

Science, Technology, and Innovation (STI) Gap Assessment of Kazakhstan

Prepared by Yelena Shevchenko
In the framework of the UNECE project
*Strengthening innovation policies for SPECA countries in support of the
2030 Agenda for Sustainable Development*

August 2020

Table of contents

1. Overview of some main aspects of STI management in the Republic of Kazakhstan	4
1.1. National STI priorities of the Republic of Kazakhstan	4
1.2. Key STI policy documents	7
1.3. STI governance and policy formulation	12
2. Key challenges and problems in fostering innovative development	22
3. Impact of COVID-19 on the economy of the Republic of Kazakhstan	27

List of Acronyms

AgriTech	Agricultural Technology
AI	Artificial Intelligence
CIT	Corporate Income Tax
COVID-19	Coronavirus Disease 2019
DAMU	Foundation for Entrepreneurship Development “DAMU”
E-Industry	Electronic Industry
FDI	Foreign Direct Investment
FinTech	Financial Technology
GDP	Gross Domestic Product
GeoTech	Geotechnology
GovTech	Government Technology
GreenTech	Green technology
ICT	Information and Communication Technology
IP	Intellectual Property
IT	Information Technology
JRG	Junior Researchers Group
JSC	Joint Stock Company
KZT	Kazakhstan tenge
MDDIAI	Ministry of Digital Development, Innovation and Aerospace Industry

MF	Ministry of Finance
MIID	The Ministry of Industry and Infrastructural Development
MNE	Ministry of National Economy
MoES	The Ministry of Education and Science
NATD	National Agency for Technological Development
NIS	National Innovation System
NCSTE	National Center of State Science and Technology Evaluation
NIIP	National Institute of Intellectual Property
No	Number
PPP	Public-Private Partnership
R&D	Research and Development
R&D&I	Research and Development and Innovation
S&T	Science and Technology
SEZ	Special Economic Zone
SME	Small and Medium-sized Enterprises
SpaceTech	Space Technology
SPIID	State Program for Industrial and Innovative Development
SSG	Senior Scientists Group
SSTC	Supreme Science and Technology Commission
STI	Science, Technology and Innovation

1. Overview of some main aspects of STI management in the Republic of Kazakhstan

1.1. National STI priorities of the Republic of Kazakhstan

The national STI policy is an integral part of Kazakhstan's broader socio-economic policy, expressing the state's positive attitude towards STI and defining the goals and plans of public authorities in advancing towards a knowledge-based economy.

Presented below are the main strategic priorities that have been identified in policy documents and strategies on STI development, including concepts regarding innovative, scientific and technological development of the Republic of Kazakhstan.

Table 1. Strategic priorities identified in main STI policy documents

	Name of priority		Name of priority
1	Science and engineering education, life-long education, human capital development	12	Manufacture of medium and high value-added goods with an export orientation
2	Entrepreneurship development	13	Extraction, processing, mining and metallurgy sectors
3	ICT and digitalization	14	Energy sector development, including clean and alternative energy sources, energy-saving technologies
4	Digitalization of government services	15	Petro-chemicals
5	Big data	16	Advanced technologies in agriculture (including eco-products)
	Artificial intelligence		Transport and logistics
6	The internet of things	17	Nano-technologies
7	Cryptocurrency blockchains	18	New materials
8	Financial technologies	19	Space technologies
9	E-commerce	20	Biotechnology
10	Industry 4.0	21	Life science
11	Robotics	22	Smart Cities
	<i>R&D priorities approved by the Supreme Science and Technology Commission headed by the Prime-Minister of the Republic of Kazakhstan (underpinning the provision of government R&D grants)</i>		
1	Energy and mechanical engineering		
2	Effective use of natural resources, including water resources, geology, processing, new materials and technologies, safe products and structures		
3	Information, telecommunication and space technologies, scientific research in the field of natural science		
4	Sustainable development of agriculture and the safety of agricultural products		
5	Health and life sciences		
6	Basic and applied research in the humanities		
7	National security and defense		

National STI policy is aimed at achieving the following objectives:

- Creating an ecosystem of innovation and techno-entrepreneurship;
- Developing well-functioning R&D infrastructure;
- Increasing science-industry collaboration;

- Improving technology and knowledge transfer mechanisms;
- Integration in global value chains and increasing high value-added production;
- Supporting the advancement of innovation and technological developments.

The main sectors of the economy of Kazakhstan are concentrated on manufacturing and providing services for production of oil, gas, minerals and agricultural products which includes only a limited amount of high value adding. Given this situation, the diversification of the economy along with increasing the production of high value-added products as well as participation in global value chains are some of the main priorities for Kazakhstan.

The National “Strategy Kazakhstan-2050” focuses on making a ‘modernization leap’ by 2030. The priorities stipulated for the first stage of the strategy are to develop traditional industries and create a processing industrial sector. The second stage (scheduled for completion in the 2050 year) focuses on achieving sustainable development via a shift to a knowledge-based economy reliant on engineering services and increasing high value-added production in the traditional sectors of country’s economy.

The main priorities for the long term development are set by the Strategy Kazakhstan-2050 as following: increasing competitiveness of the country, establishment of national clusters in priority areas (based on the principles of public-private partnership), support of entrepreneurship, development of advanced education system and lifelong learning (support of technical and engineering specialization), introduction of new principles of social policy, strengthening regional and global security.

The following priority areas has been identified: alternative energy and clean energy technologies, development of advanced water management technologies, introduction of environmentally friendly fuel and electric vehicles, developing space technologies including the establishment of an assembly and testing complex for spacecraft in Astana, a remote space sensing system, a national space monitoring system and ground-based infrastructure as well as a high-precision satellite navigation system, development of advanced technologies in agriculture and food processing to enable the nation to become a global producer of eco-friendly food products.

The main strategic document in the medium-term is the Strategic Plan for the Development of the Republic of Kazakhstan until 2025. The Plan aims to ensure economic growth of the country and the increase in living standards of the population. The qualitative economic growth should be based on increasing competitiveness of business and human capital development, technological modernization and implementation of eco-friendly technologies for sustainable development.

According to the Plan new sectors and technologies such as digital technologies, nanotechnologies, regenerative medicine and medical tourism, robotics, alternative energy and others should be developed. For the implementation of the tasks focused on the modernization of Kazakhstan in the framework of the high-tech economy development, implementation of Industry 4.0 technologies, digitalization of traditional sectors such as agriculture, energy, mining, metallurgy, as oil and gas sectors will be supported. It is expected that export-oriented industrialization of existing enterprises and development of high-tech industries and services will result in a new, more diversified economy.

In the Message of the President of the Republic of Kazakhstan, on 2 February 2019, the President Kassym-Jomart Tokayev noted that a key strategic goal for Kazakhstan is to ensure the comprehensive development of market institutions and mechanisms with the Government playing a stabilizing role in the process. One of the specific priorities mentioned was the development of the “economics of simple things”, essentially to replace imported socially significant foodstuffs with locally produced ones.

Another key priority for the country is the development of a digital economy to achieve a leading position in the region on ICT infrastructure. In this regard, the president stated that the government should make all the required adjustments to legislation to allow for the introduction of 5G, smart cities, big data, blockchains, digital assets and new digital financial instruments. In connection with this, Kazakhstan has the goal to construct sophisticated data centers for the

development of data transit and to more broadly participate in the global digital services market. Finally, another crucial focal point elucidated for Kazakhstan is to develop an organic, eco-friendly agricultural sector with improved processing of agricultural products.

The first President of Kazakhstan, Nursultan Nazarbayev, in his Message to the nation on 5 October 2018, indicated the strategic priority of Kazakhstan is to become one of the 30 most developed countries in the world by the year 2050. To achieve this, the main priority areas identified were for the country is to become a healthy nation (healthy food, healthy lifestyle, healthy environment and effective health care system), to expansively develop the production of medium- and high-value products that can be competitive in global markets, attract advanced technologies to the agricultural sector and the development of the processing sector of agricultural products with an export orientation. Additionally, were prioritized the development of service and innovation sectors (future economy sectors) such as alternative energy sources, new materials, bio-medicines, artificial intelligence, big data, the internet of things, fintech and blockchain technologies as well as completing the e-system providing public services to the population.

In a similar previous message by the First President of Kazakhstan Nursultan Nazarbayev on 10 January 2018 he prioritized reforms that would focus on solving the following 10 tasks:

1. Industrialization to transform the manufacturing and processing sectors to high productivity and be more innovation-based by using the advantages of Industry 4.0. Special attention should be given to the development of IT and engineering services as well as to the development of digital industries.

2. Development of alternative energy sources with alternative energy accounting for 30% of the total electricity supply by 2030.

3. Embracing smart technologies for the development of agriculture to increase labor productivity and exports of processed agricultural products.

4. Transport and logistics should be developed using digital technologies that result in an intelligent transportation system based on big data analysis and blockchain technology.

5. Implementation of advanced technologies in the construction sector, including quality, environmental friendliness and energy efficiency.

6. A "reset" of the financial sector to improve the investment climate and develop a stock market, as well as the development of smart cities.

7. As with many countries in the region, one of the main priorities for Kazakhstan is human capital development, especially in natural sciences, mathematics and IT, achieved through the acceleration of the development of an advanced education system which includes life-long learning for all citizens.

In the health care sector, the prime objective is to ensure a properly functioning health care system with a focus on disease prevention, highly effective early diagnostics and the promotion of a healthy lifestyle.

8. The enhanced effectiveness of governance systems was also given priority and notably, the emphasis here was placed on the importance of transforming government through digitalization, including the digitalization of government services.

9. Eliminating corruption was also seen as key as was ensuring the supremacy of the law. To combat corruption and improve the efficiency of government institutions a two-pronged approach will be adopted that will see the implementation of institutional reforms and reforms in the judicial and law enforcement systems.

10. The Government will implement a new package of systematic measures designed to improve the business climate, especially at the regional level, and to support business practices that will decrease the size of the shadow economy.

In the field of industrial and innovation development, the main strategic document is the State Program for Industrial and Innovative Development of the Republic of Kazakhstan for 2020-2025. This program is designed to develop a competitive manufacturing industry for both the domestic and global markets. It stipulates that priorities for industrial and innovative development

should be identified by conducting National Foresight Exercises that will become a basis for designing the National STI policy.

