



Innovation support measures currently in place in Ukraine

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List of Abbreviations

RI-LINKS2UA	Strengthening Research and Innovation Links towards Ukraine
DoW	Description of Work
WP	Work Package
NCUST	National Council of Ukraine on Science and Technology Development
NASU	National Academy of Sciences of Ukraine
PPP	Public-Private Partnership
S&T	Science and Technology
GDP	Gross Domestic Product
EU	European Union
H2020	Horizon 2020
UAH	Ukrainian Hryvna
R&D	Research and Development
MESU	Ministry of Education and Science of Ukraine
SMEs	Small and Medium-Sized Enterprises

Executive Summary

This deliverable contains a brief description of the general dynamics of innovation activities in Ukraine, based on the utilization of traditional statistics for innovation activities in industrial enterprises, along with the calculations of the Ukraine's place in the EU Innovation Scoreboard. Special attention has been paid to the evolution of the legal foundations of support in innovation activities and the existing elements of innovation infrastructures. It also focuses on the importance that of innovation ventures such as technoparks, science parks, and others could have for the future of Ukraine.

Furthermore, this deliverable offers a description of main types of innovation support organizations and their interactions at local and international level. For this, the role of international co-operation in research and innovation processes in Ukraine is considered in this document. Finally, conclusions and recommendations are made about the current status of the S&T and innovation project in the country.

1 Introduction

This deliverable aims to provide updated information on specific features of the Ukrainian innovation system, especially in terms of currently ongoing innovation support measures. The second chapter contains data on the dynamics of key innovation- related indicators. This includes statistics of innovation activities of industrial enterprises, and the results of calculations on the position of Ukraine in the EU Innovation Scoreboard and others. This chapter also contains a description of the evolution of legal foundations of innovation activities in Ukraine. This information has been updated using the latest available data.

The third chapter presents the existing elements of innovation infrastructure in Ukraine such as technoparks, science parks and other institutions focus on this activity. It also describes their role in supporting innovation projects. In addition, it presents a brief description of the main types of innovation support organizations and their interactions. The next section of this deliverable presents the role of international co-operation in research and innovation processes in Ukraine. Finally, conclusions and recommendations are made in the last part of this deliverable.

2 Ukrainian innovation system

2.1 Dynamics of innovation development: key figures

In recent years, Ukraine has experienced a difficult period in its history. The economic crisis and political unrest had a negative impact on the R&D sector and innovation activities in the country. In this regard, the share of R&D expenditures in GDP dropped to all times low level of 0.48 % in 2016 from more than 1% a decade ago (see Figure 1).

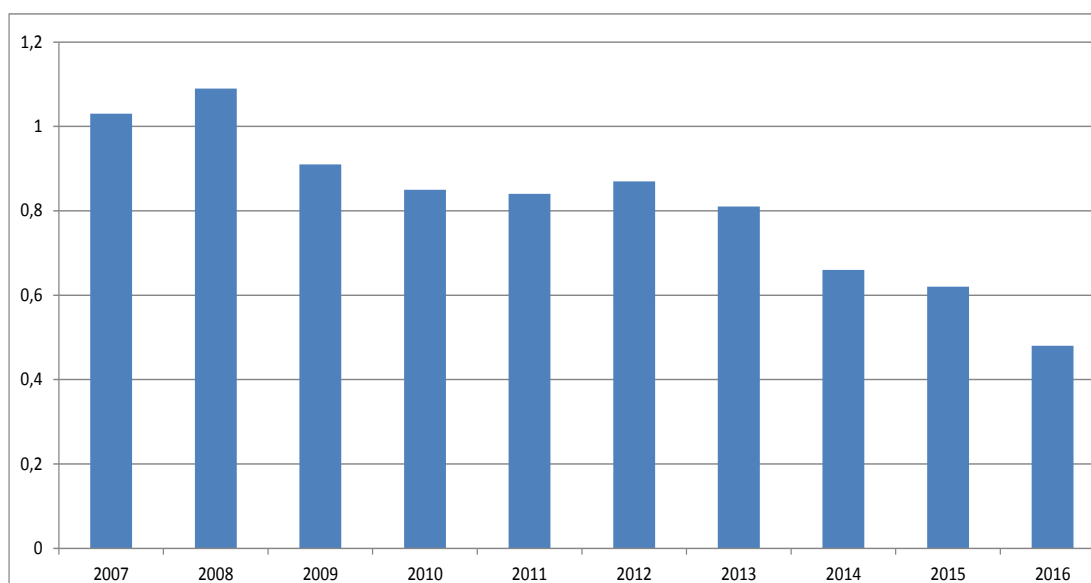


Figure 1. Level of Ukrainian GERD in 2007-2016, %.

Source: Data of the State Statistical Service of Ukraine: www.ukrstat.gov.ua/ Electronic Yearbooks on Statistics of R&D and Innovation (Naukova ta naukovo-tehnichna dialnist v Ukraini), various issues for 2008-2016 and preliminary data for 2016, published on the website in 2017.

The share of innovative enterprises in industry rose from the minimal level of 10% to approximately 15-17%. Nevertheless, the methodology to calculate this element has changed. At present, this situation creates a barrier to comparing the data for different time periods¹. At the same time, expenditure on innovation activities dropped substantially in 2014 and 2015 in comparison with previous years. However, it is possible to identify two peaks of growth in the innovation activities in Ukraine: in 2007, due to the expansion of cheap bank loans, and in 2011, due to solar energy programme.

The difficulty lies not only in the decline of financial options for R&D projects in Ukraine. In general, the R&D sector in Ukraine remains unreformed, and its capacity is under-utilized. The level of innovation activities remains at low levels in comparison to the neighbouring countries in Central and Eastern Europe (see Figure 2).

