

Science, Technology, and Innovation (STI) Gap Analysis of Uzbekistan

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

November 2020

Contents

Part A. Overview of main aspects of national STI governance	3
1. National STI priorities.....	3
2. Key STI policy documents.....	6
3. STI governance structure	10
4. STI policy instruments, policy implementation and coordination	14
Part B. Key challenges and problems in fostering innovative development in Uzbekistan.....	18
Description of the survey and its participants	18
Analytical note summarizing the results of the stakeholder survey.....	19

Part A. Overview of main aspects of national STI governance

1. National STI priorities

In Uzbekistan, the introduction of modern innovative ideas, developments and technologies has been identified as among the key factors promoting quick and meaningful progress towards joining the ranks of developed countries in the world economy.

The advancement of education and science in Uzbekistan has been identified by the Government as a priority area for societal development in the 2017–2021 period according to Presidential Decree No. UP-4947, dated 7 February 2017 and entitled **“On the Strategy of Actions for the Further Development of the Republic of Uzbekistan”**. At the same time, an agenda was established to stimulate research and innovation, create effective mechanisms for the introduction of scientific and innovative achievements into practice, create specialized scientific and experimental laboratories as well as high-tech centres and technology parks at higher educational institutions and research institutes.

In Uzbekistan, 2018 was the “Year of support for active entrepreneurship, innovative ideas and technologies” and in pursuance of the Action Strategy was established by the Decree of the President of the Republic of Uzbekistan No.UP-5308, dated 22 January 2018, a state programme was approved. This programme is designed to implement the Action Strategy which covers five priority areas that have been targeted for development during the 2018–2021 period. The state programme is particularly supportive of economic development and actively encourages entrepreneurship through the creation of favourable conditions, development of innovative ideas and technologies, further improvement of the legal framework, including guarantees of protection and mechanisms for preventing illegal interference in the activities of business entities. In addition to the above, the programme seeks to address shortcomings in tax and customs policies, banking and finance, developing a strategy to reform the agricultural sector, the provision of benefits to industries and sectors of the economy and, finally, to actively development regional Uzbekistan.

Presidential Decree No.UP-5544, dated 21 September 2018, approved the **“Strategy for Innovative Development Of the Republic of Uzbekistan for 2019–2021”** to accelerate the country along the path of being able to employ and contribute to modern science, to develop and introduce innovative ideas and technologies as well as consistently implement the other tasks defined by the Action Strategy. This decree also approved the **“Roadmap”** for the implementation of the strategy and targets for the innovative development of the Republic of Uzbekistan until 2030.

The main goal of the Strategy for Innovative Development of the Republic of Uzbekistan for 2019-2021 (hereinafter referred to as the Strategy) is the development of human capital as the main factor that will determine the level of the country’s rate of innovative progress and competitiveness in the world arena.

The main objectives of the Strategy are defined as the following:

- Entry of the Republic of Uzbekistan into the world's top 50 countries according to the Global Innovation Index by 2030.

- Improving the quality and availability of education at all levels, developing a system of continuous education and ensuring the flexibility of this system based on the needs of the economy.

- Strengthening the scientific potential and effectiveness of research and development and creating effective mechanisms for integrating education, science and entrepreneurship for the widespread implementation of the results of research, development and technological work.

- Increasing the level of investment of public and private funds in STI as well as the introduction of modern and effective forms of financing activities in these areas.

- Increasing the efficiency of government bodies by introducing modern methods and tools of management.

- Ensuring the protection of property rights, creating competitive domestic markets and ensuring equal conditions for doing business for all firms operating in the country, coupled with the development of public-private partnerships;

- Creation of stable, functioning social and economic infrastructure.

The main directions of the Strategy are defined as:

1. The development of STI transfer.
2. Improving the system of financing of innovative activities.
3. Development of infrastructure and information and communication technologies (ICT).
4. Improving the education system and developing of human capital.
5. Development of competition and the reduction of administrative barriers.

It should be noted that the last three years has been a period of fundamental transformation in innumerable areas of socio-economic activity in the Republic of Uzbekistan. In this short period, a large amount of work and reform has been carried out in the country designed to create an innovation-oriented economy and the conditions necessary for the widespread introduction of innovations.

The Ministry of Innovative Development was created as the key government body that implements the unified state policy regarding STI in Uzbekistan, a task facilitated by the creation of a dedicated fund to support this work. In 2017, the Decree of the President No.UP-5264, dated 29 November 2017 and entitled "On the formation of the Ministry of Innovative Development of the Republic of Uzbekistan", was issued to establish both the Ministry of Innovative Development and the Fund Supporting Innovative Development and Innovative Ideas. Furthermore, this decree

determined that the main directions of innovative development of the Republic of Uzbekistan were:

1) The creation of a strategic planning system allowing for the formation of future models of innovative development in priority areas and industries based on long-term scenarios to increase the country's intellectual and technological potential.

2) The introduction of innovative forms of public administration to ensure the optimization and simplification of procedures for the provision of public services while simultaneously increasing the efficiency of government bodies.

3) The creation of modern infrastructure for the development of STI and that is capable of providing the necessary conditions for sustainable growth of the socio-economic potential of the regions and rural areas of Uzbekistan as well as improving the population's living standards and well-being.

4) Attract greater investment into the development and implementation of STI in Uzbekistan coupled with an improvement in and ongoing development of the regulatory framework.

5) Offer comprehensive support and stimulation of research and innovation activities, especially the creative ideas and innovations of the younger generation as well as creating favourable conditions for the active participation of talented youth in such activity.