To achieve the program’s goal the following priority directions should be supported:

- Technological modernization of mining and metallurgical sectors and processing industries throughout the country should be based on the digitalization of production and industry-wide spheres of economic activity, that is to say, the creation of high-level information technology platforms for the mining and metallurgical sectors as well as IT manufacturing industries;
- The development of e-industry in accord with the framework provided by the state program entitled “Digital Kazakhstan”.
- The development of a manufacturing sector with export-oriented production consisting of medium and high-value products.

According to the State Program of Development of Education and Science in the Republic of Kazakhstan for 2020-2025, priorities of R&D, as well as scientific and interdisciplinary research, should be based on the results of National Foresight Exercises with an orientation on market needs. In this respect, the program emphasizes the importance of modernization and digitalization of science infrastructure and places priority on improving the efficiency of science and the ability to integrate into the global scientific community while simultaneously increasing science-industry collaboration.

1.2. Key STI policy documents

National STI policy is an integral part of the country’s social and economic policies as science, technology and innovation are all viewed as indispensable to Kazakhstan’s future development. Appendix 1 and 2 at the end of this paper provide a general framework of public policies and the list of legislative acts and strategic documents on STI development employed by the country.

The system of STI planning in Kazakhstan is primarily aimed at:

- Identification of priority sectors for STI development;
- Assessment of possible innovations and critical technologies;
- Designing programs for STI development in priority sectors.

Figure 1. The general framework of the National Strategies of the Republic of Kazakhstan



The main strategic document at the national level, the Strategy Kazakhstan - 2050, was launched in 2012 and focuses on making a ‘modernization leap’ by 2030 to become one of the top 30 most developed countries in the world.

The strategy proposes to create a diversified, knowledge-based economy by increasing STI development, promoting competitiveness in all economic sectors, improving the local business environment, developing world-class research institutions and universities and constructing smart cities.

The three key aims of the Strategy Kazakhstan - 2050 are to define new markets where Kazakhstan can form productive partnerships and create new sources of economic growth, create a favorable investment climate, and finally, to effectively develop and modernize both the public and private sectors. It is crucial for Kazakhstan to expand planning horizons accordingly to the new global environment in which it finds itself and to accelerate the transition to a low-carbon economy. To accomplish these goals, Kazakhstan needs to integrate the economy with global and regional economic environments by capitalizing on its transit potential and bolstering information technology capabilities.

Along with the systemic reforms, seven priority policies are highlighted in the Strategy - 2050, namely:

1) Orientation of macroeconomic policy on the coordination of macroeconomic and structural policies, increasing the role of monetary policy, fiscal sustainability and reducing non-oil sector deficits as well as keeping the level of public debt at an acceptable level.

2) Competitiveness throughout different sectors of the economy. The aim here is to strengthen the position of local industries in the global market, further industrialize them and oversee the introduction of new products to foreign markets while developing new industries and services.

3) Development of the financial sector to improve the investment climate by modernizing regulations and strengthening the protection of investor's rights,

4) Proactive attraction of domestic and foreign investments.

5) Ensuring a high quality of life for the citizenry by increasing the targeting and inclusiveness of social support, developing affordable and quality health care systems in conjunction with increasing the availability and comfort of housing and housing infrastructure

6) Environmental protection to ensure, among other things, higher quality of life, attract green investment, de-carbonization of the economy and the development of alternative energy sources, improving the quality of both water and land resources in Kazakhstan, improving air quality, developing a low-waste economy and preserving biological diversity.

7) Foreign economic policy is aimed at developing the most favorable economic conditions for Kazakhstan by participating in globalization, engagement with international projects and organizations as well as promoting Kazakhstan's national interests in foreign markets.

As one of the nation's strategic documents, Strategy Kazakhstan - 2025 identifies the priority areas for the implementation of the tasks of the Third Modernization of Kazakhstan. The strategy identifies the following key drivers to implement a new economic model of Kazakhstan:

- Tech economy, including digitalization of all the basic sectors of the economy (agriculture, mining, metallurgy as well as fuel and energy). The immediate goal is to improve operational efficiency, maximize processing depth and ensure integration into global supply chains.

- Enhance the industrialization and export-orientation of the economy.

- Restructure the economy based on the development of new industries and services such as transport, logistics, space tech, ICT, medical tourism, engineering, education.

The primary objectives presented in the Strategy Kazakhstan - 2025 are:

1) New human capital creation through the development of competencies for the future economy.

2) Technological modernization and digitalization based on increasing sectoral productivity and complexity, development of infrastructure, attracting of high-tech companies and

development of advanced technologies, supporting high value-added production processes, export promotion and economic diversification.

3) Creating the basis for a new economy through the development of digital competency, stimulation of innovations and research development.

4) Redesigning of the government's role in the economy by increasing the efficiency of the privatization program, development of favorable conditions for public-private partnerships, stimulation of business development and increasing competitiveness, development of transport, logistics and trade infrastructure.

5) Strong regions and urbanization – increasing regional competitiveness and the economic freedom of regions, development of towns and implementation of the “Smart City” concept, including in transportation systems.

6) Ensuring an acceptable minimum quality of life in all regions by providing basic social services, improvement of environmental conditions and involvement of society in the process of STI policy elaboration.

The Inter-Sectoral Plan for Science and Technology Development of Kazakhstan by the year 2020 is designed to achieve technological leadership in key sectors of the economy and has two stages. Stage 1 (2010-2014) was focused on the identification of key industries and assessing the country's scientific, technical and technological potential, creating and launching a system of scientific, technical and technological forecasting and planning. Stage 2 (2015-2020) was dedicated to the formation of a mechanism to constantly modernize key industries and set priorities of scientific and technological development according to the results of National Foresight Exercise.

The law “On Science” governs public relations in the field of science as well as scientific and technical activities, determines the basic principles of designing and implementing national scientific systems in the Republic of Kazakhstan. It stipulates the competence of state bodies in the scientific and technical sphere and focuses on the implementation of a new model of science administration and funding. The law has established the Supreme Science and Technology Commission, a coordinating body chaired by the Prime Minister which brings together top-officials from all ministries, National Research Councils in priority areas (these consist of leading Kazakhstani and foreign scientists, government officials and business representatives which play a crucial role in the decision-making processes on approving proposals for government R&D grants) along with the National State Centre on Science and Technology Evaluation.

The law “On Commercialization of the Results of Scientific and (or) Scientific and Technical Activities” is based on the principle underlying the Bayh-Dole Act of providing adequate incentives for science's commercialization by:

- Increasing the transparency and integration between key actors of the commercialization process.

- Guaranteeing the rights and interests of researchers involved in invention and commercialization processes.

- Providing economic incentives for the commercialization of scientific results in the priority sectors of the economy.

The main aspects addressed by this law are:

1) Ownership of research results – according to domestic IP law, rights resulting from publicly-funded research belong to the scientific institutions where the research was conducted unless the contract between the inventors and institution states otherwise. Universities and research institutions hold exclusive rights over any IP generated by their employees.

2) Rewards to inventors - the law on commercialization equally provides incentives for innovators by determining a minimum amount of payment to be received by an inventor. If the IP

rights belong to a university or research institution where the research was conducted, inventors should receive a one-off payment equivalent to at least one average monthly salary, regardless of whether the innovation is commercialized or not. In cases involving licensing or the signing of a contract involving IP rights with a third party, the inventor should be paid at least 30% of the income generated.

3) The law also establishes a minimum amount that a university should allocate to the funding of their technology transfer offices (at least 2% of the R&D grants received by the university and not less than 10% of the income accrued from the license agreements or contracts of assignment regarding IP rights).

4) Furthermore, the law mentions that the government shall provide additional incentives to universities and research institutes involved in technology commercialization, such as commercialization grants, training on entrepreneurship, and so forth.

The main legislative acts intended to protect IP rights are in the civil code's law "On Copyright and Related Rights", the law "On Trademarks, Service Marks and Appellations of Origin", and so forth. According to this legislation, the Ministry of Justice of the Republic of Kazakhstan is responsible for general regulatory functions as the authorized body for the protection of intellectual property rights. The National Intellectual Property Institute is responsible for procedures involving the registration of trademarks, service marks and appellations of origin, procedures for recognition of trademarks as well known, procedures for the transfer of trademark rights, procedures for challenging trademark registrations, the scope of protection of trademark rights and the status of patent attorneys.

The State Program for Education and Science Development for the period of 2020-2025 sets a goal to increase the competitiveness of Kazakhstani education and science as well as the impact of science on the social and economic development of Kazakhstan. Objectives for this scientific development are to modernize and digitalize scientific infrastructure, to increase the efficiency of R&D and to integrate Kazakhstani science into the worldwide scientific community.

Among the important measures being undertaken are an increase of government R&D spending by 1% in GDP by 2025, increasing support for young scientists, the introduction of an annual research grants competition with a requirement for co-funding and the establishment of a special government funding program for the development of research infrastructure. Special attention will be dedicated to the establishment of the National S&T Information System designed to increase science-industry collaboration.

The State Program "On the Development of Productive Employment and Mass Entrepreneurship 2017-2021" has the goal to promote productive employment and enhance entrepreneurship. The main objectives of the program are to ensure the provision of professional and technical education in accordance with the needs of the labor market, short-term professional training at the request of employers to deliver the qualifications and skills that are in demand, vocational training for employees under an employment contract and including those individuals impacted by layoffs, entrepreneurship training programs, expansion of micro-credit in small settlements, towns, cities and mono-cities, guarantees on loans and microcredits in rural settlements, towns, cities and mono-cities, provide state grants for the implementation of new business ideas, increase the mobility of human capital, develop digital platforms for job placement and so forth.

The State Program for Industrial and Innovative Development of the Republic of Kazakhstan for 2020-2025 (hereinafter - SPIID) focuses on the formation of a competitive manufacturing industry operating in both domestic and foreign markets.

The SPIID is based on the following principles:

- The continuity of industrial innovation policy;

- Support for efficient manufacturers;
- The development of "the economy of simple things";
- A pairing of industrial-innovative and regional development;
- Promoting the synergy of industrial-innovative development and digital technologies.

The program's efforts will be aimed at pursuing pro-active trade policy, technology transfer, development of high-quality industrial and digital infrastructure, special economic and industrial zones, innovation clusters development, human capital development, support of medium and high-tech exports and venture capital development, development of small and medium-sized enterprises (SMEs) and corporate acceleration programs to increase, among other things, innovation and R&D commercialization as well as attract foreign direct investment (FDI) in the manufacturing industry, integration into the global value-chain, etc.