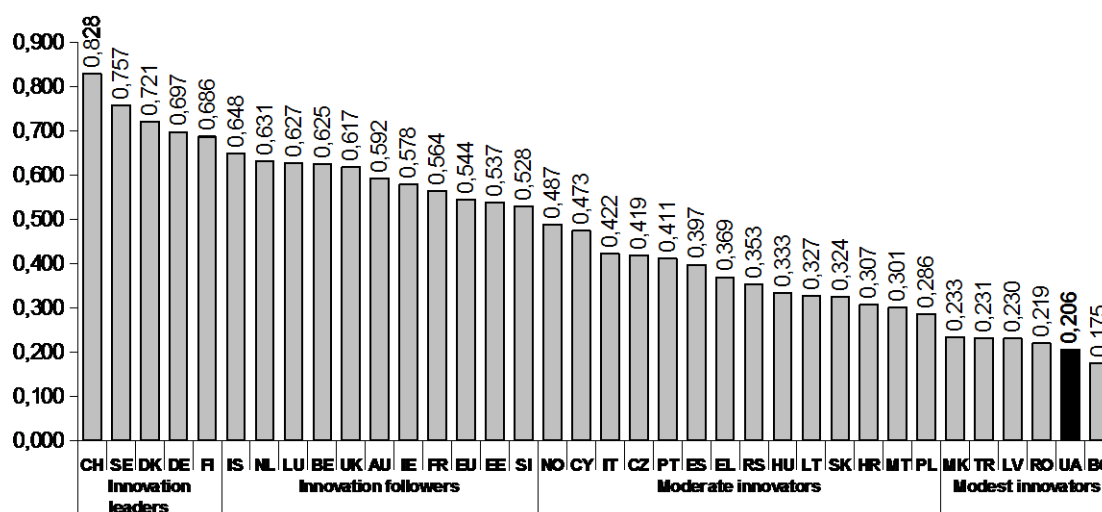


Figure 2. Position of Ukraine (UA) according to the Summary innovation index for EU, Ukraine and other countries, 2014.

Source: European Innovation Scoreboard, 2016².

¹ Naukova ta naukovo-tehnichna dialnist v Ukraini in 2015. – Kyiv: State Statistical Service of Ukraine. – 2016 (in Ukrainian)

² It is worth mentioning that after changes in the methodology of composition of the Summary innovation index in 2016, Ukraine could not provide corresponding data for calculations. This situation could change if some changes in the national statistics are made.

These difficulties in the R&D and innovation sectors in Ukraine can be traced back over the last two decades, and have now reached such a proportion where a fast or inexpensive solution is no longer possible.

The government of Ukraine does not have a comprehensive provision regarding innovation and business support services in this sector. Other problems in Ukraine include the lack of infrastructure for innovation and business support services. The infrastructure is largely underfunded and is not equipped with the necessary tools, methodologies and knowledge to provide state-of-the-art support services³. This in turn affects start-ups and SMEs in the country, whose potential customers are increasingly demanding a well-provided service. For that, the lack of decent infrastructure currently creates a barrier to developing an international network. As a result, the start-ups and SMEs are not often able to cope with external demands when it comes to the necessary knowledge needed to innovate and develop commercially viable products and services. In this regard, the production speed and quality of the Ukrainian R&D sector has to contend with an increasingly competitive and complex global market⁴.

2.2 Legislative instruments of support of innovation activities

After Ukraine gained its independence in 1991, more than 80 different legislative acts passed through the Parliament or were issued by the Ukrainian government. This period of reform continued in 2014-2016 in order to resolve a number of problems in S&T and innovation at the local level. For this, the Ministry of Education and Science of Ukraine (MESU), along with other ministries, the State academy of Sciences and non-governmental organizations, substantially modified the law "On Scientific and Scientific-Technical Activity". This law was approved and passed through Ukrainian Parliament at the end of 2015.

The new version of this law contains a number of amendments which aim to improve upon the previous version. The new law reinforces the institutional support of S&T activities, and opens the way for the transformation of the national research system. Similarly, the law establishes the National Council of Ukraine on Science and Technology Development (NCUST) under the control of the Cabinet of Ministers of Ukraine. The main task of this body is to ensure the effective cooperation between representatives of the scientific community, state agencies and the private sector in the preparation and implementation of state policies

³ Heets V.M. and others, eds. (2015) Innovatsiyna Ukraina 2020- National Report. – Kyiv: NASU

⁴ Odotiuk I.V. and others, eds (2016) Implementatsia visokih tehnologiy v ekonomiku Ukrainy. – IEP: Kyiv.

on S&T. The NCUST was conformed in late May 2017 by of two separate committees: the Administrative and the Scientific Committees. Each committee has 24 members. The members of the Administrative Committee are nominated by the central government, and the members of the Scientific Committee are elected by representatives of the scientific community.

Another addition was the creation of the National Fund for Research, which replaced the State Fund for Basic Fundamental Research (SFFR). This fund is subordinated to the MESU. The main function of this fund is to provide support for basic and applied research in natural sciences, engineering disciplines, humanities and social sciences in the shape of grants for these studies. The fund can also support experimental development and innovation projects in S&T priority areas. In this regard, the NCUST provides the legislative and normative basis for the activities carried out by the fund. However, the delay in the conformation of the fund seems to be problematic. It would be difficult for the NCUST to create the fund before the 2018 fiscal year. For this reason, the tentative start work date of the fund could be moved to 2019⁵.

The new law plays an important role in the transformation process of the State Academy of Science of Ukraine. The Law has created the possibility for everyday scientists to be elected in the governing bodies of the Science Academy. Similarly, it also establishes certain constraints on the possession of the highest positions in the Academies and on the number of members and corresponding members of the academies. In addition, the new law opens the way for research institutions from the government sector to be co-founders of commercial companies taking part in the formation of such share capital ventures. Lastly, the Institutional framework of Research and Innovation policy fostered by the new law can be presented in the following fashion (see Figure 3):

⁵ Personal communication with the Head of SFFR Academician Boris Gryniiov on June 1, 2017.

