IMPORTANCE OF THE NATIONAL İNNOVATION SYSTEM IN THE ECONOMIC GROWTH OF THE REPUBLIC OF AZERBAIJAN

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Abstract - This article is devoted to the formulation and development process of the national innovation system and its regulatory and legislative issues in the direction of achieving innovative economic growth of the country. Thus the NIS of the Republic of Azerbaijan and its institutional, regulatory aspects and performance level have been emphasized, also conclusion and some recommendations related to the formulation and development of the NIS towards the achievement of innovative economic growth of the country of Azerbaijan have been proposed.

Keywords - Economic Growth, Innovation, Institutional, National Innovation System

I. INTRODUCTION

In the current stage of the modern world economy, the formation and development of the National Innovation System (NIS) ensure strengthening the economic power of the country and its competitiveness in the world economy. But so far, the formulation of the NIS hasn't been completed yet in Azerbaijan and innovation activities are not the main key factor for the economic growth of the Republic of Azerbaijan. Mainly, the economic growth of the Republic of Azerbaijan occurs due to the export of natural resources such as oil and natural gas that consist 90% of the total export of the country[1], which in turn this case makes the country's economy to be dependent on the prices of raw materials in the world market, and delay the development of technology field in the country. This type of development strategy affects the existing innovation potential of the Republic of Azerbaijan adversely. This kind of resource-based economic model has to be changed by increasing the level of education, R&Ds, developing and or creating high-tech industrial areas, innovation infrastructures and improving other perceptual areas such as agriculture, transport, and logistics, etc. The appropriate condition for the development of innovation in Azerbaijan hasn't been provided yet, and scientific & technical policy hasn't been conducting continuously and high-technologies haven't become the main driving factor for the economic development in the country.For the development purpose, Azerbaijan has to integrate its scientific and technical potential into the global economy and the global scientific and technical arena. In order to decrease differences in levels of development between Azerbaijan and developed countries, it needs to adopt new world knowledge & technologies, as well as complete formulation of the NIS of the Republic of Azerbaijan and maintain development of the NIS at all the time.

The global experiences show that in a condition of economic stability, the state and formulation of innovation, mostly, depend on the country's adequate investment policy. Also, the scientific and technical policy in the country should stimulate the private companies so that they to take directions towards innovation in their development strategies. In addition, proper anti-monopoly policies, anti-corruption policies, customs policies, and intellectual property protection policies also support the promotion of innovation activities and these policies have to be updated accordingly for the purpose to activate innovation activities.

II. INSTITUTIONAL ASPECTS OF THE NATIONAL INNOVATION SYSTEM OF THE REPUBLIC OF AZERBAIJAN

As the first stage for the purpose to accelerate the process of forming the NIS in the Republic of Azerbaijan, it is required to take legal, economic, and political sets of measures to achieve the substantial structural changes in the economy of Azerbaijan, as well as providing proper financial support for R&Ds and High-tech industries.

In the modern economic and political conditions, one of the main priorities of the country should be the activation of innovation activities so that to increases competitiveness in economic life and boosts economic development of the Republic of Azerbaijan. Implementing innovation in the country's economy is a highly complex process, involving the interaction and relationships of a whole range of innovation stakeholders:

- Academic and R&D institutions
- Structural units of the government supporting innovation
- Financial institutions, national policies in the area of innovation, the framework conditions for innovation
- The business sector as source and target of innovation development
- Innovation entrepreneurship, innovation intermediaries and support institutions

The concept of the national innovation system reflects the innovation processes take part in the system, and characterizing systematic interdependencies that influence the processes of generation and diffusion of innovation in the economy, in other words the NIS is a network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies.

There are some specific features of characters of the national economic environment of the Republic of Azerbaijan that needs to be taken into consideration:

- ✓ Before the independence of the Republic of Azerbaijan, science and R&D activities in the country followed the traditional Soviet model's central planning and control mechanisms.
- ✓ After gaining independence of the country, the economic, industrial and trade relationship between Azerbaijan and other post-soviet countries were broken down and the local industry, R&D system were considered obsolete for the market economy.
- ✓ The unusually ascendancy of the oil and gas sector in the national economy of Azerbaijan, combined with the low level of development of the local high-tech industries, the sector that is usually considered as a key factor in innovation activities.