The State Program "Digital Kazakhstan" has a goal to accelerate economic development and enhance the quality of life of the population through the implementation of digital technologies and digital economy development. To achieve this goal the program supports the digitalization of existing economic sectors and at the same time seeks to develop digital industries of the future using five key areas for implementation:

- 1) Digitalization of different economic sectors based on the transformation of the traditional sectors by implementing positively disruptive technologies that will result in increased productivity and capitalization.
- 2) Development of digitally based systems for the Government.
- 3) Implementation of "The Digital Silk Way" which takes the form of high-speed and secure data transition, storage and processing infrastructure.
- 4) Development of human capital to transform the workforce into a creative springboard for the knowledge economy.
- 5) Creation of innovation ecosystem based on sustainable horizontal connections between business, science and government. The government will act as a catalyst of the new economic ecosystem that can generate, adjust, implement and diffuse innovation.

The Entrepreneurial Code of the Republic of Kazakhstan (henceforth, the Code) establishes the legal, economic and social conditions and guarantees free enterprise in the Republic of Kazakhstan, regulates social relations arising from the interaction of business entities and the State, including government regulation and support for entrepreneurship. The general provisions of the code establish the legal basis for interaction between business entities and the State by setting out the primary framework of state support for small and medium businesses, agribusiness and non-agricultural types of business activities in rural areas, industrial innovation activity and investment activity.

The state program "On Business Support and Development "Roadmap Business-2025" is designed to ensure the sustainable growth of regional entrepreneurship as well as maintain existing and create new permanent jobs. The program focuses on increasing access to financial resources for entrepreneurs in rural settlements, towns and mono-cities, increasing production capacities of entrepreneurs in these areas, increasing manufacturing industry production, the creation of new competitive industries, providing information and analytical support for entrepreneurship as well as improving the competencies of entrepreneurs and so forth.

The "30 Corporate Leaders of Kazakhstan" program is tasked with consolidating business and state efforts to establish new entities and modernizing existing ones while ensuring the diversification and development of the export potential of the non-primary commodity sectors. The main objectives of the program are to promote the development of competitive, export-oriented industries and non-primary commodity sectors production through the formation of

corporate leaders at the regional and global level, create a favorable business environment and investment climate, increase the competitive development of industrial and innovative infrastructure, ensure compliance with international standards and that these are adequate to meet the requirements of businesses.

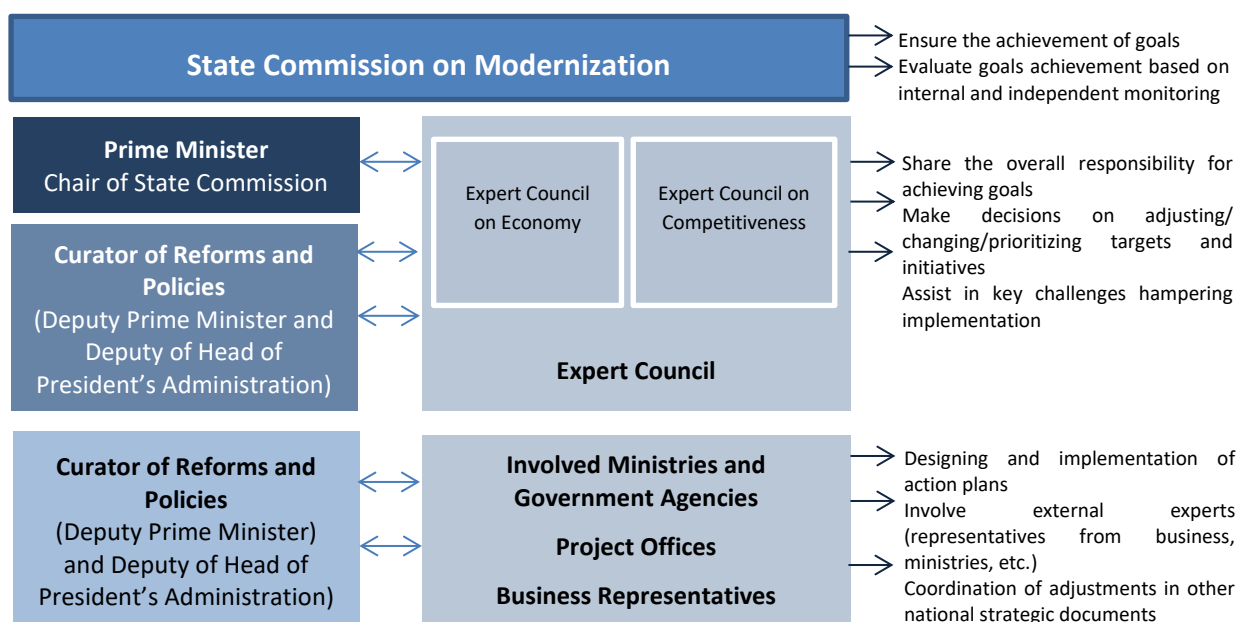
1.3. STI governance and policy formulation

The government of the Republic of Kazakhstan plays a key role in designing and supporting the process of STI development. There are multiple strategies and programs on STI development have been adopted in the country and numerous institutions have been established to manage both its development and implementation.

In the STI management system implemented in the Republic of Kazakhstan, the decision-making process is concentrated in the hands of the central authorities, which includes the Presidential Administration, the Office of the Prime Minister and the Ministry of National Economy.

To ensure the effective implementation of economic modernization goals, the State Commission on Modernization under the guidance of the president of the republic was created in 2007. The main tasks of the commission are to advise on improving the competitiveness and efficiency of the Kazakhstani economy as well as on the re-allocation of anti-crisis funds distributed from the National Fund of the Republic of Kazakhstan. The commission provides recommendations on industrial and innovative development and modernization of the economy.

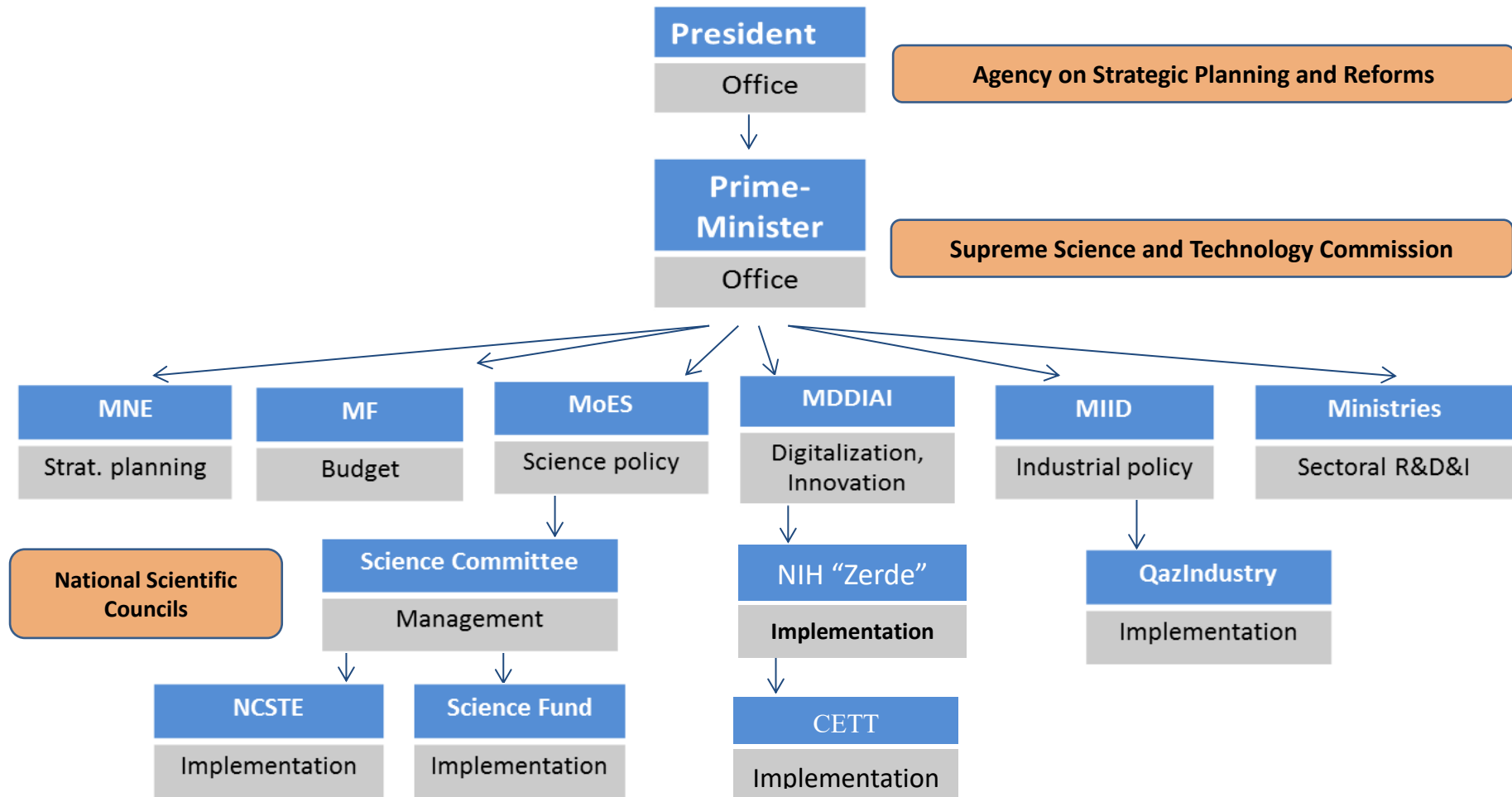
Figure 2. Framework for the modernization and reform process at the country level



The governance of STI is a key factor to ensure a significant positive impact of STI activities on the development and promotion of inclusive knowledge-based societies. The government of the Republic of Kazakhstan has put great efforts into the development of comprehensive legal framework and governing structures to ensure the effective implementation of STI policy. The Government of Kazakhstan highlighted the main focus of STI policy on supporting the development of an innovation ecosystem to encourage innovation across all sectors.

