in the gross domestic product,
facilitate the transition of Kazakhstan's economy on a path of innovative development based on the introduction and use of high technologies.

The Law of Kazakhstan No. 237 dated on 02.03.2007 “On introducing amendments and addenda to some legislative acts of the Republic of Kazakhstan on issues of intellectual property” identified types of rights and basic concepts of the intellectual property explaining different rights and ways how to protect them.

The program for the development of innovation and the promotion of technological modernization in the Republic of Kazakhstan for 2010-2014 is described in point 3.4.1.


The responsible state agency for the Program is the Ministry of Industry and New Technologies. The aim of the Program is building a national innovation system to ensure competitiveness of the economy through the creation of management systems of innovation - technological development, innovation development of industries and regions, creating conditions for the development of high-tech small and medium enterprises and enhance the scientific and engineering potential of the country.
The development of this program due to the need is to develop a set of integrated, inter-related actions of a systemic nature, an effective national innovation system, which includes the mechanisms of generation, distribution and commercialization of knowledge.

State Program for Accelerated Industrial and Innovation Development of Kazakhstan for 2010 - 2014 is approved by the Decree of the President of the Republic of Kazakhstan on 19.03.2010, No. 958. The developers of the Program are the Ministry of Economy and Budget Planning of Kazakhstan and the Ministry of Industry and Trade of the Republic of Kazakhstan. The purpose of the Program is ensure sustainable and balanced economic growth through diversification and increasing its competitiveness. The Program’s objectives are:

Development of priority sectors, ensuring its diversification and increased competitiveness
Creation a favourable environment for the formation of centres of industrialization, economic growth based on a rational territorial organization of economic potential
Ensuring the effective interaction between government and business in the development of priority sectors

Funding of the Program requires resources and sources of the State budget and funds of enterprises, organizations, including the national companies and organizations with state participation. The amount of funding from the state and local budgets will be refined during the formation of the respective budgets for the planning period.

In 2015 the main priority policy of forced industrialization will be the implementation of major investment projects in the traditional export sectors of the economy, with new animation business opportunities for small and medium-sized businesses through targeted development of local content, subsequent redistribution and recycling.

The initiators of progress of major projects will be joint-stock company "National Welfare Fund" SK "(hereinafter - JSC" Fund "SK"), backbone of the company's fuel and energy and metallurgical sectors, as well as strategic foreign investors.

In parallel, will be the formation and / or strengthening of economic sectors, non-commodity sector and the domestic-oriented, and subsequently to the regional markets (countries of the Customs Union, Central Asia).

The State will support the initiative of Kazakh small and medium businesses, to transfer advanced technology to attract foreign investors to set up modern import-substituting industries, with the prospect of development of their export orientation.
In order to form the foundations of post-industrial economies continue to develop the national innovation infrastructure and support for scientific and technological groundwork, with prospects for commercialization.

In general, government support for economic diversification will be through the implementation of systemic measures of economic policy at the macro and sectoral levels, as well as selective support measures for specific sectors and projects.
S&TI Policy Mix Peer Review. Country Report Kazakhstan

System measures of economic policy will focus on the formation of a favourable macro environment and investment climate, measures to improve productivity and competitiveness of the national economy.

Selective actions will be based on a combined package of financial and nonfinancial support to priority sectors and projects. The state of system will build its engagement with business on the basis of the formation of effective institutions for cooperation at the national and regional levels.

Adequate objective of economic policy trajectory of industrialization by 2015 will have an internal consistency with the resource, infrastructure, institutional and technological constraints. Systemic, embedded in the program mechanisms promoting diversification and technological upgrading of the economy, provide:

- creation of favourable macroeconomic conditions;
- improving the business climate and encourage inward investment;
- massive technological upgrading and development of the national innovation system;
- improving the quality of human capital.

The concentration of state resources and business development in the priority sectors of the economy will be accompanied by an interactive process of harmonization of government and business solutions, using modern information systems for monitoring and implementation of specific tools.

Map of Industrialization of Kazakhstan for 2010-2014 is adapted by the Decree of the Government No. 303 on 14 April 2010, and includes 101 subjects of industrialization.

The Program "Productivity 2020" was developed as part of the Message of the President of the Republic of Kazakhstan to the People of Kazakhstan "New Decade - New Economic Growth - What's New in Kazakhstan," Strategic Plan for Development of Kazakhstan till 2020, the State program and protocol 23rd plenary meeting of the Council of Foreign Investors Republic of Kazakhstan № 01-8.1 on June 4, 2010. The program was developed with the methodological support of the World Bank and is one of the tools for implementing the State program of forced industrial-innovative development of Kazakhstan for 2010-2014.

The Transport Strategy of Kazakhstan till 2015 is approved by the Decree of the President № 86 on April 11, 2006. Its objectives are the integration of the transport system of Kazakhstan with the global transportation system, the formation of a single appearance of an integrated transport area, the creation of the modern perspective of the national transport infrastructure development and effective use of transit potential, to achieve the greatest efficiency of transport processes and the decline in transport cost of final products in the domestic, export and transit-import traffic, harmonization of national transport legislation with international legal norms and standards in regional and international organizations to strengthen the single economic space and the development of interregional links, as well as ensuring the availability of transport to a level that guarantees economic growth and social stability, improving the competitiveness of the transport system Kazakhstan through innovation and cluster development of infrastructure, ensuring the
safety of transport processes, reducing the number and severity of accidents in transportation, environmental safety and rational use of energy resources, the formation of favourable investment climate in the transport sector.

State Program of Education Development in the Republic of Kazakhstan for 2011–2020 approved by the decree of the President of the Republic of Kazakhstan No 1118 dated December 7, 2010. Developer of the Program is the Ministry of Education and Science of the Republic of Kazakhstan. Its goal is increasing competitiveness of education and development of human capital through ensuring access to quality education for sustainable economic growth. The Program objectives are the following:

- development of new mechanisms of education financing, increasing availability of quality education;
- training highly qualified staff for education sector;
- increasing state support and stimulating labour of teachers;
- improvement of education management including implementation of corporate governance principles;
- development of the public-private partnership system (further – PPP) in education;
- improvement of the system of monitoring education development, that includes establishment of national education statistics with consideration of international requirements;
- creation of conditions for automation of education process;
- enlarging the network of preschool organizations;
- updating the content of preschool education and upbringing;
- staff training for preschool education organizations;
- transition to 12-year education model and updating educational content;
- solution of problems of ungraded schools;
- improvement of inclusive education system in schools;
- updating the structure of the content of technical and vocational education according to the demands of the country’s industrial-innovative development;
- development of staff training infrastructure for the sectors of economy;
- enhancing prestige of technical and vocation education;
- training staff for undergraduate and postgraduate degrees meeting the demands of the country’s industrial-innovative development;
- integration into European higher education space;
- integration of education, science and industry; creation of conditions for commercialization of intellectual property products and technologies. Training highly-qualified scientific and scientific-pedagogical staff;
- creation of conditions for life-long education, education for all;
- implementation of a package of measures on patriotic education, encouragement of active citizenship and social responsibility and a mechanism of revealing youth potential;

Law of the Republic of Kazakhstan on Science approved on 18 February 2011 regulates the social relations of science and scientific and technological activities, defines the basic principles and
mechanisms of functioning and development of the national scientific system of the Republic of Kazakhstan.

The Law of the Republic of Kazakhstan "On state support of industrial innovation", signed by President of Kazakhstan Nursultan Nazarbayev on 9th January 2012. Law is aimed at establishing the legal, economic incentive and institutional framework of industrial innovation in priority sectors of the economy and the identification of measures of state support. In addition, the law clarifies and specifies the principles and objectives to support industrial innovation and determine the measures of state support.

Some outcomes of the Innovation Policy in 2010-2011.

**Technological Modernisation**
- 3 sectoral construction bureaus (CB) were established, one CB at the stage of registration, 52 construction technical documentation (CTD) was developed, purchased 53 CTD, produced five prototypes, four of which tested.
- The methodology and strategy for commercialization with the CNP (UK) was developed, has signed agreements with nine universities and research institutes to establish on their basis of their commercialization offices
- The Program Productivity- 2020 was developed. The budget of 19.9 mln.tg. Tools - equipment leasing, service of design and engineering organizations, attracting foreign specialists, implementation of management and production technology (increase energy-effectiveness, automation of production processes)

**Creation of basis of economy of future**
- The master plan of development of Social Economic Zone "Park of Information Technologies" (SEZ PIT) was worked out and approved. Managing Committee was founded, the board of trustees is being created. The managing company will be attracted.

The method of conducting of forecasting was developed jointly with KISTEP (South Korea), expert panels were conducted, the long list of critical technologies with attraction more than 1000 experts.

**Creation of favorable innovation environment**
- Two norms of tax stimulation : 150% for R&D and 1% of mandatory payments for R&D by subsoil users
- Two International centers of technology transfer with France and Korea. The negotiations with Germany and Finland are being conducted.

- Two innovation congresses in 2010-2011, 300 experts, from 14 countries
- Calls of reasonable proposals, business-plans, best articles about innovation. Coverage - 1.2 mln. people, leading TV channels of Kazakhstan

- Innovation grants – 7.5 bln. Tenge, 677 applications, business incubation – 306 mln. tenge., not less than 209 applications

The foundations for creating an innovation infrastructure were laid, improvement of organization structure of scientific and technological development of the country occurred.
Policy and programme implementation structures (e.g. ministries, funding agencies or councils), instruments (e.g. individual and collaborative R&D projects, networks, PhD and post-graduate fellowships, mobility grants, etc.) and processes (e.g. calls for proposals, evaluation and selection, programme monitoring and evaluation)

The National Scientific Councils (NSC) are created by the Decrees of the Government № 519 dated 16.05.2011 “About national scientific councils”, and № 785 dated 12.07.2011 “Confirmation of structure of the national scientific councils” in order to realize point 6 of the Article 3 of the Law of Kazakhstan “On Science”. There are 5 NSC in the following priority areas of science:

- Energy (includes 14 members: 12 from different institutions of Kazakhstan + 1 from the Belgian Royal Academy of Science, and 1 from the Cambridge Central Asia Forum);
- Deep processing of raw materials and products (14 members from different institutions of Kazakhstan + 1 from Russian State Technical University);
- Information and Communication Technologies (11 members from Kazakhstan + 1 from Russian Academy of Sciences, and 1 from the London Imperial College);
- Life sciences (10 members from Kazakhstan + 1 from Russia and 1 from USA);
- Intellectual potential of the country (11 members from Kazakhstan + 1 from Russia and 1 from USA).

Members of the National Scientific Councils are authorized competent representatives of Kazakhstan and foreign countries including national managing holdings, national institutes of development, national companies, SMEs, scientific organizations, universities and scientific public. The main objectives of national research councils are:

- Building-up specialized research areas in accordance with the priorities defined by the HSTC;
- Identification of types and amounts of funding scientific researches;
- Assessment of scientific novelty, scientific and technical level, perspectives, degree of elaboration proposed scientific, technical projects and programs, the economic feasibility of the requested funding;
- Assessment of need of the Republic of Kazakhstan in the new research areas;
- Implementation of competitive selection of scientific, technical projects and programs on basic and applied research proposed to fund from the state budget;
- Monitoring of scientific research, including on-site.

National Scientific Councils take group decisions about grant and program-targeted financing (stop financing) from the state budget:

- Projects and programs of scientific-research, experimental-design and technological works;
- Projects of international scientific-technical programs, implemented with participation of scientific institutions, organizations and enterprises of RK;
- Innovation projects.

Decisions of NSC are crucial to approve final decisions on the implementation of specific research projects and programs. Decisions of the National Scientific Council will be binding for execution by
the authorized bodies - the Ministry of Education and Science, other ministries, coordinating research: health, agriculture, etc.

Thus, the role of the scientific community in decision-making is not just stronger, it becomes decisive.

The role of the High Science and Technology Commission under the Government of the Republic of Kazakhstan as a strategic authority that sets the national priorities for science in accordance with the economic priorities of the country and forming proposals for funding of scientific and technical activities of the state budget becomes stronger.

The Government of the Republic of Kazakhstan created the National Center for State scientific and technical expertise, in order to ensure unity of administration, independence, transparency and publicity of expertise of scientific, technical and innovative projects and programs. The objective of the National Center for State scientific and technical expertise includes:

- organization of work for carrying out the state scientific and technical expertise of scientific, technical and innovative projects and programs proposed for funding from the state budget;
- organization of national research council’s;
- direction of the results of the state scientific and technical expertise to the National Research Council;
- Results evaluation carried out scientific, technological and innovative projects and programs (reports);
- monitoring of the impact of on-going research, science, technology and innovation projects and programs;
- providing a qualitative selection of Kazakhstan and foreign experts;
- methodological and organizational-technical provision of the state scientific and technical expertise;
- formation of data banks of scientific, technical and innovative projects and programs;
- conducting of scientific research activities to improve their work;
- other activities not prohibited by the laws of the Republic of Kazakhstan.

National Center for State scientific and technical expertise is entitled to:

- request and receive from government agencies, research entities and (or) scientific and technical activities the information necessary to carry out the functions and performance of its tasks;
- provide explanations on matters within its competence;
- monitor the research stages of their implementation and completion;
- engage in the prescribed manner for examination and monitoring of other research organizations, Kazakh and foreign scientists
- Work in the prescribed manner with foreign research organizations;
- Establish a consultative and advisory bodies in the field of scientific and technical activities;
- carry out activities on research and technological development;
- carry out publishing activities.
Funding for the National Center for State scientific and technical expertise is made from the state budget.

Funding for scientific and (or) scientific and technical activities of the state budget will be implemented in the following ways: 1) basic funding, 2) grant funding, 3) program-targeted funding.

The role of government is in the basic budget funding of infrastructure functioning (current maintenance and overhaul of fixed assets, including the unique research facilities, equipment), staff preparation and retraining, and patent information support of scientific and technical activities, the development of international scientific cooperation.

The state should finance within the public order: basic research in the field of mathematics, physics, geology, chemistry, medicine, biology, and in the field of social sciences and humanities - history, archaeology, linguistics, literature, economics, philosophy and oriental studies (as an integral part of national property); programs of national importance (the development of mineral resources, mining, industrial, fuel and energy, water systems, ensure seismic, environmental safety, prevention and liquidation of emergency situations of natural and man-made character and others).

Program-targeted funding of perspective projects and selective support of competitive teams and individual scientists from the national budget through the Ministry of Education and Science (basic and applied research) and JSC "Science Foundation" (initiative and risk research of applied nature). This will provide grant funding for innovative and risky research of applied nature in all areas of scientific and technical activities at the expense of the republican budget and other sources not prohibited by the laws of the Republic of Kazakhstan. Approved by HSTC new scientific programs are additionally presented for approval to Republican Budget Commission and financed in accordance with the established procedure, beside specified in this Program volumes of funding.

Till 2012 the following structure of expenses for R&D will be provided:
By kind of research: basic research - 20%, applied research - 30%, experimental-design developments - 50% from all means, designated to RTDI supporting;
By source of financing: state budget - 45-50%, private and business sectors - 45-50% and foreign investments - 5%.

Such approaches will allow forming the structure of the sphere of science with parameters, specific for the countries with developed economy of knowledge. The Government will finance the initial stages of scientific projects that contain the risk for the private sector. Allocation of budgetary funds should be supplemented by flexible mechanisms of co-financing of research and development by government and business. For these purposes will be used opportunities of Kazakhstan Development Bank, the Investment Fund, the National Innovation Fund, newly created holding companies, etc. This will create a mechanism for pass-through funding development of the innovation cycle.

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5 State program of development of science of Republic of Kazakhstan for 2007-2012 years, dated on the 20-th of June, 2007, # 348
In 2006, the Science Foundation was established as a joint stock company with 100% of state participation. The main objective of the Fund is the promotion of development of priority, initiative, risk research and development activities. The problems solved by the Fund:

- Financing of projects in development activities, initiative and risk research;
- Market research and consulting services in the field of legal and financial-economic analysis of scientific and technical projects;
- Search for investors for co-financing scientific and technological projects;
- Organization of seminars, workshops, conferences on the preparation of R&D projects, organization of financing and commercialization.

JSC “Science Foundation” in accordance with the Program of Formation and Development of the National Innovation System for 2005-2015 will establish effective cooperation with the institutes of development JSC "Kazakhstan Holding for Management of State Assets" Samruk", JSC Sustainable Development Fund "Kazyna", JSC "National Innovation Fund" and JSC "National Scientific and Technological Holding" Samghau. These institutes should promote the integration of science with real sector and increasing the productivity of invested funds.

JSC “Science Foundation” is a part of the National Scientific and Technological Holding "Parasat" - the main purpose of holding determined implementation of breakthrough research and investment projects for the introduction of advanced developments in various sectors of the economy. JSC "National Scientific and Technological Holding “Parasat” with 100 per cent state participation in the authorized capital is formed according to the decision of the Government of the Republic of Kazakhstan dated July 3, 2008 # 668 “About creation of joint stock companies the National Scientific and Technological Holding "Parasat". The payment of the authorized capital of JSC "National Scientific and Technological Holding" Parasat" the stocks and shares of the following organizations are included:

- JSC Center of Earth Sciences, Metallurgy and Ore Beneficiation, established in 1945;
- JSC International Scientific-production holding “Phytochimiya”, established in April 1995;
- JSC National Center for Scientific and Technical Information, established in 1957;
- JSC National Center of Informatization, established in January 1999;
- JSC Science Foundation», established in November 2006;
- LLP Physic Technical Institute, established in March 1970;
- LLP Institute of Seismology, established in June 1976;
- LLP Akhmedsafin Institute of hydrogeology and geocology, established in 1965;
- LLP «Altai Geological and Environmental Institute», established in 1949;
- LLP « Institute of geological science named after Satpayev K.» established in 1940;
- LLP « Institute of Geography» established in 1983.

The priority areas of the Parasat Holding accord to the state priorities:

- mineral resources;
- new materials
- water resources;
- energetics;
- pharmaceutics
One source of funding from the state budget of scientific-technical and innovation activities, along with the base, program-targeted funding is grant funding. Grant funding is allocated for research to enhance scientific research, scientific and technological capabilities and competitiveness of research institutions and their communities, as well as scientists.

The main RTDI priorities and amounts of grant funding approved by the Highest Scientific and Technical Commission pursuant to the recommendations of the National Scientific Councils in accordance with the priority areas of science of the Republic of Kazakhstan and shall be considered in due course of the Republican Budget Commission. The legal basis of the Commission activity\(^6\) is made by Constitution of Republic of Kazakhstan, Budget Codex of Republic of Kazakhstan, legislative and other normative legal acts of Republic of Kazakhstan.

The main objectives of the Commission are to provide timely and quality development of the draft national budget for the financial year and proposals for clarification and execution of the national budget, for the following spheres:

- forecasting of socio-economic development;
- indicators for draft national budget for the planning period;
- drafts of normative legal acts, providing increasing of expenses or reduction of income of the republican and local budgets;
- clarification of the national budget

In the competition for grant funding accredited academic subjects and (or) scientific and technological activities, as well as the autonomous organization of education and their organizations on an equal conditions can participate. Grant funding is provided by the authorized authority or industry competent authority announced a competition, or any other person (body) authorized by the Government of the Republic of Kazakhstan on the implementation of financing scientific and (or) scientific and technical activities.

Innovative grants are provided under grant programs developed for specific priorities. Grant Program sets criteria for the selection of applications for innovation grants, for amounts of allocated funds for the program by years and for the maximum amount and percentage of project funding, for the list of allowable types of costs to be recovered, for key performance indicators. Providing innovative grants shall be in accordance with the Rules of providing innovative grants and report on measures taken to implement intellectual property, approved by the Government of the Republic of Kazakhstan dated August 6, 2009 № 1202.

Management of grant programs is assigned to the national operator of technology policy. The decision to give innovative grant is accepted by technological sectoral council, where not less than two thirds of independent experts, including foreign experts, representatives of science, business, non-governmental organizations. The procedure for providing innovative grants is approved by the Government of the Republic of Kazakhstan. Ministry of Industry and New Technologies of the Republic of Kazakhstan for the first time in 2010, held a call for proposals of innovative projects.