6) The creation of effective mechanisms for the promotion and implementation of prospective domestic achievements in research and innovation, including the organization and strengthening of the material and technical base of specialized scientific and experimental laboratories, advanced technology centres, technoparks and other innovation-oriented infrastructure that includes participation by foreign investors.

7) To actively promote the introduction of environmental, resource and energy-saving technologies, including through the widespread use of alternative energy sources, modern forms of water purification and desalination along with its efficient use.

8) The widespread introduction of advanced technologies in the field of healthcare, allowing for the early detection and prevention of diseases, timely and effective treatment as well as the creation of an integrated system aimed at promoting healthier lifestyles in society.

9) The promotion of innovative ideas, developments and technologies in the agricultural sector, including new varieties of crops, all of which contribute to increased production efficiency, the export potential of agricultural producers and, thus, strengthening the country's food security.

10) Accelerated introduction of modern information, communication, industrial and other innovative technologies that ensure the comprehensive development of the real economy.

11) Expansion of cooperation with leading foreign (international) organizations in the field of innovation by attracting them into the domestic market for the transfer of know-how, and production nanotechnology and high-tech outputs (goods and services).

Besides the above key points, this same decree determined the main focal points of the ministry's activities in the field of innovation, namely in state and public construction, agricultural and social development, implementing a system of environmental protection and nature management as well as initiating, coordinating and stimulating the introduction of advanced technologies.

On 30 November 2017, one day after the above-mentioned decree was issued, Presidential Resolution No. PP-3416 entitled "On the organization of the activities of the Ministry of Innovative Development of the Republic of Uzbekistan" was issued. This resolution approved the organizational structure of the Ministry of Innovative Development, the structure of its central office with the maximum number of management personnel (110 staff). The resolution also detailed the ministry's mandate, the structure of its Executive Directorate of the Fund Supporting Innovative Development and Innovative Ideas, the composition of the fund's Supervisory Board and the regulations governing the fund.

2. Key STI policy documents

In Uzbekistan, two main documents regulate STI - the Law of the Republic of Uzbekistan "On Science and Scientific Activity" No.ZRU-576 dated 29 October 2019 and the Law of the Republic of Uzbekistan "On Innovation Activity" No. ZRU-630, dated 7 April 2020.

The law "On Science and Scientific Activity" indicates that the priorities for the development of science and technology are focused on those areas that can provide scientific solutions to problems related to achieving global competitiveness and efficiency for the national economy, increasing labour productivity, creating new industries along with systems of science and education as well as improving the quality of life of the population. The same law outlines the main goals of this science and scientific related activity:

1) To achieve global competitiveness and efficiency for the national economy through the development of science and scientific activity.

2) Make a determination of the priority directions for the development of science and technology and the target direction of resources.

3) The development of state scientific programmes, support for well-grounded initiatives and projects.

4) Provide support for public-private partnerships in the field of science and scientific activity.

5) Maintaining the nation's natural environment and its attractiveness while striving for scientific advancement, attracting young people to scientific activities and the training young talent.

6) Protection of intellectual property rights.

7) Facilitate a reasonable increase in funding for STI activities.

8) Ensure the close integration of science, education and production while increasing both domestic and foreign interest in it.

9) Ensure the close integration of science and scientific activity with the information space.

10) Develop international cooperation in the field of STI.

The Law of the Republic of Uzbekistan "On Innovation Activity" states that the main goals of state policy in the field of innovation are:

1) To ensure the effective legal regulation of innovative development.

2) Determine priority areas in the field of innovation, including forecasting future needs that will require technological developments.

3) Creating the necessary conditions and infrastructure for the implementation of innovative activities.

4) Providing state support and stimulation of innovative activity.

5) The development and implementation of national, regional and sectoral programmes for STI.

6) Assist in attracting investment in innovative activities.

7) The development of public-private partnerships in the field of innovation.

8) Organizing training, retraining and advanced training of personnel to promote STI developments.

9) The development of international cooperation in the field of innovation.

In 2018, the Resolution of the President of the Republic of Uzbekistan No.PP-3682 dated April 27, 2018 "On measures to further improve the system of practical implementation of innovative ideas, technologies and projects" was adopted.

To further promote the creation of innovative infrastructure, favourable conditions for the development of entrepreneurship, investment potential, the widespread introduction of innovative ideas, technologies and projects in production, as well as in accordance with the objectives of the Action Strategy in five priority areas of development of the Republic of

Uzbekistan in 2017-2021, it was determined to hold since 2018, on an annual basis, international interactive innovation fairs and international innovation and investment forums with active participation in them of foreign innovation and research centres, investment funds, technology agencies, technology parks and business incubators.

In Uzbekistan, special attention is paid to comprehensive support and stimulation of active entrepreneurship, the introduction of innovative ideas and technologies, the creation of the necessary conditions for the accelerated development of science and innovation, contributing to an increase in the socio-economic potential of the rural areas and a sustainable increase in the standard of living and well-being of the population. So, in order to eliminate existing problems and create favourable legal and organizational conditions for the development of active entrepreneurship, the formation and functioning of the innovation market, as well as the promotion of local and foreign innovative developments in the real sector of the economy, the Resolution of the President of the Republic of Uzbekistan No.PP-3697 dated May 5 was adopted 2018 “On additional measures to create conditions for the development of active entrepreneurship and innovation”. This resolution approved the proposal to create, **based on a public-private partnership** –centres for innovative ideas, developments and technologies in the Republic of Karakalpakstan, regions and the city of Tashkent, which develop, test and master innovative start-up projects, transfer and commercialize the results of innovation. It was determined that these centres operate on a commercial basis and from the moment of their creation are exempt from all types of taxes for five years.