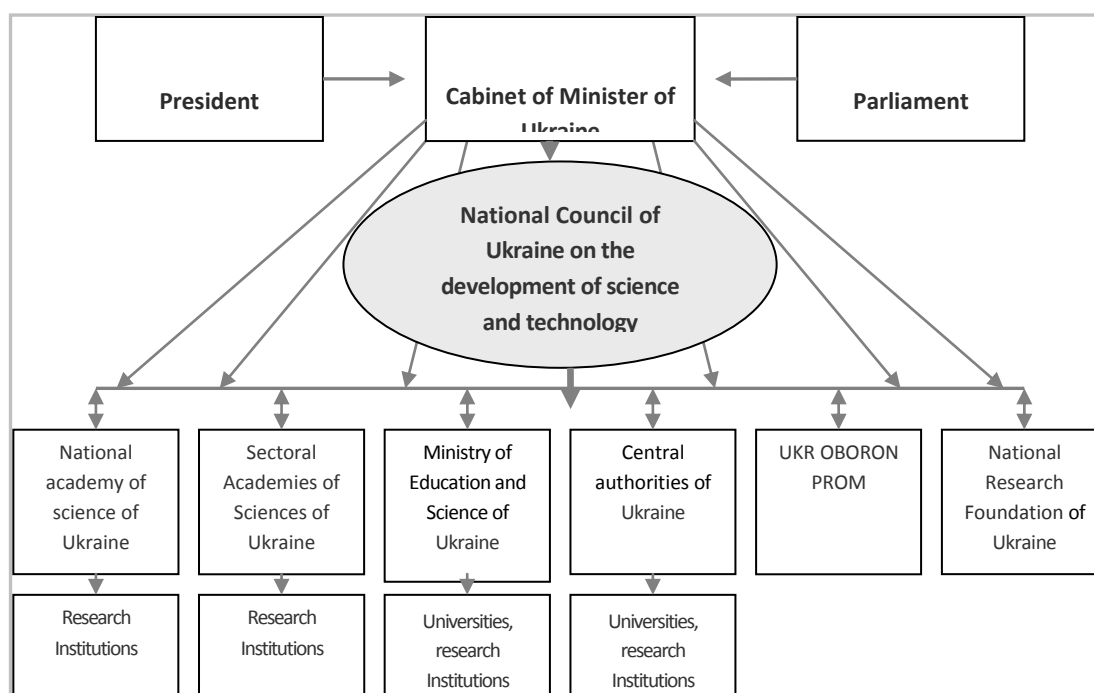


Figure 3. Institutional framework of Research and Innovation policy

Source: Ministry of Education and Science of Ukraine, 2016

There are other important legislative acts in the sphere of S&T and innovation, such as the laws “On special regime of innovation activity of technological parks”⁶, “On Scientific Parks”⁷, and “On state regulation of activity in the sphere of technology transfer”⁸ among others.

It is also important to mention that the Ministry of Education and Science prepared a draft version of the law “On supporting and development innovation” in 2016. This law would replace the existing law ‘On innovation activities’⁹. This is because the previous version of this law has not been effective. This law contained a number of declarations about the importance of innovations and some basic definitions in innovation sphere. The first version of the law also contained clauses which provided specific incentives for innovation activities, including a lower level of taxation for innovation enterprises¹⁰. However, the implementation of these norms was postponed for the first two years, and was then later

⁶ Law of Ukraine On special regime of innovation activity of technological parks on 16/07/1999- with amendments, made on 15.12.2012 - <http://zakon3.rada.gov.ua/laws/show/991-14>

⁷ Law of Ukraine On Science Parks on June 25, 2009 - <http://zakon2.rada.gov.ua/laws/show/1563-17>

⁸ Law of Ukraine On the State Regulation in the Area of Technological Transfer - on September 9, 2006 <http://zakon2.rada.gov.ua/laws/show/143-16>

⁹ First version of this law passed through the Ukrainian Parliament in 2002 but some changes were made several times during the last fifteen years.

¹⁰ To be precise, in Ukraine, this could be applied not to enterprises, but to their innovation projects. Innovation project, not company is the key objective of possible incentives in Ukrainian legislation.

abolished. The parliament voted to annul the corresponding clauses. The main reason given was the decline in revenue from the sectors anticipated by the Ministry of Finance. For that, the level of incentives was not justified properly but it was at least possible to try to use them in some sectors of the national economy.

The new law has to determine the forms of public-private partnership (PPP) in the innovation sphere (clusters, technological platforms, start-ups). This includes the necessary instruments to develop PPP in innovation. For that, the new law simplifies the procedures to obtain government support on innovation projects. This is done with the aim of defining the functions and sources that will finance the Innovation and Development Fund that has to be created under the new law. This aspect will devise the mechanism to attract private, domestic and foreign investments to the innovation and development sector in Ukraine. This will be done by creating innovative venture capital funds with favourable conditions for their functioning. Nevertheless, it is not clear if all initiatives, including the creation of the fund, will be supported by the Ukrainian Parliament. Passing and implementing this kind of laws in the parliament is not a simple task. This is due to the large number of ministries and state agencies, including Ministry of Economic Development and Trade, Ministry of Finances, Ministry of Education and Science and some others¹¹ who are all involved in this process and are required to approve such legislative acts. This impediment can be seen in the laws 'On Amendments to Law of Ukraine 'On innovation activity of technological parks'; 'On Amendments to the Tax Code of Ukraine', 'On Amendments to the Budget Code of Ukraine (to add the chapters, related to introduction of incentives for innovation activities)', 'On Amendments to the Law of Ukraine' and 'On state regulation of activities in technology transfer', among others.

It is not yet determined when the draft versions will be approved. In 2016 and in the first half of 2017, complex issues emerged for the approval of this piece of legislation. The parties involved in this set back are the Ministry of Economic Development and Trade and the Ministry of Finance. For this reason, the initial version of the draft of the law will be substantially revised in coming months, a situation that will prevent an expedited approval of the legislation.

Ukraine is trying to utilize modern instruments for innovation development through the implementation of other legislative acts. The new law on PPP (2015) opens new

¹¹ Number and the list of ministries and agencies can vary, depending on the specific law.

opportunities for innovation activities in Ukraine. Ukraine has already a number of PPPs in different areas, and some of them are the objects of innovation activities, especially in the waste processing and energy sectors (see Figure 4).