In 2011, the Supreme Science and Technology Commission (henceforth, the SSTC) was established in Kazakhstan as an advisory body to the government. The SSTC is chaired by the Prime Minister and approves science and technology priorities as well as National R&D programs with the policy emphasis having been shifted towards innovation and commercialization since 2015. In 2019, as a result of the transformation of the STI governing system, a new ministry - the Ministry of Digital Development, Innovation and Aerospace Industry (MDDIAI) was established. MDDIAI is responsible for the development and implementation of innovation policy. Prior to this, two main ministries were involved in the process of elaboration and implementation of innovation policy, namely the Ministry of Education and Science and the Ministry of Investments and Development (former the Ministry of Industry and New Technologies (2004-2014) and currently the Ministry of Industry and Infrastructural Development).

Figure 3. STI governance structure in the Republic of Kazakhstan (macro-level perspective)



MNE – Min. of National Economy
 MF – Min. of Finance
 MDDIAI – Min. of Digital Development, Innovation and Aerospace Industry

MoES – Min. of Education and Science
 MIID – Min. of Industry and Infrastructural Development
 NCSTE – National Center of State Science and Technology Evaluation
 CETT – Center for Engineering and Technology Transfer

In October 2020, the Agency on Strategic Planning and Reforms was established by the Decree of the President of Kazakhstan. Among the main functions of the Agency are strategic planning at the national level, organization of effective functioning of the state statistics service, conducting reforms and evaluating the efficiency of government authorities. The Agency reports directly to the President of Kazakhstan.

In 2019-2020 as part of the latest government reorganization, responsibility for the development and implementation of innovation policy in Kazakhstan was transferred to the Ministry of Digital Development, Innovation and Aerospace Industry (henceforth MDDIAI).

The MDDIAI is engaged in the design and implementation of state policy in such fields as the digital and innovative development of the country, the development of e-government, coordination of the activities of the state corporation "Government for Citizens", information security, electronic industries, the aerospace industry as well as geodesy and cartography.

The Ministry of Industry and Infrastructural Development (henceforth MIID) provides guidance in the areas of industry and industrial and innovative development, scientific and technical development of the country, mining and metallurgical complex, mechanical engineering, coal, chemical, pharmaceutical and medical industries, light, woodworking and furniture industries, construction industry and production of building materials. The MIID has a strong focus on the development of the country's economy through the introduction of technological developments and the formation of high-tech industries.

The Ministry of Education and Science (henceforth MoES) is the state authority performing management in the spheres of education, science, protection of children's rights. MoES contributes to the National Innovation System by providing funding for R&D, coordinating research in fundamental and applied sciences, developing research infrastructure, assessing scientific projects as well as R&D commercialization. The MoES is also responsible for overseeing most of the research institutes in the country.

The Ministry of National Economy has overseen negotiations involving Kazakhstan's accession to the World Trade Organization and was consequently involved in discussions concerning the country's adherence to international IP regulations set down in the Agreement on Trade-Related Aspects of Intellectual Property Rights. This ministry works in conjunction with the Ministry of Justice which oversees the activities of the National Institute of Intellectual Property (NIIP) and is responsible for aspects of the court system relating to enforcing IP rights. Other ministries, such as the Ministry of Agriculture, the Ministry of Energy, the Ministry of Defense, and the Ministry of Healthcare, also shape STI policies in their respective areas.

To ensure effective implementation of strategies and policies coordinated actions of all main actors are needed: government, business, research and society.

Table 2. Key actors involved in STI development in Kazakhstan

N	Key actors	Main roles
<i>Ministries and Committees</i>		
1	Ministry of Education and Science (MoES) https://www.gov.kz/memleket/entities/edu?lang=en	Development, coordination and implementation of policy, strategies and state programs on education and scientific development.

		Provides funding (grants, targeted funding) for basic and applied research and R&D commercialization. Monitors performance and evaluates state support programs and coordinates scientific development processes.
2	Ministry of Digital Development, Innovation and Aerospace Industry (MDDIAI) https://www.gov.kz/memleket/entities/mdai?lang=en	Formulates and coordinates policy, strategies and state programs on digitalization and innovation development. Implements and monitors efficiency of policies, strategies and state programs on digitalization and innovation development. Coordinates and supports the technology platforms (innovation clusters) development in priority sectors. Provides funding (innovation grants) for technology commercialization, technological development of enterprises and priority sectors.
3	Ministry of Industry and Infrastructural Development (MIID) https://www.gov.kz/memleket/entities/miid?lang=en	Formulates and coordinates policy, strategies and state programs on industrial development. Implements and monitors efficiency of policies, strategies and state programs on industrial development. Development of industrial clusters in priority sectors. Provides funding (grants) and attracts investments for industrial development.
4	Supreme Science and Technology Commission under the Prime-Minister	Advisory body represented by the top officials from all ministries involved in STI development. Coordinates scientific and R&D development. Identifies priorities for scientific and technological development.
5	Committee of Science of the Ministry of Education and Science https://www.gov.kz/memleket/entities/sc?lang=en	Performs functions of the implementation of state policies in the field of science within the competence of the MoES and controls functions in the fields referred to its competence. Coordinates implementation of scientific and technical programs, projects in basic and applied research supported by MoES. Coordinates the process of grant funding for R&D commercialization.
6	National Academy of Science https://nauka-nanrk.kz/	Association of scientists that supports the process of elaboration of an annual report on science development. Advises the MoES on the identification of scientific priorities. Participates in the process of identifying priorities for state R&D support.
<i>Development Institutions (Quasi government organizations) in STI development</i>		
7	National Management Holding “Baiterek” (Board of directors chaired by Prime-Minister) https://baiterek.gov.kz/en	Provides financial support to non-extractive sectors of the economy to boost industrial diversification, SME development, export growth. Comprises 11 subsidiaries (including Development Bank of Kazakhstan, Investment Fund of Kazakhstan, Damu Entrepreneurship Development Fund (institution for SME support)).

8	National Welfare Fund "Samruk-Kazyna" (Board of directors chaired by Prime-Minister) https://www.sk.kz	Coordinates activities of the biggest state-owned companies across different industries, including R&D activities of major state-owned companies.
9	National Infocommunication Holding "Zerde" (Reports to MDDIAI) https://zerde.gov.kz/en	The main purposes of the Holding are: - Creation of favorable conditions to enhance competitiveness and economic efficiency of information and communication field; - Development of information and communication resources and standards; - Promotion of investment and innovative activity in the infocommunication sphere.
10	"Center for Engineering and Technology Transfer", JSC (Reports to the National Infocommunication Holding "Zerde" and MDDIAI)	Participates in designing policies and strategic documents on STI development. Acts as an operator of state innovation grant program: innovation grants on commercialization, innovation grants on technology development of enterprises and innovation grants on priority sectors development. Coordinates the process of development of technology platforms in priority sectors.
11	"Kazakh Center for Industry and Export "QazIndustry", JSC (Reports to MIID) https://qazindustry.gov.kz/en	Supports industrial enterprises at all stages - from technological solutions and new production lines to certification, export and introduction of digital technologies. Provides reimbursement of certain types of costs to enterprises aimed at increasing labor productivity and export promotion (operator of state support program). Coordinates activities of special economic and industrial zones.
12	National Company "Kazakh Invest", JSC (Reports to Min. of International Affairs) https://invest.gov.kz/	Promotes sustainable socio-economic development of the Republic of Kazakhstan by attracting foreign investment in priority sectors of the economy and comprehensive support of investment projects. Acts as the central reference point for investors on the provision of public services, including the provision of measures of state support to investors in the form of investment preferences, assistance in obtaining various permits required for the implementation and further operation of investment projects.
13	Export Insurance Company "KazakhExport", JSC (Sole shareholder of the National Management Holding "Baiterek") https://en.kazakhexport.kz/	Provides export manufacturing sector enterprises and second-tier banks with insurance protection against the risk of non-payment in their foreign trade operations and ensures the safety of export transactions.
14	"QazTechVentures", JSC (Reports to the National Management Holding "Baiterek")	Venture funding operation. Promotes the development of private business incubators, supporting the process of providing grants as a part of business incubation. Technology consultation services.

15	Foundation for Entrepreneurship Development “DAMU” https://damu.kz/en/	Implementation of public programs to finance SMEs – offers lines of credit. Supports second-tier bank lending to SMEs and provides interest rate subsidies as well as loan guarantees.
16	National Chamber of Entrepreneurs of the Republic of Kazakhstan “Atameken” https://atameken.kz/en/	Non-profit organization. Represents the interests of members (SMEs and large business) covering all business areas, including internal and external trade. Protects the interests of members, supports the improvement of business and investment environment.
17	The project in collaboration with the World Bank “Fostering Productive Innovation” (Reports to the NMH “Zerde” and MDDIAI) http://fpip.kz/	Acts as an operator of the grant program for senior scientists’ group (SSG), junior researchers’ group (JRG), the PhD Research and Training Grant Program, "Inclusive Innovation Consortia" Grant Program
18	“Science Fund”, JSC (Reports to Science Committee MoES) http://science-fund.kz/en/	Acts as an operator of the state grant program on R&D commercialization. Participates in designing of national strategies for S&T development, R&D commercialization.
19	“National Center for State Science and Technology Evaluation”, JSC (Reports to Science Committee of MoES) https://www.ncste.kz/en/main	Ensures the unity of administration, independence, transparency and publicity of expertise of scientific, technological and innovative projects and programs. Conducts S&T evaluation of research grant proposals (applications for state R&D grant programs) and Supports the activities of the National Scientific Councils. Monitors the subsequent effectiveness of ongoing scientific research, evaluates results of scientific, technical and innovative projects and programs carried out within the MoES grant support programs.
20	International Techno Park of IT Startups “Astana Hub” https://astanahub.com/en/	International technology park of IT start-ups that provides conditions for independent development of Kazakhstani and foreign technology companies, conducts acceleration and incubation programs for startup development.
21	Autonomous Cluster Fund, Park of Innovation Technologies “TechGarden” (Reports to MDDIAI) https://techgarden.kz/en/	Supports high-tech production development. Supports business innovation (such as Industry 4.0, smart industry, etc.) Oversees startups development.
22	National Management Holding “KazAgro” (Reports to the Ministry of Agriculture) https://kazagro.kz/en/	Supports development of agri-business thus increasing its competitiveness. Provides loans and financial leasing in the agricultural sector.
23	“Development Bank of Kazakhstan”, JSC	Provides assessment and structuring of large infrastructure and industrial projects, provides finance

	https://kdb.kz/en/	for projects in the field of industry and infrastructure, assists in attraction of foreign and domestic investments and attracts long-term, low-cost loans and investments for corporate clients.
--	---	---

In order to increase the efficiency of STI policy implementation in the Republic of Kazakhstan several development institutions have been established.