In Uzbekistan, state and economic management bodies include various ministries, state committees, agencies, inspections, centres, banks, concerns, companies, and associations. In accordance with paragraph 4 of president decree No. PP-3698, dated 7 May 2018 and entitled “On additional measures to improve the mechanisms for introducing innovations in the industry and the economy”, the heads of state and economic management bodies cited above were instructed to determine each a deputy head each responsible for issues of innovative development. In addition, by October 1 each year, these heads of state and economic management bodies were to develop, in agreement with the Ministry of Innovative Development, road maps for the innovative development of key areas for the next year. These road maps defined the specific amounts and sources of funding for activities as well as means for their effective implementation, however, this decree has not yet been implemented.

The Republic of Uzbekistan has been engaged in widespread work to ensure the effective use of available financial and material resources to create favourable conditions for the implementation of various STI activities for a number of years. In particular, in 2014–2018, about 800 billion soums were allocated from the national budget to finance applied- science and innovative projects and developments, as a result of which more than 700 inventions were patented by research and higher educational institutions.

However, to better accelerate economic development needs more to be done in terms of exploiting the commercialization potential of the results of innovative activities being undertaken by scientific research and higher educational institutions in the country.

However, analysis of the practical uses of STI activities indicates existing systemic problems in their creation, legal protection and real-world implementation. To address this problem, presidential resolution No. PP-3855, dated 14 July 2018 and entitled “On additional measures to increase the efficiency of commercialization of the results of scientific and scientific and technical activities” was adopted. This resolution sought to ensure the accelerated implementation of domestic STI activities, increase the contribution of science to strengthening the country’s economic competitiveness as well as create effective mechanisms that promote promising domestic STI undertakings.

In Uzbekistan, comprehensive measures are being taken to enhance the role of scientific research in the socio-economic development of the republic as well as to further the integration of science with education and production. As a part of these efforts, the Programme of Comprehensive Measures for Strengthening the Infrastructure of Research Institutions and Development of Innovation Activities for 2017-2021 is being implemented.

The necessary conditions are being created to ensure effective mechanisms for the commercialization of domestic developments, expand the sources of funding for STI activities, protect the owners of intellectual property and support the implementation of innovations. At the same time, a few analytical studies indicate the presence of a number of organizational, practical and infrastructural problems in the integration of science and production, the introduction of STI developments in the areas of both state and public life.

To ensure the most effective integration possible between science and production as well as providing the necessary infrastructure for STI activities, taking into account modern requirements, presidential resolution No. PP-3899, entitled “On measures to improve the efficiency of the system for integrating scientific and innovative activities”, was adopted on 6 August 2018. This resolution created an additional deputy minister in the Ministry of Innovative Development who is responsible for ensuring the commercialization and dissemination of scientific developments, technologies and other innovative outputs from research institutions. The same resolution also created a Scientific and Technical Centre with a design bureau and a prototype production facility associated with the Academy of Sciences of Uzbekistan which was largely modelled after the Specialized Design and Technological Bureau of the U.A. Arifov Institute of Ion-Plasma and Laser Technologies. Finally, the resolution also established a presidential fund administered by the Ministry of Innovative Development for the commercialization of the results of STI activities. The fund’s financial resources are drawn from the national budget, grants and loans from international financial institutions and other foreign donors, income derived from depositing that portion of the fund which is temporarily idle with commercial banks as well as several other sources not prohibited by law.

In recent years, a large amount of work has been carried out in the republic regarding entrepreneurship development and the creation of a favourable environment for attracting investments and doing business.

Presidential decree No. UP-5583. dated 24 November 2018 and entitled "On additional measures to improve financing mechanisms for projects in the field of entrepreneurship and

innovation", was issued to help create the most favourable conditions for the creation and development of sustainable chains of financing for innovative ideas, startups, venture projects, accelerating the production of the results of innovative developments and the promotion of local innovative products to the international market. Simultaneously, and in accordance with the tasks defined by the Action Strategy for the five priority areas of development targeted in the 2017-2021 period, the practice of creating investment and management companies was expanded to prompt and effective attraction of investment deposits of investors, primarily foreign ones.

On 22 January 2018, presidential decree No. UP-5308 was issued under the title "On the State Programme for the Implementation of the Action Strategy in Five Priority Areas of Development of the Republic of Uzbekistan in 2017-2021 in the Year of Support for Active Entrepreneurship, Innovative Ideas and Technologies". The actions taken under this decree are scheduled to run until to 1 January 2022 and involve the study and evaluation of the effectiveness of investment and management companies and covers the following:

- The relationship between investment companies, management companies and qualified investors is regulated solely on the basis of an agreement that can independently determine its terms, including the free choice of forms and methods of resolving disputes arising from their joint activities.
- Investment companies have the right to issue loans, including interest-free loans with or without collateral.
- The investment company is obliged to annually organize an external audit in the manner determined by its constituent document and legislation.
- Monitoring of the activities of investment and management companies is carried out by the state body authorized to regulate the securities market.
- Investment and management companies created and operating until 1 January 2022 can continue their activities in the prescribed manner.
- Until 1 January 2023, venture funds co-financing high-tech entrepreneurial start-up projects and high-tech start-up projects co-financed from venture funds are exempt from all types of taxes and mandatory payments except for unified social payments.

3. STI governance structure

In the field of science and research policy

In Uzbekistan, the regulatory bodies of STI are the Cabinet of Ministers, the Ministry of Innovative Development, the Academy of Sciences, various tertiary education institutions as well as the scientific organizations of ministries, departments and agencies in the field of science and scientific activity under their jurisdiction.