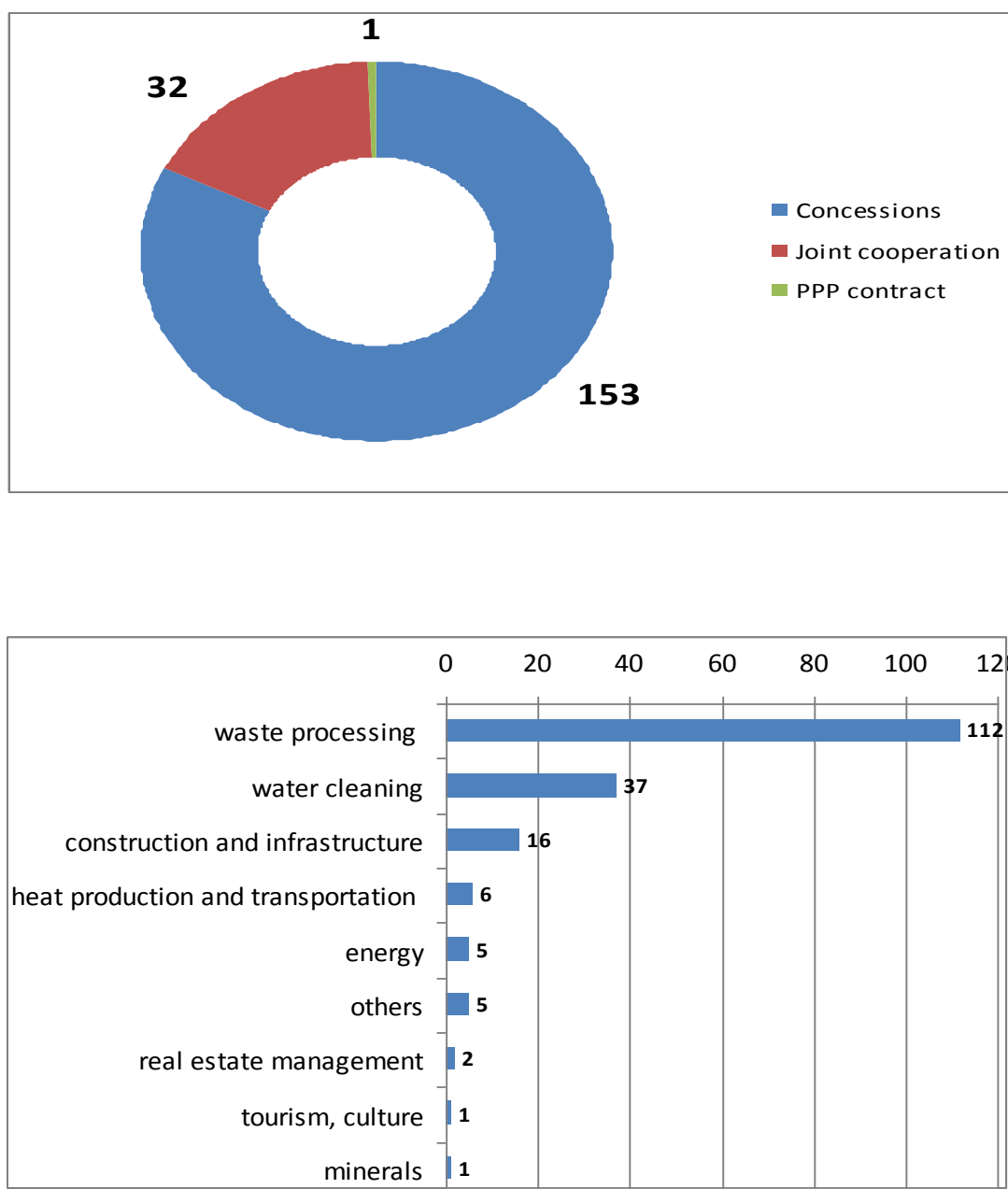


Figure 4. Key areas of PPP in Ukraine

Source: Ministry of Economic Development and Trade of Ukraine, 2017.

The new Law on PPP makes it easier to implement new technologies by attracting domestic and foreign private capital for innovation projects. Previous regulation in PPP sphere comprised only of concessions, while it is possible to extend PPP to other types of

activities. It is worth mentioning that the creation of specific forms of innovation support, like industrial parks, look to be the most promising form of PPP¹².

In the first two and a half decades of independence, research and innovation policies in Ukraine were mainly directed from the central government, while the role of the local authorities to exert influence on S&T and innovation development was limited. As part of the 2015 decentralization reform, the situation has changed and regional governments could become important actors in their formulation and implementation of these projects. The reform will allow the local tax revenues in the regions to grow, and at the same time, it will empower the regional leaders, and make them part of the decision-making process over how innovation initiatives are supported.

Nevertheless, local authorities still play a minor role in S&T policy. There is a lack of specific governance systems for R&D and innovation throughout various regions of Ukraine. There are examples of support for regional initiatives from the private sector in the past. The ISD of Mr. Rinat Akhmetov has supported the implementation of energy-saving technologies and undertaken a comparative analysis of the Ukrainian regions according to the WEF methodology¹³.

According to the proposed changes in legislation, one of the primary responsibilities given to regional authorities involves the formulation and financing of regional R&D and innovation programmes within the limits of regional budgets. The authorities are also required to create a regional financial organization to provide loans for R&D and innovation projects. Finally, regional authorities are also designated to control and evaluate R&D and innovation activities, using economic resources from the regional budgets. However, in reality, local authorities have almost no funding to support for R&D. In recent years, the regional share of total funding for R&D has been close to 1%. For the period of 2015-2016, these expenditures dropped to level of 0.3% of total R&D spending. The total research budget of regional authorities was less than €2m, according to the official exchange rate in 2015. However, in some regions, development programmes have a sectoral dimension. These regions typically influence R&D through indirect measures, such as the provision of land, the upgrading of infrastructure, or through lobbying interests of local research

¹² Chmyr O. S. and others (2012) Derzhavno-privatne partnerstvo u naukovo-tehnichniy ta innovatsiyniy sferi: teoreetichni zasady i praktichni problemy vprovadzhenniy v Ukraini.- Nauka i naukoznavstvo N.3. – p. 98-109.

¹³ Zvit pro konkurentospromozhnist regioniv Ukrainy (2013) – Fond effektivne upravlinnya (in Ukrainian)

organisations in Kiev (Kyiv). They also tend to exert influence on the central government by requesting funding increases for R&D organisations by including research components in their regional development programmes. The first comprehensive programmes was created by the Donetsk region more than decade ago. Since then, almost all regions have prepared this kind of programmes.

Due to the processes of decentralization, it is possible to expect that in the near future, this situation could change substantially. The local authorities will have more financial resources in their hands to stimulate R&D innovation in the interests of their communities and regions.

The recent and proposed changes in the Ukrainian legislation could be considered as positive. However, previous experience shows that the proper implementation of legislative acts traditionally remains as one of the weakest part of S&T and innovation policy. This is usually because of the need to modify a number of other legislative acts. This process takes time and substantial efforts from those who propose the changes (government, Parliamentary committee on education and science or Ministry of Education and Science). Another reason is the lack of money for the implementation of corresponding Acts. Sometimes, the lack of political will and/or differences between political forces play an important role in this development.

3 Innovation support organizations and Programmes

3.1 Innovation support organizations

Officially, the country has a substantial number of innovation support organizations. The creation of these entities can be considered as an organizational innovation, initiated by the Ukrainian government. The Ministry of Science and Education of Ukraine has provided extensive data on specific organizations focused on innovation that were created with the direct support of the Ukrainian government (see Table 1).

It is important to note that not all these organizations are active in the local innovation sphere. The Ministry of Education and Science of Ukraine collects general data about these organizations, yet this information is not published openly. Only some types of

organizations provide more or less detailed information about their activities¹⁴. This information is presented below.

Table 1.
Organizations of innovation infrastructure in Ukraine, 2016

Organizations of innovation infrastructure	Number
Technoparks	16
Innovation Business Incubators	24
Innovation Centres	22
Centres of IP Commercialization	38
Innovation and Technology Transfer Centres	24
Centres of science, engineering and economic information	14
Innovation Venture Fund	1
Science parks	21
Research results implementation enterprises	27
Others	263

Source: Ministry of Education and Science of Ukraine, 2017

The figures in Table 1 can be considered as overestimations of the number of these organizations in Ukraine, as some of these organizations exist only on paper as a formality. Their activities are reduced to the collection of information at local level. This is the reality for some centres of commercialization and regional centres of IP commercialization. Usually, these organizations have support from the central government or the local administration, however, this support only helps to cover a small portion of the expenses these organizations have. It normally covers rent, utilities, and the salaries for 2 or 3 employees.