\(^6\) Statement about Republican Budget Commission, dated on the 1-st of April 2009, # 780
“Science Fund” and JSC "Center for Engineering and Technology Transfer (CETT)" (since 2011 merged with the NIF) were authorized to manage the call by collecting the applications, conducting evaluation procedure and providing innovation and R&D grants, including grants for feasibility study and patenting. In total 344 applications are submitted to the call for proposals, part of them submitted to the Science Fund and part of them to CETT. In result of the call 37 contracts with grantees were concluded for a total amount 1 691 750 610 (about 8.63M EURO) to conduct R&D and technology transfer activities, feasibility studies and for patenting of intellectual property.

According to the Law “On Science” it is considered an allocation of grant funding for conducting of researches through the carrying out by authorized body in the sphere of science or by sectoral authorized body of competition for grant funding, in which all subjects of scientific-technical activity may participate in equal conditions. Applications for participation in the grant funding are applied by the subjects of scientific-technical activity to the appropriate state body, who announced the competition, but the decision about grant funding submitted by the National Science Council and approved by the relevant competent authority, declared the competition.

In Science Foundation built a system of processes and has the appropriate organizational structure, subdivided into two groups:

- expertise (back–office);
- management (front–office).

This structure allows not only to organize the works on selection and assessment of projects, but also the management of scientific projects, i.e. to implement control over their implementation and to assist in achieving results.

In the frame of activity of Science Foundation it is possible to hold the next restructuring approaches to funding of research projects

National Research and Innovation calls for grant and program-targeted funding annually announced by the MES of RK and the NIF. Under the new system of funding, each institution must either win a grant to conduct any research, or to receive a state order. Those institutions that did not have time for this were left without money. Who won the grant funding or program-targeted funding, they are funded. Those institutions that did not make it there, or in another place, they will just shut down because they do not have research projects.

There is a basic funding, i.e. minimum funding, which is allocated for the maintenance of institutions and for labour costs of administrative, service staff and information maintenance of scientific activity. In order to attract experts to conduct scientific and technical expertise creates a database of international experts nominated by the leading foreign universities, research institutions, national academies of science and scientific communities. The selection of experts shall be in accordance with their specialization and the characteristics of the project. Scientists, experts, including foreign, involved in the evaluation of scientific, technical and innovative projects
and programs are required to maintain confidentiality and ensure the preservation of trade secrets submitted to the examination of materials.

In Kazakhstan, JSC National Center for State scientific and technical expertise is responsible for the selection of evaluators and expertise of projects applied for competition. Peer review of projects is conducted under scientific priorities approved by the Government of the country.

Intergovernmental S&T Cooperation in the coming years will be an important factor in support of Kazakh science. It will promote increased participation of Kazakh scientists and teams in the competition for grants, scholarships, etc. from foreign sources, the alignment of the conditions of access to grants in different regions of the Republic of Kazakhstan.

One of the main directions of IS&TC should be the Program of target return of Kazakh scientists engaged in research activities abroad. During three years seven scientists returned to Kazakhstan. However, their return was not a planned and systematic.

At the same time the need for scientific personnel of international level in Kazakhstan is increasing. Only for three research centres of Nazarbayev University in a five-year perspective it will be necessary up to 200 researchers. To solve this problem is possible by the target return of Kazakh scientists engaged in a successful scientific career abroad (more than 100 people). International experience of repatriation of scientists (China, Austria, Russia, etc.) demonstrates the high efficiency of similar programs.

For a quick and effective solution to the problem of scientific personnel is provided a pilot version of attracting scientists compatriots - is awarded on a competitive basis, 5-10 of large grants to Kazakh scientists working abroad (from 2 to 4 million U.S. dollars) for creation of modern labs on base of Nazarbayev University and other leading universities in the country. National scientists will be involved in the development of a scientific breakthrough of universities and education of the younger generation of scientists. Implementing research projects in their laboratories, they will be actively involved in the design and development of PhD programs of domestic universities. Thus, there will be a qualitative point of growth for the advancement of science in Kazakhstan and academic programs, PhD

Successful implementation of the pilot project will provide the basis for greater involvement on a competitive grant basis of successful foreign scientists to work in Kazakhstan, including those from former Soviet countries, for breakthrough development priorities for science.
The public science base – universities, Academy of Sciences, sectoral R&D institutes

The State Statistic Agency of Kazakhstan registered 424 research organizations engaged in S&T development. Among them, in accordance with Government Program on science development of Republic of Kazakhstan 2007-2012 was created 5 national scientific laboratories of collective using and 15 laboratories of engineer profile.

National research laboratory communities at:

Kazakh National University named after al-Farabi, Almaty (nanotechnology and new materials)
National Center for Biotechnology of the Republic of Kazakhstan, Astana (Biotechnology).
East-Kazakhstan State University named after S. Amanzholov, Ust-Kamenogorsk (nuclear technology and renewable energy technologies)
JSC "Center of the Earth Sciences, Metallurgy and Enrichment, National Scientific and Technological Holding "Parasat", Almaty (technologies for hydrocarbon and mining sectors and associated service industries)
Kazakh National Technical University named after K. I. Satpayev" Almaty (information and space technologies).

Laboratories of engineering profile at universities

Kazakh National Technical University named after KI Satpayev, Almaty (new technologies for hydrocarbon and mining sectors and related service industries).
East-Kazakhstan State Technical University named after Serikbaev, Ust-Kamenogorsk (nanotechnology and new materials).
South-Kazakhstan State University named after M. Auezov, Shymkent (nanotechnology and new materials, biotechnology).
Kazakh National University named after al-Farabi, Almaty (nanotechnology and new materials).
Karaganda State Technical University, Karaganda (new technologies for hydrocarbon and mining sectors and related service industries)
West-Kazakhstan Agrarian Technical University Zhangir Khan, Uralsk (Biotechnology).
Atyrau Oil and Gas Institute, Atyrau (new technologies for hydrocarbon and mining sectors and related service industries)
Eurasian National University named after LN Gumilev, Astana (nuclear technology and renewable energy technologies).
Taraz State University named after Dulati, Taraz (nanotechnology and new materials)
Semipalatinsk State University named after Shakarim, Semey (nuclear technology and renewable energy technologies)
Kazakh National Agrarian University, Almaty (nano-biotechnology and ecology).

8 http://www.scedu.kz/ru/nauchnye_laboratorii/
There are 41 research entities included into the system of the Ministry of Education and Science of Kazakhstan.

<table>
<thead>
<tr>
<th>#</th>
<th>The scientific organization</th>
<th>City</th>
<th>Main activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Eastern Scientific-Research Institute of Mining and Metallurgy of nonferrous metals</td>
<td>Ust-Kamenogorsk</td>
<td>metallurgy of heavy non-ferrous metals</td>
</tr>
<tr>
<td>2</td>
<td>Astrophysical Institute. B. Fesenkov</td>
<td>Almaty</td>
<td>astrophysics, atmospheric physics</td>
</tr>
<tr>
<td>3</td>
<td>Institute of Experimental Biology, JSC</td>
<td>Almaty</td>
<td>genetics, biotechnology of farm animals</td>
</tr>
<tr>
<td>4</td>
<td>Institute of Mining named after Kunaev</td>
<td>Almaty</td>
<td>mining</td>
</tr>
<tr>
<td>5</td>
<td>Institute of Archaeology named after A Margulan</td>
<td>Almaty</td>
<td>Archeology</td>
</tr>
<tr>
<td>6</td>
<td>Institute of Botany and Phytointroduction of the Center for Biological Research</td>
<td>Almaty</td>
<td>floral, studies of introduction, geobotany, paleobotany</td>
</tr>
<tr>
<td>7</td>
<td>Institute of Oriental Studies named after R. Suleimenov</td>
<td>Almaty</td>
<td>Oriental studies, regional geography</td>
</tr>
<tr>
<td>8</td>
<td>Institute of Geography</td>
<td>Almaty</td>
<td>assessment of natural resource potential and the state of landscape</td>
</tr>
<tr>
<td>9</td>
<td>Institute of Geological Sciences named after K. Satpayev</td>
<td>Almaty</td>
<td>geology and deep crustal structure of Kazakhstan, minerals</td>
</tr>
<tr>
<td>10</td>
<td>Institute of Hydrogeology and Hydrophysics named after W. Ahmedsafin</td>
<td>Almaty</td>
<td>groundwater modelling of hydrological processes</td>
</tr>
<tr>
<td>11</td>
<td>Institute of Zoology</td>
<td>Almaty</td>
<td>zoology, conservation of biological diversity</td>
</tr>
<tr>
<td>12</td>
<td>Institute of Ionosphere</td>
<td>Almaty</td>
<td>Earth’s atmosphere</td>
</tr>
<tr>
<td>13</td>
<td>Institute of History and Ethnology named after Sh. Ualikhanov</td>
<td>Almaty</td>
<td>basic research in the field of history, ethnology, anthropology of the Kazakh</td>
</tr>
<tr>
<td>No.</td>
<td>Institute Name (Complete)</td>
<td>Location</td>
<td>Research Focus</td>
</tr>
<tr>
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</tr>
<tr>
<td>14</td>
<td>Institute for Space Studies named after Academician M.W. Sultangazin</td>
<td>Almaty</td>
<td>Remote sensing, study the property of metallic melts in microgravity.</td>
</tr>
<tr>
<td>15</td>
<td>Institute of Literature and Art named after M.Auezov</td>
<td>Almaty</td>
<td>Literature, folklore, art, history of Kazakh folklore</td>
</tr>
<tr>
<td>16</td>
<td>Institute of Mathematics</td>
<td>Almaty</td>
<td>Mathematics, mathematical modelling</td>
</tr>
<tr>
<td>17</td>
<td>JSC &quot;Center of the Earth Sciences, Metallurgy and Enrichment&quot;</td>
<td>Almaty</td>
<td>Technological improvement of metallurgy, high-temperature synthesis of materials with desired properties</td>
</tr>
<tr>
<td>18</td>
<td>Institute of Mechanics and Engineering Science named after W. Dzholdasbekov</td>
<td>Almaty</td>
<td>Methods of calculating the strength of machines, the study of mechanics and industrial processes in the Earth</td>
</tr>
<tr>
<td>19</td>
<td>Institute of Microbiology and Virology</td>
<td>Almaty</td>
<td>Maintaining beneficial strains of microbes, the creation of microbiological protection of crops, animals and humans</td>
</tr>
<tr>
<td>20</td>
<td>Institute of Molecular Biology and Biochemistry named after M. Aitkhozhin</td>
<td>Almaty</td>
<td>Molecular biology, genetics, bioengineering</td>
</tr>
<tr>
<td>21</td>
<td>Institute of General Genetics and Cytology</td>
<td>Almaty</td>
<td>Genetics, cytology</td>
</tr>
<tr>
<td>22</td>
<td>Institute of Organic Catalysis and Electrochemistry named after D. Sokolski</td>
<td>Almaty</td>
<td>Processing of natural resources, development of new renewable energy</td>
</tr>
<tr>
<td>24</td>
<td>Institute of Nutrition</td>
<td>Almaty</td>
<td>Metabolism, diseases of the digestive system</td>
</tr>
<tr>
<td>25</td>
<td>Institute of Informatics and Management</td>
<td>Almaty</td>
<td>Development and research methods and information security</td>
</tr>
<tr>
<td>27</td>
<td>Institute of Seismology</td>
<td>Almaty</td>
<td>Forecast and reduce damage from earthquakes</td>
</tr>
<tr>
<td>28</td>
<td>Institute of Chemical Sciences named after A. Bekturov</td>
<td>Almaty</td>
<td>Membrane, polymers</td>
</tr>
<tr>
<td>29</td>
<td>Institute of Physiology, human and animal physiology</td>
<td>Almaty</td>
<td>Physiology, lymphatic system</td>
</tr>
<tr>
<td>No.</td>
<td>Organization</td>
<td>Location</td>
<td>Function</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>30</td>
<td>Institute of Plant Biology and Biotechnology Bioengineering plant</td>
<td>Almaty</td>
<td>cellular, molecular biology and genetic engineering</td>
</tr>
<tr>
<td>31</td>
<td>Institute of Philosophy and Political Science</td>
<td>Almaty</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Institute of Economy</td>
<td>Almaty</td>
<td>Kazakhstan's model of sustainable economic growth</td>
</tr>
<tr>
<td>33</td>
<td>Institute of Linguistics named after A. Baitursynov</td>
<td>Almaty</td>
<td>speech, ethnolinguistics, onomastics of the Kazakh language.</td>
</tr>
<tr>
<td>34</td>
<td>Seismological Experimental-Methodical Expedition</td>
<td>Almaty</td>
<td>registration and processing of data on earthquakes controlled territories and adjacent areas</td>
</tr>
<tr>
<td>35</td>
<td>Physico-Technical Institute</td>
<td>Almaty</td>
<td>condensed matter physics, high energy physics</td>
</tr>
<tr>
<td>36</td>
<td>Institute of Nuclear Physics, NNC</td>
<td>Almaty</td>
<td>applied research in nuclear physics</td>
</tr>
<tr>
<td>37</td>
<td>Chemical and Metallurgical Institute named after J. Abishev</td>
<td>Karaganda</td>
<td>enrichment and agglomeration of ferrous and nonferrous metals processing technologies and substandard man-made materials</td>
</tr>
<tr>
<td>38</td>
<td>The Central Scientific Library of RK</td>
<td>Almaty</td>
<td>creation a system of basic bibliographic and reference databases</td>
</tr>
<tr>
<td>39</td>
<td>Institute of Soil Science and Agrichemistry named after W. Uspanov</td>
<td>Almaty</td>
<td>study the current state of the soil cover of Kazakhstan. Development of methods, improving soil fertility.</td>
</tr>
<tr>
<td>40</td>
<td>National Centre for Scientific and Technical Information of the Republic of Kazakhstan</td>
<td>Almaty</td>
<td>deposit information resources in the form of databases and data banks on the branches of science. Collecting, processing, analysis of documentary flows.</td>
</tr>
<tr>
<td>41</td>
<td>Kazakh Academy of Education named after Altynsarin</td>
<td>Almaty</td>
<td>research on the issues of general and professional education</td>
</tr>
</tbody>
</table>

And the rest of research institutions belong to different Ministries of Kazakhstan such as Ministry of Industry and New Technologies, Ministry of Health, Ministry of Agriculture, Ministry of Oil and Gas, Ministry of Environment, and other ministries.

In general, the distribution structure of organizations engaged in R&D fields look as the following:
According to MES in 2011 in Kazakhstan, there are 148 universities including 56 public and 92 private universities. Among them, according to the Agency on Statistics, 121 universities are engaged in R&D.

Nazarbayev University was established in order to integrate education with science and innovation process. There are three research centres of world level created in it, focused not only on research but also on the integration of science into the educational process, the specific output of research results into production in commercial innovation.

It became one of the very few examples in the world creation "from the beginning" of absolutely new university, and initially of high level - on the staff, material and financial resources, intellectual potential.

The process of creating universities that have research institutes and centres was started. The pioneer of such university which already includes the Institute of Chemical Sciences named after A.B. Bekturov and the Institute of Organic Catalysis and Electrochemistry named after D.V. Sokolsky became Kazakh-British Technical University, which occupies the first place in the ranking of technical universities in the country. In addition, in the university now operate ten research laboratories.

Not all higher education institutions are performing research and development. The List of universities of Kazakhstan by data of the State Statistics Agency published on the 2nd September 2011, consists of 146 higher education institutions, including: National High Educational Institutions (HEIs) - 9, International HEIs - 1, Autonomous Educational Organisation "Nazarbayev University" - 1, State HEIs - 33, Joint Stock Universities - 16, private HEIs - 73, Non - civil HEIs- 13.

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9 According to the Kazakhstan Agency for Statistics. [www.stat.kz](http://www.stat.kz)
### National HEIs

<table>
<thead>
<tr>
<th>#</th>
<th>National Universities (9 units)</th>
<th>City</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Eurasian National University named after L.N. Gumilev</td>
<td>Astana</td>
</tr>
<tr>
<td>2.</td>
<td>Kazakh National Academy of Arts named after T. K. Zhurgenov</td>
<td>Almaty</td>
</tr>
<tr>
<td>3.</td>
<td>Kazakh National Conservatory named after Kurmangazy</td>
<td>Almaty</td>
</tr>
<tr>
<td>4.</td>
<td>Kazakh National Agrarian University</td>
<td>Almaty</td>
</tr>
<tr>
<td>5.</td>
<td>Kazakh National Medical University named after S.D. Asfendiyarov</td>
<td>Almaty</td>
</tr>
<tr>
<td>6.</td>
<td>Kazakh National Pedagogical University named after Abai</td>
<td>Almaty</td>
</tr>
<tr>
<td>7.</td>
<td>Kazakh National Technical University named after K.I. Satpaev</td>
<td>Almaty</td>
</tr>
<tr>
<td>8.</td>
<td>Kazakh National University named after al-Farabi</td>
<td>Almaty</td>
</tr>
<tr>
<td>9.</td>
<td>Kazakh National University of Arts</td>
<td>Astana</td>
</tr>
</tbody>
</table>

### International HEIs

| 10. | International Kazakh-Turkish University named after J. Yassavi     | Turkestan |

### Autonomous Educational Organisation

| 11. | Nazarbayev University                                             | Astana    |