The Cabinet of Ministers of the Republic of Uzbekistan:

- Ensures the implementation of the main directions in the sphere of science and scientific activity.
- Approves priority areas targeted for STI development.
- Ensures the formation of the infrastructure necessary for effective scientific activities to be undertaken.
- Approves the procedure that assesses whether state scientific programmes have been successfully implemented and achieved their goals.
- Determines the measures to ensure the close integration of science, education and production.
- Determines the procedure for financing science and scientific activity as well as the procedure for distributing state funds.
- Provides social protection and incentives to individuals engaged in scientific activities.
- Determines the procedure for awarding scientific degrees and awarding scientific titles.
- Determines measures to disseminate information to the public regarding the foundations and achievements of science and technology as well as to promote relevant events in the field of science.

Another authorized state body in the field of STI is the Ministry of Innovative Development of the Republic of Uzbekistan which is responsible for:

- Implementing the policy on science and scientific activity.
- Forms the priority directions for the development of science and technology.
- Coordinating the activities of government bodies, scientific organizations, higher educational institutes as well as various other information and analytical institutions to further the development of STI related activity.
- Developing and approving state programmes for scientific activities and state target programmes for scientific activities as well as controlling their implementation.
- Holding competitions between projects within the framework of state programmes for scientific activities and financing the winning projects.
- Developing the state demand for scientific projects, maintain state records, monitoring their implementation and reviews reports on them.
- Forming and approving the list of unique scientific projects.
- Assisting in the development of mutually beneficial international scientific cooperation, attracting foreign investment into local scientific endeavours.
- Coordinating the system of further training personnel with a scientific degree.

The Academy of Sciences of the Republic of Uzbekistan, within the limits of its authority, is responsible for:

- Making proposals on the formation of priority directions for the development of science and technology, state scientific programmes as well as international programmes.
- Determining and implementing measures to ensure close integration of science, education and production.
- Creating favourable conditions for researchers and innovator by providing access to centres for the use of shared scientific equipment and unique scientific projects in accordance with the procedure established by law.
- Increasing the potential of scientific organizations and further training of personnel with a scientific degree.
- Promoting the commercialization of scientific developments and encouraging innovators as well as creating the conditions necessary to attract young people to innovative scientific activities.
- Representing employees of scientific organizations for state and international awards.
- Studying, analyzing, popularizing and promoting the achievements of foreign and domestic scientific innovations and achievements within Uzbekistan as well as developing recommendations for their use.
- Participating in cooperation with foreign academies of sciences, scientific organizations and foundations, and organization of international scientific events.
- Tertiary education institutions, ministries and departments involved with various STI-related activities as well as the scientific organizations subordinate to such entities.
- Making proposals on priority areas targeted for STI development.
- Participating in the development of state scientific programmes as well as international programmes then ensuring their implementation.
- Ensuring the implementation of effective and competitive scientific activities in educational institutions and those scientific organizations under their subordination.
- Providing training for personnel with a scientific degree in relevant areas.
- Determining and implementing measures to ensure the close cooperation between science, and industry.
- Strengthening the material and technical base of scientific organizations under subordination.
- Commercializing scientific innovations and creation of necessary conditions for attracting young people to scientific activities.
- Participating in the popularization of the STI endeavours as well as the promotion of relevant events in the field of science and scientific activity.

Local government bodies, within the limits of their authority, are responsible for:

- Participating in the implementation of policy in the field of science and scientific activity.
- Developing regional programmes for scientific activities and ensuring their implementation.

- Participating in the formation of priority areas for the development of science and technology.
- Assisting in the development of scientific activity and the creation of the modern infrastructure it requires.
- Determining and implementing measures to ensure the close cooperation between science and industry.
- Organizing systematic work related to the creation, support and popularization of scientific developments.
- Systematically promoting STI achievements and events as well as other related information to the local population.

In the field of innovation policy

The Cabinet of Ministers of the Republic of Uzbekistan is responsible for the following issues:

- Ensuring the implementation of a unified state policy for innovation.
- Ensuring the formation and coordination of activities for the implementation of innovative development strategies.
- Approving priority areas for the innovative development of targeted economic and social sectors.
- Creating the necessary conditions for innovative development.
- Approving the criteria for assessing the achievement of target indicators of innovative development.
- Creating the necessary conditions for the commercialization of new developments and technology transfer.
- Ensuring the development of international cooperation in the field of innovation.

Another authorized state body in the field of innovation is the Ministry of Innovative Development which is responsible for:

- Implementing a unified state policy in the field of innovation.
- Coordinating the activities of state and economic management bodies, local government bodies in the field of innovation.
- Developing and implementing strategies for innovative development.
- Developing normative legislation pertaining to innovation.
- Developing recommendations for assessing the risks of innovation.
- Analyzing the state of the country's innovative developments.
- Implementing measures to ensure interaction between subjects of innovation activity.
- Ensuring the organization of state expertise of innovative projects.
- Forming, approving and financing innovative projects as the single state customer that will purchase innovative outputs.

- Monitoring and evaluating the effectiveness of the implementation of innovative projects within the framework of state guidelines governing the creation of such innovations.
- Registering contracts for the transfer of technologies purchased via the state budget.
- Recommending new sources and methods of financing innovation to state and economic management bodies, local government bodies and other organizations.
- Financing the commercialization of innovations and assisting in technology transfer.
- Contributing to the creation and development of subjects of innovation, creating effective mechanisms for the commercialization of the results of innovation.
- Participating in the organization of a system to allow the training, retraining and further specialization of personnel for subjects of innovative activity.
- Encouraging and facilitating international cooperation in the field of innovation.