Additional to the above-mentioned items, it should also be noted that the formulation of the NIS of the Republic of Azerbaijan hasn't been completed yet, and many important aspects of the innovation system are not available in the country. So far, a national innovation strategy and plan has not been developed in Azerbaijan and no coherent national innovation policy framework been put in place. The task of developing innovation in Azerbaijan is entrusted to some structural bodies of the government, and responsibilities regarding the support of R&D and innovation activities are dispersed among them but in a limited context as compared to developed economies. The main scientific organization and supreme public body implementing science and technology (S&T) policy in the country is the Azerbaijan National Academy of Sciences (ANAS). According to the current regulations of the Republic of Azerbaijan, ANAS is assigned the functions of organizing and managing national scientific activity and identifying the directions of the S&T policy.[2] So, it is expected to be the main source of public initiatives in the area of innovation, to be further discussed and approved by the Government accordingly. It is also assigned the responsibility of organizing and implementing basic and applied researches and coordinating basic researches conducted in other R&D organizations and universities. In recognition of this, the financing of the Academy and its main activities are included in a separate item in the state budget of Azerbaijan. One of the essential structure of the Academy is the High-Tech Park of Azerbaijan National Academy of Sciences that was established on the 8th of November, 2016. The purpose of establishing the High-Tech Park is: to increase government support in the field of increasing sustainable economic growth and competitiveness; the development of innovation and high-tech sectors based on scientific and technological achievements; the creation of modern complexes for scientific research and development of new technologies.

The High-Tech Park of ANAS is the place which has the necessary infrastructure, the logistics, and management institutions for conducting R&Ds and implementation (commercialization) of their results in industrial, service and other areas in order to develop and or improve innovation product and high technologies. In order to ensure the provision of other services, taking necessary measures is the main priority of the Technologies Park for the establishment of internal and external infrastructure and implementation of business activity in the area of High-Tech Park. [3] Regarding the implementation of innovations and scientific researches, the Ministry of Economics of the Republic of Azerbaijan has the duty to formulate the innovation and S&T policy in the industry with relevant government structures, take into consideration the advanced international experiences, and implement the results of the R&D accordingly. However, there's no rule concerning the coordination of the formation of the national S&T policy and its priorities between the Ministry and the Academy. As an example, a draft law on R&D policy in Azerbaijan was prepared already back in 1998; since that time it has been given two readings in Parliament, but the law has not yet been adopted. [4]

The State Committee for Standardization, Metrology and Patent of the Republic of Azerbaijan is the central executive authority that carries out public policy and regulation in standardization, metrology and quality control, as well as in the protection of industrial property rights.[5] Many of its functions have a direct effect on the country's environment for innovation activity. The Copyright Agency of the Republic of Azerbaijan was established on the 24th of November, 2016 and this Agency provides development of the sphere of copyrights, related rights, intellectual property rights and carries out regulation and control in this sphere, and coordinate the activities accordingly. [6] The Ministry of Transport, Communication and High Technologies is another public body with a relatively role in promoting innovation. Its main functional responsibilities are to formulate and apply public policy and regulation in information and communication technologies (ICT), transport and high technologies (information technology, microelectronics, nanotech, bio, and other innovative

technologies) and regulations transport the related regulations. [7]

The importance of this Ministry has grown in recent years due to the high priority that ICT has been assigned in the Government's policy portfolio, which has specified the development of the ICT sector as a long-term strategic goal for Azerbaijan. State fund for development of information technologies was established on the 15th of March 2012, it operates under the Ministry of Communications and High Technologies of the Republic of Azerbaijan and it is a state body that stimulates functions in the field of information and communication technologies, the innovations in this field, as well as provides financial support for the expansion of operative scientific researches. The Fund serves its functions in terms of the state and local self-governmental bodies, juridical people operating in the field of information and communication technologies, credit, financial and insurance institutions, associations which support the development of entrepreneurship, non-governmental and international organizations. [8]