### State HEIs (33 units)

<p>| 12. | Aktobe State Pedagogical Institute                               | Aktobe    |
| 13. | Arkalyk State Pedagogical Institute named after I. Altynsarinen  | Arkalyk   |
| 14. | Atyrau State University named after Kh. Dosmukhamedov            | Atyrau    |
| 15. | Atyrau Institute of Oil and Gas                                  | Atyrau    |
| 16. | The East Kazakhstan State Technical University named after D. Serikbaev | Ust-Kamenogorsk |
| 17. | East-Kazakhstan State University named after S. Amanzholov       | Ust-Kamenogorsk |</p>
<table>
<thead>
<tr>
<th></th>
<th>Institution Name</th>
<th>City</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>East Kazakhstan Regional University</td>
<td>Ust-Kamenogorsk</td>
</tr>
<tr>
<td>19</td>
<td>Semei State Medical University</td>
<td>Semei</td>
</tr>
<tr>
<td>20</td>
<td>Zhetysu State University named after I. Zhansugurov</td>
<td>Taldykorgan</td>
</tr>
<tr>
<td>21</td>
<td>West-Kazakhstan Agrarian Technical University named after Zhangir Khan</td>
<td>Uralsk</td>
</tr>
<tr>
<td>22</td>
<td>West Kazakhstan State Medical University named after M. Ospanov</td>
<td>Aktobe</td>
</tr>
<tr>
<td>23</td>
<td>West-Kazakhstan State University named after M. Utemisov</td>
<td>Uralsk</td>
</tr>
<tr>
<td>24</td>
<td>Kazakh State Women Pedagogical University</td>
<td>Almaty</td>
</tr>
<tr>
<td>25</td>
<td>Karaganda State Industrial University</td>
<td>Karaganda</td>
</tr>
<tr>
<td>26</td>
<td>Karaganda State Medical University</td>
<td>Karaganda</td>
</tr>
<tr>
<td>27</td>
<td>Karaganda State Technical University</td>
<td>Karaganda</td>
</tr>
<tr>
<td>28</td>
<td>Karaganda State University named after E.A. Buketov</td>
<td>Karaganda</td>
</tr>
<tr>
<td>29</td>
<td>Caspian State University of Technology and Engineering named Sh. Essenov</td>
<td>Aktau</td>
</tr>
<tr>
<td>30</td>
<td>Kokshetau State University named after Ualikhanov</td>
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<td>31</td>
<td>Kostanai State Pedagogical Institute</td>
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<td>Kostanai State University named after A. Baitursynov</td>
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<td>33</td>
<td>Kyzylorda State University named after Ata Korkyt</td>
<td>Kzyl-Orda</td>
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<td>Pavlodar State Pedagogical Institute</td>
<td>Pavlodar</td>
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<td>35</td>
<td>Pavlodar State University named after Toraigyrov</td>
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<tr>
<td>36</td>
<td>North Kazakhstan State University named after M. Kozybayev</td>
<td>Petropavlovsk</td>
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<td>37</td>
<td>Semipalatinsk State Pedagogical Institute</td>
<td>Semei</td>
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<tr>
<td>38</td>
<td>Semipalatinsk State University named after Shakarim</td>
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<td>39</td>
<td>Taraz State Pedagogical Institute</td>
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<tr>
<td>40</td>
<td>Taraz State University named after M. Kh. Dulati</td>
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<tr>
<td>No.</td>
<td>HEI Name</td>
<td>Location</td>
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<td>41</td>
<td>South Kazakhstan State Pharmaceutical Academy</td>
<td>Shymkent</td>
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<td>42</td>
<td>South Kazakhstan State University named after M. Auezov</td>
<td>Shymkent</td>
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<tr>
<td>43</td>
<td>Aktobe State University named after K. Zhubanov</td>
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<td>44</td>
<td>Aktobe State University named after S. Baishev</td>
<td>Aktobe</td>
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<tr>
<td></td>
<td><strong>Non-civil HEIs (13 units)</strong></td>
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<tr>
<td>45</td>
<td>Academy of National Security Committee of Kazakhstan</td>
<td>Almaty</td>
</tr>
<tr>
<td>46</td>
<td>Police Academy of the Republic of Kazakhstan</td>
<td>Almaty</td>
</tr>
<tr>
<td>47</td>
<td>Aktobe Law Institute of Ministry of Internal Affairs of the Republic of Kazakhstan</td>
<td>Aktobe</td>
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<tr>
<td>48</td>
<td>Military Engineering Institute of Radio Electronics and Communications Ministry of Defence of the Republic of Kazakhstan</td>
<td>Almaty</td>
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<tr>
<td>49</td>
<td>Military Institute of Air Forces Defence of Ministry of Defence of the Republic of Kazakhstan</td>
<td>Aktobe</td>
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<tr>
<td>50</td>
<td>Military Institute of the land-forces of Ministry of Defence of the Republic of Kazakhstan</td>
<td>Almaty</td>
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<tr>
<td>51</td>
<td>Karaganda Academy of Ministry of Internal Affairs named after B. Beisenova</td>
<td>Karaganda</td>
</tr>
<tr>
<td>52</td>
<td>Kokshetau Technical Institute, Ministry of Emergency Situations of the Republic of Kazakhstan</td>
<td>Kokshetau</td>
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<tr>
<td>53</td>
<td>National University of Defence of Ministry of Defence of the Republic of Kazakhstan</td>
<td>Shchuchinsk</td>
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<tr>
<td>54</td>
<td>Higher Military School of Interior Forces of the Republic of Kazakhstan</td>
<td>Petropavlovsk</td>
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<tr>
<td>55</td>
<td>Frontier Academy of the National Security Committee of Kazakhstan</td>
<td>Almaty</td>
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<tr>
<td>56</td>
<td>Academy of Committee of the criminal-executive system of MIA RK</td>
<td>Kostanai</td>
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<tr>
<td>57</td>
<td>Military Institute of the Ministry of Defence of the Republic of Kazakhstan</td>
<td>Almaty</td>
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<tr>
<td></td>
<td><strong>Joint Stock HEIs (16 units)</strong></td>
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<tr>
<td>58</td>
<td>Academy of Civil Aviation</td>
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<td>59</td>
<td>Almaty University of Energy and Communication</td>
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<tr>
<td>60</td>
<td>Zhezkazgan University named after O.A. Baykonuro</td>
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<td>University Name</td>
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<tr>
<td>61</td>
<td>Kazakh Academy of Sport and Tourism</td>
<td>Almaty</td>
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<tr>
<td>62</td>
<td>Kazakh Academy of Transport and Communication named after M. Tynyshpayev</td>
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<tr>
<td>63</td>
<td>Kazakh University of International Relations and World Languages named after Abylaikhan</td>
<td>Almaty</td>
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<tr>
<td>64</td>
<td>Kazakh Agro-Technical University named after S. Seifullin</td>
<td>Astana</td>
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<td>65</td>
<td>Kazakh Humanitarian Law University</td>
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<td>66</td>
<td>Kazakh Economic University named after T. Ryskulov</td>
<td>Almaty</td>
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<td>67</td>
<td>Kazakhstan Institute of Management, Economics and Strategic Research</td>
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<td>68</td>
<td>Kazakh University of Friendship of Peoples</td>
<td>Shymkent</td>
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<td>69</td>
<td>Medical University of Astana</td>
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<td>70</td>
<td>International Humanitarian and Technical University</td>
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<td>71</td>
<td>International University of Information Technologies</td>
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<td>72</td>
<td>Academy of Finance</td>
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<td>73</td>
<td>Kazakh State Academy of Civil Engineering and Architecture</td>
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<td></td>
<td><strong>Private HEIs (73 units)</strong></td>
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<td>Academy of Design and Technology &quot;Symbat&quot;</td>
<td>Almaty</td>
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<td>76</td>
<td>Academy &quot;Kokshe&quot;</td>
<td>Kokshetau</td>
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<td>77</td>
<td>Academy of Economics and Law</td>
<td>Almaty</td>
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<td>78</td>
<td>Academy of Economics and Law named after O.A. Dzholdasbekov</td>
<td>Taldykorgan</td>
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<td>79</td>
<td>University &quot;Dunie&quot;</td>
<td>Aktobe</td>
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<td>80</td>
<td>Almaty Academy of Economics and Statistics</td>
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<td>81</td>
<td>Almaty humanitarian and technical university</td>
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<td>82</td>
<td>Almaty Technological University</td>
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<td>University Name</td>
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<td>83</td>
<td>Almaty University of Continuous Education</td>
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<td>Atyrau Institute of Engineering and Humanities</td>
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<td>Humanities Institute, &quot;Akmeshit&quot;</td>
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<td>Eurasian Academy</td>
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<td>Eurasian Institute of Market</td>
<td>Almaty</td>
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<td>Egyptian University of Islamic Culture &quot;Nur-Mubarak&quot;</td>
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<td>Innovative University of Eurasia</td>
<td>Pavlodar</td>
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<td>Kazakh Academy of Labour and Social Affairs</td>
<td>Almaty</td>
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<td>Kazakh Academy of Engineering and Technology</td>
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<td>Kazakh Academy of Finance and Economic</td>
<td>Semei</td>
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<td>Kazakh Humanitarian Law University Innovation</td>
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<td>97</td>
<td>Kazakh University of Railway Transport</td>
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<td>98</td>
<td>Kazakh University of Technology and Business</td>
<td>Astana</td>
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<td>99</td>
<td>Kazakh University of Economy, Finance and International</td>
<td>Astana</td>
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<td>Kazakh-Chinese University</td>
<td>Kzyl-Orda</td>
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<td>102</td>
<td>Kazakh University of Engineering and Technology</td>
<td>Almaty</td>
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<td>Kazakhstan's multi-institute &quot;Parasat&quot;</td>
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<td>Kazakhstan University &quot;Alatau&quot;</td>
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<td>Kazakh-American Free University</td>
<td>Ust-Kamenogorsk</td>
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<td>Caspian Public University</td>
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<td>112</td>
<td>University of Karaganda &quot;Bolashak&quot;</td>
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<td>Kostanai socio-technical university named after Z. Adamzhar</td>
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<td>Kostanai Engineering and Pedagogical University</td>
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<td>Kokshetau Institute of Economics and Management</td>
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<td>116</td>
<td>Kokshetau University named after Myrzakhmetov</td>
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<td>Mangistau Institute &quot;Bolashak&quot;</td>
<td>Aktau</td>
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<td>118</td>
<td>International Academy of Business</td>
<td>Almaty</td>
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<td>International Business Academy</td>
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<td>University of &quot;Bolashak&quot;</td>
<td>Kyzylorda</td>
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<td>University of Suleyman Demirel</td>
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<td>University &quot;Syrdarya&quot;</td>
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<td>University «Turan-Astana»</td>
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<td>University of foreign languages and business career</td>
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<td>131</td>
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<td>Institute of Management</td>
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<td>South Kazakhstan Humanitarian Institute named after M. Saparbayev</td>
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<td>Legal Academy “Themis”</td>
<td>Karaganda</td>
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<td>Technic-Economy Academy of Cinema and Television</td>
<td>Almaty</td>
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<td>143</td>
<td>University named after D. Kunayev</td>
<td>Almaty</td>
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<td>144</td>
<td>Rudny Industrial Institute</td>
<td>Rudny</td>
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<tr>
<td>145</td>
<td>Academy of Financial Police of the Republic of Kazakhstan</td>
<td>village Koschi</td>
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<tr>
<td>146</td>
<td>Kazakh State Automobile and Road Institute, named after L.B. Goncharov</td>
<td>Almaty</td>
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</table>

On the official website of MES RK for 2010/2011 academic year there were given 148 HEIs. But in the list of universities/higher education institutions on the website is shown only 139.

In our report we provided the list, which is given by the official site of the State Statistics Agency. On 2011/2012 academic year there are 146 HEIs in Kazakhstan (according to the data of the State Statistics Agency of RK published on March 2012). Among them, 121 HEIs are engaged in R&D, the rest 25 are engaged only in educational activity.

National research laboratories of collective use and laboratories of engineering profile at universities
In accordance to the State Program for the Development of Education in the Republic of Kazakhstan for 2007-2012 on a competitive basis five national research laboratories for collective use and fifteen laboratories of engineering profile have been established.

National research laboratories of collective use are created at the:
- Kazakh National University named after Al-Farabi, Almaty (nanotechnology and nanomaterials)
- National Center of Biotechnology of Republic of Kazakhstan, Astana (biotechnologies)
- East-Kazakhstan State University named after Amanzholov S., Ust-Kamenogorsk (nuclear technologies and technologies of renewable energetic)
- JSC “АО «Center of Earth Sciences, Metallurgy and Ore Beneficiation», National scientific-technological holding Parasat, Almaty (technologies for hydrocarbon and mining sectors and related service industries).
- Kazakh National Technical University named after Satpayev K.» Almaty (information and space technologies).

Laboratories of engineering profile at the universities:
- Kazakh National Technical University named after KI Satpayev, Almaty (new technologies for hydrocarbon and mining sectors and related service industries).
- The East-Kazakhstan State Technical University named after Serikbaev, Ust-Kamenogorsk (nanotechnology and new materials)
- South Kazakhstan State University named after M. Auezov, Shymkent (nanotechnology and new materials, biotechnology).
- Kazakh National University named after al-Farabi, Almaty (nanotechnology and new materials).
- Karaganda State Technical University, Karaganda (new technologies for hydrocarbon and mining sectors and related service industries).
- West-Kazakhstan Agrarian Technical University Zhangir Khan, Uralsk (Biotechnology)
- Atyrau Institute of Oil and Gas, Atyrau (new technologies for hydrocarbon and mining sectors and related service industries)
- Eurasian National University named after LN Gumilev, Astana (nuclear technology and renewable energy technologies).
- Taraz State University named after M. Dulati, Taraz (nanotechnology and new materials)
- State University named after Shakarim, Semey (nuclear technology and renewable energy technologies)
- Kazakh National Agrarian University, Almaty (nano-biotechnology and ecology)
- Karaganda State Industrial University, Karaganda region Temirtau (new technologies for hydrocarbon and mining sectors and associated service industries).
- Karaganda State University named after E.A. Buketov, Karaganda (new technologies for hydrocarbon and mining sectors and associated service industries).
- Kyzylorda State University named after Korkyt-Ata, Kyzylorda (new technologies for hydrocarbon and mining sectors and related service industries)
- Kokshetau State University named after Ualikhanov, Kokshetau (Biotechnology)

National Accreditation Center of MES RK, beginning from 2006, holds the ranking of higher educational institutions of the Republic of Kazakhstan. The methodology of the National
Accreditation Centre is developed with the latest advances in assessing the quality of higher education and builds ratings in countries such as USA, UK, Germany, Poland, Russia, Japan and others.

Purpose of determining the rating is the following:

- provide society with the information for decision making (applicants and their parents, politicians, foundations, employers; international organizations);
- promote competition between higher education institutions;
- encourage creation and development of centres to ensure quality in higher education institutions.

The procedure of institutional accreditation is carried out in accordance with Government Resolution, dated on December, 29, 2007, # 1385 "On Approving the Rules of accreditation of educational institutions" and the Regulations on organization and conducting of the accreditation of educational institutions, approved by Order # 109 by Acting Minister of Education and Science of the Republic of Kazakhstan dated March 5, 2008. It includes the following steps:

- Phase number 1 - self-assessment (internal assessment);
- Phase number 2 - an external evaluation by expert committee;
- Phase number 3 - Accreditation Council decision and, if approved, a certificate of accreditation.

The procedure for self-assessment conducted by university standards and criteria for institutional accreditation for a period of 1 to 2 years and covers all aspects of the university, after which a report on self-assessment is prepared. During the high school self-evaluation, by prior agreement with him, the Independent Kazakhstan Quality Assurance Agency in Education (IKQAA) provides consulting services on-site representatives to place. Conduct three workshops: for top-management; for heads of departments and faculty members, who include lectures and workshops on leadership and management, strategic planning, development and evaluation ultrahigh quality assurance system, the introduction of a quality culture in the university.

Upon completion of the self-assessment accredited institution (not less than one month before the proposed visit by the expert commission) should send to the agency 5 copies of the report on self-assessment, which is being carefully studied by all members of the expert group before visit the university.

After that, the expert commission makes visit to university to assess the reliability of self-examining. The procedure of external visit is carried out by the expert commission within 2-4 days. Regulation of the expert group at the university is carried out according to the Guide to the external visit, developed by IQAA. University Visit and writing a report conducted by experts in IQAA, each stage takes 1-2 days. The results of the report will be sent to the organization of education.

The report, the recommendations made by the expert commission, and the materials on the accreditation of the university are considered in IKQAA by Council on Accreditation. The Council on Accreditation of the university consists of representatives of the Majilis of the Parliament of the
Republic of Kazakhstan, the rector of the higher education institutions, research organizations, representatives of employers and the society. The members of this Council are approved by the order of IQAA.

Accreditation of universities is carried out at the finance expenses of universities based on the application of educational organization and preparation of contract to conduct accreditation. The final decision by the Council on Accreditation IKQAA implements analyse of report and recommendations of the expert committee, and submit to the Council on Accreditation for decision making. A positive report of expert commission and the conclusion of IKQAA is a compulsory condition for accepting of positive decision by the Council on Accreditation.

The term of the assignment of status of accredited organization to the university is five years. Upon expiration or renewal of accreditation, university must be re-accredited. In the case of a positive decision on accreditation, IKQAA publishes a summary report on the accreditation of the university in the media and on its website.

National Center of Scientific-technical Information (NCSTI) is in charge of gathering, systematization and analysis of scientific information of Republic of Kazakhstan. The work of NCSTI is dedicated on promotion of results of scientific-technical activity of Kazakh scientists, analysis of intellectual potential of realized scientific researches and developments.

From 2005, the bibliographic database (BDB) of citation of scientific publications of Kazakh authors is formed. BDB citation is an information-analytical system, which is collected and processed bibliographic information on articles of Kazakh scientists and published in domestic and foreign magazines, as well as links on Kazakhstan authors, available in these publications:

- about 600 domestic and foreign journals is reviewed;
- available bibliometric data on more than 700 periodicals, obtained from a list of links of refereed articles;
- the total number of pro-refereed articles is 28 123 with more than 42 thousand references to the authors of Kazakhstan;

Statistical data of BDB citation allow us to determine the publication activity and citation of the individual authors, research groups and organizations, as well as the impact factor of scientific journals of Kazakhstan

Kazakhstan research activity in international Scopus database:

- The share of publication of Kazakhstan \( \approx 0.02 \% \);
- Subject area of knowledge - \( > 20 \);
- The largest number of publications in chemistry, materials science, earth sciences, physics and astronomy \( \approx 63 \% \) of all publications;
- The average number of international co-publications \( \approx 50 \% \);
- Foreign partners of Kazakhstan in science sphere \( \approx 30 \) countries;
- Cited works \( \approx 45 \% ;\)
- a publication of the average citation \( \approx 3.0 \);
The highest average citation of works has for the Life Sciences (various branches of biology, biotechnology and medicine). National Centre for Scientific and Technical Information conducted bibliometric evaluation of scientific publications in Kazakhstan, using information from databases Scopus and WoS. The obtained results allow to judge about the effectiveness of the scientific achievements of Kazakhstan, about the situation with domestic science in general and its individual regions, as well as the location of Kazakhstan publications in the global scientific publication stream. Chronological period of research covers publications of 1991-2010 years. During the described period in Scopus it was included information on 4493, in the WoS - 5634 scientific publications of Kazakh scientists and specialists. As of 2011 year 5314 publications of Kazakh scientists were included in Scopus, 6081 publications of Kazakh scientists and specialists were included in WoS. The Change of research activity over the years is shown in Figure A.

![Graph showing research activity of Kazakhstan in international databases of citation.](image)

**Figure A – Research activity of Kazakhstan in international databases of citation.**

<table>
<thead>
<tr>
<th>#</th>
<th>Organizations</th>
<th>Number of publications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The National Academy of Sciences of the RK</td>
<td>1308 Scopus, 1217 WoS</td>
</tr>
<tr>
<td>2</td>
<td>Al-Farabi Kazakh National University</td>
<td>710 Scopus, 829 WoS</td>
</tr>
<tr>
<td>3</td>
<td>Ministry of Education and Science</td>
<td>308 Scopus, 380 WoS</td>
</tr>
<tr>
<td>4</td>
<td>Institute of Organic Catalysis and Electrochemistry named after D.V. Sokolsky</td>
<td>214 Scopus, 92 WoS</td>
</tr>
</tbody>
</table>

10. BDB citation of publications of Kazakh authors: first outcomes and perspectives of development, Almaty, 2011, JSC “National Center of Scientific-Technical Information”.

11. Scientific publications of Kazakhstan and their citation (according to the databases of Scopus and WoS).
With the transition to a market economy, Kazakhstan is becoming more open to international economic and scientific-technical cooperation. In favour of intense communication of Kazakh scientists, the following fact evidences that, since 2003, 41-55%, and by 2007 is 59.4% or more of their publications in recognized journals is performed in collaboration with foreign colleagues.

Kazakhstan's foreign partners in the scientific field are more than 40 countries, 11 of them - the leaders of scientific collaboration (see Figure B).

The most constructive scientific contacts of Kazakhstan researchers with researches from Russia, USA, Japan, Germany, Italy, Great Britain, Poland, Canada, etc.
In general array of information flow of investigated databases the contribution of Kazakhstan publications in average not more than 0.018%. It may be noted the main areas of knowledge in which research activity exceeds this figure. First of all, it relates to chemistry (0.062%), physics and astronomy (0.045%), Earth Science (0.045%), mathematics (0.038%).

The share of publications in the field of agricultural and biological sciences, computer sciences and engineering, and science subject areas related to medicine and health, is negligible. For the objective performance of scientific activity is widely used citation analysis of publications.

The share of annual cited publications in Kazakhstan in both bases under consideration is about 45%.

One of the criteria for the quality of the paper is its average citation. It is defined as the ratio of the total number of references received for publication to the total number of publications and is the number of links, corresponding to an average of one article. This figure is for the publication of Kazakhstan during the study period was 3.27 to Scopus, the WoS - 3.82.
In the system of scientific publications in Kazakhstan articles on medical science, despite the relatively small research activity in this area, give the relatively high average citation rates. Actively cited also papers on the pharmacology, health care and sciences of the Environmental Protection

Despite the fact that in the study database the largest number of articles of Kazakhstan accounted for chemistry, mathematics and engineering disciplines, and their average citation not more than 2 units.

In general, the publications of Kazakhstan in all spheres of knowledge, except for computer science, are cited in an average from 1 to 9 times....

Bibliographic Citation Database (BBD) of scientific publications of Kazakh authors is forming from 2005.