Other Government bodies, within their respective limits, are responsible for:

- Participating in the implementation of a unified state policy in the field of innovation.
- Ensuring the implementation of legislation on innovation.
- Participating in the formation, financing and implementation of innovative projects.
- Coordinating the activities of their subordinate subjects of innovation in the implementation of innovation projects.

Local government bodies responsibilities toward innovative endeavours include:

- Participating in the implementation of a unified state policy in the field of innovation in the relevant territory.
- Participating in the formation, financing and implementation of innovative projects in their locality.
- Approving, in agreement with the authorized state body, local programmes in the field of innovation and ensuring their implementation.
- Creating favourable conditions for the development of innovative activities in their locality.
- Financing innovative activities on the recommendation of an authorized state body or their own initiative as well as the commercialization of new developments and technology transfer.

4. STI policy instruments, policy implementation and coordination

Presidential decree No.UP-5308, entitled “On the State Programme for the Implementation of the Action Strategy in Five Priority Areas of Development of the Republic of Uzbekistan in 2017-2021 in the Year of Support for Active Entrepreneurship, Innovative Ideas and Technologies”, was issued on 22 January 2018. This decree established that from the date of its issue until 1 January 2023 all types of taxes and mandatory payments, except for the unified social payment, were waived for:

- Existing venture funds that co-finance high-tech entrepreneurial startup projects.

- High-tech startup projects co-financed by venture capital funds.
- The income received by research institutions, innovation centres and design bureaus from the sale (transfer for use) of their own new technologies to entrepreneurs.
- The income of any organizations derived from the transfer of new technologies to domestic entrepreneurship.

The Decree also foresees the creation of corporate venture funds, taking into account their industry specialization.

In June 2017, presidential decree No.UP-5068 entitled “On the creation of an innovative technopark in the Yashnabad district of Tashkent city” was issued to create a favourable environment for the development of advanced technologies. Furthermore, this decree was designed to ensure the sustainable development of scientific, technological and innovative entrepreneurship, create small innovative enterprises as well as establish the production and supply of competitive, in-demand high-tech products to both domestic and foreign markets. This decree also determined the specialization of the Yashnabad Technopark for scientific research and development, pilot testing and the transfer of innovative product samples for further development in such areas as:

- Chemical technologies, biotechnologies, pharmaceuticals, medical biotechnologies and plant protection products.
- Materials sciences, metal processing technologies, earthquake-resistant construction and other building materials.
- The food industry.
- Energy conservation, use of alternative and renewable energy sources, electronic measuring devices, robotics as well as mechanical and electrical engineering.

At the same time, the decree created favourable conditions for the residents of the technopark to modernize their operations and increase production. In particular, commercial banks were recommended to allocate soft loans for up to 7 years for innovative projects implemented in the Yashnabad Technopark. These loans were offered with a two-year interest-free period and an interest rate of no more than 50% of the established refinancing rate of the Central Bank of the Republic of Uzbekistan and which allowed purchased (created) equipment to be accepted as collateral when supplemented by a guarantee from the Yashnabad Technopark Directorate.

The Yashnabad Technopark was established with an operational lifespan of 30 years with the possibility of a subsequent extension, during this period the management, and any residents involved in ongoing innovative projects, are exempt from payments for:

- Land and property tax
- Customs payments (except for value-added tax and customs duties) for imported equipment, raw materials, processed materials, reagents, components and construction materials purchased for their own production needs as a part of the

implementation of their innovative projects approved by the relevant government bodies.

When it comes to the innovation support infrastructure in Uzbekistan, the following are concerned: innovative technology parks, technology transfer centres, innovation clusters, venture capital organizations, innovation centres.

Further below the main definitions and functions of the innovation infrastructure support elements are detailed in accordance with the relevant legislation of Uzbekistan.

A technopark is an initiative managed by expert professionals with the main purpose to support the innovation and competitiveness culture of the information-based firms within to increase the wealth of the society. A resident of an innovation technopark is a legal entity or individual implementing an innovation project in the premises of an innovation technopark.

The main activities of the innovation technopark are:

- Assistance in ensuring the integration of science, education and production.
- Assistance in the development of innovative entrepreneurship.
- Provision of material, technical, organizational, methodological, financial and information consulting as well as other services to residents.
- Assistance with the management of innovative projects.
- Conducting pilot industrial tests of innovations and assisting in the provision of legal protection to objects of intellectual property rights.
- Attracting domestic and foreign investors as well as business entities interested in advancing high-tech and innovative ideas in various industries.
- Assistance in the implementation of overseas marketing in various forms to promote innovations gaining access to foreign markets.
- Ensuring close and practical interaction between those involved in innovative activities.

The main tasks of the innovation technopark is to support its residents by:

- Assistance in the creation of production facilities for the development of new or improved technologies and their commercialization.
- Provision of movable and immovable property on a contractual basis, including for premises having various functional purposes.
- Performance of work related to the manufacture and testing of a prototype and other developmental work undertaken by residents.
- The provision of services for the certification and registration of products, including services for the provision of legal protection for objects subject to intellectual property rights.
- Promoting innovative products, technologies by organizing their inclusion in exhibitions, conferences and other events.
- Provision of other services related to the STI activities of the technopark.

The rental funds received from residents for their use of laboratory equipment, production facilities, office space and other workspaces as well as for any services rendered remain at the disposal of the technopark.

The status of an innovation technopark resident is granted on a competitive basis for up to ten years. The relationship between the technopark and its residents is based on contracts concluded between them for the implementation of innovative activities. The technopark and its residents can be provided with tax exemptions, customs benefits and preferences in accordance with the law while the creation, reorganization and liquidation of the technopark are carried out in the manner prescribed by law.