3.1.1 Technoparks

According to the MESU, 8 technoparks (out of 16 announced and 12 registered) are currently operating. The main objective of the technoparks as specific innovation support organizations is to organize high-tech production, and at the same time, to provide

¹⁴ The Ministry of Education and Science collects detailed information on technoparks and science parks, but in different formats. Information on other organizations is very scarce. As a rule, it is reduced to the number of such organizations only.

comprehensive assistance in the development and implementation of new technologies. The list of technoparks and a brief description for each, can be found in Annex 1.

For the period 2001-2014, the support of technology parks by the government amounted to 510 million UAH. In turn, the technoparks transferred 1033 million UAH to the state budget during this same period of time. This represents a proportion of almost 2 UAH to 1 UAH when it comes to revenues obtained from this activity¹⁵.

Key indicators of the technopark's activities are presented in the Table 2.

Table 2.
Key indicators of the technoparks activities in 2000-2014

N	Indicator	Total
1	Number of projects in technoparks, number	120
2	Volume of innovation production mln. UAH	12 654
3	Including export, mln. UAH	2007
4	Import of components and equipment, mln. UAH	1859
5	Taxes paid, mln. UAH	1543
6	Including taxes to the central budget, mln. UAH	1033
7	Subsidies to technoparks, mln. UAH	510
8	Balance, mln. UAH	523
9	New working places created, number	3 5643
10	Total investment, mln. UAH	531
11	Total volume of loans, mln. UAH	3 502
12	Total budget financing, mln. UAH	51

Source: Internal information of the Ministry of Education and Science of Ukraine, 2016

It is worth mentioning that the creation of the first technoparks in the late 1990s was a successful experience with regards to the management and commercialisation of research projects. However, this experience is associated with functioning of technoparks in 1999-2005 only. Technoparks can be regarded as a group of high-tech companies, scientists and

¹⁵ Boiko O.M. (2016) Technologichni parki yak mehanizm stimuluvannia innovatsiynoi dialnosti realnogo sektoru ekonomiki derzhavi - Ekonomika i upravlinnia. – N3. p. 25-37.

engineers, who were able to receive favourable conditions for the realisation of their innovation projects.

One of the best examples of this policy can be seen in on of the technoparks that were created by the institutes of the National Academy of Sciences of Ukraine. This technopark was developed with a strong technological orientation provided by the Paton Institute Electric Welding and the Institute of Mono-cristals¹⁶. These two technoparks concentrated more than 90% of the innovation projects in terms of the output of the volume contracted¹⁷. As previously mentioned, tax privileges could not be received by the institutes or companies themselves. This means that the only bodies entitled to receive this grants are the specially registered executioners of the innovation projects. These projects have to be considered by a panel of independent experts, followed by a special commission made up of specialists and experts from the technopark. This commission will judge and decide how innovative the projects presented are. The key indicators for assessment are the level of innovativeness, the level of readiness of the prototypes, the results of market reviews for new products or processes, including export potential, levels of expenditures and revenues among others.

The technoparks were a success in innovation activities in their first years of existence 1999-2004. However, after the abolishment of the tax privileges in 2005, the number of innovation projects stagnated, and the importance of technoparks for the national innovation development started to decline since 2010s.

Statistical data shows that the peak of the activities was registered in 2006-2007. On the other hand, in 2010-2014 both the financing and tax payments dropped to almost zero¹⁸.

3.1.2 Science Parks

Another form of support for innovation activities and the commercialization of R&D results is the so-called science park. Ukraine currently has 21 such parks, however, data for only 19 of them could be found in the official list of science parks. A detailed list of science parks can be found in Annex 2.

¹⁶ This is an official title of the institute in English

¹⁷ Kaleniuk I., Sakun O. (2011) Rozvitok technoparkiv v Ukraini: istoria nf problemy stanovlennia /Naukovyi visnik CHDIEU. - №2(10). – p.9-15.

¹⁸ ‘On Technological and science parks in Ukraine’- Unpublished analytical report, prepared by MESU, (2016). – 6 pages

According to the Ukrainian law ‘On science parks’, a science park is a legal entity that is created at the initiative of universities and/or research institutions by the pooling of resources from the founders. These resources are used for the organization, coordination, management of science park projects. In reality, most of the science parks were established by the universities or by joint effort between universities and research institutes.

Science parks were created with the purpose of effectively and efficiently managing projects with existing scientific potential. This includes the material and technical base for the commercialization of the results of scientific research, and their further implementation in the domestic and foreign markets¹⁹.

The founders, partners and project executors of the science parks can use the property of the state organizations involved in this activities on favourable conditions. The funds received from the lease of the state property shall be directed only to the implementation of the agreed projects of the science park.

Moreover, in accordance with the Ukrainian Customs Code²⁰, the laboratory and research equipment, components and materials provided by the scientific park to develop the project should be exempt from import duties.

Currently, science parks are conducting over 42 projects in different areas, such as satellite communication systems, radio relay communication systems, energy-saving technologies, electronic systems and networks, the creation of information-analytical systems, the development of e-government technologies, the creation of intellectual informational, communicative and analytical technologies, and integrated databases, among others.

The Kyivska Polytechnika is the most well-known science park in Ukraine. It was established over ten years ago by the National Technical University of Ukraine in compliance with the law of Ukraine “On Science Park “Kyivska Polytechnika” No. 523-V of December 22, 2006. The Kyivska Polytechnika is currently developing 11 projects with a total value of 10,245.3 thousand UAH. The “Kyivska Polytechnika” Science Park has been working on unmanned aerial vehicles (UAV) under a contract with the Ministry of Defence of Ukraine since 30 May, 2015. This project has been implemented with the aim of increasing the defence capability of the country, with investment support from a Venture Fund named after

¹⁹ Cherniyk V. (2016) Naukovi parki v Ukraini – stan ta problemi dialnosti – Teoria i praktika intelektualnoi vlasnosti – №1, – p. 68-75.

the academician Mikhalevich. The total expenses on the project amount to 13 million UAH. This park has also other defence-related contracts in different areas with the State enterprise "Ukroboronservis". The total value of these contracts reaches 4 million UAH.

The park has started a joint innovation project in the space sector, which involves partners from other cities and organizations. It is expected that this project could attract funds of almost 60 million USD.