The primary institution coordinating the state program for digital development is the National Information Holding “Zerde”.

The National Information Holding “Zerde” and the Center for Engineering and Technology Transfer, JSC (CETT was reorganized in 2019 by splitting-up the National Agency for Technological Development into two development institutions: 1) CETT as an institution responsible for innovations development and 2) QazTech Ventures as an institution responsible for venture capital development and business incubation).

Scientific and R&D development policy is managed by the Science Committee under the MoES.

The economy of Kazakhstan remains dominated by state-owned enterprises and large private industrial and financial conglomerates. Almost 47% of large companies are owned by the State and consolidated under the National Holding Samruk-Kazyna (including the extraction, mining, transport and storage, information and telecommunications sectors). The government controls 100% of the shares in the largest companies in oil and gas extraction, gas distribution, telecommunications, petroleum refining, financial services, transport, postal services, telecommunication services, healthcare and electricity supply. To decrease the State’s participation in the economy the Privatization Program and the Comprehensive Privatization Plan for 2016-2020 have been implemented.

The State’s controlling interest in medium-size enterprises is more than 50% and in small companies it is around 8.8%. According to official statistics from 2019, Kazakhstan had 1.6 million SMEs registered that employed 37.6% of the total workforce. In 2019 SMEs contributed 27.9% to the nation’s GDP.

The government has initiated a wide range of programs and strategies that include different measures to support STI development. A summary of the key support measures is presented below:

I. Incubation and acceleration programs, innovation and commercialization grants:

- 1) Support programs for incubation and acceleration of innovative ideas on early stages:
 - Astana Hub International Technology Park provides a platform for startup development and an accelerator program for early-stage startups.
 - QazTech Ventures provides support to business incubators, as a part of the business incubation - co-financing of activities of incubators is provided through reimbursement of their operating expenses as well as financial support for projects that are accepted by these incubators.
- 2) Commercialization and innovation grants.
 - Center for Technology Engineering and Technology Transfer provides 3 types of state innovation grants on the principle of co-funding, these are:
 - commercialization grants – aimed at support of commercialization of startup projects;
 - grants for the technological development of enterprises - aimed at increasing the technological level of enterprises through the transfer of modern and advanced domestic and foreign technologies.
 - grants for the technological development of priority sectors – mainly aimed at the development of existing industries through the transfer of advanced technologies, practices, knowledge and skills.

- 3) Science Fund provides grants for R&D commercialization - grants will enable full commercialization of domestic R&D, developed by local universities, research institutions or the private sector.
- 4) The Project of the Republic of Kazakhstan and the World Bank “Fostering Productive Innovation” consists of two primary components, namely:
 - Component 1 involves the development of a knowledge base for innovation and oversees the implementation of the grants program for the senior scientists’ group and junior researchers’ group.
 - Component 2 is the "Innovative consortia" - implementation of grants programs for the productive sector consortia and inclusive of innovation consortia.

II. **Innovation clusters and Technology Platforms development**

- 1) Astana Business Campus under the Nazarbayev University has the goal to develop high-tech entrepreneurship and support innovative ideas using instruments such as:
 - Business incubators (ABC Incubation Program and Tech Central Asia Program) – a program for innovative ideas of startups in their early stages.
 - Business Accelerator (ABC Quick Start) – support startups in their early stages to find investors.
 - Seed Funds (ABC-I2DF) – small grants for startups and scientific projects.
 - Special Economic Zone “Astana Technopolis” (established in 2017) – tax exemptions to attract investments
 - Technopark NURIS – support the commercialization of innovation projects.
 - Digital Creativity Lab (co-working center for media technologies development), Fabrication Lab (digital prototyping), Machine Shop (experimental workshop).
- 2) Autonomous Cluster Fund “Park of Innovative Technologies” (PIT TechGarden) – a special economic zone created to support the acceleration of innovative startups implementing advanced technological solutions for sub-oil users and supporting development and implementation of Industry 4.0 technologies. It serves as a key location for the digitalization of industry. There are sample projects for digitalization, model factories, lab complexes and so forth located at this site.

Investors enjoy preferential tax rates, including 0% property, corporate income, social and land taxes. The cluster actively works on establishing effective cooperation with global innovation centers. It cooperates with big national companies such as Eurasian Energy Corporation, JSC, Mining and Metallurgical Company “Kazzinc”, Kazakhmys Corporation, Voskhod-Oriel, LLP and others.

- 3) The “Astana Hub” is an international Technology Park for IT startups with the main goal to develop IT entrepreneurship and innovative technologies. It supports the development of breakthrough IT startups and attracts young and talented IT specialists from around the world.

Residents of the Astana Hub are provided with preferential tax treatment and the simplification of their visa regimes (work visas valid for up to 5 years) and relaxed labor regulations for international participants (exemption from quotas for foreign workers).

- Acceleration Program for technology startups development.
- Regional Development Program – support the development of regional incubators, accelerators, technoparks and co-working centers.
- Invest Day – a program aimed at helping startups to find investors.
- Corporate Innovations – solving adverse issues and implementing innovations for large companies.
- Online Coaching – a coaching program for startups.
- School for Investors – development of competences for investors in tech-startups.

- 4) In 2020 the MDDIAI initiated the development of technology platforms in 10 priority areas: GovTech, FinTech, Industry 4.0, SpaceTech, GreenTech, GeoTech, Smart City, AgriTech,

E-Industry, Artificial Intelligence. These technology platforms are aimed at increasing innovation and technological development through the synergy effect based on key actors collaboration.

III. State incentive measures for enterprises

Kazakhstan has implemented systemic measures aimed at the development of the manufacturing industry, such as export promotion, stimulation of labor productivity, promotion of local goods on the domestic market, loan guarantees and state support to infrastructure projects.

"*QazIndustry*" provides financial support to industrial enterprises by encouraging high value-added production with export orientation, increasing labor productivity, stimulating cluster development and supporting the development of special economic and industrial zones.

Entrepreneurship support programs

The DAMU Entrepreneurship Development Fund is the main institution responsible for the implementation of state programs that support SMEs by offering lines of credit support from second-tier banks and providing interest rate subsidies and loan guarantees.

The state program on Development of Productive Employment and Large-Scale Entrepreneurship for 2017-2021 focuses on providing access to micro-financing for startups and existing projects in rural areas, small towns and mono-cities on a preferential basis for up to seven years. It aims to create opportunities for productive employment by providing free vocational and technical education based on market demand, workplace-based youth practice training of up to six months for people under the age of 25 and one-year professional training courses for unemployed or self-employed individuals and entrepreneurs ("Business Bastau" Program).

IV. Technology Parks

In Kazakhstan, a two-tier system of technoparks has been adapted to operate at the national and regional levels. A distinctive feature of national technoparks is the presence of a sectoral focus of their activities and being designated as a Special Economic Zone (SEZ) with preferential tax treatment.

The implementation and operation of technology parks in Kazakhstan are carried out using the modern European model which has the following features: the presence of a building with capacity to accommodate the dozens of small firms and this, in turn, contributes to the formation of a large number of new small and medium-sized innovative enterprises enjoying all the benefits of the collective system of services; a service system consisting of both complex and simple services supplied by firms which are required by the existing structure of innovative enterprises in the services sector.

In the period between 2004 and 2016 10 regional technoparks were established with government participation, however, 5 of these were closed by 2017. The major activity of technoparks is business incubation in such fields as IT, mining, geology, machinery, metallurgy, oil and gas, petrochemicals and agriculture.

National technological parks are focused on the creation of the new high-tech industries in the Republic of Kazakhstan. Some of the most prominent regional parks are Almaty Algorithm, Uralsk city UniScienTech and Karaganda city, all of which were established to promote the development of the region's innovation potential. Two of the other main characteristics of Kazakhstani technological parks collaborate with large enterprises in the region, as well as with leading universities and research institutes.

V. Special Economic Zones and Industrial Zones

Provides the following support measures:

- Tax preferences (0% corporate income tax, land tax, property tax).
- Exemption from customs duties on imports.
- Provision of a free land plot.

- Priority right to purchase land.
- Simplified procedures for hiring foreign labor.

Kazakhstan currently has 13 Special Economic Zones (Astana-New City, Astana-Techopolis, Turkistan, Port Aktau, Park of Innovative Technologies, Ontustik, National Industrial Petro-Chemical Park, Saryarka, Pavlodar, Horgos – East Gates, Chemical Park Taraz, International Cross-Border Cooperation Center “Horgos”, Quzulzar) and 31 Industrial Zones.

VI. Special tax regime and preferences for STI development

According to the Entrepreneurial Code of the Republic of Kazakhstan, preferential tax regimes shall be granted to registered legal entities in a manner established by the tax laws of the Republic of Kazakhstan. Such tax regimes are provided in accordance with the provisions of the Tax Code and special tax regulation applies on the territory of Special Economic Zones, Industrial Zones, Innovation Clusters.

Sub-soil users operating on the territory of Kazakhstan must contribute 1% of gross annual income on R&D activities. The Park of Innovation Technologies TechGarden was established to help sub-soil users to implement innovations and introduce new technologies through applied R&D projects.

The tax preferences scheme for investment projects is structured as follows:

1) Tax relief under the investment priority project, reduction of corporate income tax (CIT) by 100% and a tax rate of 0% for both land and property.

2) Tax relief for investment projects. With VAT exemption for imports of raw and processed materials under the investment contract.

3) Tax relief for special investment project with VAT exemption for the import of raw and processed materials and (or) materials under the special investment project as per the procedures set out in the Tax Code of the Republic of Kazakhstan.

The effective period of any preferential tax regime is prescribed in the investment contract but no longer than the period which is specifically set in the tax code.

2. Key challenges and problems in fostering innovative development

A survey of the main stakeholders was conducted to complement the report with the opinions of the stakeholders regarding STI development problems and challenges in the various economic sectors with high innovation potential for the country. A total of 63 stakeholders representing different institutions, companies and bodies (government officials, representatives from academia, science, the business community and non-government organizations) as well as representatives of civil society were approached and interviewed to highlight key challenges and problems in fostering innovative development of Kazakhstan.

In-person and phone interviews were conducted with government officials at the Ministry of Digital Development, Innovation and Aerospace Industry, the Ministry of Industry and Infrastructure Development, the Ministry of Education and Science and the Science Committee. Top management and key experts of various development institutions also actively participated in the survey.