The **technology transfer centre** is a legal entity created to ensure the effective transfer of new technologies and the commercialization of the outputs of innovative endeavours. The main activities include:

- Conducting market research to identify organizational and technical opportunities to promote innovations.
- Provision of engineering, consulting and design services.
- Provision of services for the preparation of business plans.
- The attraction of investments.
- Dissemination of information related to technology transfer.

An **innovation cluster** is created without the formation of a legal entity by a group of geographically proximate interconnected companies, associated institutions and individuals in a particular area of research, the main purpose of which is to stimulate innovation through effective interactions, the sharing of capacities and exchanges of knowledge, competencies as well as providing input into technology transfer. The main activities include:

- Combining the potential of various innovative endeavours in a field of science, education and/or production to yield STI advances and meet the needs of the market.
- Formation of orders (state demand) for training and retraining of personnel related to the activities of innovation clusters, including the creation of innovations.
- Assist in the creation of enterprises specializing in the production of new or improved products, production methods and/or services.
- Joint promotion with the innovator of the results of innovative activities to the market.

An innovation cluster is created based on the mutual interest of innovators to better satisfy the needs of the economy and such clusters can be liquidated in the manner prescribed by law.

Venture capital organizations, funds and partnerships are specialized financial sources that can exist with or without the formation of a legal entity and whose main activity consists of financing the implementation of risky innovative projects. Venture capitalists can be legal entities or individuals domiciled domestically or abroad that inject funds into fledgling innovative

enterprises without requiring collateral, surety or guarantees but that often retain a vested interest or stake in such enterprises.

An **innovation centre** is created as a legal entity to implement a full work cycle for an innovation, namely to help innovators go from the creation of new ideas to the commercialization of an innovative output. The main activities of an innovation centre are:

- Formation of a base of new ideas and developments.
- Taking measures to improve and strengthen new ideas (acceleration).
- Assistance in providing the material and technical resources needed to translate new ideas and developments into actual innovations.
- Conducting training on innovative management methods.
- Financing the implementation of innovative projects.
- Marketing research.
- Development of recommendations for the orientation and adaptation of new developments to best meet market requirements.
- Development of cooperation between innovators.
- Organizing advertising and exhibitions to popularize new ideas, developments and technologies.

Part B. Key challenges and problems in fostering innovative development in Uzbekistan

Description of the survey and its participants

Only 10 experts took part in the survey, including 1 expert from the Ministry of Innovative Development, 3 experts from the Centre for Advanced Technologies which operates under the same ministry, 3 from startup enterprises, 1 from the Institute for Forecasting and Macroeconomic Research (operating under the Ministry of Economic Development and Poverty Reduction), 1 expert from the UN Office in Uzbekistan and finally, 1 expert from a joint project promoting youth employment being undertaken by the Ministry of Employment and Labour Relations and the UNDP. Details on the surveyed experts are provided below:

1. Mr Shukhrat Otajonov, Head of the Science and Technology Development Department of the Ministry of Innovative Development of the Republic of Uzbekistan.

2. Mr Rustam Abdukhatovich Khalmatov, Candidate of Geological and Mineralogical Sciences, Deputy Director of the Centre for Advanced Technologies under the Ministry of Innovative Development.

3. Mr Artyom Yuryevich Baev, PhD, Senior Researcher, Laboratory of Experimental Biophysics, Centre for Advanced Technologies under the Ministry of Innovative Development.

4. Mrs Barnohon Artikkhodjaeva, PhD - student of the National University of Uzbekistan, founder and head of a startup project, Centre for Advanced Technologies under the Ministry of Innovative Development.

5. Mr Khamidulla Zabikhullaevich Makhmudov, Director of “JobCafe” LLC

6. Mr Shokhrukh Boimurodov, Head of a startup enterprise.

7. Mrs Zilola Muminjanova, Director of a startup enterprise.

8. Mr Anton Kostyuchenko, Chief Researcher, Institute for Forecasting and Macroeconomic Research under the Ministry of Economic Development and Poverty Reduction.

9. Mr Zarif Zhumaev, Economist, Office of the UN Resident Coordinator in Uzbekistan.

10. Mr Usmon Aminzhanovich Rakhimdzhonov, Head of the department promoting youth entrepreneurship under the joint project involving the Ministry of Employment and Labour Relations and the UNDP.

The survey with each expert was conducted using both an interview and a questionnaire which the respondent completed.

Analytical note summarizing the results of the stakeholder survey

1. The actual results of the first part of the survey are presented in Table 1.

Table 1. Opinions about economic sectors/industries with high potential to be technologically upgraded and targeted for innovative development.

No.	Economic sector/industry	Percentage of respondents who indicated the sector
1.	Biotechnology	30 %
2.	Agriculture	30 %
3.	Chemical industry, including the production of fertilizers	30 %
4.	Textile industry	20 %
5.	Pharmaceutical industry	20 %
6.	Educational services	20 %
7.	Utilities	20 %
8.	Energy	20 %

9.	Nuclear physics, nuclear technologies	20 %
10.	Renewable energy	10 %
11.	Manufacturing industry	10 %
12.	Information and communications	10 %
13.	Light industry	10 %
14.	Food processing	10 %
15.	Production of selected construction materials	10 %
16.	Electro-technical industry	10 %
17.	Financial technology	10 %
18.	Water industry	10 %
19.	Plant growing	10 %
20.	Karakul breeding	10 %
21.	Mining and metallurgical industry	10 %
22.	Government services	10 %
23.	Banking sector	10 %
24.	Information technology and software engineering	10 %
25.	Financing of science and scientific activities	10 %
26.	Regulation of land relations	10 %
27.	Public finance, budget formation and execution at all levels	10 %
28.	Regulation of export-import relations	10 %
29.	Health care	10 %
30.	Labour market and job creation	10 %
31.	State procurements	10 %
32.	Payment systems	10 %
33.	Pension system	10 %

2. An assessment of the average value of all the expert opinions received on the effectiveness of STI policies and policy instruments that support the development of STI in the country is presented in Table 2.