Since 2012, the science Park has hosted the annual Ukrainian Festival of innovation projects, known as the "Sikorsky Challenge". The participants of this event can present independently prepared business-oriented projects that are innovative in nature, and which have scientific and practical value. As a result, contracts for more than 573 million UAH were signed between participants and investors during the Festival "Sikorsky Challenge -2015".

Comparing the support provided by the government to these organizations, it is evident that the Technology Parks received more benefits than the Science Parks. This can be seen in the benefits granted to the Technology Parks in the implementation of projects related to the industrial production of innovative products and products processes.

In turn, the Science Parks are focused on the development of scientific and technical processes at the experimental stage. Science Parks are not oriented towards the mass production of innovative products.

Some Science Parks have established their own start-up schools. In these schools, experienced instructors teach courses that cover the basics of innovative entrepreneurship. This helps in the development of business models and in presenting business plans to potential investors with the intent of attracting investments for the implementation of the projects generated by these start-ups. The start-up schools help young people to test the validity and the scope of their ideas and products. The courses are focused on developing the necessary skills and knowledge in innovation. This is also combined with the commercialization of new technologies.

While start-ups are a vulnerable species in the current global scenario, they face particular challenges in an economy of transition like in Ukraine. As a result, the Ukrainian National Innovation System currently faces obstacles in promoting the establishment of new high-tech start-ups. The central government has made efforts to bring together different researcher networks, innovators, universities and other organizations by coordinating special workshops and conferences. These meetings are often between the administrations of the

science parks and/or experts from the EU programmes on technical assistance. Nevertheless, these efforts have not been very successful. The main issue is that the start-ups do not see any practical results in participating in this kind of events. These networking events are usually organized to set up information exchange mechanisms: meetings, conferences, training, access to expertise, databases, and other types of information, centres of science, engineering and economic information. They establish benchmarks for best practice when it comes to project development. Here, the members can rate their performance against their local or international peers. They support the professionalization of organizations and individuals within their sphere of interest. The networks themselves become learning organizations that promulgate good practice. In general, Ukrainian innovation and business support infrastructure is under-networked, in comparison to their Western counterparts. The Ukrainian innovation and business support infrastructure is not as actively engaged in networks as happens in the West.

There is no official data about activities of the other types of organizations that were created to support innovation in Ukraine. However, some general data about the total number of these organizations is available, yet their activities are not visible enough to be analysed in details.

Taking into consideration the chronic state of most business support organizations in Ukraine, the lack of international links might be seen as a minor problem. However, being isolated from the international learning experiences, best practices, methodologies prevent these organizations to perform their job effectively. In this sense, they cannot provide business support services in an adequate manner, a situation that makes it increasingly difficult for the business to become more competitive in Ukraine. The Ukrainian innovation and business support infrastructure must be equipped with appropriate resources that comply with the international standards when it comes to business support services methodology and tools. This in turn will help to minimize the gap between the Ukrainian organizations and their potential foreign counterparts.

3.2 Government S&T and Innovation Programmes

Specific governmental S&T programmes are an important component of the central government support of R&D and innovation.

The main goal of these programmes is to connect research institutions and industrial enterprises in solving important S&T problems and in organization of production of

innovation products with the assistance of the state. Thus, the aim of state scientific, technological and innovation programmes is the implementation of R&D results according to established priorities in science and technology development. These priorities have to be established every 5 years by the Ukrainian Parliament.

According to this legislation, the priorities of S&T and innovation have to be established by two separate state laws every five years. Yet, the last updates in these laws were passed during the previous decade. However, these priorities have not been revised in recent years. For that, instead of the two required laws only one, the State Law of Ukraine 'On Priorities in Science and Technology Development' was approved by the Parliament in 2012. These priorities include:

- Basic research of prominent multi-disciplinary scientific problems
- Environmental studies
- Information and communication technologies (ICT)
- Energy generation and energy-saving technologies
- New materials
- Life sciences, including methods of fighting leading cause of illness and disease

However, there is no available data on the corresponding shares of the total GBAORD allocated for these research priorities.

In this regard, the government programs have been prepared in accordance with these priorities, based on the requirements stated in this legislation. The executors of the programs could receive additional financing and/or other financial incentives for their activities²¹.

The science and innovation policy instrument and programmes have their roots in the former Soviet Union science system. Nevertheless, this policy instruments have undergone several changes to meet the needs of the transition to an open market economy. Special legal acts regulate the initiation and performance of state target programmes in the spheres of economy and society (general state programmes, regional programmes, branch of

²¹ Shkvorets Yu. F. (2016) Programno-tsilivoe upravlinnia formuvanniam i realizatsieu derzhavnih prioritetiv naukovo-tehnichnogo ta innovatsiynogo rozvitku. – Kyiv- Serdiuk Publishing

industry programmes, economic, cultural, environmental, healthcare, defence programs etc.).

The development of the priorities in science and technology is carried out by the R&D and innovation projects based on the governmental goals set by science and technology programmes. These programmes have to combine the capacities of the private and the governmental sector. However, in Ukraine, enterprises participated in less than 1% of governmental science and technology programmes. In developed countries, the project's co-funding by the private sector is often one of the criteria necessary for the funding decisions. There are no effective instruments or mechanisms to set up strong ties with partners within the programs. Another problem is that the programmes are developed by ministries, state committees and/or agency staff, without the contribution of the private sector. This in turn results in programmes that are not well designed, especially when it comes to the financial planning and co-ordination between the different entities or the general implementation plan of the project. In addition, the funding decisions are not taken by a group of independent evaluators. This prevents a transparent procedures and selection criteria, as happens in developed countries.

In the years after independence these programmes worked properly. However, since late 1990s and the beginning of 2000s the role of these programmes has declined. In the period of crisis of 2008-2009, the financing of state programmes dropped to almost zero. The program "Science in Universities" received funds that represented only 1.1% from the initially announced amount. As a result, none of the objectives set by the programmes were achieved.

In 2012, the central government established a ban on new S&T programs. Thus, only a few long-term programmes are currently being implemented. This is due the financial importance this programmes presents for the Ukrainian economy.

On the other hand, the government has made it possible to renew some programmes or to start absolutely new ones only if they can prove they are effective and in accordance with their priorities.

3.3 International co-operation in S&T

The Ukrainian government undertakes a great deal of endeavours to stimulate co-operation with foreign states. However, this co-operation is concentrated more in R&D activities, not on innovation.

Ukraine has bi-lateral agreements on co-operation in S&T with 70 countries. 23 of these countries belong to the EU (see Figure 5). However, not all the agreements are equally important for Ukraine. Some of them have no practical use due to a lack of economic resources for their development and implementation. Almost all scientific co-operations with Russia were terminated in 2014 as a result of events in Crimea and Donbas. On the other hand, the relations with other countries, especially in Europe have improved.