"Innovations Center" is a government owned entity of the State Agency for Public Service and Social Innovations under the President of the Republic of Azerbaijan. This Center has been established to enable social innovation in Azerbaijan and to work closely with state authorities, academia and international business communities in order to introduce innovative solutions within the public services and beyond. "Innovations Center" comprises wide range of activities like application of information technologies and provision of technical support for various organizations, introduction of innovative solutions, creation and development of information systems and information resources, conduction of wide range of trainings and seminars. This Center supports the expansion of cooperation between the state bodies and business sector entities and has sufficient technical capabilities and expertise to carry out work on developing and implementing innovative ideas. [9] In developed countries, the government support for innovation is embedded in the framework of well-defined national priorities and strategic goals. Azerbaijan is only now commencing on this type of policy approach. While innovation and innovation policy have often been on the Government's agenda, so far the authorities have not developed either a formal national innovation strategy or a coherent innovation policy framework.

III. THE PERFORMANCE LEVEL AND REGULATORY ASPECTS OF THE NATIONAL INNOVATION SYSTEM OF THE REPUBLIC OF AZERBAIJAN

According to the empirical researches (for example, in the periods of 1960-2006 years, the annual economic growth rate of oil-rich countries were 1.67%, while non-oil countries had a 1.76%, [10]) the economic growths of the oil-gas-rich countries are lower than the developed countries and for the purpose to achieve sustainable economic growth, it is required to develop innovation activities in the country. In this regard, the main goal of Azerbaijan's economic development strategy has to be the development of the non-oil sectors and diversification of the economy by stimulation the innovation sphere so that to achieve sustainable economic growth. For this purpose, in the official documents of the country, some strong motivation mechanisms have to be prepared and developed on the implementation of innovation. The implementation of innovations in the country have a positive impact on economic growth, and it is one of the main key factors of increasing economic growth. It should be noted that new innovations can be the improvement of existing products and or a new products, processes, and or a business model based on new knowledge. For this reason, it is required to provide financial support for R&D by state and private sectors. Gross domestic spending on R&D is defined as the total expenditure on R&D carried out by the resident companies, research institutes, university and government laboratories, etc., in the country. It should be noted that the level of national innovation activity and performance in Azerbaijan is low, even as compared to some of other CIS countries, and the national statistics of R&D and innovation in the country are quite scarce. In this regard some selected aspects of innovation activities in the country have been evaluated in this article.

Table 1: Main indicators of science of the Republic of Azerbaijan

Indicators	2012	2013	2014	2015	2016
Number of organizations carried out research and development works	140	140	145	141	135
Number of employees engaged in research and development works, person	21 573	22 358	23329	23093	22527
Number of research and educational employees of higher educational institutions which are not on the staff of scientific research subsector, scientific research subsector, but carrying of out and development works, person research	10 217	10 077	10026	9910	9676
Number of academicians - total	52	49	73	65	74
Allocated funds from state budget for science, million AZN	116.7	117.0	124.2	113.2	110.2

Science expenditures in percent to GDP	0.2	0.2	0.2	0.2	0.2
Science expenditures in percent state budget	0.7	0.6	0.7	0.6	0.6
Domestic expenditures for research and development works, million AZN	117.3	122	123.8	120.9	124.7
Domestic expenditures for R&D in percent to GDP	0.2	0.2	0.2	0.2	0.2
Fixed assets for research works, million AZN	88	107.2	122.2	114.2	129.5

Source: The state statistics committee of the Republic of Azerbaijan

As indicated in the table 1, the level of gross expenditure on R&D in Azerbaijan is just around 0.2% of GDP, for the comparison, the level in Georgia is 0.3%, Belarus is 0.5%, Ukraine is 0.5% and in Russia is around 1.1%. Also, the export of net high-tech is only 0.1% of total export (see table 2), for the comparison, the export of net high-tech of the total trade in Georgia is 0.3%, Belarus is 2.1%, Ukraine is 3.1%, Russia is 2.3% and in Austria is 11.5%. [11]

As it is known, innovations are based on some key factors like investments, institutions, human capital, existing infrastructure, and business environment. In this regard the indicates in the table 2, reflecting the above mentioned key factors accordingly.