Below is the analysis of publication activity of research institutions and universities in Kazakhstan under the national bibliographic database.
### Ranking of the Kazakh Research Institutes according to publication activity

<table>
<thead>
<tr>
<th>Institute Name</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institute of Chemical Sciences named after A. Bekturov</td>
<td>1</td>
</tr>
<tr>
<td>Institute of Livestock and fodder production</td>
<td>2</td>
</tr>
<tr>
<td>Institute of Metallurgy and Enrichment</td>
<td>3</td>
</tr>
<tr>
<td>Institute of Organic Catalysis and Electrochemistry named after D. Sokolski</td>
<td>4</td>
</tr>
<tr>
<td>Institute of Geological Sciences named after K. Satpaev</td>
<td>5</td>
</tr>
<tr>
<td>Institute of Mathematics</td>
<td>6</td>
</tr>
<tr>
<td>Kazakh Research Institute of Food Industry</td>
<td>7</td>
</tr>
<tr>
<td>Research Centre for Sheep</td>
<td>8</td>
</tr>
<tr>
<td>Institute of Mining named after Kunaev</td>
<td>9</td>
</tr>
<tr>
<td>Scientific-Production Center of Agriculture</td>
<td>10</td>
</tr>
<tr>
<td>Kazakh Research Institute of Mechanization and Electrification of Agriculture</td>
<td>11</td>
</tr>
<tr>
<td>Institute of Soil Science and Agricultural named after W. Uspanov</td>
<td>12</td>
</tr>
<tr>
<td>Research and Production Center of farming and crop production</td>
<td>13</td>
</tr>
<tr>
<td>Scientific-Production Center of Phytochemistry</td>
<td>14</td>
</tr>
<tr>
<td>Institute of Organic Synthesis and Coal Chemistry</td>
<td>15</td>
</tr>
<tr>
<td>Astrophysical Institute named after B. Fesenkov</td>
<td>16</td>
</tr>
<tr>
<td>Institute of Plant Biology and Biotechnology Bioengineering plant</td>
<td>17</td>
</tr>
<tr>
<td>Kazakh Research Institute of Potato and Vegetable</td>
<td>18</td>
</tr>
<tr>
<td>Kazakh Research Institute of Water Resources</td>
<td>19</td>
</tr>
<tr>
<td>Research Center on complex processing of mineral raw materials</td>
<td>20</td>
</tr>
<tr>
<td>Institute of Ionosphere</td>
<td>21</td>
</tr>
<tr>
<td>Institute of Plant Protection and Quarantine</td>
<td>22</td>
</tr>
<tr>
<td>Chemical and Metallurgical Institute</td>
<td>23</td>
</tr>
<tr>
<td>Institute of Horticulture and Viticulture</td>
<td>24</td>
</tr>
<tr>
<td>Research and Production Center of Grain Farming</td>
<td>25</td>
</tr>
</tbody>
</table>

©InExCB-KZ 2012
Kazakhstan Research Institute of Agribusiness and Rural Development - 128
Institute of Geophysical Research Nat. nuclear center - 124
Institute of Combustion Problems with KazNU - 117
Institute of Botany and Phytointroduction - 115
Kazakhstan Research Institute of Environment and Climate - 107
Institute of Microbiology and Virology - 104
North-Kazakhstan Research Institute of Animal Husbandry and Veterinary - 103
Institute of problems of information and management - 99

### Ranking of Kazakh Universities according publication activity

<table>
<thead>
<tr>
<th>University Name (in Kazakh)</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>КазНУ им. аль-Фараби 1</td>
<td>1</td>
</tr>
<tr>
<td>КазНАУ 2</td>
<td>2</td>
</tr>
<tr>
<td>АТУ 3</td>
<td>3</td>
</tr>
<tr>
<td>ЮКГУ им. М. Ауэзова 4</td>
<td>4</td>
</tr>
<tr>
<td>КазНИИ имени К. Сатпаева 5</td>
<td>5</td>
</tr>
<tr>
<td>КазАТУ им. С. Сейфуллина 6</td>
<td>6</td>
</tr>
<tr>
<td>КарГУ им. Е. Букетова 7</td>
<td>7</td>
</tr>
<tr>
<td>ПГУ им. С. Торайгирова 8</td>
<td>8</td>
</tr>
<tr>
<td>КазАТК им. М. Тынышпаяева 9</td>
<td>9</td>
</tr>
<tr>
<td>ТарГУ им. М. Х. Дулати 10</td>
<td>10</td>
</tr>
<tr>
<td>Костан. ГУ им. А. Байтурсынова 11</td>
<td>11</td>
</tr>
<tr>
<td>ВКГТУ им. Д. Серикбаева 12</td>
<td>12</td>
</tr>
<tr>
<td>ЗКАТУ им. Жангир хана 13</td>
<td>13</td>
</tr>
</tbody>
</table>

Kazakh National University named after al-Farabi - 2167
Kazakh National Agrarian University - 1328
Almaty Technological University - 916
South Kazakhstan State University named after M. Auezov - 894
Kazakh National Technical University named after K.I. Satpaev - 881
Kazakh Agro-Technical University named after S. Seifullin - 815
Karaganda State University named after E.A. Buketov - 702
Pavlodar State University named after Toraigyrov - 508
Kazakh Academy of Transport and Communication named after M. Tynyspayev - 471
Taraz State University named after M. Kh. Dulati - 463
Kostanai State University named after A. Baitursynov - 401
East Kazakhstan State Technical University named after D. Serikbaev - 372
West-Kazakhstan Agrarian Technical University named after Zhangir Khan - 308
According to Thomson Reuters and Scopus is published about 300 articles of Kazakh scientists, in average, this is one publication on 60 scientists. According to the Minister of Education and Science it is too low.

Committee of Science in conjunction with the Department of Finance and investment projects entrusted to work out concrete proposals for an increase of scientific publications, significantly raise the overall quality level of Kazakh scientific journals, to increase the number of domestic rating publications\textsuperscript{12}. See Chapter 3.7.

\textsuperscript{12} From the speech of the Minister of Education and Science of RK- Zhumagulov B. on the meeting on science development (conclusion word) Astana, 16 February 2012.
Public and Private (industrial and SME) R&D and innovation structures and activities

To preserve the potential of large industrial research organizations that are leaders in their fields of expertise, there are 6 national research centres in Kazakhstan (National Nuclear Center, Chemical and Technological Research of RK, Centre for Physical and Mathematical Research of RK, the Center of geological and geographical studies of RK, the National Center for Scientific technical Information of RK, National Center for Biotechnology RK). They are designed to ensure the implementation of industrial research output, fully brought to the level of commercialization, patent protective, successfully pilot testing and have proved to be really scientific, technical and economic efficiency.

On the basis of academic research institutes three research centres were established: Center for Earth Science and Metallurgy enrichment, Center of biological and astrophysical research center. The purpose of the research centres is the concentration of scientific and technological capacity in priority areas of basic research and strengthening its contribution to basic research for the solution of socio-economic development.

According to the Statistics Agency of Kazakhstan, in 2010 there were 424 research institutions. During 2000 - 2010 their number increased to 167 units. Changes were mainly due to the increasing number of universities and engineering, design organizations. Number of research institutions in 2009-2010 decreased in compare with previous years. The number of industrial enterprises, carried out research and development for ten years has doubled.

Table 4
Organizations, executed research and development by type in 2000-2010, units.

<table>
<thead>
<tr>
<th>year</th>
<th>Total</th>
<th>research institutes</th>
<th>design, engineering design and technological organizations</th>
<th>universities</th>
<th>Industrial enterprises</th>
<th>others</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>257</td>
<td>144</td>
<td>15</td>
<td>43</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>2001</td>
<td>259</td>
<td>180</td>
<td>18</td>
<td>40</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>2002</td>
<td>267</td>
<td>178</td>
<td>19</td>
<td>42</td>
<td>5</td>
<td>23</td>
</tr>
<tr>
<td>2003</td>
<td>273</td>
<td>176</td>
<td>11</td>
<td>45</td>
<td>12</td>
<td>29</td>
</tr>
<tr>
<td>2004</td>
<td>295</td>
<td>148</td>
<td>23</td>
<td>83</td>
<td>5</td>
<td>36</td>
</tr>
<tr>
<td>2005</td>
<td>390</td>
<td>176</td>
<td>25</td>
<td>113</td>
<td>7</td>
<td>69</td>
</tr>
<tr>
<td>2006</td>
<td>437</td>
<td>185</td>
<td>31</td>
<td>123</td>
<td>10</td>
<td>88</td>
</tr>
<tr>
<td>2007</td>
<td>438</td>
<td>170</td>
<td>26</td>
<td>133</td>
<td>11</td>
<td>98</td>
</tr>
<tr>
<td>2008</td>
<td>421</td>
<td>148</td>
<td>30</td>
<td>126</td>
<td>11</td>
<td>106</td>
</tr>
<tr>
<td>2009</td>
<td>414</td>
<td>118</td>
<td>46</td>
<td>114</td>
<td>13</td>
<td>123</td>
</tr>
<tr>
<td>2010</td>
<td>424</td>
<td>133</td>
<td>26</td>
<td>121</td>
<td>11</td>
<td>133</td>
</tr>
</tbody>
</table>

Resource: data of Statistics Agency of RK
In general, the organizational structure of the science of Kazakhstan retained the disproportion between the units of a single chain: research - development - design - production (reproduction). In 2010, 31.4% of all organizations of science belonged to research institutes and only 6.1% design and design engineering organizations. Scientific research and design departments in industrial enterprises are one of the main functions of scientific and technical systems of the country to ensure the implementation of research in the form of design documentation, prototypes and complex work on the development of mass production.

11 industrial enterprises compose only 2.6% of the total number of scientific and technical organizations (424) of Kazakhstan. Amount of research, development departments in enterprises in 2010 reached 723 units, the growth rate in 2003-2010 was 99.2%, it means an increase of almost in 2 times have accrued. This figure shows increasing of departments engaged in R&D, and not the enterprises.

This indicates a rising innovation potential of enterprises. The largest portion of investment in innovative projects have own funds of enterprises - 93.2%, foreign investment - 1%, the budget funds - 2.4%. Total costs of enterprises in technological innovation in 2010 amounted to 219 441.9 million Tenge (1.12 mln. euro), which vastly higher than in 2006 by as much as 220.8%.

In the structure of innovation active enterprises by type of activity belongs to the dominant role of state enterprises, the share of innovative enterprises by ownership in the period 2006-2010 was 8.9 - 9.8%, on the second place - foreign enterprises (5-3,6%), and finally, private enterprises amounted to 4,4-4,0%.

In accordance to self-assessment done by the National Innovation Fund small part of businesses in Kazakhstan is engaged in scientific development, their costs are still small in absolute terms and in terms of intensity. Much of the spending is on large companies, namely companies with state participation, but their absolute level below all international norms, which does not yet allow to local companies be competitive compared to major international innovative giants.

However, the pace of innovative development of companies in Kazakhstan is significant, reflecting the relatively high innovative potential of our companies. Also in Kazakhstan type of unproductive entrepreneurship dominates, which has no purpose to create and innovate, and having to capitalize through reallocation of existing wealth. Therefore, despite the growth of the main indicators of enterprise development contribution of small and medium businesses in the development of innovation is small.

The presence of such problems involves the formation and implementation of new public policies that support small business innovation principles, aimed at the development of productive entrepreneurship based on a competitive basis, because acting instruments of financial support is mainly focused on medium and large enterprises.

To do this, it is necessary in Kazakhstan to create a system of management, enabling transfer of non-productive type of performance. Government support should be expressed in the formation of economic and legal conditions, incentives for self-development and competitiveness of small
enterprises taking into account sectoral, geographic, ethnic, historical background and traditions, as well as international experience of business support

According to the Statistics Agency of Kazakhstan there are 467 SME innovative active enterprises (190 – small, 122 – midle, 155 – large). The synergy of science and industry, the introduction of scientific achievements in the business environment is also a major area of innovation in Kazakhstan. At the time being the Government develops a road map, "Business and science - 2020", where will be determined the participation of business community in scientific research.

In 2011 a group of companies of the Fund "Samruk-Kazyna" allocate 8 billion Tenge for research and development. Kazakhstan aims to increase the funding for RTDI up to 1% of GDP by 2015.

Highest Science and Technology Commission approved the new priorities of Kazakhstan's science. It's – energetic and energy efficiency, deep processing of raw materials and products, life sciences, information and telecommunications technology. These priorities are focused on scientific and technological development of production and human health, and involve a mandatory final output of research in innovation. Within these priorities approved 88 the most actual projects on program-targeted and grant funding. Their implementation will go on a competitive basis from next year, for this in 2012 provided 10 billion Tenge. For system support of innovation activity, the necessary legislative basis and institutional base laid in the country.

The financial instruments of support were expanded especially for innovations, new tax privileges and preferences for small and medium-sized businesses in high technology were introduced. In addition, a "Park Information Technologies" - "Smart" city of high-tech industries is created. Expansion of R&D is provided by reducing the taxable base for corporate income tax on 150% from the cost on implementing the results of R&D.

Therefore, to solve problems and achieve goals and objectives of the Strategy of Industrial and Innovation Development of Kazakhstan for 2003-2015 is supposed to strengthen the functioning of institutional structures such as the National Fund of Kazakhstan JSC "Development Bank of Kazakhstan", JSC "Investment Fund of Kazakhstan", JSC "National Innovation Fund", which are the major tools of the implementation of the Strategy. In general, these institutions will pursue a policy of investing in new and developing existing industries with high added value and support scientific and technological research and development on the basis of comprehensive analysis of the promising sectors identify the most important areas.

National Innovation Fund was established by the Presidential Decree of 23 August 2000 in order to ensure a stable socio-economic development, the accumulation of financial resources for future generations (saving function), reduce economic dependence on the impact of adverse external factors (stabilizing function). The Fund is a combination of financial assets accumulated in the account of the Government at the National Bank of Kazakhstan.

JSC "Development Bank of Kazakhstan" was established by Decree of the President dated 28.12.2000 "On the Development Bank of Kazakhstan." The main goal of the Bank is to improve and increase the efficiency of public investment, the development of industrial infrastructure and
manufacturing industries, encouragement of domestic and foreign investment in the economy. Relevance of the Development Bank of Kazakhstan is currently dictated by the need to ensure sustainable development of national economy, especially its real sector.

Joint Stock Company "Kazakhstan Investment Fund" based on the Decree of the Government of the Republic of Kazakhstan from May 30, 2003. The main purpose of the Investment Fund is to assist in the implementation of the Strategy of Industrial and Innovation Development of Kazakhstan for 2003-2015 through investment, and investment in promising enterprises. The need to create IFC by underdeveloped equity market, rather low capitalization of domestic companies, as well as the absence of the domestic market of adequate mechanisms to ensure inflow of investments in the manufacturing industry.
Human resources for R&D and innovation

In Kazakhstan, in 2010, number of employees engaged in R & D relative to the economically active population in Kazakhstan amounted to 0.19% vs. 0.21% in 2000, these are 17 thousand people. In 2010, among them 10.8 thousand people (63.8%) - research specialists. Due to the rapid transition of Kazakhstan to innovative development it is obvious that the proportion of scientific and technical personnel in relation to the economically active population should increase.

Table 5

Number of specialists, carrying out scientific research and development by organization type*, people

<table>
<thead>
<tr>
<th>Organization type</th>
<th>year</th>
<th>2000</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of specialists, carrying out scientific research</td>
<td></td>
<td>4756</td>
<td>18912</td>
<td>19563</td>
<td>17774</td>
<td>16304</td>
<td>15793</td>
<td>17021</td>
</tr>
<tr>
<td>and development</td>
<td></td>
<td>scientific research institutes</td>
<td>9508</td>
<td>12659</td>
<td>13072</td>
<td>10974</td>
<td>9062</td>
<td>7927</td>
</tr>
<tr>
<td></td>
<td></td>
<td>universities</td>
<td>4305</td>
<td>4035</td>
<td>4362</td>
<td>4437</td>
<td>4828</td>
<td>4504</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Design, engineering design and</td>
<td>520</td>
<td>972</td>
<td>922</td>
<td>753</td>
<td>703</td>
<td>1443</td>
</tr>
<tr>
<td>technological organizations</td>
<td></td>
<td>Departments on industrial</td>
<td>378</td>
<td>344</td>
<td>306</td>
<td>277</td>
<td>291</td>
<td>303</td>
</tr>
<tr>
<td></td>
<td></td>
<td>enterprises</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>other</td>
<td>45</td>
<td>902</td>
<td>901</td>
<td>1333</td>
<td>1420</td>
<td>1616</td>
</tr>
</tbody>
</table>

* Excluding the scientific-pedagogical personnel performing research and development, along with teaching
** Based on data of Statistics Agency of RK

Most of the employees engaged in R&D in 2009 are concentrated in research organizations and universities - 78.7% (2000 - 94%). At the same time there was a noticeable increase in the number of scientific workers in other organizations - their share increased from 0.3% in 2000 to 10.2% in 2009, i.e. is the outflow of scientists from research institutions in other organizations of scientific-technical sphere. In the structure of employees engaged in R&D in 2010, the growth in the proportion aged under 30 is observed.
Based on data of Statistics Agency of RK
Considering the overall changes in the structure of scientific personnel of the country by age, it should be noted that the trend of aging of science personnel still remains: for the period 2000-2010
The trend of personnel aging is observed and maintained in all areas of science. The main reasons of outflow of scientific staff, observed in recent years, it is, above all, low wages in the scientific field and the lack of demand for domestic science, leading to leakage of internal and external specialists and a lack of young people into science and technology

The potential of highly qualified personnel is used in science and technology is not sufficiently far, and its reproduction is not guaranteed. Remains important and unresolved question of how many highly qualified personnel needed for Kazakhstan, how many and what professionals need to prepare. To do this, across the country need to create a multi-layered and flexible system for monitoring, analysing and forecasting demand for highly qualified professionals. It should form the basis of new evidence-based model of the labour market.

In accordance with the concept of education development in Kazakhstan, one of the areas of state regulation of higher education is the formation of state order for preparation of specialists - graduators of universities. Apparently, it is advisable to introduce a state order for higher qualification staff preparation. Preparation of highly qualified personnel in the post-graduate training provides only 10-15% of those defended their candidates and doctors of science.

Developing the system of preparation of qualified personnel, including highly qualified scientific personnel required to focus attention on the issue of training them abroad, as well as on the issue of quality professionals who receive scientific degrees. In this case, the implementation of the Presidential program "Bolashak" may be the solution to the problem of preparation of highly qualified staff of new formation - skilled managers, experts, specialists in the field of intellectual property, innovative marketing, venture capital, management training for high-tech industries, and experts in the field of project management - for implementation of innovation.

High school is a source of manpower for all sectors of the economy, including the scientific-technical sphere. In basic industries like mining, processing and transportation of minerals, mechanics and engineering, as well as in selected areas, which ensure the creation of science-intensive technologies (instrumentation, computer science, biotechnology, etc.); there is a
shortage of highly qualified personnel. To attract young people into scientific and technical sphere the government took practical steps to direct financial state support of young scientists, namely, established prizes and scholarships in science, introduced a monthly fee for a degree for the scientists performing the state order. Overall, despite some positive developments in the scientific sphere, the staff of Science of Kazakhstan requires effective state support.

In Kazakhstan, gender rights are not affected, there is no restriction for women to exercise their professional knowledge, including S&TI.