Ukraine signed an agreement of association with the EU Horizon-2020 programme in March, 2015. This opened the way for more active co-operation with EU countries in R&D. However, extra support from the Ukrainian government for the promotion of joint research and innovation activities is needed, as well as additional links between Ukrainian research establishments and their EU counterparts. This is required in order to foster partnerships for future projects. This will also help to develop support capacity-building measures in research and innovation using different instruments provided by the corresponding policies. In this order of ideas, the first priority is specialized innovation –oriented programmes.

INTERNATIONAL AGREEMENTS IN THE SCIENCE AND TECHNOLOGY SECTOR BETWEEN UKRAINE AND OTHER COUNTRIES

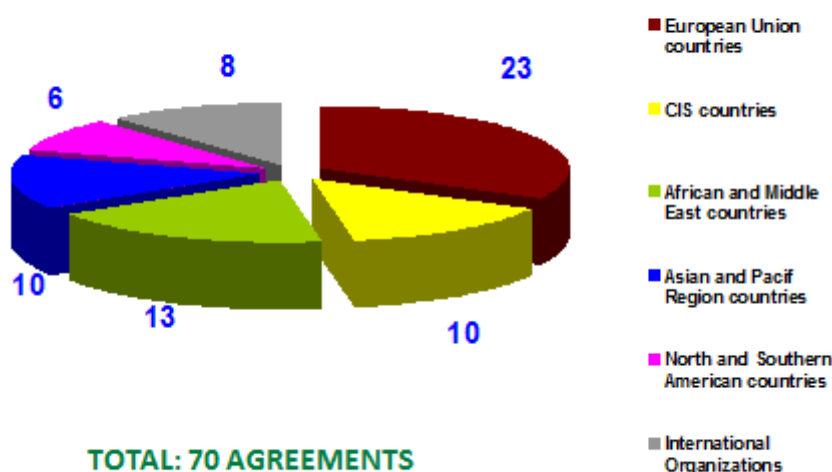


Figure 5. Bi-lateral agreements on co-operation in S&T

Source: Ministry of Education and Science of Ukraine, 2016

There are still a number of barriers that prevent international co-operation between Ukrainian and foreign organizations. **Financial regulations** remain as one of the key barriers to setting up these agreements. The lack of trust in Ukraine hinders local organizations from becoming the leading partner in international research consortia. This is because of the difficulties that entities face when trying to transfer money from Ukraine to potential project partners. Additionally, the decision-making process is highly centralized in research organizations and in many cases the control over the research groups from the administrative side is excessive.

4 Conclusions and Recommendations

The problems in the S&T and innovation spheres in Ukraine can be only solved by coordinating efforts between the state and the scientific community.

Ukraine not only needs a serious transformation within the S&T and innovation systems, but it is also important that changes are made in the country's business environment. For this to happen, the introduction of **adequate legal protection for intellectual property rights** is critical, considering the high impact it would have for individual researchers, S&T institutes and innovative enterprises, especially from foreign countries. This is also important for foreign companies looking to engage in direct investment, or other forms of business alliances. Similarly, this will facilitate the cooperation between foreign and domestic companies. Ukraine needs more institutions that have the potential to finance the innovation sector. These institutions should be willing to accept the high level of risks in turn for high potential profits. For these reasons, these institutions should not require collateral or charges for interest. It would also be important to provide short, medium and long term loans to contribute to the development of the innovation activities in Ukraine. For the business environment, this would be useful to create conditions where entrepreneurs will be willing to trade a significant part of their shares with foreign entities that will also be willing to be acquired or to participate in public offerings.

The labour market has to be sufficiently flexible in order to provide the necessary work force for the growing firms.

Special attention has to be paid to the development of cooperation with the member states of the EU. This cooperation can provide important expertise in advanced areas, and will help to compensate for the aforementioned difficulties of the national innovation system of Ukraine. Some preconditions to expand these cooperation agreements are already in place. Ukrainian researchers are currently developing projects to have a more active participation in the H2020 funding scheme. It is also important to attract the private sector to engage in joint innovation projects in Ukraine. This will allow for more responsible cooperation and will increase the chances of success of the projects, as some neighbours in the EU member states have demonstrated.

The increase in the R&D and innovation expenditure itself cannot solve the institutional problems that exist in Ukraine. The main challenge to the government in the S&T areas is to empower the national research organizations to contribute in a better manner to the economic recovery of Ukraine and its further development. For the time being, the investment in R&D is viewed largely as a liability. This is partly the result of structural and organisational mismatches that hinder the development of these projects. Similarly, the low relevance these investments have in terms of the market realities is a hinderance to its development. The creation of favourable conditions for science-based SMEs could help to solve the problem of adequate utilization of intellectual capacities of scientists and engineers. Furthermore, it can contribute to a positive structural change in the national economy, which has a high shares in traditional heavy industries.

The problem of relatively low innovation activities in the country is, to a large extent, associated with the **underdeveloped innovation culture**. At the same time, the level of development in innovation culture is dependent on other cultural factors like the **level of social capital and trust in the society**. If there is lack of trust among the citizens and organisations of the society, and the effectiveness of government is not well established, support measures that function well in the EU or in other developed world are not likely to succeed in Ukraine. Ukraine faces great challenges in these respects and the support to the civic society should be prioritized, since it is a necessary condition to develop an innovation culture. Nevertheless, it is also possible that support to the innovation culture may have a

positive impact on civic society at large. From the point of view of social and economic development, there is evidence suggesting that innovation activities are liable to certain parts of the society. Cultural factors, such as openness and tolerance of the people in a region, might affect these developments. The government could also search for opportunities to provide a mixture of vibrant cultural spaces and relaxed urban infrastructures in suburban areas that may be attractive for talented work force. Nevertheless, it is very difficult to imitate innovation cultures in the government sector. This is because of all the barriers the local government in Ukraine has at the time to develop new projects that are perceived as not relevant for the current situation of the country.