Table 2. Opinions about the effectiveness of STI policy and the policy instruments supporting STI development in Uzbekistan

No.	Policy aspects	Average rank
1.	The national authorities assign high importance to the development of STI.	4
2.	National STI priorities and the strategic directions of STI development are well formulated and widely publicized.	3.2
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.	3.0
5.	There is good coordination in the functioning of the different public bodies tasked with STI governance.	2.9
6.	The functioning of the main R&D institutions in the country is well guided and managed.	3.1
7.	The authorities allocate sufficient public funds to support STI activities.	3.1
8.	The policy instruments used to support STI activities are efficient and well managed.	3

3. An estimate of the average value of all expert opinions about the framework conditions and business environment in the country and how they contribute to innovative development is presented in Table 3.

Table 3. Opinions about the framework conditions and business environment in the country: 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 of doing business.	3.4

2.	The authorities assign a high priority to SME development and SMEs have access to different forms of public support.	3.7
3.	Entrepreneurship is encouraged and the development of an entrepreneurial culture is supported by the authorities.	3.7
4.	It is relatively easy for entrepreneurs to start and develop a new business.	3.5
5.	Businesses cooperate with R&D and academic institutions for the commercialization of their R&D results.	2.4
6.	Universities encourage the establishment of startups and spin-offs for the commercialization of innovative ideas.	2.5
7.	The intellectual property rights of innovative entrepreneurs are well protected by law and regulations.	2.9
8.	Innovative entrepreneurs and SMEs have access to public funds to support the initial stages of commercializing their ideas.	3.1
9.	There exist adequate private funding sources to support innovative entrepreneurs and SMEs in the initial business stages.	2.3
10.	SMEs have relatively easy access to bank credit and other commercial funding for the development of their businesses.	2.7

4. The respondent experts were asked to answer the question: **“In your opinion, which are the main existing problems, obstacles and bottlenecks that hinder innovative development in your country?”**. Their various responses are generalized and systematized in the following section.

In Uzbekistan, there was a period of several decades which saw stagnation in the area of science advancement causing the country to lag some 20-25 years behind technologically more advanced economies (according to a speech of the President of the Republic of Uzbekistan Mr Shavkat Mirziyoyev given at a meeting with scientists held in 2018 at the Institute of Chemistry of Plant Substances in Tashkent). This led to the widespread loss of trust in science among manufacturers.

In recent years, to increase the scientific potential in the country, tangible work has been carried out to support and stimulate scientists and to widely involve young researchers in scientific activities. While a significant number and variety of activities have been undertaken, it is still too early now to see the results of these recent efforts.

However, despite this positive development, there are currently many problems in Uzbekistan that impede innovative development, a number of which are detailed in the following.

1. There is an acute shortage of skilled labour in Uzbekistan and both the quality and coverage of higher education leaves much to be desired. The scientific potential of each country is often determined by the number and quality of its scientists. In 2018, Uzbekistan had only 476 scientists per 1 million people. To put this into context, the world average is 1478 while in Israel, for example, this figure is 8342, in the Republic of Korea it is 7498, the USA it is 4245 and the Russian Federation it is 2822.

There are simply not enough specialists in Uzbekistan with the necessary knowledge and skills to efficiently organize and manage significant innovative activities. Currently, there are no educational institutions, or even educational programmes, for the training of world-class personnel for the expansion of innovative entrepreneurship, a key driver for the technological development of key economic and social sectors. The availability of such individuals is limited to those who have worked for a certain time in foreign companies or who have completed short-term refresher courses abroad. This understandably has a negative impact on both the process of creating innovations and their practical implementation.

2. The material and technical base of scientific research and higher educational institutions is physically and technologically outdated. To eliminate this problem in 2019 in Uzbekistan US\$2.95 million was allocated for the purchase of the modern equipment for scientific laboratories of research institutions and higher educational institutions.

3. R&D funding remains at an extremely low level – only 0.2% of GDP. This extremely low level of funding guarantees that R&D cannot become a driver of innovation and economic growth.

The problems associated with this low level of research funding is further compounded by the fact that the funds that are allocated for the development of scientific and innovative activities do not correspond to the current needs of the national economy as the bulk of the money is used to pay the wages of workers at scientific organizations.

As note above, Uzbekistan currently allocates 0.2% of its GDP to STI related activities while the world average is 1.7%. Since 2008, China has increased its STI spending from 1.4% to 2.14%, in the Republic of Korea it has gone from 3.1% to 4.5%. The low level of interest from local industry in scientific research and participation in its financing places a heavy burden on the state budget of Uzbekistan. In the past 3 years, funds allocated from the state budget for science have increased 2-3 fold but these increases have been largely consumed by increases in the salaries of those engaged in scientific activities meaning the country does not have sufficient surplus funds to develop the new material and technical fundamentals required to advance the work of scientific institutions.

4. Another systemic problem in Uzbekistan is that in most industries, ministries and organizations, the various departments responsible for the introduction of innovations do not function well. This situation is made worse by the fact that many such entities are necessarily engaged in other matters not related to innovations which further drains their limited resources. As a result of this, responsibility for the implementation of innovations in industry has been transferred to the Ministry of Innovative Development but, again, it is too early to see if this will measurably improve the situation.