Table 6
Number of personnel engaged in R&D (2006-2010)

<table>
<thead>
<tr>
<th>years</th>
<th>total number of personnel engaged in scientific area, people</th>
<th>researches</th>
<th>technicians</th>
<th>supporting personnel</th>
<th>others</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>16578</td>
<td>9899</td>
<td>1300</td>
<td>3018</td>
<td>2361</td>
</tr>
<tr>
<td>2004</td>
<td>16715</td>
<td>10382</td>
<td>1102</td>
<td>3112</td>
<td>2119</td>
</tr>
<tr>
<td>2005</td>
<td>18912</td>
<td>11910</td>
<td>1270</td>
<td>3133</td>
<td>2599</td>
</tr>
<tr>
<td>2006</td>
<td>19563</td>
<td>12404</td>
<td>1281</td>
<td>3214</td>
<td>2664</td>
</tr>
<tr>
<td>2007</td>
<td>17774</td>
<td>11524</td>
<td>1290</td>
<td>2824</td>
<td>2136</td>
</tr>
<tr>
<td>2008</td>
<td>16304</td>
<td>10780</td>
<td>1166</td>
<td>2349</td>
<td>2009</td>
</tr>
<tr>
<td>2009</td>
<td>15793</td>
<td>10095</td>
<td>1151</td>
<td>2366</td>
<td>2181</td>
</tr>
<tr>
<td>2010</td>
<td>17021</td>
<td>10870</td>
<td>1078</td>
<td>2754</td>
<td>2319</td>
</tr>
</tbody>
</table>

Including scientific degree:
Doctor of science (traditionally in former Soviet system of education is the second or highest scientific degree)

<table>
<thead>
<tr>
<th>years</th>
<th>researches</th>
<th>technicians</th>
<th>supporting personnel</th>
<th>others</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>979</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2004</td>
<td>1013</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2005</td>
<td>1106</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2006</td>
<td>1157</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2007</td>
<td>1166</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2008</td>
<td>1191</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2009</td>
<td>1340</td>
<td>1338</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>2010</td>
<td>1347</td>
<td>1341</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

Doctor of philosophy PhD (According to international standards today we have only PhD degree form 2010)

<table>
<thead>
<tr>
<th>years</th>
<th>researches</th>
<th>technicians</th>
<th>supporting personnel</th>
<th>others</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>2004</td>
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<td>2008</td>
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<tr>
<td>2009</td>
<td>68</td>
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<tr>
<td>2010</td>
<td>59</td>
<td>59</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Candidate of science (traditionally in former Soviet Union is the first stage of the scientific degree)

<table>
<thead>
<tr>
<th>Year</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
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<tbody>
<tr>
<td>2003</td>
<td>2782</td>
<td>2740</td>
<td>3018</td>
<td>3147</td>
<td>3058</td>
<td>2861</td>
<td>2756</td>
<td>3041</td>
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<tr>
<td>2004</td>
<td>2781</td>
<td>2739</td>
<td>3018</td>
<td>3147</td>
<td>3058</td>
<td>2861</td>
<td>2734</td>
<td>3012</td>
</tr>
<tr>
<td>2005</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>2006</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>9</td>
<td>19</td>
</tr>
<tr>
<td>2007</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>-</td>
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<tr>
<td>2008</td>
<td>-</td>
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<td>-</td>
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<td>-</td>
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<tr>
<td>2009</td>
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<td>-</td>
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<tr>
<td>2010</td>
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<td>-</td>
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<td>-</td>
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<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Kazakhstan has introduced internationally accepted system of preparation of PhD, two scientific ranks are regulated legislatively - an associate professor and professor, currently only system of preparation of doctors PhD works. Before 2010 in Kazakhstan there were Doctor of Science and Candidate of Science, from 2009 - Doctor of philosophy, PhD.

In 2010, the growth of scientific personnel in relation to 2000 was 15.3%; the absolute increase is equal to 2.26 thousand persons.

Resource: on data of Statistics Agency of RK
According to the Agency on Statistics of Republic of Kazakhstan the number of personnel engaged in R&D (end of 2010) are 17 021 people, including researchers 10 870 people. Among researches there are Dr. 1341 people, PhD 3012 people.

There are several problems associated with staffing in the field of science. There is a long-term downward trend in the number of specialists engaged in scientific, technical and technological development.

According to the results of 2010 were reported increasing of this indicator 10 870 people engaged in research and development, which is higher than the same in 2009 to 7.7%.

There are following problems in the system of scientific training:
- lack of objective methods for determining the needs of Kazakhstan's scientific staff;
- the work with talented students involved in scientific activity weakened;
misbalance in training of scientific personnel in majors;
employment of mostly graduates of scientific disciplines in the private sector, not related to science;
aging of scientific personnel;
low-prestige of scientist in Kazakhstan, caused by the unpopularity of science in society

To support the effective reproduction of human resource capacity of science the following problems should be solved:

- Creating a system of selection and development of talented scientific staff as the basis for the formation of strategic human resources of the country and bringing it into the sphere of research and development;
- Training of scientists, corresponding to the priorities of development of science and State Program of Accelerated Industrial-Innovative Development" (SPAIID);
- The introduction of creative and financial stimulation for researchers to attract domestic and foreign scientific and engineering personnel to participate in the development of science in Kazakhstan;
- The effective employment of existing staff who have received natural-technical education in the best educational institutions of the world according to their areas of specialization;
- Attracting scientists-compatriots, working abroad, for the development of national scientific schools and implementation of research in Kazakhstan. Providing conditions for their research;
- Retraining and continuing training of specialists;
- Creation of scientific and educational-industrial consortiums involving research universities, high-tech companies and national scientific organizations.

Council of young scientists, being created nowadays, will be a permanent advisory body for the interaction of state bodies with young scientists, preparation of proposals on topical issues of national science, technology and innovation policy, and public policy in the field of training of the teaching staff, improving the effective participation of young scientists in development of scientific-technical sphere and social security.

Council of young scientists is created under the Foundation of the First President of the Republic of Kazakhstan was created on behalf of President of RK, is an advisory body, which aims to interact with scientists and research organizations in Kazakhstan and abroad, to develop proposals on actual issues of state scientific-technical and innovation policy.

The Council of young scientists consists of physicists, mathematicians, chemists, philosophers, economists, linguists, miners. In total, there are 25 people from five regions. The chairman is Gulmira Abdirajymova, professor of sociology of KazNU named after Al-Farabi.

The main aims and objectives of the Council are:
- Support and development of active role of young scientists in the processes of design and creation of the future of the Republic of Kazakhstan;
• Promote achievements of young scientists of Kazakhstan, the possibility of their use in market conditions
• Organization of scientific conferences, symposia, seminars, exhibitions;
• Conduct research activities with the participation of young scientists at the national and regional levels;
• Preservation and development of leading scientific schools, scientific succession of generations, increase the intellectual potential of the Republic of Kazakhstan;
• Carrying out systematic work to support and attract to the country talented Kazakh scientists, working abroad.

Basic principles of social welfare of scientists and researchers:

Providing the attractiveness of scientist’s and researcher’s career in all scientific fields (remuneration, social security, health insurance, warranties)
Stability and the functioning of science as a major area of scientists and researchers life.

The status and salaries of scientists will be increased, with a view to enhance the prestige and attractiveness of the status of scientist, legislatively will be fixed wage system, which provides an opportunity for more wages within the grant funding, and funding of research from other sources not prohibited by law, increasing of allowances for academic degrees, a double increase in the size of bonuses for academic degree of Candidate of Sciences, Doctor of Philosophy (PhD), Doctor of the profile, and four monthly minimum wages for doctoral degrees. It is envisaged the inclusion of researchers, mentioned in adopted law, to the number of subjects, who may be granted provisional housing loans with long-term budget loans at preferential interest rate.
Differentiation of scientists and researchers welfare based on socially relevant circumstances. A number of scientists work at hazardous sites with unhealthy working conditions (nuclear physics, radiation sources, etc.). They should have firm guarantees of social security
The problem of "brain drain" is not so acute as in the 90s of last century. Then, the brain drain was not only outside the country to their historic homeland, but also in developing of small business sector of economy, and other structures. Together with the Ministry of Foreign Affairs been established relationship with Kazakhstan scientists, working abroad (in the database 121 scientists). In accordance with the Law "On Citizenship of the Republic of Kazakhstan" compatriots may apply for restoration of citizenship, if they get a permanent residence permit in the Republic»
In accordance with Article 139 of the Labor Code of the Republic of Kazakhstan, women are granted maternity leave. Maternity leave is given without keeping salary on child care until the child reaches age of three.
According to the Law of the Republic of Kazakhstan "On Compulsory Social Insurance” working women are entitled to a social welfare payment for pregnancy and childbirth and monthly welfare payments for child care until the age of one year.

13The interview to «Мегаполис» newspaper of the Deputy of Chairman of Science Committee of MES of RK – Mogilnyi V. , 20 February 2012
**Science-business knowledge and technology transfer – activities, support structures, IPR legislation**

The structure of the acquired technologies shows that only one per cent is technology transfer, 12.8% - the results of research and know-how transfer and 30.6% of industrial designs. Trends in the structure of the acquired technologies remain negative, with a predominance of purchases not of knowledge and technology, but finished goods and services (table 7.)

Table 7

<table>
<thead>
<tr>
<th>Structure of new acquired technologies (technical achievements) and program facilities</th>
<th>Structure of new transferred technologies (technical achievements) and program facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>2007</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

**Including forms of transfer:**

<table>
<thead>
<tr>
<th>patents, licenses to use inventions, useful models, industrial designs</th>
<th>20,5</th>
<th>5,4</th>
<th>25,1</th>
<th>50</th>
<th>30,6</th>
<th>2,7</th>
<th>3,3</th>
<th>38,9</th>
<th>21</th>
<th>11,8</th>
</tr>
</thead>
<tbody>
<tr>
<td>results of R&amp;D</td>
<td>9,1</td>
<td>0,7</td>
<td>0,7</td>
<td>3</td>
<td>12,8</td>
<td>72,3</td>
<td>17,9</td>
<td>52,8</td>
<td>74,4</td>
<td>66,1</td>
</tr>
<tr>
<td>know-how, agreement on technology transfer</td>
<td>1</td>
<td>0,9</td>
<td>2,4</td>
<td>0,6</td>
<td>1</td>
<td>0,5</td>
<td>0,1</td>
<td>-</td>
<td>0,6</td>
<td>-</td>
</tr>
<tr>
<td>purchase of equipment</td>
<td>52</td>
<td>41,7</td>
<td>55,7</td>
<td>-</td>
<td>-</td>
<td>11,8</td>
<td>1,2</td>
<td>4,2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>other</td>
<td>17,4</td>
<td>51,3</td>
<td>16,2</td>
<td>46,3</td>
<td>55,6</td>
<td>12,7</td>
<td>77,5</td>
<td>4,2</td>
<td>4</td>
<td>22,1</td>
</tr>
</tbody>
</table>

Note: according to data of Statistics Agency of RK

Target indicators have been indicated in Kazakhstan:

- Increasing the number of internationally recognized patents up to 30 to 2014.
- Increasing the number of new implemented technologies, research and development activities to 2014 up to 200 and 160 respectively.
- Creation and development of existing innovation infrastructure in the period till 2014: the number of sectoral centres- 2 units, design bureau -3 units, technoparks-4 units.
- Increasing of innovation activity of enterprises in the country to level: by 2015 - 10 %; by 2020 - 20%.

The structure of science funding is composed in the following proportions: 20% are payment from the governmental budget for the basic research, 30% are for the applied research, and 50% are any
other grants or target payment for research and development, which are allowed by the current legislation.\textsuperscript{14} Researchers engaged in number of R&D projects will get higher salary.

\textsuperscript{14} State Program for Accelerated Industrial-Innovative Development of Kazakhstan for the years 2010 -2014, Astana, 2010
Cooperation in STI at national level

In the framework of Program for the Development of Innovation and the Promotion of Technological Modernization in the Republic of Kazakhstan for 2010-2014 direct project and venture funding for innovative projects is provided.

JSC "National Innovation Fund (NIF)" provides funding for innovative projects by non-controlling equity participation. One of the most important components in the selection of innovative projects submitted for consideration by the Fund is their innovation and commercialization content, which can also include the research component, but it is not compulsory. NIF finances projects aimed to further innovation and commercialization.

The purpose of the innovative project is the creation of new or changing of existing systems - technical, technological, informational, social, economic, organizational, and achieve cost savings by resources (industrial, financial, human), radically improving the quality of products, services, and high commercial effect.

Innovative projects can be classified depending on the application to:
- research;
- scientific and technical;
- organizational

The idea of an innovative project should have a basis in the form of scientific and marketing research, as the production, must adjust to the consumer and based on scientific research.

In order to increase innovation activity in Kazakhstan, NIF fulfils financing of innovative projects (including start up projects) via call for proposals up to 500 million Tenge (2,54 MEURO) by the non-controlling equity participation (up to 49%) in the share capital of the project company. Such conditions of financing allow participation of applicant in share capital of the company submitted the project not less than 51%. In this case, payment of intellectual property rights is permitted, certified by a patent, in an amount not more than 20% of the share capital of the project company. As for 2011, NIF finances 9 innovative projects through direct (project) investing.

Terms of innovation grants in 2011, in accordance with the rules of the grant (example)

<table>
<thead>
<tr>
<th>#</th>
<th>Type of grant</th>
<th>Max. amount</th>
<th>The term, months</th>
<th>The result of the development</th>
<th>Type of expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Implementation of experimental-development works and (or) the risky nature of applied research</td>
<td>20 mln. Tenge 98 183 Euro</td>
<td>24 months</td>
<td>1) experimental or prototype proposed for the production of products; 2) package of design documentation for the production of the products; 3) The test report of the pilot or prototype proposed for the production of products;</td>
<td>State scientific and technical, economic and environmental expertise</td>
</tr>
</tbody>
</table>
JSC "National Innovation Fund" is a partner of 4 domestic venture capital funds in Kazakhstan, established jointly with local investors in a public-private partnerships: JSC "AIFRI" Venture Fund "Centras", JSC "AIFRI" Venture Fund «Delta Technology Fund», JSC "Fund for High Technology "Areket" and JSC “Logycom perspective innovations”. Venture Fund “Centras” locates in Almaty. It was established in 2005, partner - JSC "Centras capital". The managing company is JSC "Centras Securities". It is a universal fund. The authorized capital is 2.6 billion Tenge (12 763 868 euro). Contribution of NIF is 1.3 bln. Tenge (6 381 934 euro).

There are seven projects at the stage of financing: LLP "Domikom", LLP "Inventum" LLP "Sans Novat", LLP "Center for Digital Technology," LLP "3U Technologies" LLC "Merida-KZ", LLP "New Chemical-Metallurgical Technologies”

NIF has been a partner in six Kazakh venture funds. In 2010, NIF has successfully emerged from two local venture funds "Advant" and «Almaty Venture Capital» for a total profit 58.2 million Tenge (0,3 MEURO). NIF’s share in Kazakh venture funds is up to 49%. Investment policy of venture funds focused on finding and bringing projects in promising sectors with export potential.

The aim of such cooperation is to develop innovative projects with high potential for further growth and the probability of production of economically viable and demanded products by investing to these projects their own and borrowed money at different stages of their development.

NIF also is a partner of the top five foreign venture capital funds from the Europe, USA, Israel, Southeast Asia - Wellington Partners III Technology Fund LP, “Central Asia supporting fund of SME”, “CASEF, LLC”, Mayban Jaic Asian Fund, Venture fund Vertex III Fund L.P.

The strategic goal of creating a joint venture funds is to provide access to advanced western technology to further transfer them to Kazakhstan. Creation of joint venture funds is also a good opportunity to go on leading technology companies in the world. The principle of the Foundation is to build an open system of exchange of knowledge, experience and technology.

15 www.nif.kz/our_activities/investment/venture_financing/domestic_venture_capital_funds/
By working with leading venture capital funds of the world, NIF seeks to attract not only financial capital of foreign investors, but also to create a network of cooperation with high-tech companies and create new opportunities for Kazakhstan science.

The main directions of development of venture capital investments in 2010-2014 are the creation of regional and sectoral venture capital funds. The objects of investment support are entrepreneurs; preference is given to small innovation business projects. Funding for innovative projects in the regions will be implemented by venture capital funds as they become available. In December 2010 the establishment of regional venture capital fund "Caspian Sea" together with JSC "NC" SEC "Caspian" based on venture fund of JSC «Logycom perspective innovations» has been approved.

**Technology commercialization**

Committee on Intellectual Property Rights of the Ministry of Justice of the Republic of Kazakhstan was created by order of the Minister of Justice of the Republic of Kazakhstan on April 21, 2008 # 102.

The Committee deals with issues of intellectual property. The Committee is responsible for the registration of intellectual property rights and execution of public policies related to the protection of copyrights, inventions, utility models, industrial prototypes, and other intellectual property, as well as for issuing certificates of copyrights, patents, trademarks and product recognition well-known marks.

National Institute of Intellectual Property accepts applications for patents for inventions, utility models, industrial designs and trademarks, conducts examination of trademarks, maintain the state registry of intellectual property and arrange for official publication. Protecting the intellectual property rights is provided by the customs authorities, who keep a register of goods containing objects of intellectual property. Items are included into this register after the application by owner of the rights to intellectual property.

Law “On Copyright and Related Rights of Republic of Kazakhstan” dated on June 10 1996, # 6 regulates relations in the field of intellectual property arising from the creation and use of scientific, literary and artistic works (copyright), performances, performances, phonograms, broadcasts of broadcasting organizations and cablecasting organizations (related rights).

Kazakhstan adopted a law "On introducing amendments and addenda to some legislative acts of the Republic of Kazakhstan on issues of intellectual property" (January 12, 2012 # 537-IV)

Commercialization system in Kazakhstan is at an earlier stage of development. There are few technoparks, commercialization departments at institutes and venture capital funds, but the number of quality projects is very limited at this time. In 2010, NIF began working on the creation and development of technology commercialization in the Republic of Kazakhstan.
To establish a network of support centres for the commercialization it is provided the establishment of three types of structures: National Center for commercialization, regional support centres of commercialization and commercialization offices at research institutions.

The main activities of commercialization centres:
- Stimulating of innovation activity
- Commercialization of innovative projects.

Stimulating innovation is done by establishing the relationship between the center of commercialization, universities, businesses and other stakeholders in an innovative environment, through training, technology audits to identify their innovation supply and demand.

National Center for commercialization plays a key role in coordinating a national program of commercialization. It conducts research necessary for the further development of the commercialization program, stimulates the development of a network of regional support centres of commercialization and commercialization offices; provides technical support in areas such as marketing and management of intellectual property for commercialization centres and offices;

Regional centres of commercialization are bridges between science and business to promote the use of scientific developments and technologies to market goods and services with maximum economic profit. Pilot centres in regions that are most powerful in the field of science and high technology industries were opened. The first three regional centres were opened in 2011: in Almaty, in Karaganda and Ust-Kamenogorsk. The 4th center will be established in 2012, the fifth - in 2013. The centres will be affiliated with the National Innovation Fund and will be located in the structures controlled by the state. Regional centres of commercialization will be based on the principle of public-private partnership. Centres will be partly financed from the budget of the National Program of commercialization, but also may use funds of program of technology business incubation. The new centres will focus on the business sector and science and will serve as a commercialization program offices in their regions.

Commercialization offices will be created as a unit in research organizations, universities and enterprises actively engaged in scientific research. In 2011 nine commercialization offices was founded jointly with research institutes and universities:
- Institute of Organic Catalysis and Electrochemistry named after D. Sokolsky;
- West-Kazakhstan Agrarian Technical University named after Zhangir Khan;
- Karaganda State University named after E. Buketov;
- Almaty Technological University;
- South Kazakhstan State University named after M. Auezov;
- Institute of Biology and Plant Biotechnology;
- The East -Kazakhstan State University named after S. Amanzholova;
- Science and Technology Park , Kazakh National University named after Al-Farabi;
- Karaganda State Technical University.
Support centres of technology commercialization, working with business organizations, and science, will assess the potential for innovative research projects and invest in those works, which will implement an effective commercialization of selected projects.
Support structures (e.g. technology transfer centres, National Contact Points)

Kazakhstan has a Network of Technology Transfer (KNTT). The main purpose of this network is to promote business innovation and commercialization of high technologies in Kazakhstan. In 2005 KNTT became a member of the Russian Network of Technology Transfer (RNTT) and the Republican Center of Technology Transfer of the Republic of Belarus, and gained access to databases of Russian and Belarusian developments, and the right to place its own technological profiles.

Between JSC “CETT” and Scotland IRC operator – company “Targeting Innovation Ltd” a memorandum of cooperation was signed. In 2009 Kazakh-French Centre of the Transfer of Technology was created in Kazakhstan.

At the present time KNTT includes 26 members of the network, the infrastructure of Kazakhstan network of technology transfer according to ENN standard is established. In Kazakhstan there are about 26 requests for technological development with the participation of the European Union. Kazakhstan Network of Technology Transfer (KNTT) is part of the national information network that is integrated into the international network of technology transfer.

At the present time Kazakhstan cooperates with the following international centres of technology transfer:
- Kazakh-Finnish centre for technology transfer
- Kazakh-German centre for technological cooperation
- Korean-Kazakhstan center for technological cooperation
- Kazakh-French center for technology transfer

In Kazakhstan, it is provided a creation of 5 engineering offices to serve the needs of businesses by segment - agricultural, electrical, mining, transportation and oil and gas engineering. Created sectoral design bureaus will provide services to improve the quality characteristics of the equipment, products, technical assistance in the establishment of pilot industrial samples. Also assist in speeding up the introduction of machine-building enterprises of new products through the transfer of design and project documentation in terms of royalties and other financial mechanisms. Access to services of experimental design bureaus according to common conditions will have all domestic enterprises.