All the involved experts participated in the survey highlighted the importance of the implementation of future thinking approaches to strategic planning processes and realizing large-scale developments to increase the efficiency and effectiveness of key economic sectors. Experts from academia and business as well as representatives from the development institutions underlined the high importance of STI development and emphasized the urgency and necessity of undertaking STI policy evaluations based on systems analysis and monitoring to provide feedback for policy and planning at all levels.

Interviewees stressed the importance of science, technology and innovation for the effective and sustainable development of the country. Among the main sectors that according to the respondents have the greatest potential for innovative development were sectors related to value-added manufacture, processing sector and those involved in the digitalization of the public services and economy. The respondents stressed the significant importance and potential in the short and medium-term of such sectors as agribusiness and food processing, mining and metallurgy, machinery production, mechanical engineering and energy. At the same time though, experts noted that the highlighted sectors and industries should have a high value-added production component.

The interviewees pointed to the particular importance of ICT, green technologies, transport and logistics, the chemical and petrochemical industries as well as the space industry as being among the sectors that have the highest potential for innovative and technological development in the medium and long term. Many of respondents stressed the importance of education and health care (life sciences), particularly in regard to the current situation with COVID-19. Indeed, the crisis has underlined the need for comprehensive strategy for the development of education and health care sectors based on digital technologies.

The table below presents a list of sectors that were indicated by the surveyed experts as sectors or industries with the highest potential for innovative development and would benefit significantly from being technologically upgraded.

Table 3. Economic sectors and industries with the highest potential to be technologically upgraded and receive innovative development

No.	Economic Sector or Industry	Percentage of respondents who nominated the sector
1	Agro-industrial sector (Argi-tech and food processing, value-added agriculture)	83
2	Mining industry and metallurgy (processing, value-added manufacturing)	56
3	Machinery, mechanical engineering, manufacturing industry (including all industries of letter D of ISEC Code)	44
4	Fuel and energy sectors	38
5	ICT, sectors digitalizing the rest of the economy	33
6	Transport and logistics	29
7	Education	27
8	Health care	27
9	Renewables, green energy	25
10	Processing industry with high value-added and wasteless production	22
11	Data centers	22
12	Chemical industry	21
13	Petrochemical industry	21
14	Oil and gas (implementation of deep processing technologies)	21
15	SpaceTech	16

In the survey, respondents have been asked to provide their opinion about the effectiveness of STI policy and policy instruments supporting STI development and accordingly the main

problems and obstacles that Kazakhstan faces in STI policy implementation. Interviewees highlighted problems with management and coordination between ministries and public institutions in particular related to the implementation of STI policy (such as weak coordination, problems with division of responsibilities between the public bodies tasked with STI governance as well as problems with the guidance and management of R&D). At the same time, Kazakhstan is facing a range of problems related to the decreasing public financial support for R&D commercialization, innovation, and technology transfer. Respondents highlighted an inefficient management by the public authorities responsible for STI management of policy instruments aimed to support STI development in the country.

Table 4. Ranking the effectiveness of STI policy and the policy instruments supporting STI development in Kazakhstan based on the results of the survey

No.	Policy aspects	Average rank
1	The national authorities assign high importance to the development of science, technology and innovation.	3.3
2	The national STI priorities and strategic directions of STI development are well formulated and widely publicized.	3.3
3	The officially proclaimed national STI priorities correspond to sectors and businesses with high innovation potential.	3.2
4	There is a clear division of responsibilities between the public bodies tasked with STI governance.	3.7
5	There is good coordination in the functioning of the different public bodies tasked with STI governance.	3.8
6	The functioning of the main R&D institutions in the country is well guided and managed.	3.7
7	The authorities allocate sufficient public funds to the support of STI activities.	3.8
8	The policy instruments used to support STI activity are efficient and well managed.	3.8

In Table 5 below, respondents' opinion about the business environment and framework conditions for STI development in Kazakhstan are displayed. According to the interviewees, one of the main obstacles for the development of science, technology and innovation in the country is a poor industry and academia collaboration that negatively affects R&D commercialization. It was noted that a large problematic issue for SMEs is finding public or private funds at the early stages of their development as well as for the scaling of business activities.

Table 5. The opinion of experts about the framework conditions and business environment in Kazakhstan: to what extent they are conducive to innovative development

No.	Aspects of the environment	Average rank
1	The authorities make efforts to reduce the administrative hurdles to do business.	3.1
2	The authorities assign a high priority to SME development and SMEs have access to different forms of public support.	3.1

3	Entrepreneurship is encouraged and the development of an entrepreneurial culture is supported by the authorities.	3.2
4	It is relatively easy for entrepreneurs to start and develop a new business.	3.3
5	Businesses cooperate with R&D and academic institutions for the commercialization of their R&D results.	3.9
6	Universities encourage the establishment of startups and spin-offs for the commercialization of innovative ideas.	3.3
7	The IP rights of innovative entrepreneurs are well protected by law and regulations.	3.0
8	Innovative entrepreneurs and SMEs have access to public funds to support the initial stages of commercializing their ideas.	3.2
9	Adequate private funding sources exist to support innovative entrepreneurs and SMEs in the initial stages of business.	3.3
10	SMEs have relatively easy access to bank credit and other commercial funding for the development of their business.	3.4

In the survey, interviewees were asked to provide their opinion about the main existing problems, obstacles and bottlenecks that hinder innovative development in Kazakhstan. **Obstacles and problems for STI development in Kazakhstan** that were highlighted during the survey are presented below, starting with those proposed by the greatest number of respondents:

1. Bureaucracy and multi-layer corruption. Corruption and bureaucracy were noted as important obstacles hindering STI development. This problem slows down STI development in both the short- as well as in the long-run. Innovative activities are affected by corruption and bureaucracy that reduce public trust in development institutions and diminish public belief in the innovation development processes of the country. Corruption negatively affects investments, competitiveness level and entrepreneurship development while simultaneously decrease the efficiency of STI policy implementation that results in reduced sustainability and increased volatility in society.

2. No well-thought-out country-level strategy (master plan) for STI development and poorly correlated master plans of the various ministries. A general short-term focus of all STI strategies and programs and frequent changes in priorities due to the frequent replacement of top managers in STI development institutions and public organizations slow down innovation development.

3. The absence of a comprehensive system of coordination, monitoring and evaluation of the results of STI policy and strategies causes the problem of weak implementation of STI policies and strategies.

4. Weak collaboration between STI development institutions, ministries and agencies in the process of STI policy implementation impedes the attainment of STI policy objectives. Issues related to innovation development are scattered across various government programs and leads to a narrowing of their focus and difficulties in linking the results of different strategies and programs to the overall development of the national innovation system due to weak cooperation and communication between different bodies and institutions. That is one of the reasons why the results of STI activities or projects supported by one ministry (or development institution) often do not

get further support for scaling, extension and dissemination in the situation when public support instruments are operated by different public institutions.

5. *Gaps in capacity for STI policy implementation.* The lack of highly qualified staff in public institutions is one of the obstacles that negatively affects the result of STI policy implementation. In addition, there are low levels of innovation and entrepreneurial culture and low human capital development. The lack of highly qualified staff is one of the problems for companies and institutions involved in STI development. There is a strong need for appropriate skills upgrading for improved performance.

6. Kazakhstan has a *relatively small research community* that rises issues related to the conflicts of interest.

7. *Poor industry-science collaboration* is one of the reasons why R&D commercialization remains weak in Kazakhstan.

A low level of science and R&D that are disconnected from the needs of the real sectors of the economy thus resulting in poor R&D commercialization.

8. *No balanced mechanisms and instruments of public support for STI development.* High-tech startups often experience a problem in finding financial support at the different stages of the innovation process (from idea generation to implementation and scaling).

9. *Insufficient funding of research and R&D commercialization* from both public and private sectors. In 2019, Kazakhstan spent 0.12% of its GDP on the R&D sector. At the same time, the private sector has general disbelief in the efficiency and productivity of the national R&D systems.

10. *Difficulties in obtaining loans or other adequate financial resources* to establish and develop businesses.

11. *Difficulties in accessing information*, including information about results of research and innovation projects conducted with government support, scientific infrastructure, researchers, as well as business information regarding market development trends, comprehensive statistical data and so forth.

12. *SMEs do not play an important role in the country's competitiveness* on the global market and the role of SME's in exports is negligible.

13. *There is a need to increase support* for the development of sectors important for the wellbeing of the society such as education and health care sectors.

In the survey, respondents proposed the following changes that need to be introduced in order to invigorate innovative development in Kazakhstan (to be introduced in legislation, in policymaking and implementation, in framework conditions, and so forth.). The proposed changes are presented below starting with those changes proposed by the high number of respondents:

- 1) Reducing corruption and bureaucracy. Application of new technologies (including complex digitalization), prioritization and providing open access to objective information can help to increase transparency, integrity and mitigate both corruption and bureaucracy. In this regard, the need for a precise framework for assessing STI policy impact, as well as introduction of personal responsibility for the results should be highlighted.
- 2) A result-oriented approach should be introduced into the process of STI policy implementation. A comprehensive system of STI policy management based on project management approach at all stages (implementation, coordination, monitoring and evaluation of STI policy, strategies and programs) should be introduced.
- 3) The development of innovation and technological entrepreneurship culture should be supported at the national level.
- 4) A STI Development Plan at the national level should be designed with subsequent alignment of the master plans of all ministries involved in STI management. This STI Development Plan will help to interlink master plans of all ministries and institutions