Additionally, the relationships between industries, ministries, enterprises and scientific organizations in the relevant areas are not integrated. This serves as an obstacle to the practical implementation of local scientific developments and increases the technological dependence of manufacturing enterprises on foreign sources as they are forced to purchase finished equipment abroad.

5. Information and communication technologies (ICTs) are poorly developed – the speed and access to the Internet remain at very low levels.

6. The business environment also remains challenging despite some progress in recent years.

7. The system of protection of intellectual property rights is also underdeveloped.

8. There is an ongoing problem of the monopolization of key economic sectors, excessive state interference in the economic activities of enterprises and industry both through direct management and through protective measures that do not stimulate real competition and innovation. Limited competition undermines incentives for private investment and innovation.

5. Answers of the experts to the question: **“In your opinion, which are the most important changes (in legislation, in policymaking and implementation, in framework conditions, etc.) that need to be introduced to invigorate innovative development in the country?”**. The various responses received are generalized and systematized in the following section.

1. The most important area for development should be the creation of medium-sized businesses and innovative entrepreneurship. Without these two drivers, funds spent on science will have no effect. To develop production capacity for innovative outputs it is necessary to introduce innovations and strengthen the mechanism for their transfer from science to practice. This requires the implementation of targeted technological platforms, the development of technology parks, design and research departments at industrial enterprises, the formation of innovation centres and the strengthening of research institutions.

2. Formation of a programme and allocation of funding to support the innovative ideas and startup projects (at an early stage) of students and young scientists by allocating “seed” and “pre-seed” grant funds and the introduction of a portfolio management approach in areas of promising technologies. This programme should include the Small Grants Programme for startups (up to US\$10,000) provided by banks.

3. It is necessary to improve university sciences and establish links across a network of multiple academic institutions by observing high-tech trends. Concrete measures are needed with regard to the modernization of the technological basis (facilities) of university sciences. It is necessary to expand the network of research institutions covering the main areas that hold promise. Furthermore, universities should merge with research institutes and, using the synergies created, form innovation clusters.

If the above can be achieved, the structure of scientific institutions, universities, research and innovation clusters, innovation centres, design workshops and business accelerators would be both more efficient and effective. With regard to regional centres, the activities of innovation centres, youth technology parks, technology transfer centres, small research and production clusters as well as innovation testing grounds will be established.

4. It is necessary to involve the private sector in research and STI activities to ensure the production of quality, marketable, competitive and affordable products. To expand work in this direction, the practice of financing scientific projects by means of public-private partnerships is being introduced.

For example, the Bukhara cotton and textile cluster allocated 15 billion soums, within the framework of the state order, to hold competitions for thematic projects aimed at addressing the problems of the enterprise. According to the rules of the competition, 50% of the financing is supplied by the State with the remainder being raised from private investors. Similarly, the Ministry of Energy along with the state committees for geology and mineral resources allocated 15.4 billion soums for competitions focused on developing tourism that has resulted in a number of scientific projects being financed via public-private partnerships.

5. The experience of technologically advanced countries and the most successful developing countries should be studied.

6. There is a strong need to involve more young people in scientific endeavours.

7. The scientific capacities of universities and research institutions need to be strengthened and expanded to allow them to more effectively contribute to further innovative developments in the country.

The modern world requires the development of many spheres of socio-economic activity to embrace the use of new and innovative ideas and technologies, irrespective of whether they originate from domestic or foreign sources. This is the main criterion for the widespread, consistent and continuous development of Uzbekistan's economy and society and the path that is most likely to lead to a promising future for the nation as a whole. To build a competitive economy, we need young people with state-of-the-art knowledge and the opportunities to exploit the great potential they have. For each Uzbek, the aspiration to master modern sciences, high culture and knowledge should be seen as a vital necessity, the importance of which is evidenced by the plans of the ministries which help facilitate the realization of these priorities.

The announcement by of the President of the Republic of Uzbekistan Mr Shavkat Mirziyoyev of 2020 as the **Year of the Development of Science, Education and the Digital Economy** testifies to the amount of attention being given within Uzbekistan to the development of these areas. This is something of a revolutionary turn that holds great promise to promote the interests of the people.

One of the focus areas in the government policy on digital economy is artificial intelligence. In some countries, artificial intelligence is widely popularized in the areas of public administration, defence and national security, industries, education, tourism, and business. In Uzbekistan, the development of artificial intelligence will contribute to the development of information technology, neurosurgery, genetics, bioengineering, cybernetics, nanotechnology, biochemistry and other areas of fundamental and practical scientific research.

The advantages of the digital economy are many, including the improvements it brings to the quality of products and services while reducing unnecessary costs and, perhaps most importantly, effectively combatting corruption. In 2019, Uzbekistan rose to be ranked 8th in the International Index of Information and Communication Technologies Development. However, individual ministries, departments and enterprises are still far from being fully digitized, a fact which highlights that Uzbekistan's effort to create a digital economy requires considerably more of the necessary infrastructure and significant funding to be realized, a task that the head of state identified as one of the priorities for the next five years.

Uzbekistan is following the STI path to develop a technologically advanced and stable economy. Paying special attention to the above areas in the next five years will lay a solid foundation for the development of an innovative ecosystem, improving the quality of life of the people and, most importantly, allowing Uzbekistan to more fully compete in the global economy and integrate into the world community.

It is also very important to continue structural reforms in the economy, including denationalization through the development of public-private partnerships, increasing the competitiveness of local industries and the attraction of private investment, especially FDI, through which new technologies usually flow and that will allow new methods of management and marketing.

Competition is the main factor driving innovation and modernization in a society. Structural reforms should be aimed at strengthening competition and in this regard, all aspects of the relevant legislation should also be strengthened along with its practical enforcement.