At present JSC "NIF" established four design bureaus: transport engineering, mining and metallurgical equipment, gas equipment, agricultural machinery.

Since 2004, Kazakhstan set up 8 regional parks:
- "Technopark" Algorithm "(Uralsk);
- "Technopark UNISCIENTECH» (Karaganda);
- "Almaty Regional Technology Park" (Almaty);
- “Regional Industrial Park in Astana" (Astana);
"Technopark KazNTU named after K. Satpayev "(Almaty); "Regional Industrial Park in the South-Kazakhstan Region "(Shymkent); "East-Kazakhstan Regional Industrial Park "Altai" (Ust-Kamenogorsk); "North-Kazakhstan Regional Industrial Park "Kyzylzhar" (Petropavlovsk)

2 357 557 683 Tenge (12 022 221 euro or about 12 MEURO) was allocated for the creation of technoparks for the period from 2004 to 2011. In 2010, for the first time the state represented services of technology business incubation in order to develop small and medium-sized innovative companies and projects; 245 million Tenge (about 1 249 426 euro), in 2011 -306 mln. Tenge (1 561 224 euro) have been allocated for this event. Services of technology business incubation received 36 applicants for innovative projects.

Assistance is provided in an innovative project by providing free of charge set of necessary services (for example, accounting, legal support, service of project manager, infrastructure services, office, office equipment), obtaining permits (certificates, licenses, technical specifications, standards, testing of the product of innovation project at the request of a potential customer, etc.).

According to the activity’s results the total number of projects, announced in the technology business incubation in the context of regional parks, amounted to 525 units, including provision of business incubation services. It was selected 35 innovative projects.

International cooperation in STI

Bilateral and multilateral and European cooperation

Cooperation with EECA-countries
A number of bilateral cooperation agreements have been concluded between Kazakhstan and the EECA countries, such as Azerbaijan, Belarus, Kyrgyzstan, Russia, Turkmenistan, Ukraine, and Uzbekistan in different fields of education and science: seismology, metallurgy, oil, gas, economy, linguistic, exchange of students and teachers, recognition of high school diploma between the countries and others. Most important of them are:

- Kazakhstan - Russia cooperation agreement in the humanitarian sphere for 2007-2010 (signed on 4 October 2007, in Novosibirsk, Russia)
- Kazakhstan - Russia cooperation agreement on cooperation in culture, science and education signed on 28 March 1994
- Kazakhstan - Russia cooperation agreement on science and technology development signed on 25 November 1996
- Kazakhstan - Belarus cooperation agreement in the field of higher and postgraduate education, entered into force on 29 October 2009
- Kazakhstan - Ukraine cooperation agreement on education and science (14 September 2010)
- Kazakhstan - Tajikistan cooperation agreement on higher education (30 May 2008)

Cooperation with EU-member states and associated countries
Kazakhstan has concluded bilateral cooperation agreements with Bulgaria, Germany, Greece, France, Poland, Spain, Turkey, and the United Kingdom. All of these agreements foresee joint research, exchange of students and teachers, creation of equal conditions for students and tutors, and many other things included into the agreements, as well as the joint participation within the EU Framework Programmes, and activities included into DCI, LLL, and ENP instruments.

In this group of countries Kazakhstan traditionally closely cooperates with Germany. Based on the bilateral agreement between the countries, institutions of Kazakhstan will participate in activities of the GTZ, the BBZ, and the DAAD.

Since its independency Kazakhstan has established close cooperation in the field of RTD. According to CORDIS figures the distribution of coordinators is as follows: Germany: 21.3%, Greece and Italy: 15.8% each, the Netherlands and the UK: 10.33 each; Austria, Belgium, Czech Republic, France, and Hungary: 5.3% each.

DCI is a programme supported by the EU Delegation in Kazakhstan, and is well known within the country thanks to its previous activity under TACIS projects. Mainly, the DCI projects are foreseen for social and political issues, and thus do not include special parts for research and scientific tasks. But the projects include some research data. Tempus programmes implemented in Kazakhstan are financed under DCI. Within the following objectives of the DCI, this instrument can contribute to improving access to other EU funded programmes:
addressing the essential needs of the population, in particular primary education and health;
promoting sustainable development through environmental protection and sustainable management of natural resources;
supporting sustainable integrated water resource management and fostering greater use of sustainable energy technologies.

At the DCI Workshop organised by InExCB-Kz under INCONET-EECA on 25-26 March 2010 in Almaty it was decided to let research institutions participate in DCI projects. Last DCI calls show that there is still no specific research activity. Research component covered so far under EU Programmes funded under DCI relates in first line to the implementation of needs assessment in respective fields.

Science and technology are certainly very important and are regularly mentioned as a priority by Kazakhstani Government. There is also a direct link for the EU and its companies to further cooperate with KZ on these issues to increase the local capacities to have more successful business and economic cooperation but also as a way to promote EU technology in the region. Now, whether the DCI is the right tool to develop this kind of support is difficult to assess. It is worth mentioning that an EU-KZ Energy Technology and Know How Transfer centre / platform is likely to take shape in KZ in the years to come through the support of the EU Instrument ICI+, the instrument for co-operation with industrialized and other high-income countries and territories, which aims to strengthen the Community's relationships with other developed countries. The instrument is intended to foster long-lasting political and commercial ties, which will strengthen the EU's profile and influence on the international stage.
<table>
<thead>
<tr>
<th>Country</th>
<th>Agreement Description</th>
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<tbody>
<tr>
<td></td>
<td>The regulation of the Kazakh-Bulgarian intergovernmental commission on trade-economic and scientific-technical cooperation. Sofia, 3/13/98. Entered into force March 13, 1998</td>
</tr>
<tr>
<td></td>
<td>Agreement between the Government of the Republic of Kazakhstan and the Government of the Federal Republic of Germany for further cooperation for the development of Kazakh-German University in Almaty. Astana, 03.09.08. Entered into force on August 20, 2010</td>
</tr>
<tr>
<td>Denmark</td>
<td>Protocol on establishing diplomatic relations (between the Government of the Republic of Kazakhstan and the Government of the Kingdom of Denmark). Almaty, 05/07/92. Entered into force upon signature</td>
</tr>
<tr>
<td>Spain</td>
<td>Agreement on strategic partnership between Kazakhstan and the Kingdom of Spain. Astana, 02.07. 09. Entered into force on September 1, 2010</td>
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<td>Country</td>
<td>Agreement</td>
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<tr>
<td>CYPRUS</td>
<td>Protocol on establishing diplomatic relations between Kazakhstan and the Republic of Cyprus.</td>
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<tr>
<td>LITHUANIA</td>
<td>Agreement between the Republic of Kazakhstan and the Republic of Lithuania on mutual understanding and cooperation.</td>
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<tr>
<td>NETHERLANDS</td>
<td>Agreement between the Government of the Republic of Kazakhstan and the Government of the Netherlands on cooperation and mutual administrative assistance in customs matters.</td>
</tr>
<tr>
<td>NORWAY</td>
<td>Protocol on establishing diplomatic relations between Kazakhstan and the Kingdom of Norway.</td>
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<tr>
<td>POLAND</td>
<td>Agreement between the Government of the Republic of Kazakhstan and the Government of Poland on economic cooperation.</td>
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<tr>
<td>ROMANIA</td>
<td>The regulation of the Kazakh-Romanian intergovernmental commission on trade-economic relations and scientific cooperation.</td>
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<tr>
<td>SLOVENIA</td>
<td>Agreement between the Government of the Republic of Kazakhstan and the Government of Slovenia on cultural cooperation.</td>
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<tr>
<td>Country</td>
<td>Agreement Description</td>
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<tr>
<td>SWEDEN</td>
<td>Agreement between the Government of the Republic of Kazakhstan and the Government of the Kingdom of Sweden on trade relations. Almaty, 23/03/94. Entered into force on September 1, 1994</td>
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**The EU and Central Asia: Strategy for a New Partnership**

The EU has strengthened its relationship with the Central Asian countries since the adoption of “The EU and Central Asia: Strategy for a New Partnership” by the European Council in June 2007 (Central Asian countries: Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, Uzbekistan). The strategy strengthens relations in all areas of cooperation, including through the reinforcement of EU-Central Asia political dialogue with regular meetings of the EU and Central Asian Foreign Ministers, the reinforcement of dialogues on human rights, the cooperation in the areas of education, rule of law, energy and transport, environment and water, common threats and challenges (including border management and combating drug trafficking), and trade and economic relations. The strategy is supported by a significant increase in EU assistance.

The main priorities of cooperation between the European Union and the Republic of Kazakhstan in the sphere of education are described in the "EU Strategy for Central Asia: Updated priorities for Kazakhstan" for 2007-2013. It includes the development of cooperation between the leading universities and partners in the European Union (student exchange and scholarship) and the
development of professional-technical education (participation in the programmes of the European Training Foundation).

Partnership and Cooperation Agreements (PCAs)
The Partnership and Cooperation Agreement (PCA) with Kazakhstan has been the legal framework for EU-Kazakhstan bilateral relations since it entered into force on 1 July 1999. In November 2006 a Memorandum of Understanding on cooperation in the field of energy between the EU and Kazakhstan has been signed establishing the basis for enhanced cooperation.
The future European Commission assistance will focus on the following priority areas: promotion of the on-going reform process at political, economic, judiciary and social level, infrastructure building, and cooperation in the energy sector.

In the last decade, developing good relations with Kazakhstan has become an ever more important priority for the European Union — driven by Kazakhstan's growth as a reliable energy supplier and the country's rising profile on the international scene.

Negotiations on a new agreement on an enhanced partnership and cooperation between Kazakhstan and the European Commission were launched in Brussels on 26 June 2011 during the 12th session of the Cooperation Committee “Kazakhstan – European Union”. This document, which will replace the current agreement signed in 1999, will take further ahead the Kazakh-EU bilateral interaction and will include unexplored areas of cooperation.

Mr Norbert Jousten, Ambassador, former Head of the EU Delegation in Kazakhstan, in the article “Kazakhstan – European Union: Strategy of Partnership” clearly described the strengthening of the cooperation between the EU and Kazakhstan:

“Research and innovation are key elements for an industrial modernisation programme. In this area we have also an on-going cooperation through the European Union’s chief instrument for funding research, the Seventh Framework Program for research and technological development (FP7). We consider that the current level of Kazakh involvement in FP7 is below its potential, but we appreciate the signs telling that interest is increasing. As Kazakhstan is an International Cooperation Partner Country, all Kazakh research entities are eligible for funding by the European Union for their participation in projects, and so enjoy the same rights and obligations as those entities established in the EU Member States.

EU grant assistance to Kazakhstan has played an important role since 1991 in the support of Kazakhstan’s development and in support of the EU-Kazakhstan relations. Since Kazakhstan has become independent, more than 300 projects amounting to €140 million have been funded. The biggest share of these funds has been and continues to be allocated to policy advice and technical assistance as well as in support of people-to-people contacts.
Currently, more than 50 EU-funded projects address important topics in six broad priority sectors defined by the “EU Central Asia Strategy for a New Partnership”:

- Human rights, rule of law, good governance and democratisation;
- Investing in the future: youth and education;
- Promotion of social and economic development, trade and investment;
- Strengthening energy and transport links;
- Environmental sustainability and water;
- Combating common threats and challenges. In all of these areas, the EU has established close cooperation links with national authorities, private sector and civil society.

Some of the projects are regional projects involving other Central Asian countries. Technical assistance in the energy sector is provided at the regional level under the Baku Initiative within the framework of the INOGATE programme on the convergence of energy markets, energy security and investment attraction. An important aspect of the cooperation is the enhancement of the environment protection in the oil and gas industries through an improved legislative and regulatory framework.

Other ecological challenges are focused as well through the EU-Central Asia Environmental Dialogue and subsequent concrete actions, especially in the field of climate change mitigation and the integrated water resources management. The main operational activities in the area of education include the Erasmus Mundus academic mobility programme, the Tempus programme on modernisation of higher education, support programmes of vocational education and research institutions.

In terms of specific goals for the EU grant based national cooperation, the Government of Kazakhstan and the EU agreed to focus in the coming years on the local development, the reform of public administration and the reform of the judiciary system, to support the rule of law in the country. This reflects our common understanding that no long-term economic prosperity is possible without a transparent and effective political and administrative system, the rule of law and an independent and competent judiciary. At the same time, this will foster social cohesion, democratic progress and respect of human rights. Since 2008, the EU has established an annual Human Rights Dialogue with Kazakhstan’s national authorities, preceded by regular meetings with the local NGOs and annual regional seminar bringing together the EU and Kazakhstan civil society on various topics such as women’s rights or the judicial system and places of detention.
Through open call for proposals, Kazakhstan NGOs can benefit from EU grants of about €1 million per year under the European Instrument for Democracy and Human Rights aimed at promoting transparency of political and economic processes and respect of human rights. The EU also considers the final Declaration of the December 2010 Astana OSCE Summit and Kazakhstan’s July 2010 UN review of its commitments under the International Covenant on Civil and Political Rights (ICCPR) as important benchmarking tools for our cooperation.

The partnership between the EU and Kazakhstan is also a commitment to work together on global challenges.

Both, the EU and Kazakhstan are currently taking stock of their achievements and consider an upgrading of the Partnership and Cooperation Agreement to reflect the progress achieved and to tackle the challenges ahead. Kazakhstan is a key partner for the EU and we look forward to continue and enhance our relations.

The overall EU co-operation objectives, policy responses and priority fields for Central Asia can be found in the EC Regional Strategy Paper for Central Asia 2007-2013. In addition to the assistance under the Development Cooperation Instrument (DCI), Kazakhstan participates in several on-going regional programmes.
Support structures (National Contact Points)

**FP7 NCP structure in Kazakhstan**

The National Coordination Board on cooperation with the European Union Framework Programmes on research, technology and innovation development was created on 22 July 2010 by the order of the Ministry of Education and Science. Eight thematic and three horizontal programmes NCPs were appointed.

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<th>National Coordination Board on Cooperation with the European Union Framework Programmes on Research, Technology and Innovation Development</th>
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**MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN**

| Hosting organisation of the FP7-NCP in Kazakhstan (FP7-NCP-Kz) is Independent Expert Consulting Board to Promote Scientific Research Activity (InExCB-Kz), which especially created in 2002 by outstanding researchers of Kazakhstan, members of the National Academy of Sciences and INTAS advisor, to build-up close cooperation between the EU and Kazakhstan scientific communities. Statute of InExCB-Kz in its part of main activities accords to requests of the EC Guidelines to set up the national contact points. InExCB-Kz was hosting organization of Kazakhstani National Information Point of FP6 INTAS Information Network in New Independent States. Since December 2006 the InExCB-Kz is appointed as the EU FP7-NCP in Kazakhstan by special order of the Committee of Sciences of the Ministry of Education and Science of the Republic of Kazakhstan. Founder-members of the InExCB-Kz have large experience in international scientific cooperation. They have carried out number of international projects and events to distribute knowledge on the EU Framework programs since 1994. InExCB-Kz was coordinator of the FP6 SSA project ‘Opening up the European Research Area to Central Asia’, in which Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan key research institutions participated. InExCB-Kz has huge database of local research institutions and all capacities to carry out analysis of science development in locale. Structure of InExCB-Kz consists of 5 departments: Departments of Social Sciences, Food and Agriculture, Space, Information and Nanotechnologies, Life Sciences and Ecosystems, and Health Research. InExCB-Kz is participant of the ICA2-CT-2000-50004-Network-Kz; FP6-501064-ERA-
CentralAsia, FP6-INTAS-ININ-NIP-KZ, FP6-023157-InJoy&Train, FP6-SCOPE-2015, ETSI/EUROTRUST, FP6-037116-INTERLINK, FP7-212226-INCONET-EECA, FP7-244417-IncoNet-CASC, FP7-223358-EECA-LINK, FP7-227204-BIO-CIRCLE, FP7-265608-BIO-CIRCLE-2 projects funded by the EU.

Director of InExCB-Kz was NCP for the FP5 and INTAS advisor, main staff of the present InExCB-Kz worked within these activities also. Staff of InExCB-Kz was involved into development of Kazakh laws on science, tax, and international relations. As well as Director of InExCB-Kz was fully involved into preparation and signing INTAS-Kazakhstan cooperation agreement. InExCB-Kz staff has very strong experience in the EU Framework Programs since 1995 being as office of INTAS advisor and FP5 National Coordinator, then FP6-INTAS-ININ-NIP-Kz and FP7-NCP-Kz. Founder-members of InExCB-Kz in different time were members of the Kazakh Parliament and the Kazakh Government.

Number of local Kazakh institutions participates in the FP7 projects and networks, through which most trainings and info days are provided. The FP7 National Coordinator Office has developed a special local programme for the training of trainers and cascade trainings to cover most institutions of Kazakhstan. This methodology includes special training courses for thematic NCPs organised by the FP7 National Coordinator during 5-10 working days in accordance to the topics of the courses and availabilities of the participants. Very often it is divided for two parts with time slot 2-3 weeks between the courses. Then thematic NCPs conduct same training with authorized representatives of their institutions and centres, which in their turn will organise the training for researchers at their departments and laboratories. FP7 National coordinator provides all trainees with necessary instructional materials and daily consulting and advisory services. FP7 NCP-Kz structure includes the FP7 National Coordinator office in Almaty and Astana, Thematic NCPs offices in Almaty, Astana, and Kurchatov.

FP7 NCP-Kz has database of 182 different research institutes, companies, universities, SMEs, which are potentially could participate at FP7. The database created by special questionnaire distributed among of entire Kazakh institutions in accordance to the list of public and private institutions available in different sources. Institutions, which like to participate at FP7 calls and events, filled in and sent to FP7-NCP-Kz their registration forms with list of their research topics, contact data of the authorized person. Actually all of them are clients of FP7-NCP-Kz. The database is allocated at website: www.inexcb.kz and at websites of the FP7 projects, in which InExCB-Kz participates, e.g. incrEAST, BIO CIRCLE, EECAlink, INCONET-EECA, INCONET-CASC.

FP7-NCP-Kz provides the Kazakhs scientific community with necessary support to participate at new FP7 calls for proposals and at on-going projects. For the period 01.01.2007-01.01-2012 there are 19 projects co-funded by the European Commission through FP7:

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Project description</th>
<th>Project Partners</th>
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The IncoNet EECA project will facilitate a coordination of S&T policies building on common interest and aiming at mutual benefit in order to strengthen the cooperation between EU and EECA.

The main objectives of IncoNet EECA are:

- To support and facilitate a bi-regional EU – EECA S&T policy dialogue and, in the case of Russia and the Ukraine, a complementary bilateral S&T policy dialogue involving stakeholders from policy making, science community and industry. The dialogue will address national S&T potential, policy goals and demands in order to define common priorities and to develop respective joint scenarios and implementation strategies in order to strengthen the S&T cooperation. During this project, three S&T Policy Dialogue Platforms will be established and supported through the creation of a knowledge base and a variety of other concrete activities.

- To address other EU policies and their Instruments from which S&T cooperation with EECA could benefit. Emphasis will be given to the European Neighbourhood Policy – ENP and the Four Common Spaces with Russia (External Relations), the Development Cooperation and Economic Cooperation (DCEC), the Education Policy (Life Long Learning Programme - LLL) and the Innovation policy (Competitiveness and novation Programme - CIP).

- To strengthen the participation of EECA in FP7 with emphasis on the 'Cooperation' Programme but addressing other Specific Programmes, such as 'Peoples', 'Ideas', 'Capacities – SMEs', as well. In parallel, concrete recommendation for future Specific International Cooperation Activities (SICAs) will be presented to the European Commission and to the responsible Programme Committees.

- To raise the capacities of the EECA countries, through particular activities that will address the institution building and human potential development of the existing National Information Points/National Contact Points.

- To implement strategic analyses that will provide a knowledge base and scientific evidence for the bi-regional/bilateral dialogue.