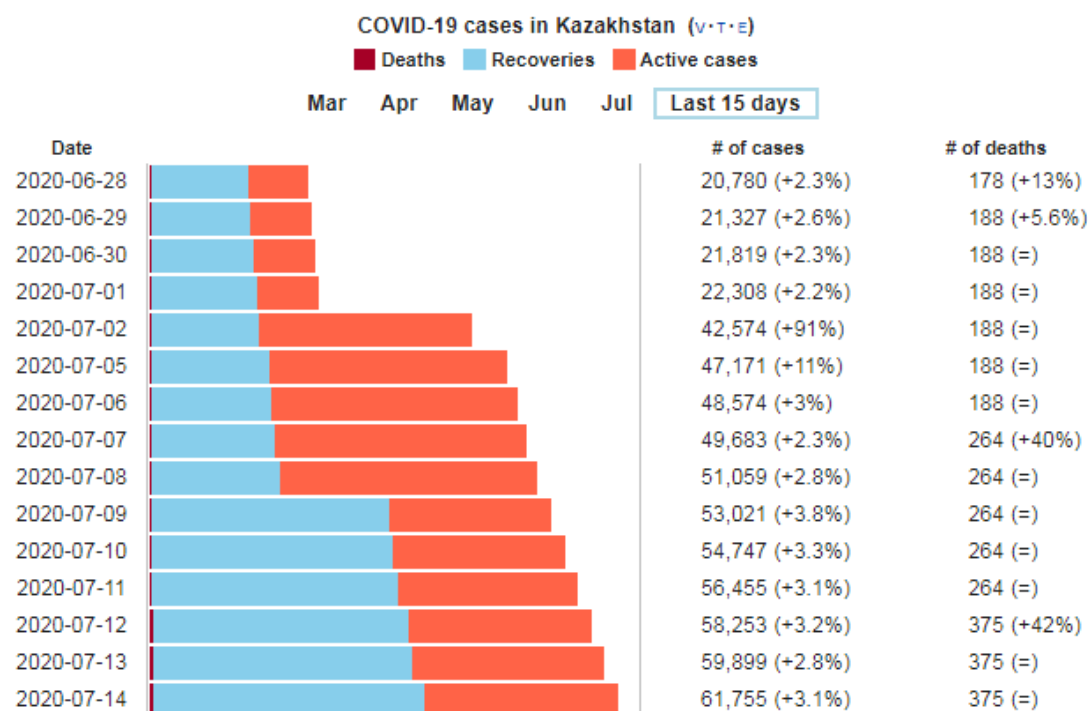
- involved in STI policy management, coordination and implementation. It will also increase public sector integrity and inter-ministerial collaboration.
- 5) R&D prioritization policy should be established to concentrate efforts and resources on the sectors and directions that have the highest potential for Kazakhstan.
 - 6) Funding of research, development and innovation should be incrementally increased in a publicly open and sustainable scheme for funding over the long term.
 - 7) Technology research budget should be more focused on helping industrial development. The links between R&D expenditure and the capability of industries should be strengthened. At the same time, science and technology policies should place more focus on the challenges and opportunities for the country in the long-term.
 - 8) Favorable conditions for investors who invest in innovative R&D should be created, including the development of special programs for attracting FDI in priority areas.
 - 9) Special attention should be paid to the development of venture funding and attracting private financial resources in STI development.
 - 10) Kazakhstan should more actively participate in international STI programs and projects to increase international collaboration.
 - 11) Special programs for human capital development to ensure the development of capabilities and skills required in the future should be supported. In addition, highly qualified specialists should be involved in the process of STI development.
 - 12) A special policy for attracting international highly qualified specialists should be designed and implemented. Favorable conditions should be created for highly qualified international professionals to come and work in Kazakhstan, especially in new emerging sectors targeted for STI development.
 - 13) The financial support for high-tech SMEs should be increased and the implementation of a mechanism for credit guarantees to SMEs should be supported.
 - 14) Science–industry collaboration should be enhanced, and applied R&D should be oriented towards the needs of the real economy sectors. In this regard, the state should encourage academia and research community collaborate more actively with business sector.
 - 15) High value-added industrialization based on technological upgrading with export orientation as well as development of high-tech startups should get higher priority support.
 - 16) The importance of education and health sectors development should be prioritized. There is a necessity to raise the status and prestige of doctors and teachers in the society.

3. Impact of COVID-19 on the economy of the Republic of Kazakhstan

The virus was confirmed to have reached Kazakhstan on 13 March 2020. The President of Kazakhstan, Kassym-Jomart Tokayev, declared a state of emergence from 16 March to 11 May 2020 and introduced quarantine and lockdown measures helped to slow down the spread of the virus. The weakening of the lockdown on May 11, however, produced the opposite results and the number of COVID-19 cases began increasing.

Since July, the number of cases of COVID-19 has rapidly increased in Kazakhstan, while hospitals across the country warn they are at or near their full capacity while the number of patients requiring hospitalization continues to tick upwards. KZT14.8 billion (US\$ 34,4 million) was allocated for the construction of three modular quarantine complexes in the cities of Nur-Sultan, Shymkent and Almaty.

Figure 4. Statistics on COVID-19 cases in the Republic of Kazakhstan



Sources:

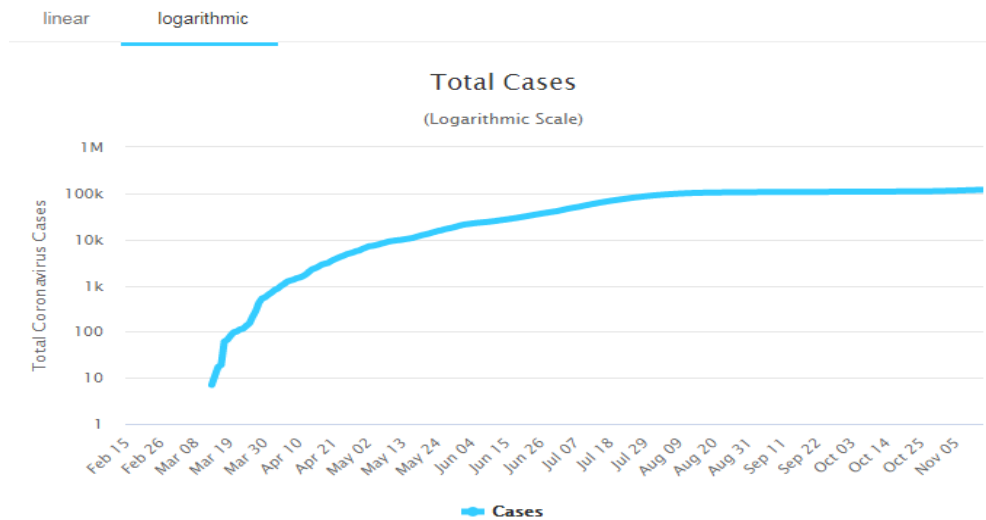
- "Updates published by Kazinform" coronavirus2020.kz (in Kazakh).

The Government of Kazakhstan announced a two-week lockdown from July 5 onwards to prevent the rapid spread of coronavirus infections that had surged in June. During the lock-down period, all companies were obliged to shift at least 80% of their staff to remote work.

The coronavirus pandemic and the drop in oil prices have adversely affected the economy of Kazakhstan. From mid-January to late-March, natural gas prices declined by 38% and crude oil prices dropped by approximately 65% and this in the context of oil and gas sectors representing 10.6% of the nation's GDP and 62% of the total value of exports. The government has put considerable effort into boosting economic diversification to improve the economy's ability to withstand such external shocks.

Kazakhstan will likely experience the adverse impact of the lockdown from medium to long-term perspectives with a high chance of prolonged scenarios of recovery.

Figure 5. Total COVID-19 cases in the Republic of Kazakhstan



Sources:

<https://www.worldometers.info/coronavirus/country/kazakhstan/>

In the period from January to June 2020, Kazakhstan experienced a fall in its GDP of 1.8%. Currently in Kazakhstan the public sector is still the overwhelmingly dominant actor of the economy. SMEs in Kazakhstan account for approximately 26.8 % of the value-added goods and services produced and employ 31% of the workforce, however, SMEs operate primarily in low value-added sectors and only 5% of them are exporters.

SME's have been negatively affected by the supply shock and decreased local demand for services and commodities caused by the lockdown and quarantine measures. According to local experts' estimations, a large number of SMEs could potentially close or be forced to change their business model as declines in revenues will be virtually universal. Kazakhstani companies may increase the domestic market penetration by expanding into regional markets, which is less profitable but also less risky than engaging in export activity.

The Government of Kazakhstan and the National Chamber of Entrepreneurship have established the Project Office on Issues of Entrepreneurs and Operational Headquarters for monitoring the status of SMEs. The government has announced its preparedness to address the potential crisis caused by the virus and introduced a package of urgent measures to support business and ensure stability in the labor market, including increasing the availability of financing, providing guarantees, tax incentives, reducing business audits and ensuring employment.

Some of the key government measures that have been announced include:

1. A financial package of anti-crisis measures, including tax relief, tax payment deferral measures and support at the local level which is expected to total approximately KZT4.4 trillion (US\$10,2 million).
2. A temporary VAT reduction for agricultural and food products and zero custom duties on essential imports.
3. Price controls with state regulation of prices expected to be introduced on socially significant goods.
4. A ban on exports of a range of "socially significant" products until the state of emergency is lifted.

To support businesses the government has also implemented the following measures:

- Within the framework of the anti-crisis plan, the State Program “The Economy of Simple Things”, which includes a soft loans program that has existed for more than a year, will be boosted with KZT 400 billion (US\$930.23 million).
- Preferential loans: a total of KZT600 billion (US\$1395.35 million) worth of lending available for 1 year at 8%. To support SMEs that suffered during the coronavirus crisis, the National Bank in cooperation with the agency responsible for the regulation and development of financial markets are initiating concessional lending to support SMEs' working capital. Combined with the State Program “The Economy of Simple Things”, the support received by local entrepreneurs from the government will reach KZT1 trillion (US\$2.33 billion).
- Agricultural sector support: farmers will get access to loans total KZT70 billion at 5% available through National Holding “Kazagro” and KZT100 billion (US\$232.56 million) at 6% through the State Program “The Economy of Simple Things”. In addition, farmers will be able to finance their operations through forward contracts (under its future harvest). Furthermore, diesel and other fuel types will be subsidized for the next sowing season;
- Oil refineries are exempt from excise taxes on exported gasoline and diesel fuel until 31 December 2020;
- SMEs are exempt from personal income tax and social payments (social tax and insurance) for 6 months (April-September 2020). This will be applied to sectors including but not limited to tourism, transport, IT, consulting, private education, private healthcare and other affected sectors;
- Business entities may apply for low-interest loans under the rescue package, with such loans for individuals capped at KZT50 million (US\$116.28 thousand) and KZT3 billion (US\$7 million) for SMEs.
- Government support will be provided to some systematically important enterprises to avoid labor and wage cuts.
- Citizens who lost income during the state of emergency by being forced to leave their jobs without pay received financial support from the state social insurance fund. The amount of social benefits per employee was KZT 42,500 (US\$100) per month and was provided in the period from March to May 2020.