Table 2: Main indicators on innovation in the Republic of Azerbaijan

Indicators	**Score/Value (0-100)**	**Rank**
1. **Institutions**	58.9	71
1.1. Political environment	42.4	88
1.2. Regulatory environment	55.9	94
1.3. Business environment	78.3	38
2. **Human capital & research**	18.4	100
2.1. Education	21.7	119
2.1.1. Expenditure on education, % GDP	3.0	102
2.2. Tertiary education	28.6	73
2.3. Research & development (R&D)	5.0	79
3. **Infrastructure**	44.4	66
3.1. Information & communication technologies (ICTs)	64.4	49
3.2. General infrastructure	29.5	101
3.3. Ecological sustainability	39.4	56
4. **Market sophistication**	55.4	26
4.1. Credit	34.4	69
4.2. Investment	75.0	3
4.3. Trade, competition, & market scale	57	76
5. **Business sophistication**	24.8	96
5.1. Knowledge workers	28.0	83
5.2. Innovation linkages	24.9	77
5.3. Knowledge absorption	21.6	96
5.3.1. Intellectual property payments, % total trade	0.1	99
5.3.2. High-tech net imports, % total trade	3.0	121
6. **Knowledge & technology outputs**	17.1	89
6.1. Knowledge creation	3.6	108
6.2. Knowledge impact	19.8	110
6.3. Knowledge diffusion	27.8	37
6.3.2. High-tech net exports, % total trade	0.1	114
6.3.3. ICT services exports, % total trade	0.5	102
7. **Creative outputs**	22.9	87
7.1. Intangible assets	39.0	70
7.2. Creative goods & services	8.7	99
7.3. Online creativity	5.0	70

Source: The Global Innovation Index 2018

The indicators mentioned in the above tables, are not in the satisfactory level and the framework conditions for R&D and innovation in Azerbaijan haven't been particularly supportive. However, the Azerbaijani government is interested in developing innovation in the country, for this purpose the following Technologies Parks have been established:

- Sumgait Technologies Park (STP) as a pioneer in the establishment of Technological Park in the region, is also a complex of plants qualified in different manufacturers. All production facilities are equipped with the best technological equipment manufactured in Europe where raw materials are imported from the leading European countries. Also, all factories are equipped with the latest laboratories manufactured predominantly in western Europe and accredited to AZS ISO/IEC 17025-2009 standard. Manufactured products have a certificate of compliance where Quality Management System was certified to ISO 9001 and OHSAS 18001.[12]
- Mingachevir High-Tech Park (HTP) is very advantageous for investors. Also, thanks to financial and tax preferences applied by the government to high tech parks HTP could provide wide opportunities for young entrepreneurs. [13]

In this regard the Ministry of Economics plans to support the establishment of several similar industrial parks in different regions of the country. It appears, therefore, that what needs further development in the local regulatory framework is the translation of the proclaimed policy goals and objectives into operational policies and mechanisms. These should support innovation and investment decisions.

The following are among the state programmes and laws on normative legal acts that address innovation issues:

- ✓ State programme on developing ICT (2005-2008) (Electronic Azerbaijan)
- ✓ National information and communication technologies strategy (2003-2012)
- ✓ Establishment of a regional innovation zone
- ✓ State programme on developing the fuel and energy complex (2005-2015)
- ✓ State programme on using alternative and renewable energy sources
- ✓ Scholarship programme for youth to study abroad.
- ✓ Law of Science of the Republic of Azerbaijan (2016)
- ✓ Development Concept and "Strategic Road Maps on national economy and main sectors (2016)
- ✓ National Education Development Strategy of Azerbaijan (2011-2021)
- ✓ National Strategy for the development of Information Society (2014-2020)
- ✓ The concept of development: "Azerbaijan 2020: Look Into The Future
- ✓ State Program on the development of industry in the Republic of Azerbaijan (2015-2020)

The most important among the above-mentioned state documents are: "the Development Concept "Azerbaijan 2020: Look Into The Future" and "the Law of Science".