- To monitor and review the activities performed in the context of IncoNet EECA in order to assess the quality of the overall process (SWOT analysis) and to ensure the sustainability of these activities beyond the 4-year duration of this project.

- To build a public 'EU-EECA S&T Web Portal' and to setup a Central Information Office to widely disseminate information and to raise awareness of the potential of and the framework for enhanced EU-EECA S&T cooperation.
<table>
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<tr>
<th>Table</th>
<th>Community targets for energy import. Evaluating technical, economic and environmental characteristics of present and future energy corridors within Europe and among Europe and the supplying regions of the World, taking into account the different typology of infrastructures and technologies (railways, pipelines, cables, terminals, ships and other carriers, ..), the flows and the distances involved for oil, natural gas, coal, electricity, uranium, biomass and hydrogen (reference to the work done within the ENCOURAGED Project and other research activities).</th>
<th>Climate Change Coordination Centre, Kazakhstan  E.T. Gaidar Institute for the Economic Policy Foundation - Russian Federation  Technical Research Centre of Finland - Finland  Fundacion General de la Universidad Nacional de Educacion a Distancia - F-UneD - Spain  National Technical University of Athens - Greece  Asatrem SRL - Applied Systems Analyses, Technology and Research, Energy Models - Italy  Kanlo Consultants S.A.R.L - France  Austrian Research Centers GMBH - ARC - Austria  Centro de Investigaciones Energeticas, Medioambientales y Tecnologicas-CIEMAT - Spain  Deutsches Zentrum fur Luft und Raumfahrt E.V. - Germany  Institutt for Energiteknikk- Norway  Universitaet Stuttgart- Germany</th>
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<tr>
<td>CoMeth</td>
<td>The project aims at reducing greenhouse gas (GHG) emissions caused by the uncontrolled exhausting of coal mine methane (CMM) to atmosphere and to explore suitable economically interesting schemes for its energetic use by the development of an universal decision guidance for optimal use of CMM under varying conditions, an analysis and comparison of the current legal and administrative situation in countries with big coal deposits (PL, CZ, RU, UA, RO, KZ and UK), the development, establishment and test of test units for new CMM utilisation technologies (use of CMM vented from a mine and CMM liquefaction) and the analysis of the emission reduction potential of CMM utilisation.</td>
<td>Fraunhofer-Gesellschaft zur Foerderung der Angewandten Forschung E.V - Germany  Kar-Metan, Kazakhstan  ECO-Alliance- Ukraine  NOVEN OOO- Russian Federation  A</td>
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<td>CASPINFO</td>
<td>CASPINFO aims at strengthening the regional capacity and performance of marine environmental data &amp; information management, and adoption of international meta-data standards and data-management practices, involving stakeholders from management, research, and industry. The objectives are: To initiate and maintain a Caspian Sea network of leading environmental and socio-economic research institutes, governmental departments, oil &amp; gas industries, and international bodies, jointly working on the definition, development and operation of the CASPINFO service.</td>
<td>Mariene informative Service Maris BV – Netherlands  «Institute of Geography» Center of sciences about the Earth, Metallurgy and Enrichment MES RK  Permanent Secretariat of the Commission on the Protection of the Black Sea Against Pollution - Turkey  United Nations Educational, Scientific and Cultural Organization –UNESCO France  Institut Probleem Ekologii I Evolyuci im A.N. Severtsov Rossiskaya Akademya Nauk - Russian Federation  P.P.Shirshov Institute of Oceanology of Russian Academy of Sciences- Russian Federation  State Oceanodraphic Institute - Russian Federation  Caspian Marine Scientific and Research Center of RosHydroMet - Russian Federation</td>
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<td></td>
<td>EU-PEARLS</td>
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<td>5.</td>
<td>Increased worldwide demand for natural rubber and latex means that alternative sustainable sources are urgently required. In order to meet this challenge, we propose to create a Network that links all stakeholders involved in the development and sustainable use of Parthenium argentatum (guayule) and Taraxacum koksaqhyz (Russian dandelion) as alternative rubber and latex sources in the EU. To guarantee the sustainable development and exploitation of both crops throughout the value creation chain, the project includes research into the collection and creation of new germplasm, biochemistry and genetics, breeding, agronomy, processing, and product development. The entire rubber biosynthetic pathway will be analysed, and potential bottlenecks will be identified and bypassed through targeted conventional breeding. Genes involved in rubber biosynthesis will be mapped, helping to accelerate breeding strategies in order to generate plants with commercially-viable rubber yields.</td>
<td>BIO CIRCLE will extend the network of National Contact Points for the FP7 theme Food, Agriculture and Fisheries and Biotechnology (BIO NCP) to National Information Points (NIP) from Third Countries over a two year period. The European Commission needs to implement the bilateral Scientific &amp; Technological Agreements signed with Third Countries (TC), for increasing their participation in FAFB FP7 and strengthening the collaboration between European and TC researchers. The main focus of the project will be on identifying, sharing and implementing good practices between NCPs and NIPs.</td>
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<td>7.</td>
<td>HITT-2008</td>
<td>Goal: To understand long-term trends of population health as a consequence of socio-economic transitions, with a focus on lifestyle-related issues. Overviews: A unique team with extensive expertise in health effects of transition will generate new knowledge on health determinants in 11 CIS countries: Russia, Belarus, Ukraine, Moldova, Kazakhstan, Uzbekistan, Kyrgyzstan, Armenia, Azerbaijan and Georgia. It employs a model of health determinants acting at individual and societal level, with distal and proximal influences on health. It focuses on alcohol, tobacco, diet, and health care, each linked to diseases specified in the call.</td>
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<td>8.</td>
<td>NMDB</td>
<td>Setting up a European digital repository for cosmic ray data.</td>
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<td>data by pooling existing data archives and by developing a real-time database with the data of as many European neutron monitor stations as possible. The data will be available through internet. Cosmic rays provide a diagnostic tool to analyze processes in interplanetary space and at the Sun. Cosmic rays also directly affect the terrestrial environment and serve as indicators of solar variability and non-anthropogenic climate changes on Earth.</td>
<td>Germany</td>
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<td>Institute of Ionosphere, Ministry of Education and Science of RK</td>
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<td>Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation of the Russian Academy of Sciences - Russian Federation</td>
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<td>Ustav Experimentalnej Fyziky Slovenskej Akademie VIED- Slovakia</td>
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<td>Institut d’Aeronomie Spatiale de Belgique- Belgium</td>
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<td>Yerevan Physics Institute after A.I. Alikhanyan - Armenia</td>
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<td>Observatoire de Paris - France</td>
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<td>Universitaet Bern - Switzerland</td>
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<td>Oulun Yliopisto- Finland National and Kapodistrian University of Athens - Greece</td>
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<td>Tel Aviv University – Israel</td>
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<td>INNO AG - Germany</td>
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<td>National Innovation Fund</td>
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<td>Institution of the Russian Academy of Sciences</td>
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<td>Institute for System Programming RAS- Russian Federation</td>
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<td>Technology Business Incubator Kharkov Technologies Non- Profit Organization - Ukraine</td>
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<td>Innovation Association Akademtechnopark- Belarus</td>
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<td>Yerevan State University - Armenia</td>
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<td>Fondation Sophia Antipolis -France</td>
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<td>Russian Technology Transfer Network - Russian Federation</td>
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<td>9.</td>
<td>ISTOK-Soyuz</td>
<td>The ISTOK-SOYUZ project, based on the sound outcomes and lessons learnt of the ISTOK.Ru project <a href="http://www.istok-ru.eu">www.istok-ru.eu</a> implemented in Russia in 2006-2008, will expand the ISTOK experience to the Eastern Europe &amp; Central Asia countries, identifying and promoting visibility of mutual RTD potential and collaboration opportunities. The project will: promote the EU ICT programme, raise awareness about benefits of mutual collaboration; identify potential for R&amp;D ICT collaboration between the European Union and 9 addressed countries of Eastern Europe and Central Asia; expand the EU-Russian ICT research community to 4 targeted countries (Ukraine, Belorussia, Armenia and Kazakhstan) through the opening of an ISTOK competence platform and implementing pilot actions such as networking &amp; brokerage events and assistance to integration into the European Technology Platforms and Networks of Excellence; provide support to research teams from the targeted countries with the goal of increasing the number of ICT FP7 partnerships between researchers from Europe and targeted countries.</td>
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<td>Oulun Yliopisto</td>
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<td>Technology Business Incubator Kharkov Technologies Non- Profit Organization</td>
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<td>Yerevan State University</td>
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<td>Fondation Sophia Antipolis</td>
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<td>10.</td>
<td>EECAlink</td>
<td>The EECAlink is a coordination action aimed at identification of joint research priorities of the EU and EECA countries and strengthening scientific collaboration among them. The priorities are: Encouragement and promotion of the international collaboration in Health sector through systematic support to creation of new research consortia and submitting proposals to the Health thematic priority of FP and Public Health Programme. Stimulation of the further development of research consortia for FP7 and Public Health calls and supports</td>
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<td>Charles University in Prague - Czech Republic</td>
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<td>Independent Expert Consulting Board to Promote Scientific Research Activity in Kazakhstan</td>
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<td>Agency for the Promotion of European Research – Italy</td>
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<td>these in preparation of their project proposals. Identification of joint research interest of the EECA and the EU Member States and assure their effective communication to the relevant policy makers. Strengthening and broadening of the existing research collaboration among participating university /academia partners. Building up and strengthening the capacities of participating EECA countries for effective collaboration within the FP7 projects and in their administration.</td>
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<td>Ivan Javakhishvili Tbilisi State University – Georgia Indo-Uzbek Centre for Promotion of Science and Technology Cooperation – Uzbekistan Institute of Biophysics and Cell Engineering, National Academy of Sciences of Belarus – Belarus Nencki Institute – Poland Odessa National I.I. Mechnikov’s University – Ukraine State Medical and Pharmaceutical University “Nicolae Testemitanu” – Moldova Technology Centre AS CR – Czech Republic University of Rome Tor Vergata - Italy University of Debrecen – Hungary Faculty of Fundamental Medicine of the Lomonosov Moscow State University – Russian Federation</td>
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<td>11.</td>
<td>PROMITHEAS-4 The project's aims are the development and evaluation of mitigation/adaptation (M/A) policy portfolios and the prioritization of research needs and gaps for twelve (12) countries (Albania, Armenia, Azerbaijan, Bulgaria, Estonia, Kazakhstan, Moldova, Romania, Russian Federation, Serbia, Turkey and Ukraine) characterized as emerging economies. The achievement of these aims is ensured through seven (7) work packages (WP) corresponding to the following project's main objectives, Evaluation of available data and information (WP1), Choice and implementation of models (WP2), Scenarios and policy portfolios (WP3), Evaluation of policy portfolios (WP4), Prioritization of research gaps and needs (WP5), Training - Dissemination (WP6), Management (WP7).</td>
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<td>12.</td>
<td>MEMBRIDGE The main objective of the proposal is to make a step towards reaching an effective integration of research activities, training, equipment sharing, and thus answer the needs for a coordinated membrane science and</td>
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<td>European Membrane House - Belgium Aquamarijn Micro Filtration BV- Netherlands Membrane Technologies-KZ MTB Technologies SP ZOO- Poland</td>
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technology R&D in Europe and Russia oriented primarily at development of eco-efficient methods in industry. This objective replies to one of most important priorities of FP7: Elaboration of concepts aimed at sustainable development, and societal innovation. This objective will be attained by rapprochement of two membrane networks: Network of Excellence NanoMemPro in Europe and Russian Membrane Network being in the way of formation.

| 13. | INCONET CA/SC | The main aims of the IncoNet CA/SC project are: enhancing the policy dialogue with the target countries for the identification of research priorities of mutual interest; development of synergies with other Community policies and instrument for a stronger support to S&T related activities; organization of Info Days and of other activities aiming at an increased participation of researchers from CA and SC in FP7; capacity building and support to the FP7 contact points in the target regions; mapping of key research institutes and analyses/studies on cooperation patterns, S&T Indicators, innovation policies, etc. |
|      |            | International Center for Black Sea Studies - Athens
|      |            | Independent Expert Consulting Board to Promote Scientific Research Activity in Kazakhstan
|      |            | Central Scientific Library-Kz
|      |            | Sh.Rustaveli National Science Foundation - Georgia
|      |            | Fund “Altyn Umit” - Turkmenistan
|      |            | Geology Institute of Azerbaijan National Academy of Sciences - Azerbaijan
|      |            | Society for Development of Scientific Cooperation (SODESCO) - Tajikistan
|      |            | Public Foundation Enconsult-Kyrgyzstan
|      |            | National Library of the Kyrgyz Republic - Kyrgyzstan
|      |            | Foundation for Research and Technology Hellas - Greece
|      |            | Ministry of Education of the Azerbaijan Republic – Azerbaijan
|      |            | Olimoni Navin- Tajikistan
|      |            | Institute of Water Problems and Hydropower of the Kyrgyz National Academy
14. BIO CIRCLE 2

The main objective of BIO CIRCLE 2 is to foster the knowledge base about FP7 FAFB & the networking capacities of Third Country researchers in order to reinforce their participation in FP7 projects. 3 project goals are distinguished: 1. Disseminate information effectively to Third Country researchers; 2. Organise information days and training for Third Country researchers; 3. Provide Third Country researchers with efficient networking opportunities. 5 European plus 16 Third Country partners (International Cooperation Partner Countries ICPC and Industrialised Countries) will all be involved in the activities. Apart from Kazakhstan and Thailand all involved countries (and the African continent represented by FARA) have signed a bilateral S&T agreement with the EU. The expected impacts are supported by various activities: Enhanced awareness of the Third Country researchers on the FP7 FAFB: WP2 will develop the regional strategies for the Third Country partners.

Agenzia per la Promozione della Ricerca Europea - Italy
Independent Expert Consulting Board to Promote Scientific Research Activity in Kazakhstan
Agriculture and Agri-Food Canada - Canada
Euro Research Support Limited - New Zealand
Universidad Nacional Autonoma de Mexico - Mexico
National University of Life and Environmental Sciences of Ukraine - Ukraine
Chinese Academy of Agricultural Sciences - China
Institut Agronomique et Veterinaire Hassan II - Morocco
Institution of the Russian Academy of Sciences, A.N. Bach Institute of Biochemistry of RAS - Russian Federation
Comision Nacional de Investigacion Cientifica y Tecnologica - Chile
Ministerio de Ciencia, Tecnologa e Innovacion Productiva - Argentina
Centre de Biotechnologie Borj Cedria - Tunisia
Association de Coordination Technique pour l’Industrie Agroalimentaire - France
Jawaharlal Nehry University - India
Forum for Agricultural Research in Africa -
| 15. | **DEGISCO** | The main aim of the DEGISCO project is the further extension of the European DCI infrastructure that is already interconnected by EDGeS to International Cooperation Partner Countries (ICPC) in strong collaboration with on the one hand local partners in ICPC countries and on the other hand European e-Infrastructure experts (including 3G Bridge know-how) and thus, reinforce the global relevance and impact of European distributed infrastructures. |
|     |         | United Kingdom National Research Center - Egypt Empresa Brasileira de Pesquisa Agropecuaria - Brazil Food Industrial Research and Technological Development Company SA - Greece Tudomanyos Akademia Szamitastechnikai es Automatizalasi intezet - Hungary Department of Science and Technology - South Africa Forschungszentrum Juelich GMBH – Germany |
| 16. | **SEOCA** | The project aims at further fostering cooperative ties between the countries of Central Asia and Europe in developing and applying Earth Observation (EO) technologies for effective environmental monitoring. The project intends to take a significant step towards deeper integration of respective organizations from Central Asian countries into the activities of GEO. The project sees its mission and overall objective to further strengthen the cooperation between Europe and the countries of Central Asia within GEO by implementing a coherent set of activities aimed at building GEO-related capacity in the domain of Earth Observation in the target countries. |
|     |         | Technical University Berlin, Aerospace Institute - Germany Engineering, Consulting and Management Office - Germany L.N. Gumilyov Eurasian National University TUBITAK UZAY, Uzay Teknolojileri Arastirma Enstitusu - Turkey JSC “The National Center of Space Researches and Technologies”, Kazakhstan JeeOijital Bilisim Teknoloji Madencilik Insaat Sanayi ve Ticaret Limited Sirketi - Turkey Aratos Technologies S.A. - Greece GIRAF PM Consultants - Germany Hydrometeorological Research Institute of the Centre of Hydrometeorological Service on Cabinet of Ministers of the Republic of Uzbekistan The State enterprise “Center of remote sensing and GIS technologies” - Uzbekistan |
| 17. | InterPregGen | The main aims of the project are: To identify the genetic factors in women and their babies which predispose to pre-eclampsia in Central Asian and European populations. To establish sustainable collaborative links between Central Asian and European research groups through training programmes, exchange visits and the creation of Central Asian biobanks. To create a predictive tool for pre-eclampsia and its complications and apply it to Central Asian and European pregnant women. |
| 18. | ADAPTAWEAT | ADAPTAWEAT will show how flowering time variation can be exploited for the genetic improvement of the European wheat crop to optimize adaptation and performance in the light of predicted climate change. It will test current hypotheses that postulate specific changes in ear emergence and the timing and duration of developmental phases, which are thought of as components of ear emergence, will improve wheat productivity. Precise genetic stocks varying in specific flowering time elements and subjected to genotyping and characterization with diagnostic markers for key flowering time genes will be used to test these hypotheses. Data analysis will aid the construction of new wheat flowering models that can be used to refine existing hypotheses. They will allow standing genetic variation for flowering time in European germplasm to be deployed more efficiently in wheat breeding programmes. This knowledge will be used to inform searches for specific phenotypic and molecular variants in diverse and non-adapted wheat germplasm panels provided by consortium members. Vital novel genetic variation will be efficiently imported into the germplasm of European wheat breeders. The project will deliver new diagnostic markers for genotyping, molecular reporters for novel breeding selection strategies and the tools and knowledge necessary for a combined physiology and genomics led predictive wheat breeding programme. |
PICTURE

- Following the tradition of scientific collaboration between EU and the EECA region, and built on the sound outcomes and lessons learnt of three clustering projects (ISTOK-SOYUS, SCUBE and EXTEND), a group of leading EU and EECA specialists from twelve countries (Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russian federation, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan) with complementary competences have come together in the PICTURE project with the sole purpose to bring the ICT R&D policy dialogue and cooperation between EU and EECA to an upper level. The overall aim of the project is to engage the EU and EECA stakeholders from across research, academia, industries, government and civil society to enrich and support the EU-EECA ICT Policy Dialogue, and to reinforce strategic partnerships between EU and EECA ICT organizations.

- To reach the objective of the project, the consortium will:
  - Update the EU-EECA ICT priorities for cooperation and provide an overview of the EECA ICT policy dialogue, currently existing in the region
  - Enrich the Policy Dialogue process and meetings between the EU and EECA, encompassing findings from policy research and stakeholder views dealing with common R&D perspectives, priorities, opportunities and challenges
  - Set up and animation of working groups, focusing on Computing Systems, Internet of Services and ICT Policy Organization of 3 workshops on Computing Systems, Internet of services and ICT Policy topics, with ten working groups meetings, providing input and follow up,
  - Implement pilot projects that would be different in each country
  - Recommend future co-operation initiatives
  - Explore and recommend existing EECA programmes in order to open new perspectives for participation of the EU ICT teams

As final outcome, the project will present recommendations and strategies for reinforcement of bilateral and multilateral cooperation, covering the large geographical area of the EECA countries.