The pandemic has changed the world and Kazakhstan needs to be prepared for a new post-COVID-19 reality. The government actively works on adjusting strategic documents and policies to the new conditions. Adjustments and changes will be introduced to the Strategic Development Plan – 2025, the State Program Digital Kazakhstan and several strategic documents on STI development. The revised strategic documents would be modified according to the changed global and local situation.

Furthermore, the Government of the Republic of Kazakhstan has adopted an Integrated Plan for Recovering Economic Growth, the implementation of which should minimize the negative consequences of external shocks and cover all important sectors and practical measures necessary to revitalize the domestic economy. The plan consists of 10 areas and 172 systemic and sectoral measures to stimulate business activity and manage to keep the economy operating at a relatively high rate of employment. The proposed measures provide significant expansion of financing and concessional lending mechanisms, including micro-businesses, and the active use of guarantees and reimbursements. The practice of concluding forward and long-term off-take contracts will be introduced. The financial burden will be reduced, and tax administration will be simplified, preferences and deferrals on taxes and loans will be applied, individual fines and fees will be abolished, and administrative barriers will be minimized.

In addition to the above, new approaches will be introduced to stimulate demand on the domestic market while simultaneously supporting domestic production and the service sector.

The COVID-19 pandemic has negatively affected the activities of STI institutions in Kazakhstan. Despite the reformation and reorganization processes that have been ongoing for the last 2 years, starting from the year 2018, no calls for public grant programs on technology commercialization and innovation have not been opened.

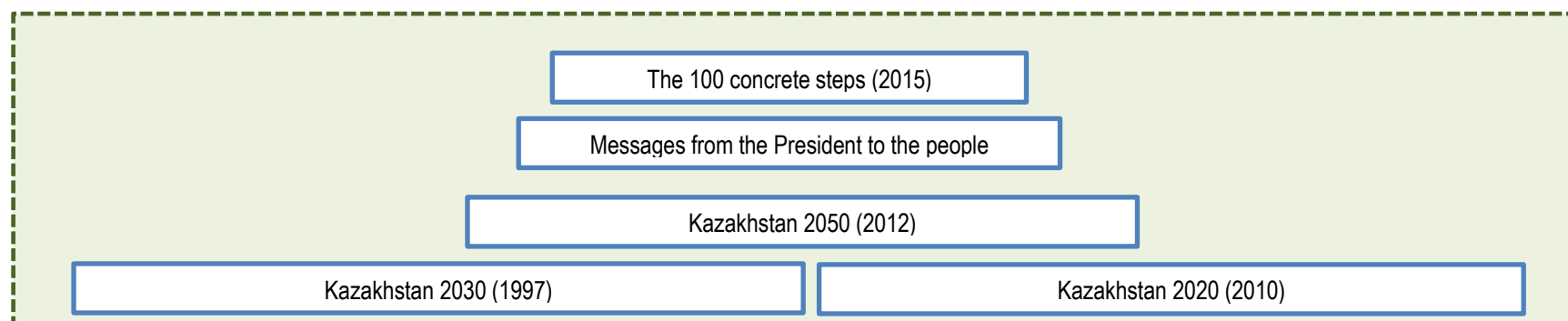
In 2019, the functions and responsibilities related to innovation development were transferred from MIID to MDDIAI. In 2020 the function of provision of the state innovation grants has been transferred to the Center of Engineering and Technology Transfer (earlier the National Agency for Technological Development was responsible for the provision of innovation grants).

MDDIAI initiated development of Technology Platforms in 10 priority sectors, namely FinTech, GovTech, GeoTech, SpaceTech, GreenTech, AgriTech, Industry 4.0, Smart Cities, the Electronics Industry and AI. The role of these technology platforms is to integrate activities and resources of the main actors from industry, academia, science and government. As could be noted from the above list, digital technologies are seen as core elements of the development of the technology platforms.

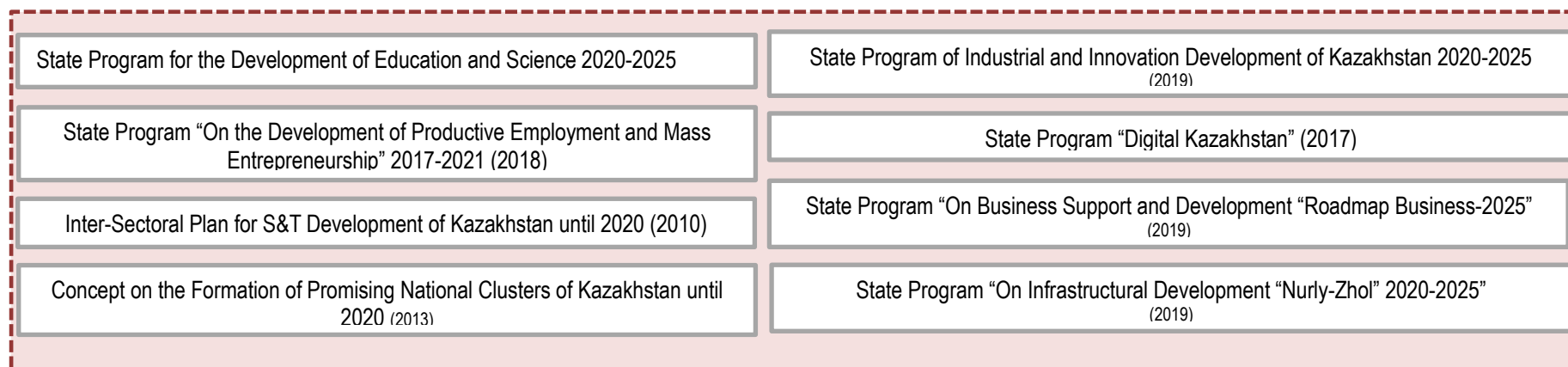
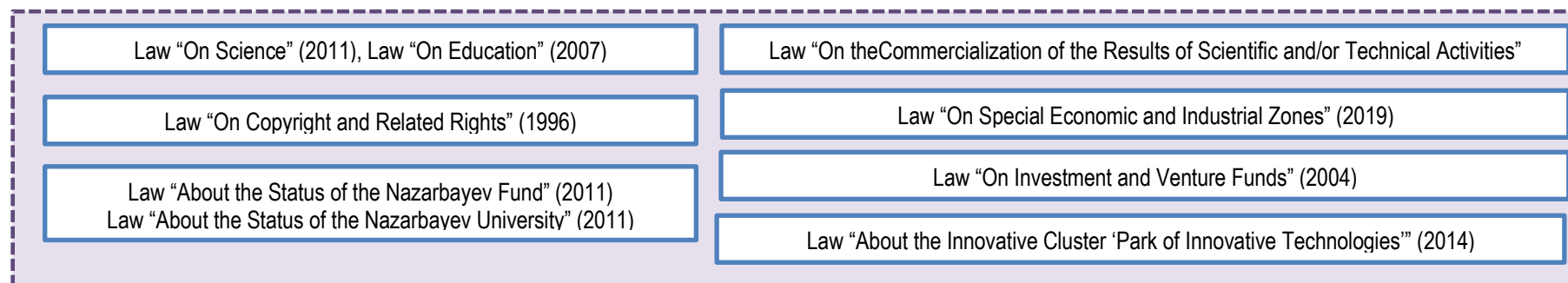
The role of the Astana Hub in the process of IT startups development, including incubation and acceleration programs, has recently been strengthened. Innovation grants will be provided to support startups with special attention to startups meeting the tasks assigned by the technology platforms development. The Ministry of Education and Science is also pursuing its policy of supporting young scientists and in 2020 special government research grants for young scientists were provided.

As is common for most nations at the time of writing, Kazakhstan is facing significant increases in the number of COVID-19 cases and this negatively affects both the economic situation and STI development. The Coronavirus has brought a lot of challenges, threats and obstacles to STI development by slowing down communication, which traditionally has been one of the main drivers that helped to accelerate innovation development in the country. However, a great share of the STI efforts are now being devoted to improving the prospects for recovery and ensuring sustainable development of the country.

The framework of public policies on STI development in the Republic of Kazakhstan



Entrepreneurial Code of the Republic of Kazakhstan (2015)



List of main strategic documents of the Republic of Kazakhstan in the field of STI development

1. Kazakhstan Strategy 2050 “A New Course for the Republic” (14/12/2012, President’s Address to the Nation)
2. The “100 Concrete Steps” constitute a roadmap of structural reforms with a view to realizing Kazakhstan 2050 Strategy (2015)
3. Decree of the President of the Republic of Kazakhstan "On approval of the Strategic Plan for the Development of the Republic of Kazakhstan up to 2025" (dated February 15, 2018 No. 636)
4. Decree of the President of the Republic of Kazakhstan "On measures to implement the election program of the President of the Republic of Kazakhstan" Well-being for all! Continuity. Justice. Progress "and proposals received during the nationwide" Bridge "campaign (dated June 19, 2019 No. 27)
5. Message from the President of the Republic of Kazakhstan to the people of Kazakhstan "Constructive public dialogue - the basis of stability and prosperity in Kazakhstan" (dated September 2, 2019)
6. Message from the President of the Republic of Kazakhstan to the people of Kazakhstan "New development opportunities in the context of the fourth industrial revolution" (dated January 10, 2018)
7. 34. Clause 8 of Decree of the President of the Republic of Kazakhstan "On measures to implement the Message of the Head of State to the people of Kazakhstan dated January 10, 2018" New development opportunities in the conditions of the fourth industrial revolution " (dated February 9, 2018 No. 633)
8. Message from the President of the Republic of Kazakhstan to the people of Kazakhstan "Growth in the welfare of Kazakhstanis: improving income and quality of life" (dated October 5, 2018)
9. Law “On Science”, No. 407-IV, 2011
10. Law “On Education”, No. 319-III, 2007
11. Law “On Commercialization of the Results of Scientific and (or) Scientific and Technical Activities”, No. 381-V, 2015
12. State Program “Digital Kazakhstan”, No.827, 2017
13. Law “On Special Economic and Industrial Zones”, No. 75-p, 2019
14. Entrepreneur Code of the Republic of Kazakhstan, The Code of the Republic of Kazakhstan dated October 29, 2015 No. 375-V ZRK (updated on 29/11/2018).
15. State Program of Industrial and Innovative Development of the Republic of Kazakhstan for 2020-2025
16. Law “On the Investment and Venture Funds”, No. 576-II, 2004
17. Law “On Innovation Cluster “Park of Innovative Technologies”, No. 655, 2013