Regarding governmental organisations, Ukraine could make use of the lessons learned about the barriers hindering the advancement of innovation culture in a bureaucracy. Advancement in the innovation culture for governmental organisations is dependent on many factors. These factors include the clarification of organisational goal setting procedures, provision of sufficient resources, monitoring and communicating good practices, as well as effective human resource management including recognition and reward mechanisms. All these factors mutually reinforce the support measures in the innovation culture for governmental organisations. It is likely that the situation is not different in Ukrainian governmental organisations. Unfortunately, the idea of knowledge - based economy driven by innovation has been seriously discredited by the Ukrainian society. This is because the ineffective and inconsistent actions of the authorities in this area that frequently advertised the projects, yet they are never materialised. In this sense responsibility in the execution of these projects is a key factor that has not been well defined. There are several ministries and agencies in Ukraine which are responsible for support of innovation activities in the country but their competences are overlapping and not clearly defined. The most recent example is the differences in understanding of competences in innovation policy between the Ministry of Education and Science and the Ministry of Economic Development and Trade. Both ministries have innovation policy units in their structures that cannot co-operate effectively. This can be seen in a recent discussion about the draft of key laws in innovation sphere in Ukraine. In addition, other mechanisms to implement innovation policy tended to suffer because they do not receive the necessary support from the governmental authorities. In many cases, legal acts on innovation support have a lower priority when compared to some other state regulations (e.g. Law on the State

Budget). This in turn results in innovation initiatives being blocked at the different levels in the government. These unfavourable conditions hinder the development of R&D sector creating gaps between science, education and the economy.

Ukraine urgently requires organizational transformation to stimulate innovation activities in the country. Horizontal innovation policy coordination is necessary in the country due to the complex government and administration organization present in Ukraine. This should be done with the intention of allowing different entities to coordinate their activities in and beyond their policy fields (horizontalisation). This is a complex and dynamic process that must be taken into account when it comes to the development of S&T, paying special consideration to the internal and external factors present in this process. For this, coordination is treated as a process, not as the outcome. This is a highly complicated task that requires an **advanced level of coordination between the various policy instruments.** This usually includes public funding that at times is hard to get in countries with transition economies like Ukraine. Moreover, regulatory changes can affect the investment in R&D without the intervention of public funds. This can be achieved by attracting foreign investment to the country, either private or governmental, in order to develop R&D projects in Ukraine. Similarly, benefits in subsidies, tax incentives, loans and regulations (e.g. environmental regulation which can have a significant impact on innovation) can have a positive impact for the R&D sector in Ukraine.

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Annex I – Technoparks of Ukraine

<i>No/№</i>	<i>Name of the technopark</i>	<i>Location</i>	<i>Date of the state registration (month, year)</i>
1.	"Paton Institute of Welding"	Kyiv	07.2000
2.	"Institute of Monocrystals"	Kharkiv	07.2000
3.	"Microchip technologies and materials, optoelectronics and sensors"	Kyiv	06.2001
4.	"Coal machines"	Donetsk	11.2001
5.	"Ukrinfoteh"	Kyiv	11.2002
6.	"Kiev Polytechnics"	Kyiv	06.2003
7.	"Institute of technical physics"	Kyiv	09.2002
8.	"Intellectual information technologies"	Kyiv	12.2003
9.	"Yavoriv"	Lviv region	08.2007
10.	"Agrotechnopark"	Kyiv	10.2007
11.	"Textile"	Kherson	12.2007
12.	"Machine-building technologies"	Dnipro	11.2008
13.	"Eco- Ukraine"	Donetsk	-
14.	"Scientific and Learning Equipment"	Symy	-
15.	"Resources of Donbass"	Donetsk	-
16.	"Ukrainian microbiological centre of synthesis and new technologies"	Odessa	-

Source: Ministry of Education and Science of Ukraine, 2016

Annex II – Science parks of Ukraine

<i>No/№</i>	<i>Name of the Science park</i>	<i>Founder</i>	<i>Location</i>
1.	Corporation 'Science Park of Kiev Shevchenko University'	Kiev Shevchenko national University, National University of food technologies, Palladin Institute of Biochemistry, Institute of Organic Chemistry, Frantsevich Institute of problems of materials	Kyiv
2.	Corporation "Science park of Mikolaiv National Agrarian University 'Agroperspectiva'"	Mykolaiv National Agrarian University	Mykolaiv
3.	Corporation 'Science park	State enterprise 'National centre of	Kyiv

	'Kyivska Politehnika'	implementation of the state investment programs' University KPI	
4.	Science park 'FED'	FED company	Kharkiv
5.	Science park "Radio electronics and informatics"	Kharkiv national radio-electronic university, S&T Center of applied radio-electronics of the NASU	Kharkiv
6.	Science park "Innovation and investment cluster 'Ternopillya'	Gas equipment plant 'Alfa-gazokomplekt', Ivan Pulyi University 'Integral' company, regional administration	Ternopil
7.	Science park "Naukograd-Kharkiv"	'Pidgorny Institute of Machine-building problems' «IPMasch company of the NASU», «Learning and research complex Resurs»	Kharkiv
8.	Science park of the National University of bioresources and environmental utilization "Sustainable utilization of environment and the quality of life"	National University of bioresources and environmental utilization and the factory, subordinated to this university	Kyiv
9.	Company Science park 'Energy efficient technologies'	5.1 <i>Kondratyuk Poltava National Technical University, Ivano-Frankivsk National Technical University of Gas and Oil, National Mining University, Khmelnytsky National University</i>	Poltava
10.	Company Science Park 'Labour medicine and labour protection –new systems and technologies'	Seven private companies and hospitals, State Institute on health protection in transport sector of the Ministry of Health of Ukraine, State Institute for labour protection and labour safety, State research institute of television technologies	Odessa
11.	Company Science Park "Biometric innovation and technological cluster - BITEK"	no information about the founders	Kharkiv
12.	Company Science Park "Center for technology transfer and civilian protection"	NGO Innovation chamber of Ukraine, Ukrainian state Research institute of construction materials NDIBMV, Ukrainian state institute of civilian protection, Private	Kyiv

		company 'Semilogistics'	
13.	Company Science Park of Odessa Polytechnic University	Odessa National Polytechnic University, Avers company, Foundation 'Science and Education XXI'	Odessa
14.	Company Science Park of Pricarpathian University	Vasyl Stephanik Pricarpathian National University	Ivano-Frankivsk
15.	Company Science Park of National Technical University 'Kharkiv Polytechnic Institute'	Company 'Spivdruzhnist', Company 'Pivdencabel', National Technical University 'Kharkiv Polytechnic Institute'	Kharkiv
16.	Company Science Park of Kyiv National Economic University	6 Vadim Hetman Kyiv National Economic University	Kyiv
17.	Company Science Park "Aerospace innovation technologies"	State enterprise 'Dniprokosmos', company 'Elmiz' state enterprise 'Zavod 410', state company 'Naukovo-vyrobnychy tsentr', National Aviation University	Kyiv
18.	Company Science Park 'DonNU- Podillya'	NGO 'Institute for socialization of innovations', Podillya Agency for Regional Development Donetsk National University	Vinnitsa
19.	Company Science Park of the State Ecological Learning and Management 'Chernobyl'	Company 'Ukrainian centre for radiation safety', State Ecological Learning and Management,	Kyiv