**Challenges**

FP7 research and Coordination and Support Action projects are co-funded by local partner institutions. There is no financial support received from the government. Activities of some NCPs (for example, BIO-NCP, Almaty Technology University, or ICT-NCP and CIP-NCP, National Innovation Fund) are co-financed by the hosting organisations. FP7 NCPs in Kazakhstan is not able to fulfil all their tasks to make awareness and information on FP7 priorities and calls for proposals as well as to participate in the FP7 events organised in the EU/AC countries without special political and financial support of

Kazakhstan still needs to strengthen the cooperation framework with the EU RTD programmes as well as with the EECA countries. First of all there is need to overcome some barriers, such as: language and cultural barriers by enhancing the staff exchange under the EU mobility programmes; facilitation for VISA issues for both parties, the EU and Kazakh researchers; enhancing of participation of SMEs (public and private) in national and international programmes providing them with necessary co-funding

- To bring closer the Kazakh scientific community into the EU Framework programmes the first needs are:
  - to support politically and financially the EU FP NCP structure within the country;
  - the EC will take care to involve into INCO projects and networks first of all formally appointed NCPs and provide them with necessary funding to participate in the FP7/FP8 trainings and events conducted in the EU/AC countries;
  - conclusion of a special S&T cooperation agreement between the EU and Kazakhstan to facilitate the participation of Kazakh researchers in the EU FP’ calls and events;
  - role of NCPs should play a significant role in bi- and multilateral S&T cooperation agreements as well;
  - NCPs should be involved in the development of STI indicators in the country along with the State Statistic Agency;
  - NCPs play a significant role in the increasing participation of the Kazakh scientific community in the EU FP7/FP8 through their daily work such as organisation of trainings and awareness activities for their local clients. This activity needs special funding, which should be spent from the governmental budget;
  - there is a need to plan the opening of a Kazakh R&D office in Brussels.

The Government of Kazakhstan should strictly follow the items of the national laws and orders on RTDI in Kazakhstan to provide the Kazakh scientific community with all necessities to escape brain drain from research and to make R&D activity more attractive for the young generation.

It is very advisable to open the Kazakh FP7 NCP structure under the Ministry of Industry and New Technologies taking into account similarities of the priorities and tasks of the EU FP7 and the Ministry.
Summary: Self-assessment of the policy and programme mix including SWOT analysis

The State Program of Science Development in Kazakhstan for 2007-2012 included comprehensive analysis of the problem to increase competitiveness of the science of Kazakhstan in its part 3, which states the following.

In today's global economy, the emphasis is less on material wealth, but rather on the intellectual potential. The ability of nations to maintain a modern and efficient system of education, to raise the intellectual potential of the workforce through education becomes a critical factor for the competitiveness of the country.

Kazakhstan is now entered into a phase of industrial-innovative development of economy. This stage is characterized by the adaptation of the scope of science to current economic conditions, which should lead to fundamental changes in the structural, organizational, personnel, infrastructure and financial support of science, governed by an appropriate regulatory framework.

The development of scientific and technological capacity should not be considered as a co-factor, which is not characteristic for the traditional sectors of the economy. The scope of science is the same sector of the economy, which has all the features, rules and regulatory mechanisms common to other sectors. While 80% of Kazakhstan's economy is in the private sector, regulation of the principles of science, inherited a weak focus on market requirements, are outdated and incomplete.

Inefficient mechanism for private sector involvement in the development of scientific and technical potential, relatively low activity of participants in research and development are still weak links across the scientific and technological system in Kazakhstan, while the development and introduction of new technologies and high-tech products are key factors in achieving and maintaining competitive advantages in both domestic and foreign markets.

The share of high technology products and spending on science in GDP are key indicators of an economy based on knowledge. In countries that are leaders in the world market of high technology products, the share of spending on science in the total GDP is tightly controlled, including through the use of economic instruments such as tax breaks, low customs duties, budget support, promote investment, scientific equipment leasing.

Macroeconomic analysis of the scientific and technological development in Kazakhstan showed that the proportion of new scientific production in GDP in recent years does not exceed 1.1%, the activity of enterprises for the production of scientific output - 2.3%. This indicates that the scientific and technical activity has not yet become the basis for economic development. It should be noted that higher activity is typical for companies with foreign participation (5%) and private ownership (3.7%) with low activity of state-owned enterprises (0.6%).
Science has been excluded from the process of economic reform. It did not provide a coherent scientific "reserve", it is necessary to activate the factors of economic and social progress and catching up with developed countries of Kazakhstan. A more detailed analysis of the problem reveals the main factors hindering the development of science in Kazakhstan.

In the organizational structure of the field of science there is no system in decision-making, resource utilization and capacity of the private sector. The large number of administrators of research programs carried out by the state budget, makes it difficult to implement legislatively fixed rate a single administration and coordination of research conducted in the country.

Structural imbalances in the organization of scientific research led to the practical absence of demand for R&D results. For example, funding of applied research consists of 71% of the state budget, while for the R&D is allocated only 8%. The cost of basic science is about 21%, which is broadly consistent with the world average.

There is very low proportion of R&D organizations; an average one out of nine scientific organizations has development project. The number of specialists in these organizations is about 5% of the total number of employees performing R&D, or 0.1% of the number of personnel of industrial sector.

In this case the main reason for the low participation of the higher education sector in research is mainly on the reorientation of its educational function. This was due to reduced state funding of higher education, primary development of free education, the emergence of private educational institutions, shareholding public institutions of higher education against the backdrop of an ever-growing competition in the sector.

There is necessary to note the presence of negative trends in the scientific training: increase the share of defending the thesis candidates who do not work in science, lack of flexibility training, lack of motivation research and education areas for further professional growth, after a degree commensurate with no financial security. These factors lead to:

- narrowing of the scope of publications and patents of domestic scientists. For example, in the country by an average of 100 scientists have a scientific paper, published abroad, 15,000 scholars received one or two international patents;
- decline in the quality of research and expertise, as a consequence, intensive growth of the holders of academic degrees;
- inconsistency of available scientific and innovative potential and production needs in the use of advanced technologies, which led to the rupture of relations between science and industry;
- lack of competition between the schools of science and individual scientists;
- drain of highly qualified personnel in the sphere of commercial and scientific organizations of foreign countries;
- reduce the flow of new scientific and pedagogical staff and a lack of young professionals in science and technology;
S&T Policy Mix Peer Review. Country Report Kazakhstan

- lower social status and prestige of science scholar;
- low efficiency of scientific research;
- break the continuity.

In addition, due to the fact that the budget cycle is only one year, three-year funding decisions on scientific and technical programs are accepted each year. This leads to increased costs of both temporal and administration. Conduct contests for state purchases of research at the beginning of the year results in the discovery of financing by the end of the first quarter, which negatively affects the receipt of R & D results, scheduled before the end of the year.

Public sector organizations perform research and development, an average of 3 times more than enterprises of private ownership. Despite the fact that in the past five years in the private sector, a weak trend towards consolidation of organizations, the average number of personnel engaged in research and development does not exceed 100 persons, while in the public sector the figure is 150 people.

Over the past decade, the position of the public sector in the structure of domestic science has hardly changed: scientific organizations, personnel involved in them, and material-technical base, located in the public domain, are the basis of scientific and technical structure of Kazakhstan. Obsolete material and technical base in general and laboratory equipment in particular do not allow for scientific research and experimental development to meet the demand of consumers. Lack of design and engineering offices (institutions) inhibits the transfer of technology in production, which leads to a violation of the connection between science and production.

The quality of public sector management, science and social science utility of the private sector remains low; there is a lack of effective implementation of the scientific capacity to ensure that Kazakhstan's competitiveness in the global market.

Thus, the implementation of the strategic objective of becoming one of the most competitive countries in the world, have developed a system of management of economic development, requires the development and implementation of long-term program, including providing specific ways and measures to develop effective science and technology system.

Analysis of the current situation of innovation activity in Kazakhstan is included into the State program for the development of innovation and the promotion of technological modernization in the Republic of Kazakhstan for 2010-2014. The Program is based on the Plan of activities of the Government of the Republic of Kazakhstan to implement the State program for accelerated industrial-innovative development of Kazakhstan for 2010-2014, approved by Decree of the Government of the Republic of Kazakhstan dated April 14, 2010 № 302.

The responsible state agency for the Program is the Ministry of Industry and New Technologies. The aim of the Program is building a national innovation system to ensure competitiveness of the economy through the creation of management systems of innovation - technological development, innovation development of industries and regions, creating conditions for the development of
high-tech small and medium enterprises and enhance the scientific and engineering potential of the country.

The Program objectives are the following:
Promote the development of technological modernization by creating demand for new technologies that offer innovation and the introduction and spread of innovation.
Create own competencies via technological forecasting and planning, orientation of applied science to the needs of business and the formation of innovative clusters.
The development of innovation environment by improving the coordination of elements of the National Innovation System, promote innovation and improve the legal framework.

The analysis of the current situation in the RTDI of Kazakhstan done in the introduction to the Program states that despite the fact that the reforms carried out in Kazakhstan for a long time, the country has not seen significant progress towards the formation of an innovative economy. For example, according to an index level of knowledge in the economy (KEI) for 2009 Kazakhstan lags behind those of countries with similar levels of per capita GDP as Chile, Malaysia and Turkey. In other words, the level of competitiveness of Kazakhstan's economy is not high enough.

In general, the assessment of the current situation in Kazakhstan suggesting that a national system of support and innovation remains the weakest link, because there is no effective system of conversion of domestic and foreign knowledge in national wealth.

In field of Innovation activity of enterprises the Program shows that in 2009, capital and operating costs of technological innovation were 61,050.9 million Tenge (in 2008 it was equal to 113,460.1 M Tenge). In this case, the costs of acquiring machinery and equipment associated with technological innovations were 78.2%, to research and develop new products, production processes directed - 12% on the purchase of new technology - 2.1%. Costs associated with the implementation of innovative activity to 80% are process innovations, i.e. there is no demand for research and development of new products.

In 2009, there have been statistical observation of innovation in 10 096 enterprises of the republic, of which only 399 were the subject of managing technological innovation (the development and implementation of a new product or production process). For comparison, in 2008 there were 447 enterprises. Thus, decrease in innovative activity of enterprises is observed.

The analysis of the scientific organizations showed that most of the projects to develop innovative products are a proactive development, not regional or scientific, technical orders, i.e. the developers themselves invent a product and subsequently forced him to seek and find buyers use these inventions.

Meanwhile, the state order, in turn, is not directly related to business needs and is determined by the public authorities themselves. This indicates a lack of connections between science and business. One of the institutional gaps is the lack of a base formed to create a network of offices and development of commercialization as a link between innovators and users of innovations.
Thus, the model of management and financing of applied science of Kazakhstan is largely focused on the satisfaction of scientific interest, rather than addressing specific technological challenges facing the business. This model is clearly not suited for creating dynamic sectors and industries that could compete in international markets.

Analysis of successful international experience has shown that one of the main conditions for effective systems for the generation of innovation is the involvement in the process of higher education. In 2009 15 joint projects were realized between enterprises and universities in Kazakhstan, which shows a very low level of cooperation. If this provision is explained not only unmotivated companies to mass innovation as the insufficient level of quality research services that are offered by our universities. This problem in turn is caused by unmotivated universities to develop their own academic skills, as they are the main income, in contrast to Western universities receive from the provision of educational services. This imbalance leads to a deterioration in the quality of research personnel and reduce young people's interest in science.

Analysis of strengths, weaknesses, opportunities and threats for the industry (SWOT analysis) identified the following factors of the National Innovation System:
### Strengths
- Political Stability
- Availability of natural resources
- Breadth of secondary and higher education
- Political support for the leadership of the country's measures to improve the efficiency of NIS
- The strong vertical of power, based on a strict chain of command and discipline in state agencies
- The presence of innovation and financial infrastructure
- Experience in the venture and project financing of innovative projects

### Weaknesses
- Lack of consistency in the implementation of public policies on science, technology and innovation
- Lack of coordinating national, regional and sectoral level of NIS (lack of formalized approaches to work at the regional level)
- The low initial level of technological and managerial enterprise
- The deficit of highly qualified technical personnel
- Lack of awareness about the possibilities of increasing productivity through innovation (weak innovation culture)
- The small domestic consumer market
- The existing gap between science and industry
- Long-term receipt of documents of title to inventions and industrial designs
- Less than 1% of Kazakhstan's application for inventions patented in other countries
- The absence of an effective mechanism for interaction with representatives of business and scientific community
- Lack of qualified personnel in the field of technology transfer

### Capabilities
- The growth performance of NIS by improving collaboration between industry and science
- A significant increase in labor productivity due to technology transfer
- Leadership in a number of promising high-tech industries at the expense of clear competitive advantages and the availability of the scientific groundwork
- The growth of markets for technology products through integration (customs union, WTO)
- Creating the conditions for the return of intellectual resources

### Threats
- Increased competition in the innovative development of developing countries
- The widening gap between the scientific and technological and productive level of developed countries
- Securing raw material orientation of the economy because of high price increases for raw materials
- High concentration of economic
- Changing priorities in public policy
- Lack of funding
- Leakage of intellectual resources
- Reducing the quality of education
- The relatively low popularity of engineering disciplines
- Increasing competition from foreign high-tech companies

Developing a national system of support and innovation in the country is in its formative stages, and thus explains some lag from the world's leading countries, where national innovation systems are already successfully operating. Many of the technologically advanced countries (USA, EU, and Japan) moved to world leadership in science and innovation for decades and have a fairly
consistent and long history. The beginning of an innovative economy formation in the world typically belongs to the period after the Second World War. In this regard, to evaluate rigorously the results of innovative development of Kazakhstan for a relatively short period of time is very inefficient. Currently, Kazakhstan is still in its initial stage of transition from resource based economy to an innovative type of development, which can be divided into two stages.

The volume of innovative products has increased by 2.1 times in comparing with 2003 and amounted to 142,166.8 mln.tng (725M EURO) in 2010. In technologically advanced countries, the costs of the business sector on research and development (60-70%) far exceeds the public spending on research and development. In Kazakhstan, while still a different structure with a predominance of public sector's role in conducting research and development while simultaneously tendency of reducing the share of public sector to conduct R&D.

However, the markedly increased innovation activity of enterprises in the period 2004-2010 is from 2.4% up to 4.3%. According to the structure of expenditure on technological innovation, Kazakh indicators are closer to the group of "modest innovators", where costs of purchasing machinery and equipment dominate, while the leaders dominate the costs of their own and custom R & D, their share is 80%.

However, keep in mind that business in Kazakhstan is in the process of modernization of production capacities and dominance of ways to update the technology investment for it is quite natural.

The analyses show that Kazakhstan has all chances to go their own way to innovate and become more successful in a number of world leaders in RTDI.
Conclusions and outlook

For successful implementation of the governmental programs for sustainable development of RTDI, taking into account the trends of the research, technology development and innovation in the country and the worldwide, the following recommendations were developed for Kazakhstan:

Public measures of Kazakhstan focused mainly on institutional development. It is advisable to strengthen the system of interaction of all elements of the innovation infrastructure.

In general, national universities have not yet become the leading generators of the creation and implementation of research and development, as it usually occurs in industrialized countries. It is recommended to strengthen the role of universities and research organizations by strengthening their ability to transform ideas into innovative projects and to focus its work on the needs of the industrial sector.

Special attention should be given to support SMEs involved into RTDI. There is need to create favorable environment to build-up new enterprises.

To give an opportunity to regions to participate in the formation of regional innovation policy and funding. Develop inter-regional competition in obtaining budgetary funding, which will be the development of innovative potential of regions.

Currently, national innovation statistics has a number of systemic problems. It is a mixture of indicators derived from different, logically unrelated, forms of statistical reporting. There is no system of indicators actually reflect the situation of innovative processes in the country. It is necessary to revise the basic definitions related to innovative development to achieve a common understanding among all stakeholders of innovation that will further enhance the level of confidence in the national innovation statistics.

The innovation can be considered only an economy in which science allows to generate a continuous stream of innovations, research and technology development. The possibility of human capital and ensure that the state move forward in all areas of development can be done only by developing high-tech science. The essence of the current stage of development is the implementation of advanced multi-vector steps in all areas. And for the successful promotion of this policy dynamic implementation of RTDI achievements should be realized.

In this regard the President of Kazakhstan in his annual Message to the people of Kazakhstan has clearly defined the problem: "By 2020, the share of universities, the last independent national accreditation according to international standards, will be 30%. The share of higher education institutions engaged in innovation activities, and implementing research results into production should be increased up to 5%.

The Government is fully aware of the importance of science in the process of formation and strengthening of the country. In early 2011 the Government approved new Law "On Science", which provides a completely new mechanisms of financing of fundamental and applied research, the implementation of scientific, technical and innovation activities, conducting research and development activities, taking into account the fact that the main trend of strengthening Kazakhstan is the transition to industrial-innovative development of the country. And innovation
can be considered only an economy in which science and knowledge can generate a steady stream of innovations that meet the rapidly changing needs of society.

Key task of the Strategy of Industrial and Innovation Development of Kazakhstan defined through the diversification of the economy shifting from extraction, increasing the share of processing industries, particularly with the use of high technologies. An important issue is the introduction of the world experience of scientific, technological and innovation capacity.

During the years of the strategy have been allocated substantial funds for the development of transport, energy and social infrastructure, adopted the State Program "30 Corporate Leaders", which purpose is the creation of new and modernization of existing facilities, providing diversification and development of export potential of non-oil sector of the country.

But today Kazakhstan needs to develop a set of additional measures to support the technological renovation of traditional industries and the development of experimental-industrial structures, R&D institutes, development of an effective mechanism for implementation of research results into the real economy. This is principally because so far the economic growth in Kazakhstan is provided mainly by the intensive development of hydrocarbon and other mineral resources.

International experience shows that the share of new knowledge embodied in technology, equipment and organization of production in the industrialized countries account for up to 75-80% of GDP. The development and implementation of scientific and technological activities in the production makes a significant economic effect on the development of society. In addition, under current conditions economically developed countries contribute to the utmost priority the development of research in nanotechnology, and their active implementation into production. The world has accumulated sufficient experience in creating a favourable environment for innovation based on market demand, opportunities to meet and priorities in research, production and management areas.

In order to solve these problems Kazakhstan also undertakes specific steps aimed to integrate the work of the centres of education and science. For example, on the basis of "Nazarbayev University" in Astana, three new research centres are created, such as Centre for Life Sciences, which will cooperate with leading scientific centres in the field of organ transplantation, artificial hearts, lungs, stem cells, medicine, and longevity; Energy Research Centre will deal with renewable energy, physics, technology, and high energy; and the third is an interdisciplinary tool centre, which will be the core of engineering, laboratory facilities and the design office.

Currently, Kazakhstan is committed to creating innovative enterprises through the introduction of advanced domestic scientific and technological developments, inventions, industrial designs, selection achievements, utility models, copyright works to use the existing intellectual potential. Further development of the society will be determined by the quality and the performance of human capital, which is formed by the education system, education and training. At this time, there is also composed of a stable legal framework for intellectual property, which is the core of innovation processes.
The main legislative acts regulating the principles of the state scientific-technical and innovation policy are the laws "On Science" and "On state support of innovation."

The new law "On Science" meets the new model of management science, multi-level system of research funding, the development of social support researchers, integrating research and production.

At present, the solution of the above mentioned problems is strategically important for the development of Kazakhstan. An effective scientific system of Kazakhstan is able to generate necessary for Kazakhstan's society and economy of ideas, knowledge and scientific discoveries to technological breakthroughs.
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## List of abbreviations

BDB - Bibliographic database  
CETT - Center for Engineering and Technology Transfer  
EC – European Commission  
EECA – Eastern European and Central Asian counties  
EU – European Union  
HEIs - High Educational Institutions  
HSTC – High Scientific and Technology Council  
ICCPR - International Covenant on Civil and Political Rights  
ICT – Information and communication technologies  
IKQAA - Independent Kazakhstan Quality Assurance Agency in Education  
IS&TC – Intersectoral Science and Technology Cooperation  
KNNT- Kazakhstan Network of Technology Transfer  
MEDT - Ministry of the Economy Development and Trade  
MES – Ministry of Education and Science  
MF - Ministry of Finance  
MINT – Ministry of Industry and New Technologies  
NATD – National Agency for Technological Development  
NCP- National contact point  
NCSTI - National Center of Scientific-technical Information  
NIF – National Innovation Fund  
NSC- National Scientific Councils  
PCAs- Partnership and Cooperation Agreements  
PPP- Public-private partnership  
R&D- Research and Development  
RK – Republic of Kazakhstan  
RNTT- Russian Network of Technology Transfer  
RTD - Research and Technology Development  
RTDI – Research and Technology Development and Innovation  
S&T-Science and Technology  
SME - small and medium enterprises  
SPAID - State Program of Accelerated Industrial-Innovative Development  
TDPC- Technology Development Policy Council  
TPC - Technology Policy Council  
UNECE – United Nations Economic Commission for Europe  
WoS- Web of Science