So, in the concept of development: "Azerbaijan 2020: Look Into The Future", it is indicated that, 'in order to ensure long-term sustainable economic development, form a knowledge based economy and speed up the creation of science intensive technology and products (work and service), the expansion of innovative activity will one of the main fields. In this connection, the development of science will be prioritized on the basis of its history in our country and global tendencies, and the process of effective integration into progressive world science will be continued. The scientific infrastructure will be improved, the material technical basis of science will be modernized and the digitalization of information support systems in this sphere will be ensured'. [14]

Also, on the 14th of June, 2016, a Law of Science of the Republic of Azerbaijan was adopted for the purpose to organize and manage the scientific activities in the country as well as develop science, scientific-innovation activity and define financial mechanisms of science. [15] In Azerbaijan the innovation policy initiatives have been sporadic and haven't followed a systemic approach. Innovations have been reviewed in a number of government programmes adopted in the past decade; however, the relevant priorities can only be considered as implicit, given that in most cases programmes do not set specific objectives and quantifiable targets. In these circumstances, innovation policy and innovation governance in Azerbaijan are also partial, uneven and piecemeal. In accordance with internationally accepted practice, the development of innovation policy should comply with the following goals and rules:

- ✓ Coherence of innovation polices;
- ✓ Maintaining a regulatory framework conducive to innovation;
- ✓ Encouraging the establishment and growth of innovative enterprises and well-functioning interfaces in the innovation system.

Many of these above-mentioned conditions are still have not implemented in Azerbaijan but there is a potential to develop them. In addition, internationally practiced approaches to formulating long-term strategic goals such as scientific and technological forecasting have not been carried out systematically. One of the reasons is the low awareness both of

policymakers and of the public of the importance of such approaches. Most of the existing programmes and policy documents lack evaluation procedures and mechanisms. One of the important components of the policymaking is the governance in the sense of aligning policy objectives with decision-making and implementation, as well as with the allocation of the necessary resources, especially regarding "horizontal" type of policies such as innovation policy. Such policies, which cut across many different sectors of the economy and are covered by line ministries, require close coordination among the public bodies overseeing these sectors.

As the first step in this direction, the Scientific Research Coordination Council of the Republic of Azerbaijan was set up on the 11th of 2004, on the initiative of the ANAS. The main activity directions of the Council are: conduct fundamental and applied investigations of scientific research and higher education institutions and coordinate activities related to the development of intersectional complex scientific and technical programs; identify new directions of science and innovative development and establish a scientific basis for their implementation; Arrange R&Ds for the important problems of scientific, technological and socio-economic progresses; provide the usage of scientific and technological achievements.[16] Also, according to its statute, the Council should discuss and endorse future directions of research in the country and coordinate the activities of all research institutions and universities. The funding of innovation and R&Ds follows a similar non-systemic pattern, with the bulk of the funding originating in the public sector. Most of the funding is allocated in the form of institutional support to R&D organizations. The funding of the branch R&D institutes, which are within the structure of different ministries, is part of the budgets of the respective ministries. Project funding of R&D is only in its initial phase. On the 21st of October, 2009, the Government established the Science Development Foundation to stimulate national scientific activity, contribute to improving the efficiency of research and encourage international cooperation in this area.[17] While the Foundation supports research projects in all fields of science, it sets its priorities in a dynamic manner. Funding applies to both fundamental and applied projects and allows also for the purchase of necessary equipment. It offers grants to scientists to travel abroad and for organizing conferences. 35.75 million AZN were allocated to the grant competition the held in the periods of 2010-2015 years.[18] Early financing of business and innovation is virtually absent in the country. This early financing is a very specific area with high risks, and banks usually are hesitant to participate in it. Financial institutions that typically conduct such risky activities (for example, business angels and venture capital institutions) need time to develop; targeted public support both in the form of the distributing some of the financial risks by the government and in establishing a supportive regulatory framework that can accelerate this process.

It should be noted that in Azerbaijan, there are 135 organizations that carry our R&Ds in the country (see table 1) and the most important organization among them is the ANAS. The Academy consists of 40 research institutes and organizations divided into six divisions.[19] The Academy also coordinates about 90 R&D institutes. Whereas the Academy focuses on basic and fundamental research, most other institutes are of an applied, sectoral nature. The total number of persons engaged in R&D in recent years has been around 22,527 persons (Table 1), of which more than half of them are employed by the Academy. Despite the number of knowledge-generating organizations in Azerbaijan is considerable, their output hasn't been impressive. The number of scientific articles by Azerbaijani authors in international publications is low, as is the level of patent applications and the citations of the scientific results published by Azerbaijani authors. Thus in 2016, just 163 patent applications were filed in Azerbaijan, compared with 521 in Belarus, 1,224 in Kazakhstan, 2,315 in Austria and 4,094 in Ukraine.[20] Overall, the level of understanding of intellectual property issues appears to be inadequate both among researchers and among technology entrepreneurs. Links between industry and science are also weak, and often non-existent. A major factor impeding industry-science cooperation is the skewed structure of the economy, dominated by the oil and gas sector and the almost complete lack of modern high-tech consumer industries. In the main time, the potential of the main prospective generator of such linkages, the foreign direct investment dominated oil and gas sector is underutilized in this sense. Recently, the Government has been placing great emphasis on developing the ICT sector, including on providing specific incentives and positive outcomes are expected in this area.

3.1. Some recommendations related to the formulation and development of the NIS

For the purpose to improve the formulation of the national innovation system of the Republic of Azerbaijan and achieve the innovative growth in the country, it is recommended to implement the following directions: elaborate general national strategy of science and technology; provide support for fundamental sciences and R&Ds and ensure a constant flow of investment in these areas; develop a strategic programme of institutional building in consultation with key stakeholders; increase the cooperation among the stakeholders within the national innovation system; integrate scientific and technical potential into the global economy and the global scientific and technical arena; prepare a programme for a national innovation system, mandate a public body with strategic functional

responsibilities for developing and applying innovation policy, including the related inter-agency coordination; ensure the establishment and inventiveness of the innovation intermediaries and or innovation-support institutions with specific focus on targeted policies; establish business angels and venture capital institutions; develop the national innovation strategy as part of the ongoing policy efforts towards economic diversification and modernization; prepare general legislation for subjects of innovation infrastructure; establish and implement a unified state register of innovation infrastructure; provide general government support and tax incentives for Innovative Infrastructure Entities; introduce special tax incentives to encourage innovation entrepreneurship. Whereas the national innovation strategy would set the main long-term objectives and indicate the path to achieving them, supportive framework conditions concerning innovation activity need to be in place to ensure that the economy is continuously guided towards these objectives.

CONCLUSIONS

Connectivity among the existing parts of the NIS is inadequate and many important institutions such as agencies/bodies entrusted with the formulation and implementation of innovation policy. Also, policy coordination mechanisms, innovation intermediaries and other support institutions, early-stage financing institutions that typically part of the national innovation system in developed counties are still missing in the Republic of Azerbaijan. So far the authorities have not developed a formal national innovation strategy neither has a coherent innovation policy framework. The framework conditions for R&D and innovation aren't particularly supportive and no incentive mechanisms are in place that targets stimulating innovation and innovative entrepreneurship. R&D activities are mostly concentrated in the ANAS, as well as the branch R&D institutes, little R&D is being carried out in the universities and the business sector. There's still a great gap between research and market. One of the main factors inhibiting stronger industry-science linkages is the skewed structure of the economy, which is dominated by the oil and gas sector while the share of high-tech industries sectors is very low, and another obstruction in the development of innovative entrepreneurship is the difficult access to capital for start-up companies. Early stage financing in the country is practically not available in the forms in which it exists in developed economies. The existing potential of the large foreign direct investment sector (mostly concentrated in the oil and gas sector) to contribute to R&D and innovation activity in Azerbaijan, including through forward and backward linkages, is still greatly underutilized. International cooperation in R&D and innovation activities is only starting to develop, but it is not supported with adequate mechanisms.

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